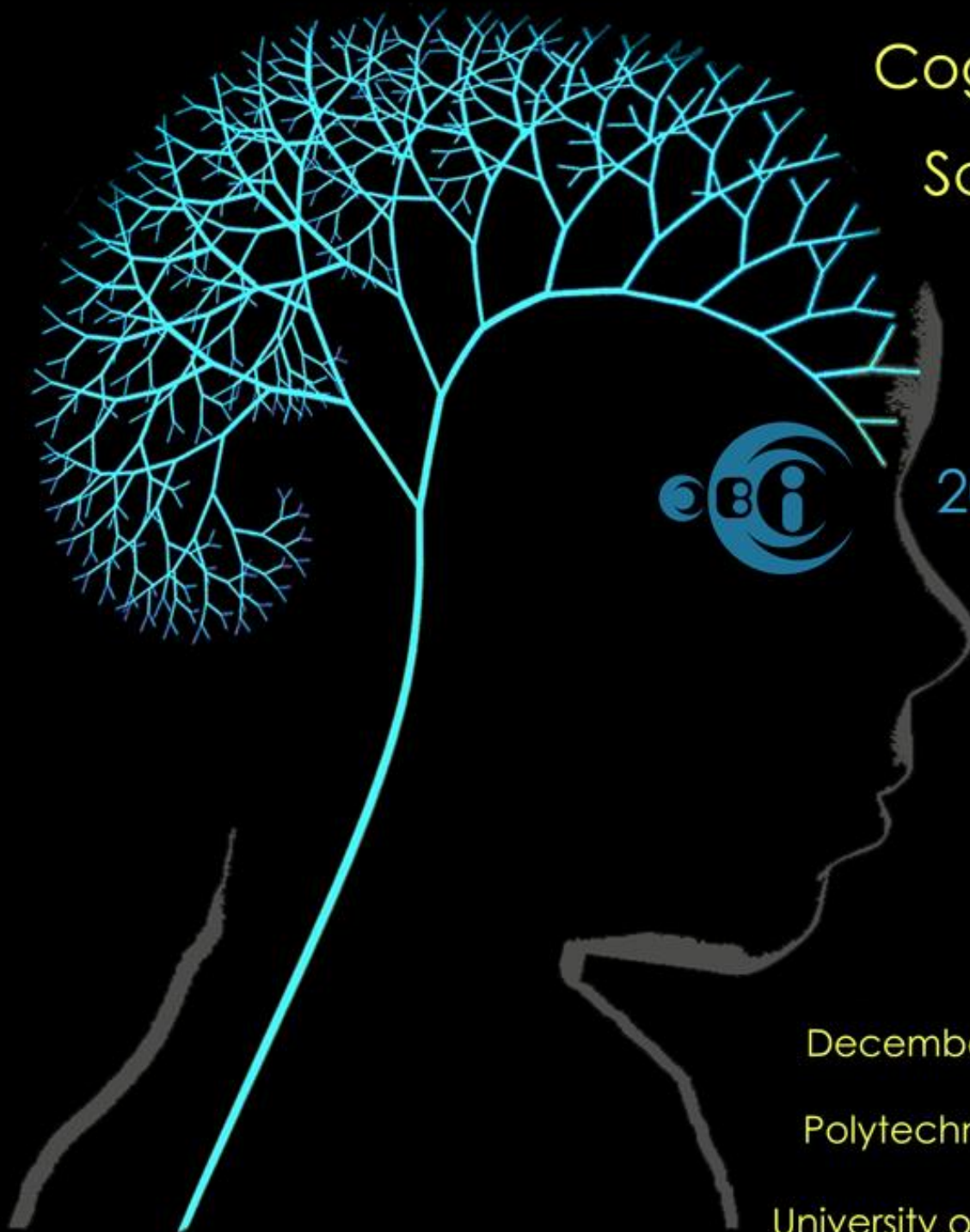


10th Brazilian International Meeting
on
Cognitive
Science



2015

December, 7 - 11

Polytechnic School

University of São Paulo



EBICC – 2015

International Brazilian Meeting on Cognitive Science

Program and Abstracts

SBCC – Sociedade Brasileira de Ciência Cognitiva
EPUSP – Escola Politécnica da Universidade de São Paulo
FFLCH – Faculdade de Filosofia, Letras e Ciências Humanas

São Paulo, Brazil
December 7 to 11, 2015



EBICC - 2015 - International Brazilian Meeting on Cognitive Science

The EBICC is an international meeting that has taken place in Brazil since its inception, in 1995. Organized by the Brazilian Society of Cognitive Science, the event is interdisciplinary in nature and brings together researchers in the fields of Cognitive Science and Philosophy of Mind. The EBICC acronym is made up of the initials of the Portuguese words used to name it: Encontro Brasileiro Internacional de Ciência Cognitiva (in English: International Brazilian Meeting on Cognitive Science).

The 10th EBICC will take place during December 7-11, 2015, at the Polytechnic School of Engineering of the University of São Paulo, situated in one of the world's largest cities. The city of São Paulo has an intense multicultural life, a cosmopolitan ambience, and since its founding has gladly welcomed immigrants from all corners of the world.

The meeting has a workshop style, including keynote conferences and roundtables for debates with experts. Its daily communication sessions feature the oral presentations of complete works selected by reviewers from the scientific committee. Posters about works in progress and speculative ideas are also welcome, and are presented in special sessions.

The central theme of the meeting is:

- Situated and Embodied Cognition: Information and Autonomous Action

The theme focuses on the situated and embodied view of cognition. However, alternative views are considered for work submissions and will be treated in the conferences and discussions.

The main sub-theme is Information and Autonomous Action. This considers questions concerning the informational coupling between the cognitive agent and the environment.

Around the central theme there are several sub-themes targeted by the event:

- Information, mind, and cognition.
- Information, structure, and cognition.
- Logic, information, and intelligence.
- Semiotics and cognition.
- Language, communication, and cognition.
- Perception, action, and attention.
- Art, emotion, neuromodulation, and cognition.
- Evolution of the concepts of cognition, mind, and brain.
- Computational and cognitive modeling.
- Machine learning, neuromathematics, and cognition.
- Cognitive architectures.
- Cognition, technology, and action.
- Agents, cognitive games, and their educational and socio-cultural roles.
- Ubiquitous computing and its relations with cognition and society.

CONFERENCES AND ROUND TABLES

December 7 - Monday

Time	Place	Activity	Title	Presenters	Mediator
9:00 - 12:30	Amphitheater Electrical Eng. Poli	NVIDIA Workshop	Mini-curso de programação em CUDA (Portuguese only)	Esteban Clua (UFF)	
12:30 – 14:00		Lunch			
14:00 – 15:00	Amphitheater Electrical Eng. Poli	NVIDIA Workshop	Palestra “NVIDIA e o Deep Learning” (Portuguese only)	Arnaldo Tavares (NVIDIA)	
15:00 – 16:00	Amphitheater Electrical Eng. Poli	NVIDIA Workshop	Palestra “Deep Learning com NVIDIA DIGITS” (Portuguese only)	Nader Vasconcelos (UFF)	

Dec 7 Parallel Activities

15:00 - 17:00	Poli ADM	Reception and Registration			
15:00 - 17:00	Poli Electrical Eng. Building	Poster Assembling			

The NVIDIA Workshop will be an extra activity of EBICC 2015. It will take place in the Amphitheater of the Electrical Engineering building of Polytechnic School, USP (Poli). This workshop is freely opened to public participation.

EBICC 2015 Reception, event material pick up, registration and payment will start on Dec 7th, 15:00-17:00 and extends to Dec 8th, 8:00-8:30. It is necessary to show a document with photo to confirm / make your registration.

December 8 - Tuesday

Time	Place	Activity	Title	Presenters	Mediator
08:00 – 8:30	Poli ADM	Reception Registration			
08:30 - 09:00	Auditorium	EBICC 2015 Opening Session	Conference chair talk SBCC president talk Provost talk	João E. Kogler Jr Marcos Antonio Alves José Eduardo Krieger / Antônio M. Saraiva	
09:00 - 10:00	Auditorium	Conference	Computational Complexity and Information Measure: The Turing and Shannon ways	José Roberto C. Piqueira (USP/Poli)	Fábio Roberto de Miranda (INSPIER)
10:00 - 11:00	Auditorium	Conference	A Slim Defense of Narrow Content	Frederick Adams (University of Delaware)	André Leclerc (UFC)
11:00 - 13:00		Lunch			
13:00 - 14:00	Auditorium	Conference	Simulation and Adaptivity	João José Neto (USP/Poli)	Ricardo L.A. Rocha (USP)
14:00 - 15:30	Auditorium	Round Table	Computational Models for Simulating Cognition and Behavior: Reflections on its Methods, Scope, and Underlying Epistemology.	Diego Zilio Alves (UFES) Flávio S. C.da Silva (USP/IME) Leonardo L. de Carvalho (UFVJM) Luciano Silva (U.P. Mackenzie)	Vinicius Romanini (USP)
15:30 - 15:45		Coffee-break			
15:45 - 17:15	Auditorium	Round Table	Information and Communications Technology (ICT) and Society: Ethical issues on the influences of ICT in individuals' daily life	Arturo Forner-Cordero (USP/Poli) Guiou Kobayashi (UFABC) João Antonio de Moraes (CLE/Unicamp) Mariana Broens (UNESP)	José A. Q. Gonzalez (UFABC)
17:15 - 18:30	Auditorium	Round Table	Advances and Perspectives in Cognitive Architectures	Ângelo C. Loula (UEFS) Mauro Muñoz (USP/Poli) Ricardo R. Gudwin (Unicamp/FEEC)	Marcio Lobo Netto (USP)

December 9 - Wednesday

Time	Place	Activity	Title	Presenters	Mediator
08:15 - 09:10	Poli-Eletrica	Communication Session	Papers & Posters	See Paper and Poster Scheduling Tables	SEE PAGE
09:30 - 10:30	Auditorium	Conference	A Neural Link-centred Approach to Brain Connectivity	Luiz Antonio Baccalá (USP/Poli)	Oswaldo F. Pessoa Jr. (USP)
10:30 - 11:30	Auditorium	Conference	Can Brain Connectivity Analysis Help Understand Brain Functions ?	Koichi Sameshima (USP/School of Medicine)	Renato Teodoro Ramos (USP)
11:30 - 13:30		Lunch			
13:30 - 14:30	Auditorium	Conference	Disentangling Three Concepts of Information in Cognitive Science	Andrea Scarantino (Georgia State University)	João A. Moraes (CLE/Unicamp)
14:30 - 16:00	Auditorium	Round Table	Information, Context and Structure in Cognition	João E. Kogler Jr. (USP/Poli) Marcos F. Lopes (USP/FFLCH) Paulo E. Santos (FEI) Renato Teodoro Ramos (USP/Medicina)	Marcelo F. da Costa (USP)
16:00 - 16:15		Coffee-break			
16:15 - 17:45	Auditorium	Round Table	Machine Learning and the Probabilistic Modelling of Cognition and Behavior	Edson S. Gomi (USP/Poli) João Ricardo Sato (UFABC) Nestor Caticha (USP/IF) Peter M.E. Claessens (UFABC)	Fábio G. Cozman (USP)
17:45 - 19:30 (Parallel session)	Auditorium	Round Table	Language, Communication and Cognition	André Leclerc (UFCE) Evani Viotti (USP/FFLCH) Leland McCleary (USP/FFLCH) William Pickering (CLE/Unicamp) Walter Lima Jr. (UMESP)	Marcos F. Lopes (USP)
17:45 - 19:00 (Parallel session)	Anphitheater Electrical Eng. Poli	Round Table	Computational Intelligence and Cognition	Emilio Del Moral Hernandez (USP/Poli) Francisco Javier Roperro Pelaez (UFABC) João Ranhel (UFPE)	Leandro Silva (U. Mackenzie)

December 10 - Thursday

Time	Place	Activity	Title	Presenters	Mediator
08:15 - 09:10	Poli-Eletrica	Communication Session	Papers & Posters	See Paper and Poster Scheduling Tables	SEE PAGE
09:30 - 10:30	Auditorium	Conference	Neutral Monism from a Pragmatic Perspective	Sofia Inês A. Stein (UNISINOS)	Leonardo L. de Carvalho (UFVJM)
10:30 - 11:30	Auditorium	Conference	The Non- Image-Forming Visual System: Its Relation To Sleep, Circadian Rhythm, Pupillary Reflex And Other Functions	Dora S. Fix Ventura (USP/Institute of Psychology)	Christina Joselevitch (USP)
11:30 - 13:30		Lunch			
13:30 - 14:30	Auditorium	Conference	Explaining Cognition: The Cognitive Neuroscience Revolution	Gualtiero Piccinini (University of Missouri)	Jonas G. Coelho (UNESP)
14:30 - 16:00	Auditorium	Round Table	Cognitive Neuroscience of Arts: A dialog among Human, Biological and Exact Sciences	Mirella Gualtieri (USP/IP) Maira M. Fróes (UFRJ) Patrícia Vanzella (UNB/UFABC) Ronald Ranvaud (USP)	Fábio Leão Figueiredo (USP)
16:00 - 16:15		Coffee-break			
16:15 - 17:15	Auditorium	Conference	A Few Remarks on Machine Ethics and Transhumanism	João de Fernandes Teixeira (UFSCar)	Marcos A. Alves (UNESP)
17:15 - 18:30	Auditorium	Round Table	The Mind-Body Problem: Reductive and Nonreductive Physicalisms	Alfredo Pereira Jr. (UNESP/Botucatu) Jonas Gonçalves Coelho (UNESP/Bauru) Oswaldo F. Pessoa Jr. (USP/FFLCH)	Diego Zilio Alves (UFES)
18:30 - 19:20	Auditorium	Round Table	Some Historical And Evolutionary Perspectives On Mind, Brain, and Cognition	Hamilton Haddad (USP/IB) Maria Inês Nogueira (USP/ICB)	André M. Cravo (UFABC)
19:20 – 20:30	Auditorium	SBCC Meeting	Board report Election of new board Plans for next EBICC SBCC Membership	Marcos Alves SBCC Board	

December 11 - Friday

Time	Place	Activity	Title	Presenters	Mediator
08:15 - 09:10	Poli-Eletrica	Communication Session	Papers & Posters	See Paper and Poster Scheduling Tables	SEE PAGE
09:30 - 10:30	Auditorium	Conference	Thinking with friends: Reflexivity and Situated Cognition in Friendship	Claus Emmeche (University of Copenhagen)	Maria Eunice Q. Gonzalez (UNESP)
10:30 - 11:30	Auditorium	Conference	The Conception of Emotion According to Peirce	Lauro F. Barbosa Silveira (UNESP/Marilia)	Ivo A. Ibri (PUC-SP)
11:30 - 13:30		Lunch			
13:30 - 14:45	Auditorium	Round Table	Cognition in Peirce's Semiotic	A. Vinicius Romanini (USP/ECA) A. João M. Queiroz (UFJF) Ivo Assad Ibri (PUC-SP)	Ricardo R. Gudwin (Unicamp)
14:45 - 16:00	Auditorium	Round Table	Logic, Consequence Operators, and Information	Hércules A. Feitosa (UNESP) Ítala M. L. D'Ottaviano (Unicamp) Marcos Antonio Alves (UNESP/Marilia)	Renata Wassermann (USP)
16:00 - 16:15		Coffee-break			
16:15- 17:00	Auditorium	Cultural Session		Danilo J. Bellini, Paulo E. Santos, Pedro Paulo Kohler B. Santos	Ronald Ranvaud (USP)
17:00 - 18:00	Auditorium	Conference	Autonomous Action in Complex Mechanical Systems: an Actual Dilemma ?	Maria Eunice Q. Gonzalez (UNESP/Marilia)	Mariana C. Broens (UNESP)
18:00 - 19:00	Auditorium	Closing Session	Marcelo Dascal Prize Presentation of awarded work author (15min) Farewell message	João A. de Moraes M.D. Prize winner Oswaldo Pessoa João Kogler	

PAPERS

WEDNESDAY – DEC 9

ROOM	DEC 9 – Wednesday
Amphitheater	<ul style="list-style-type: none"> Paper 6 - Beatriz Sorrentino Marques (FFLCH-USP): "Presuppositions about the role of consciousness in the Agent Causation conception of agents and the problem of the Disappearing Agent" Paper 37 - Richard Hanley (U. Delaware): "Skepticism revisited: Chalmers on <i>The Matrix</i> and brains-in-vats" Mediator: Osvaldo Pessoa
B2-03	<ul style="list-style-type: none"> Paper 19 - João Pedro P. Ruivo et al. (Poli-USP): "A model for facial emotion inference based on planar dynamic emotional surfaces" Paper 28 - Luiz C. Vieira & Flavio S. C. da Silva (IME-USP): "Assessment of fun in interactive systems: a survey" Mediator: Felipe Pait
B2-04	<ul style="list-style-type: none"> Paper 22 - Cacilda Vilela (FFLCH-USP): "Face-to-face interaction and the minimal enchronic unit" Paper 44 - Garri Hovhannisyan & Caleb Dewey (York U. - Toronto): "Natural and normative dynamical coupling" Mediator - João Moraes
B2-05	<ul style="list-style-type: none"> Paper 48 - Bruno Camargo & Peter Claessens (UFABC): "Dynamics of subjective contrast in sequential comparison of Gabor patches" Paper 58 - Mirella T. S. Barboni et al. (IP-USP): "Physiological mechanisms underlying ON and OFF visual perception in humans" Mediator: Balázs Vince
B2-10	<ul style="list-style-type: none"> Paper 7 - Charles Borges (PUC-RS): "Brain-Body-Life: Towards a panpsychist theory of embodied cognition" Paper 41 - Daniella de Aguiar et al. (UFJF): "Creativity as niche construction and some examples in theatrical dance" Mediator: Vinicius Romanini
Auditory	<ul style="list-style-type: none"> Paper 8 - Zhengmao Ye & Habib Mohamadian (Southern U.): "Integration of fuzzy C-means clustering and fast level set for aerial RGB image segmentation"

PAPERS

THURSDAY – DEC 10

ROOM	DEC 10 – Thursday
Amphitheater	<ul style="list-style-type: none"> • Paper 3 – André Bazzoni (UCLA): “ Logical and philosophical foundations of partial belief models” • Paper 24 - Edilson Rodrigues et al. (UFABC/FEI/USP): A qualitative-spatial account for the Brazilian Portuguese preposition ‘em’ ” • Mediator - Osvaldo Pessoa
B2-01	<ul style="list-style-type: none"> • Paper 5 - Lucy Mari Tabuti et al. (Poli-USP) : “ Análise das competências e habilidades de raciocínio lógico em um jogo de lógica nos meios físico e digital” • Mediator - Roseli Lopes • OBS - Presentation in Portuguese
B2-05	<ul style="list-style-type: none"> • Paper M. Dascal Prize - Pablo de Araújo Batista “Superinteligência artificial: Utopia ou distopia tecnológica?” • Mediator - João Moraes • OBS – Presentation in Portuguese
B2-10	<ul style="list-style-type: none"> • Paper 15 - Roberto Ivo da Rocha Lima Filho (UFRJ): “Traders’ decision-making processes: results from an investment simulation monitored with an EEG” • Mediator - Osvaldo Guimarães

PAPERS

FRIDAY – DEC 11

ROOM	DEC11 – Friday
Amphitheater	<ul style="list-style-type: none"> • Paper 54 - Walter Lima Jr. & J. Reinaldo Silva (UMESP): “From Licklider to cognitive service systems” • Paper 59 - Samuel Bellini Leite (UFMG): “The revisionist strategy in cognitive science” • Mediator - Vinicius Romanini
B2-01	<ul style="list-style-type: none"> • Paper 2 - Vinicius Fernandes et al. (UFABC): “Analysis of sample entropy during a resting-state EEG recording in Alzheimer's disease” • Paper 29 - Luciana Campos et al. (UFMG): “A concurrent, minimalist model for an embodied nervous system” • Mediator - Carlos Santos
B2-05	<ul style="list-style-type: none"> • Paper 23 - Paulo Uzai (Unesp-Marília): “A crítica de Armstrong à noção searleana de background” • Paper 40 - Lucas Machado (FFLCH-USP): “É a consciência uma tela que vê a si mesma?” • Mediator - João Moraes • OBS – Presentations in Portuguese
B2-06	<ul style="list-style-type: none"> • Paper 27 - Ágnes Urbin & Beáta Korcsok (Budapest UTE): “Etho-robotics: an insight” • Mediator - Marcos Barreto
Auditory	<ul style="list-style-type: none"> • Invited paper - João Fabiano (Oxford): “Complexity and fragile moral cognition” • Mediator - Osvaldo Pessoa

POSTERS

All sessions

from 8:15 AM to 9:10 AM

Dec 9 to 11

Poster number	Title	Authors
1	Application of Support Vector Machines for adulteration detection of bovine milk	Wesley Becari, Gabriel Durante, Henrique E. M. Peres & Francisco Javier Ramirez-Fernandez.
9	Repetition probability modulates repetition suppression without perceptual awareness	Leonardo S Barbosa & Sid Kouider.
10	A modelagem multiagente como metodologia de estudos de fenômenos sociais	Denis James Pereira & Leonardo Lana De Carvalho.
12	Ethanol Fuel Analysis Using Artificial Neural Networks	Daniel Rodrigues, Wesley Becari, Alexandre Neto, Péricles Oliveira, William Silva & Henrique Peres.
13	Information and Complexity in the Study of Cognition	Mariana Vitti-Rodrigues.
14	An Event-Related Analysis Of The Traders Decision-Making By Using ICA	Marcelo Taddeo & Roberto Ivo Da Rocha Lima Filho.
16	What can a drone operators' PTSD tell us about embodied and extended mind?	Marek Vanzura.
18	The relation between James and Damasio: the body loop of emotions and feelings	Luiz Augusto Rosa.
20	Gain Control at the First Visual Synapse	Kae Leopoldo, Diego Decleva, Maarten Kamermans & Christina Joselevitch.
21	Phineas Gage and ADHA. Some related aspects.	Ana Gomes & Joao Fernando Marar.
25	Integration of the basal ganglia connectivity and structural information to enhance the default mode network detection perturbed by motion artifacts	Aura Forero.
26	Behavior Analysis and Neuroscience: Exploring frontiers for a new neuroscientific model	Ricardo Tiosso, Marcelo Benvenuti & Christina Joselevitch.
31	Pointing gesture for communication between robots	Wallas Pereira, Angelo Loula & Joao Queiroz.
32	Long-term time perception: A Pilot Study	Camila Agostino & Yossi Zana.
33	E-picturebooks and Cognitive Niche Construction	Thales Estefani, Pedro Atã & João Queiroz.

34	Computational tool for structural analysis of concept maps for assessing mappers proficiency	José F. Santos Neto & Paulo R. M. Correia.
35	Modeling the body temperature regulating system through artificial neural networks	Lucas A. Caetano, Reginaldo Júnior Palazzo & Nelson Afonso Lutaif
36	Emergence of Bodily Gestural Communication among Robots	Maria Alice Leal & Angelo Loula.
38	The Persistence of Mental Representation and the different levels of representation	Rogério S. Teza.
39	Sentimental analysis of social network messages: Twitter Data Mining	Ariana Moura Da Silva & Ricardo Luis de Azevedo Da Rocha
42	Proprioceptive-visual integration and situated embodied cognition: A developmental perspective	Edison De Jesus Manoel, Pedro F.V. Felício, Roberto Gimenez, Cristiane Makida, Rafael Do Nascimento Soares & Alessandro Freitas.
43	Society semantics as the logic of quasi-truth	Luiz Henrique Da Cruz Silvestrini
45	Monism of Triple Aspect a proper concept to sustain the ontology of the nature of mind-body in Meditation	Edilene De Souza Leite.
46	Self-organization and circular causality: where are we going with neo-mechanicism?	Mariana Matulovic & Maria Eunice Gonzalez.
47	A non-linguistic analysis of information: the possibility of other forms of expression of thoughts	Amanda Veloso Garcia.
49	Synchronization, self-organization and creative action: new horizons in cognitive science studies	Renata Souza.
50	A software platform for adaptive systems modelling and simulation, with application to the study of cognitive processes	Ian Oliveira and Joao Eduardo Kogler Junior.
51	The Consciousness Concept as Pattern Recognition	Gilberto De Paiva
52	Essay on the description of human behavior in engineering research projects	Diego Queiroz & Ricardo Luis de Azevedo Da Rocha
53	Learning and perception of causality	Peter Maurice Erna Claessens, Victor Gregório De Queiroz Lima & Manasses P. Nóbrega.
55	Moral action and complexity: An essay on human morality based on self-organization theory	Josiane Gomes de Oliveira & Sílvia Helena Guttier Faria.
56	Possible solutions to the mind-body problem: Nagel and Searle	Luana Camila Marques & Juciane Terezinha Do Prado.
57	What we're made: An analysis of the relevance of the body in cognitive processes	Nathália C. A. Pantaleão & Franciele Da Silva Leal.
58	Auto-organização e autonomia: princípios básicos na caracterização de saúde mental	Daniel Luporini



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- **Andrea Scarantino** , Georgia State University, United States of America
 - Title: **Disentangling Three Concepts of Information in Cognitive Science**
- **Claus Emmeche** , Niels Bohr Institute and University of Copenhagen, Denmark
 - Title: **Thinking with friends: Reflexivity and Situated Cognition in Friendship**
- **Dora Selma Fix Ventura** , Institute of Psychology, University of São Paulo, Brazil
 - Title: **The non- image-forming visual system: its relation to sleep, circadian rhythm, pupillary reflex and other functions**
- **Frederick Adams** , University of Delaware, United States of America
 - Title: **A Slim Defense of Narrow Content**
- **Gualtiero Piccinini** , Center for Neurodynamics, University of Missouri - St.Louis, United States of America
 - Title: **Explaining Cognition: The Cognitive Neuroscience Revolution**
- **João Fernandes Teixeira** , Federal University of São Carlos, Brazil
 - Title: **A Few Remarks on Machine Ethics and Transhumanism**
- **João José Neto** , Polytechnic School of Engineering, University of São Paulo, Brazil
 - Title: **Simulation and Adaptivity**
- **José Roberto Castilho Piqueira** , Polytechnic School, University of São Paulo, Brazil
 - Title: **Computational Complexity and Information Measure: the Turing and Shannon ways**
- **Koichi Sameshima** , School of Medicine, University of São Paulo, Brazil
 - Title: **Can Brain Connectivity Analysis Help Understand Brain Functions ?**
- **Lauro Frederico Barbosa Silveira** , State University of São Paulo - Marília, Brazil
 - Title: **The Conception of Emotion According to Peirce**
- **Luiz Antonio Baccalá** , Polytechnic School of Engineering, University of São Paulo, Brazil
 - Title: **A Neural Link-centred Approach to Brain Connectivity**
- **Maria Eunice Quilici Gonzalez** , State University of São Paulo - Marília, Brazil
 - Title: **Autonomous Action in Complex Mechanical Systems: an Actual Dilemma ?**
- **Sofia Inês Albornoz Stein** , University of Vale do Rio dos Sinos, Brazil
 - Title: **Neutral Monism from a Pragmatic Perspective**

Abstracts

Andrea Scarantino , Georgia State University, United States of America

- **Disentangling Three Concepts of Information in Cognitive Science**

Ever since Dretske (1981) published his seminal *Knowledge and the Flow of Information*, philosophers have tried to develop an adequate theory of information. The Holy Grail of this research program is to make sense of information as a naturalistic commodity, and then use it to provide a reductive account of knowledge and other sophisticated mental capacities. This project requires disentangling a variety of concepts of information that are commonly conflated in cognitive science. In this talk, I will distinguish between what I call natural information, code-based referential information and evidence-based referential information, and provide tentative theories

of each grounded in probability theory.

Claus Emmeche , Niels Bohr Institute and University of Copenhagen, Denmark

- **Thinking with friends: Reflexivity and Situated Cognition in Friendship**

Can research in situated and embodied cognition inform the study of interpersonal relations like friendship? And conversely, can friendship studies from disciplinary and interdisciplinary perspectives inspire the research in cognitive science? These will be the guiding questions for this talk. The individual and social formation of a human self as a cognitive and emotional agent, from its emergence in early childhood through adolescence to adult life, has been described within philosophy, psychology and sociology as a product of developmental and social processes mediating a linguistic and social world. Focusing upon levels of information and sign action specific to humans, the formation of the personal self and the role of friendship and similar interpersonal relations in this process is explored through classic ideas of the friend as ‘another self’, and contemporary research on the interplay between individual subjectivity, social structure and interpersonal relations in a dynamics of human agency. Although processes of reflexivity and friendship follow general patterns in the formation of an emerging cognitive agent, such processes are socially heterogeneous and contingent upon different modes of reflexivity.

Dora Selma Fix Ventura , Institute of Psychology, University of São Paulo, Brazil

- **The non- image-forming visual system: its relation to sleep, circadian rhythm, pupillary reflex and other functions**

The discovery of melanopsin in the retina provided answers to questions that had no response after decades of search. What controls the circadian rhythm of sleep and awakesness ? Why people have Winter depression? The replies to these questions were surprising. A new type of cell, that is directly activated by light, as the cones and rods are, was found in the retina. This cell type forms a subset of retinal ganglion cells – the intrinsically photosensitive retinal ganglion cells (ipRGCs). They are also known as melanopsin retinal ganglion cells (mRGCs), after the pigment that found in their soma and projections, which enables them to respond to light and is maximally activated by blue light, dominant in daylight. Research on the functions of these cells show that they give rise to a separate visual pathway, a non-image forming visual pathway. Thus in addition to the well known image forming visual pathways, initiated by the activation of rods and cones, we have a second type of pathway initiated by the ipRGCs whose neural circuits are related to non-image forming functions – pupillary light reflex, circadian rhythm, mood, and cognitive capacity. A brief review of these important discoveries and of our research on the topic will be presented.

Frederick Adams , University of Delaware, United States of America

- **A Slim Defense of Narrow Content**



This talk considers Gabriel Segal's recent attacks on content externalism. Segal argues that the existence of empty kind terms refutes content externalism. He argues that an obvious rescue of saying that empty kind terms have no content might save the theory but for the fact that thoughts involving those empty kind terms are involved in perfectly meaningful behavior. Then Segal gives several examples of such terms and such meaningful behavior that they explain. Hence, he claims empty kind terms cannot be meaningless, and thus externalism is false. I show why Segal's examples and arguments still fail to establish that content externalism is false.

Gualtiero Piccinini , Center for Neurodynamics, University of Missouri - St.Louis, United States of America

- **Explaining Cognition: The Cognitive Neuroscience Revolution**

I outline a framework of multilevel neurocognitive mechanisms that incorporates representation and computation. I argue that paradigmatic explanations in cognitive neuroscience fit this framework and thus that cognitive neuroscience constitutes a revolutionary break from traditional cognitive science. Whereas traditional cognitive scientific explanations were supposed to be distinct and autonomous from mechanistic explanations, neurocognitive explanations aim to be mechanistic through and through. Neurocognitive explanations aim to integrate computational and representational functions and structures across multiple levels of organization in order to explain cognition. To a large extent, practicing cognitive neuroscientists have already accepted this shift, but philosophical theory has not fully acknowledged and appreciated its significance. As a result, the explanatory framework underlying cognitive neuroscience has remained largely implicit. I explicate this framework and demonstrate its contrast with previous approaches.

João Fernandes Teixeira , Federal University of São Carlos, Brazil

- **A Few Remarks on Machine Ethics and Transhumanism**

The talk will focus on the ethical consequences of the enhancing of human Body through the use of exoesketons, prosthetic attachments and the ingestion of drugs for the potentialization of cognition. The main focus will be on the transhumanistic proposal as advocated by Bostrom et alia as well as on a reconsideration of meritocracy in this new scenario.

João José Neto , Polytechnic School of Engineering, University of São Paulo, Brazil

- **Simulation and Adaptivity**

Simulation is among the most popular computing techniques, featuring a multitude of applications in almost all areas of knowledge. Simulators and their variations turn computers into versatile tools that help their users to mimic behaviors in selectable degrees of fidelity that range from crude approximations to detailed and faithful reproductions, even in real time. In our current state of technology, an ambitious challenging goal remains steady in focus, despite its complexity and low feasibility: replicating the behavior of natural, biological and especially neuronal and cognitive processes. Rule-driven devices are those whose behavior can be fully encoded in a finite set of *if..then* rules, and for their simplicity, the behavior they describe can be easily interpreted by a computer program such as a simulator. Adaptivity is the feature that enables devices to self-modify the set of rules defining their behavior, without external intervention, just in response to its history. One may turn any rule-driven computing device into a corresponding adaptive one by allowing them to perform self-modifications, and their ease of simulation is then further improved by allowing them to change their own behavior by modifying their set of *if..then* rules. In order to do so, adaptivity is easily achieved with the help of a couple of functions: one for inserting new rules and another for erasing existing ones. Even under the limitations of current technology, the association of adaptivity to simulation (and to other standard techniques) has shown to be helpful to the search of solutions in the field of complex problems. Standard divide-and-conquer strategies usually help us to separately investigate, understand and explore the multitude of aspects considered of interest, by adequately modeling learning and cognition processes, and by upgrading them with extra features from adaptive methods. Therefore, adaptivity is not proposed here as a “magic” for solving all problems in this area, but it has already proved to be highly promising as an effective tool (when used in conjunction with standard techniques and methods) to make successful incursions into unexplored and hard-to-access fields of knowledge, as it happens in cognitive sciences.

José Roberto Castilho Piqueira , Polytechnic School, University of São Paulo, Brazil

- **Computational Complexity and Information Measure: the Turing and Shannon ways**

This talk presents, in a qualitative way, the concepts of algorithmic computational complexity (Turing) and informational computational complexity (Shannon), emphasizing how independent thinking, with different nature, produced similar mathematical concepts with great utility for modern computation.

Koichi Sameshima , School of Medicine, University of São Paulo, Brazil

- **Can Brain Connectivity Analysis Help Understand Brain Functions ?**

Neurons are the basic elements of the nervous system that connect to each other using structures called synapses, thru which send and receive chemical or electrical signals. To understand the human brain, with its more than 80 billion neurons, neuroscientists have been studying its structures and functional dynamics at multiple scales of organization from molecules, genes, cells, neuronal circuits, to neural networks in an attempt to unravel its complex interactions. It has long been known that the brain is functionally segregated and hierarchically organized. One of important experimental paradigms in neuroscience to uncover brain functions has been the study of how neurons or neural structures interact to process information and generate behavior. Since we introduced it in 2001, we have been studying a connectivity measure called *partial directed coherence* (PDC), that is closely related to the *Granger causality*, which we believe is a robust and clinically promising method to analyze brain connectivity and stage brain dynamics in the frequency domain. We will show that by combining well designed behavioral protocols with multisite/multichannel brain activity recording (e.g., EEG and BOLD signals) one can study novel aspects of neural information processing and brain functions thru PDC connectivity analysis. An interesting line of exploration is to understand neurological diseases and disorders that emerge with abnormal brain connectivity, such as epilepsy.

Lauro Frederico Barbosa Silveira , State University of São Paulo - Marília, Brazil

- **The Conception of Emotion According to Peirce**

Peirce, along the years worked on the exerted role of emotions and sentiments for the foundation of thought and the scientific inquiry. Relevant researchers contributed with their reading attending to the elucidating dialogue on this relevant question. The reading of Peirce's texts and of those produced by these commentators intends to collaborate to the evaluation of the sense and the relevance of theme in consideration.

Luiz Antonio Baccalá , Polytechnic School, University of São Paulo, Brazil

- **A Neural Link-centred Approach to Brain Connectivity**

The last couple of decades has seen a methodological shift in the characterization of brain dynamics where the early prevalent search for areas of increased neural activity under stimulus, often termed neofrenology, is slowly being replaced by investigations that focus on how those areas interact. The general term connectivity has been used far and wide to describe this trend. Early on, however, the need was felt for qualifying what one means by connectivity with more precision. Adjectives like 'effective' and 'functional' connectivity are in common use today even though their application is often inconsistent throughout the literature. This fuzzy scenario has

been recently compounded by the advent of *Granger causality* based connectivity estimators that expose the directionality of information flow in addition to the presence of mere correlation, leading to the need for establishing a more general and consistent classification of how one should interpret connectivity issues, we which address by touring the historical evolution of these ideas.

Maria Eunice Quilici Gonzalez , State University of São Paulo - Marília, Brazil

- **Autonomous Action in Complex Mechanical Systems: an Actual Dilemma ?**

In this talk, we analyse the relationship between situated and embedded information and autonomous action in complex mechanical systems such as self-organizing robots. This type of system involves nonlinear interactions, which due to the degree of interdependence established among its elements, lead to the emergence of order parameters that control the elements that gave rise to them. Complex mechanical systems involving self-organization processes and circular causality, amongst others, characterize contemporary neo-mechanicism. In this context, the problem that will guide this analysis can be characterized as follows: Is there compatibility between the concepts of autonomous action and self-organizing mechanical actions? We shall argue that the paradigm of complexity, which unites inter-and transdisciplinary research perspectives in the areas of Physics, Biology, Robotics, Complex Systems Science, and Cognitive Science, offers a useful conceptual resource for analysis of the problem in question.

Sofia Inês Albornoz Stein , University of Vale do Rio dos Sinos, Brazil

- **Neutral Monism from a Pragmatic Perspective**

We are facing now a widespread dilemma in the scientific community: either we accept the common descriptions made by humans of their own subjective experiences (their "talk about impressions") and correlate to what we can observe scientifically from the physical changes they have, taking them as parallel events, or we try to investigate, from a behaviorist point of view, what is happening physically and in terms of behavior given they are at the right position of perception, discarding the first-person mental description, by linking initial physical behavior to resulting physical behavior. Anyway, the link between subjective experiences and starting or ending physical behavior is yet to be discovered. This link, thought Russell (1921) by maintaining the neutral monism, to be found in particular neutral elements that synthesize sensations (mental) and sensory data (physical). Today, the neurosciences do not prove the existence of sensory data, but retain the empirical goal of finding a causal network that goes from the physical objects to the "mental" perception of them. This network must include various forms of "representations" of object properties. The observation of neuronal activation in the process of perception of physical objects led to the conclusion that perception goes through several stages and that, in a broad sense, the objects are actually built gradually in our brain, through the inter-relationships that are established between different parts of it, each performing a different function. I discuss, using recent literature, the possibility of interpreting Russell neutral monism - and criticize, to be able to use it partially - from a semantic and pragmatic perspective that relativizes discourse about mental events, making

it plausible to think mental events as something knowable and describable from different perspectives, without thereby falling into idealism.

Round tables abstracts

Round table 1

Computational models for simulating cognition and behavior: reflections on its methods, scope, and underlying epistemology

Diego Zilio (UFES – coordinator)
Flávio Soares Correa da Silva (USP/IME)
Leonardo Lana de Carvalho (UFVJM)
Luciano Silva (U.P. Mackenzie)

a) On the Different Sorts of Artificial Intelligence: Deep, Shallow and Mimicking

Flávio Soares Corrêa da Silva
(Department of Computer Science – IME – University of São Paulo)

The field of Artificial Intelligence (AI) as we know it today started in 1956 in the United States, as an initiative of J. McCarthy and colleagues. It was planned to be multidisciplinary and has always aimed at the study of Intelligence through its reconstruction in human designed platforms. Around the same period and location, the field of Human-Computer Interaction (HCI) started to be structured around the notion of *Human Augmentation* proposed by D. Engelbart, among other scholars. For several years, AI and HCI were developed by separate, nearly disjoint research communities, carrying conflicting views about the most appropriate ways to bring together humans and digital/computational machines. Along the history of AI, some initiatives have taken the road of foundational scientific endeavor, while other have focused on the appropriation of techniques inspired by biological phenomena to design and build useful artifacts. Within the AI research community, some scholars have named the former initiatives *Deep AI*, and the latter *Shallow AI*. Deep AI refers to attempts and initiatives to isolate Intelligence as an observable phenomenon, and to build a deeper and broader understanding of this phenomenon through model building and simulation in man-made substrates. Shallow AI, in contrast, emphasizes the potentialities of techniques that emerge as a result of observing biological systems whose behavior can be deemed *intelligent*, as tools to build artifacts that, based on some appropriate metrics, can be considered improvements on previously existing artifacts for similar functionalities. A third possible road, in which digital artifacts could be designed to *mimic* intelligent behavior convincingly, was initially viewed as a road to be avoided, as the results of initiatives built this way could be taken as forgery and potentially unethical behavior. Recently, however, interesting methodological evolutions have taken place, aligning the fields of AI and HCI and clarifying that Deep, Shallow and Mimicked AI were not, in fact, as different as initially considered. By taking a more encompassing (and hence significantly more challenging) design stance, one can consider the design of social systems comprised by digital/computational artifacts as well as human participants. Such systems - frequently coined *Social Machines* - should be structured in such way that digital components are programmed and human components are incentivized effectively to



cooperate. In order to build high quality social machines, one needs to build appropriate interaction networks and protocols; program the behavior of digital components based on well grounded (*deep*) models of intelligence; make sure that these models are computationally efficient (hence implemented according to the precepts of good *shallow* models of intelligence) and, finally, make sure that digital components can be perceived by human components as intelligent, so that social interactions can occur with the required fluidity. As a consequence, *mimicked* intelligence has been accepted as a third facet of intelligence that is required to build digital devices which may deserve to be accepted as intelligent in social interactions.

b) Emergent Signs, Enactive Cognition and Complex Systems

Leonardo Lana de Carvalho

(PPG Ciências Humanas, Universidade Federal do Vale do Jequitinhonha e Mucuri, Diamantina, MG)

We emphasize that any form of naturalization of phenomenology will be widely different from pure phenomenology. The concept of enaction would provide a natural alternative, strongly connected with biological scientific thinking and inspired by phenomenology, to explain cognition. The living being is presented to be a producer of itself. This is only possible with beings that produce the conditions of their own existence. The environment modifies or perturbs a structure whose function keeps this structure. In this sense, the living entity is described as a history of perpetuating in the world that takes place through its structural coupling and its operational closure. The evolution of the species occurs by means of a natural drift. The source of intelligence is the body in action, and we stress that the nature of cognition is to be in action ("en acción"). If a system is self-organized, structurally coupled in an environment, their actions are adaptive; these actions are intelligent in this environment. In this sense the theory of enaction do not need the concept of a "res cogitans" or "mental representation" to explain cognition. On the other hand, forms of material representations have been proposed by other theories in cognitive science with great success in modeling and synthesis of intelligent systems. The purpose of this paper is to defend a promising possibility of theoretical and practical alliance between the enactive theory of cognition and consistent notions with this theory of "information", "representation", "sign", etc. In our view, the key concept of this alliance is that of the emergent sign. The enactive approach received significant influence from connectionism, especially regarding the concepts of self-organization and emergent properties. The connectionism has sought solution to the problem with the concepts of microrepresentations (material symbols manipulated by the machine) and macrorepresentations (emerging patterns from the material symbolic activity in interaction with the environment). Maturana and Varela argue in this sense that "... interactions (once recurring) between unity and an environment consist of reciprocal disturbances. In these interactions, the environmental structure only triggers structural changes on autopoietic units (do not determine or inform), and vice versa for the environment." We argue that the main influence of enactive theory in computational thinking is the renewal of artificial intelligence that explores the concept of enactive theory. However, the overcoming of the "problem" of "enaction" versus "representation" means the introduction of a new paradigm in cognitive science, the complex systems paradigm to cognition. Steels begin to signal the transition from the enactive theory to the complex system theory of cognition. His work on the development of language, such as "Language as a Complex Adaptive System" from 2000, presents language as emerging from a complex network of interactions, conceived from the interaction of agents with their environment. We understand that another important article was published in 2003, titled "Intelligence with



representation". In this paper, the author opposes Brooks, explaining that a semiotic notion of representation should be maintained. Mitchell (1998), in the article "A complex-systems perspective on the 'computation vs. dynamics' debate in cognitive science" argues that; "Most of these theories assume that information processing consists of the manipulation of explicit, static symbols rather than the autonomous interaction of emergent, active ones." We argue that enactive cognitive agency must contain an algorithm that should not be a reinforcement function, nor a problem-solving algorithm consisting on deduction and inference functions. Indeed, the construction of a world is sought as a way of being in the world. Using Dreyfus's term, a "skillful coping" algorithm, or an autolelic principle. The agent would not be getting an input i or a reinforcement s , but the inputs would be better described as perturbations. Our point is that these perturbations lead to an internal building B that is, from the perspective of the history of the system, the effect of the agent coupling with the environment. This kind of B building block can be useful to the agent for reprogramming itself, its own algorithm (self-programming). According to Rocha & Hordijk (2005), this B can serve to guide the development of complex adaptive systems, such as a biological organism that makes use of its genetic code to guide its development. According to Steels (2003), this B can also be useful to agent architectures as signs in semiotic relationships under the aegis of cross or multi-scale levels of structural coupling processes. We stress the importance of enactive approach in the design of agents and agents as artificial autopoietic beings, understanding that previous approaches have very different cognitive architectures and that a prototypical model of enactive cognitive architecture is one of the major challenges today. Indeed, this is a sensitive matter and we would not have the space here to address this issue properly. However, we would like to notice that nowadays, it is an aspect that divides the community in embodied cognitive sciences, and it may even be signalling a transition to a complex systems theory of cognition. Crutchfield (1994) understands that new machine models are required to investigate the emergence and complex systems. According to the author, the complex systems approach of the computing machine consists of a particular notion of structure. The complex machine structure would be based on a "nonlinear mechanical computing processes". This malleable structure can be modified by means of mechanisms for transformation of the structure. These mechanisms of transformation would lead to a constant "reconstruction of the hierarchical machine" by itself. To connect the structural reconstruction processes, Crutchfield provides "evolutionary mechanics". Then, he suggests that this complex machine should be the standard model for the study of complex systems and emergence. Conclusively, we support that any cognitive agency to have enactive bases must actually conceive agent's structures as coupled to the environment. An autopoietic machine should be able to pass through natural drift. However, the constructions of complex machines need a coherent theory assimilating the concepts of enaction and material representation. We think that this theory is based on the concept of emergent signs or similar notions. Following Fodor (2000), perhaps the investigation of this reality is not interesting for some cognitive engineers. However, this research is profoundly important to cognitive science and philosophy of the mind. We argue that technological applications will surpass the expectations.

c) Algebraic Semiotics for Specification of Cognitive Aspects in Human-Computer Interaction

Luciano Silva
(U.P. Mackenzie, São Paulo)

In Human-Computer Interaction (HCI), there is a constant need for understanding the mechanisms of human perception linked to the interaction process with computers, whose result may yield important information for specifying and building interfaces with better usability and learning measurements. If communication processes with the interface are not



accordingly planned with the observation of human factors, one may generate common problems such as difficulty in locating desired tasks as well as a long time and way to complete them. For example, the presence of functions that are not used and others not available, joined to the difficulty to remember the route to the tasks may compromise indices associated with the evaluation of an interface. Techniques of Cognitive Sciences can be used for the improvement on interface Project. They provide a mental user model which can be exploited to observe the intensity of requests from processes cognitive derived from users (experience, interpretation, memory and learning). One of the recurring problems in using these mental models is how to model them formally in such a way to promote their inclusion as components in the formal specification of an interface or in evaluation procedures. There are several approaches to this problem and Algebraic Semiotics has offered a viable environment not only for representing cognitive issues on interfaces but also to integrate them in evaluation procedures based on formal methods. Algebraic Semiotics provides a framework for quantitative and qualitative analysis of interfaces, design criteria for creating interfaces and a strong relation to dynamics algebraic semantics. Using a system of signs, the Algebraic Semiotics can address various cognitive aspects in an interface through precise algebraic definitions for sign system and representation, calculus of representation with laws about operations for combining representations and precise ways to compare quality of representations. Moreover, it is possible to extend the constructions of Semiotics Algebraic to include dynamic signs for user interaction (e.g. Hidden Algebra), combination of algebraic structures with Gibsonian affordances, narrative structures, social foundations, computational semiosis and choose ordering on representations.

d) Explaining Psychological Phenomena: The Role of Experimental and Artificial Simulations

Diego Zilio

(UFES – Federal University of Espírito Santo, Vitória, ES)

What is the role of simulation in explaining psychological phenomena? My goal in this talk is to discuss this question. I will start by analyzing the definition of “simulation” as representation through models. Two possible ways of simulating psychological phenomena arise from this definition: (a) simulation as experimental models usually adopted in experimental psychology in the study of human and non-human behavior; and (b) simulation as artificial models used in cognitive science aiming the implementation of cognitive processes in machines. Both alternatives will be discussed in the light of a biological oriented mechanistic conception of explanation. I will argue that experimental simulations are essential to the construction of psychological knowledge and must precede artificial simulation when possible. Artificial simulations, on the other hand, have at least two main functions: to contribute to the validation of the knowledge produced by experimental simulations and to create useful technologies aiming the resolution of human problems.



Round table 2

ICT and Society: Ethical issues on the influences of ICT in individuals' daily life

Arturo Forner Cordero (POLI-USP)
Guiou Kobayashi (UFABC)
João Antonio de Moraes (UNICAMP – coordinator)
Mariana Claudia Broens (UNESP/Marília)

a) Common spontaneous action in the context of the new informational technologies

Mariana C. Broens
(Department of Philosophy, State University of São Paulo, UNESP, campus Marília)

The objective of this communication is to investigate possible implications of the new informational technologies in human common action, especially in spontaneous actions of everyday life. In order to do so, I will characterize common spontaneous action as the result of the information offered by affordances present in the environment (GIBSON, 1986), without the need of mediation by mental representations. Following I will analyze possible difficulties to the cognitive modeling of this kind of action. Finally, I will discuss pragmatic implications in common spontaneous action of the generalized use of the new informational technologies, like Internet of Things, currently mediators of a meaningful part of human interactions in industrialized societies.

b) Ubiquitous systems and Internet of Things, and their impact on society and personal life

Guiou Kobayashi
(Federal University of ABC, UFABC).

Internet of Things (IoT) is a scenario where devices like sensors, actuators and other real world objects are connected over a network (like the Internet), with the capacity of exchange data with computer systems without necessarily requiring human intervention. Some of these devices are ubiquitous (as defined by Mark Weiser), meaning that they are designed to interact with humans, and others are pervasive and embedded in the environment and in the everyday objects and machines. With IoT, it will be possible for the computer systems to interact with the real physical world, including people, machines, and the environment. Sensors and actuators will provide feedback to the systems built for specific purposes (*purposeful systems*), allowing these systems to measure the effectiveness and efficiency that their actions have in the real world. It will be possible to develop systems intended for the purposes of *persuasion* for example, (improvement of *suggestion* systems already in use in e-commerce), with actions on real world provided by IoT. The improved data availability and accuracy, coupled with database integration capabilities and data mining might enable finer adjustment of the actions. IoT raises a new level of privacy and ethical concerns. Despite the widespread use of smartphones in industrialized societies, it is still possible to turn these devices off or disconnect them from the network. With IoT technology, however, the sensors might be everywhere and they might always be turned on. In this case, it will *not* be possible to disable them, because individuals are not the owners of the devices. Who owns the data collected by IoT in public places? How, and by whom, will the data be used? In today's



scenario, where a small number of Internet companies (Google, Microsoft, Facebook, etc.) can access all the available data on the net, these questions must be analyzed seriously.

c) Robots for care and assistance ethical implications in the ageing society

Arturo Forner Cordero

(Biomechatronics Lab, Mechatronics Department, Politechnic School of University of São Paulo, USP).

There are several ethical and legal issues (BOGUE, 2004a, 2004b) regarding the development and deployment of robots. In particular the military robots and more recently drones have received a lot of attention due to the ethical implications of their operation. An emerging area of robotics research focuses on service robots oriented to provide care, help, assistance, rehabilitation or training to the human user. In this group some authors include companion or pet robots such as Paro or Aibo. However, in my opinion, they must be considered separately due to the emotional problems they may elicit. In care robot design and the human-robot-interface there are two main ethical issues that are already well established: safety and privacy. For instance, in a class of care robots, such as exoskeletons, that have a strong physical and cognitive interaction with the user it is necessary to define safety mechanisms at several levels of the design. At the mechanical level there could be passive safety elements: including mechanical stops at the joints to prevent going beyond the range of motion of the subject or active: limiting the maximal forces/torques applied by the actuators. At the control level systems like impedance control or limiting functions can be used to avoid the generation of large torques, velocities and accelerations that could compromise the safety of the subject. Privacy is another issue already solved: as the robot gathers lots of information about the human user it is possible to have a privacy problem. This issue is commonly addressed in the Institutional Review Boards with respect to data obtained from experiments and the same solution can be applied to care robots. Departing from the obvious ethical problems, it is possible to include some methodology to integrate ethics into the design of exoskeletons (SULLINS, 2015). This methodology includes the evaluation of different aspects of the exoskeleton and its expected mode of operation. The practice and context of operation, the actors involved along with their levels of responsibility, the type of robot (rehabilitation, assistive, enabling) and the possible moral elements involved (WYNSBERGHE, 2013). This type of methodology will be presented with a case study about a lower limb exoskeleton designed to assist biped gait of paraplegic patients.

d) ICT, society, and the emergence of the *hybrid beings*

João Antonio de Moraes

(PhD Candidate of Philosophy, Institute of Philosophy and Human Sciences, State University of Campinas, UNICAMP).

Because of the increasing presence of ICTs in the individuals' daily life, new ways of being-in-the-world are emerging, changing current habits and influencing the way that individuals act and understand themselves in the world, both in relation to other individuals and to their environment. The Internet stands out as a catalyst to digital being-in-the-world. One of the most noteworthy and prominent changes associated with the influence of ICTs over individuals is in terms of communication, where individuals, who were until recently only receivers of information, have now become producers of information for a global network. In doing so, the new communication paradigm changes one's conception of the world and they



become both actor within, and catalyst to, an immersed digital environment, thus constituting a bottom-up movement that is decentralized, an environment by which users are active participants. Beyond the communication aspect, there is a naturalization of new forms of action in the world in the process of digitalization, much like there is in any new dynamic of society where ICTs is more than tools. As Capurro (2010) remarks, “The view of computers as something ‘other’ is disappearing, i.e., they are less and less ‘some-thing’ or ‘other-than-us’ and permeate the world in which we – or, more precisely: some of us – live”. Moreover, with the development of ICTs and the disappearance of the boundary between physical and digital worlds, there is a direct influence of ICTs in the personal identity of individuals, where “in designing tools we are designing ways of being”. As expressed by Ihde (2004), there is a change in the life-world texture. With the notion of ICTs as “technologies of the *self*”, Floridi (2014) believe that ICTs has promoted changes in the self-understanding of individuals within the world, in his/her relation to the others and his/her environment. In Floridi’s (2014) words: “The self is seen as a complex informational system, made of consciousness activities, memories, or narratives. And since ICTs can deeply affect such informational patterns, they are indeed powerful technologies of the self”. From such understanding, once you have new possibilities for action, and expressions within the world by individuals, there are new ways for influence and change individuals’ self-understanding. What little analysis has been offered towards understanding the influence that ICTs have had on the behavior and self-understanding of individuals and has been thus far largely restricted to user groups that include children and teenagers, namely the so-called Generation Z (“Z” in correspondence to zettabytes, the amount of information generated before 2010; GANTZ & DAVID, 2011). These individuals, often called “digital natives”, have never known access to a world without the presence and persistent influence of Google, Twitter, Wikipedia, and Facebook, where such terms are understood not as merely services but as verbs (FLORIDI, 2014). Generation Z was born into, and raised, surrounded by ICTs, and all of the above ‘novelties’ of information and communication are rendered through natural actions in the case of digital natives. It is in this scenario that we will argue that the *hybrid beings* appear as a result of the influence the dissemination of ICTs in individuals’ daily life, promoting the naturalization process and of the digitalization of the world, executing two expressions of the same world. As Moraes & Andrade (2015) argues the hybrid being is characterized by his/her ability to act without strangeness in a context in which ICTs are disseminated. Thus, action and an individual’s own personal identity is reinterpreted via mediation of ICTs, and this already becomes a part of his/her own existence. In other words, the hybrid being is the result of a process of an informational reinterpretation promoted by the inclusion of ICTs in the daily life of individuals, expressed in physical/digital dimensions. Questions on the characteristics and performances of *hybrid beings* in the world will also be discussed.

Round table 3

Advances and Perspectives in Cognitive Architectures

Ricardo Ribeiro Gudwin (UNICAMP – coordinator)
Márcio Lobo Netto (USP/Poli) / Mauro Muñoz (USP/Poli)
Angelo Conrado Loula (UEFS)

a) Toolkits or Frameworks : What is the Best Approach for Deploying a Cognitive Architecture?

Ricardo Ribeiro Gudwin.
(DCA-FEEC-UNICAMP - Department of Computer Engineering and Industrial Automation - School of Electrical and Computer Engineering - University of Campinas)

Artificial Minds are a special kind of control system for an autonomous agent, inspired in the functions and characteristics of animal or human minds. Cognitive Architectures are both theoretical models of artificial minds and software implementations of these models. Currently, there are many different cognitive architectures reported in the literature (see e.g. <http://bicasociety.org/cogarch/architectures.htm> for a comparative table of at least 26 different cognitive architectures), and some of them have their code available for sharing with the community. This code is available mainly in 2 different options, depending on the cognitive architecture: Toolkits or Frameworks. Cognitive Toolkits are a special kind of software library, where different versions of cognitive functions are provided as a repertoire of classes, which can be combined and used together in many different ways, and the overall behavior of the cognitive architecture will depend on the features chosen by the toolkit user in order to fully implement his/her specific cognitive architecture. Cognitive Frameworks, on the other side, are reusable software environments providing a complete implementation of a cognitive architecture, which are configurable in order to enable or disable specific cognitive features and capabilities available in the framework. Cognitive Frameworks contain some distinguishing features that separate them from Cognitive Toolkits: (a) *inversion of control*: in a framework, unlike in a toolkit, the overall program's flow of control is not dictated by the caller, but by the framework - the framework calls your code, not the opposite; (b) *default behavior*: a framework usually has a default behavior, which provides a basic set of cognitive functions to be used by the architecture if no additional configuration is provided; (c) *configurability*: a framework can be configured and extended by the user, which might choose among alternative ways of providing a given functionality or provide additional functionalities not originally present in the framework.; (d) *non-modifiable code*: the framework code, in general, is not supposed to be modified, while accepting user-implemented extensions. In other words, users can extend the framework, but should not modify its code. The construction of a particular cognitive architecture suitable to a specific application (or a specific agent), will require different programming modes. In the case of a toolkit, the overall architecture will be set up by using the toolkit classes in order to perform a bottom-up construction process which will result in the final architecture. In the case of a framework, usually this construction is a top-down approach. There is a single point of contact with the framework's code, usually creating just a single object from the framework, and giving the control to it. All the user programming will be in providing extension classes which are plugged-in to the framework code and providing a configuration, usually by means of external files (e.g. XML or text files) providing the configuration information. In this work, we will present some concrete examples



of toolkits and frameworks provided by different cognitive architectures, and will discuss the advantages and shortcomings of each of these programming modes, with the aim of building up a cognitive architecture for a specific application.

b) On the Emergence of Representational Processes in Communicative Cognitive Agents: Experiments and Analysis

Angelo Conrado Loula

(Intelligent and Cognitive Systems Lab - Universidade Estadual de Feira de Santana, UEFS)

Representations are a topic of interest in Artificial Intelligence (AI) since its foundation and remains as an important issue in current research. The initial concept that intelligent systems are capable of reasoning based on representations, following a formal logic approach to cognition, brought together a question on what such representations would be, an ontological issue, and a question on how they could be produced and interpreted, an epistemological issue. But the first answer was limited to determining the appropriate data structures, in a merely technical perspective, and on how to collect and insert data that would represent the knowledge on which inferences would be applied and new knowledge would be obtained. This led to several criticisms, such as the Symbol Grounding Problem, that essentially challenged how something could actually represent something else for an intelligent system, and not only to the designer that provided the data to the system. On the other side, the so called Nouvelle AI proposed a new approach for intelligent systems, committed to situatedness and embodiment of cognition. In these new systems, embodied artificial agents are situated in an environment, establishing sense and act loops and interacting with other agents. Agents would build its cognitive competences as a consequence of its history of sensory-motor cycles and interactions, based on learning, adaptation and evolution. Nevertheless, there was a refusal to deal with representations in this new approach, maybe considered as a minor or unnecessary trait. Meanwhile, more recently, there has been a great variety of research on the emergence of communication and language among artificial agents, robotic and simulated ones. As a methodological principle, the cognitive or social process of interest is not previously present in a community of agents, but by means of interactive and adaptive processes it can emerge among the agents. But, even though communication and language are strongly related to representational processes, there has been little or no discussion on this issue in such research works. Based on the fact that communication can be seen as the production (by a speaker) and the interpretation (by an interpreter) of representations, it is fundamental to understand the characteristics and conditions for the emergence of diverse modalities of representational processes, associated with communication and their relation to other cognitive traits. As such, we take the research scenario on the emergence of communication in a community of artificial agents as a particularly relevant framework to study underlying representational processes. We propose to present an approach to study representations in communicative cognitive agents, based on theoretical principles from C.S. Peirce's semiotics, including a description of cognitive architectures that fulfill minimal requirements to implement representational processes. We also describe computational experiments involving the emergence of communication and representations, with an analysis of internal mechanisms of the agent's cognitive architecture, representation processes and evolutionary dynamics.



c) Issues in Artificial Cognitive System Architectures

Mauro Muñoz & Márcio Lobo Netto.
(Escola Politécnica - Universidade de São Paulo)

An important issue for artificial cognitive systems is how they deal with the problem of Symbol Grounding (SG) firstly pointed out by Harnard who recently reformulates it as: "is the problem of causally connecting symbols inside an autonomous system to their referents in the external world without the mediation of an external interpreter". The SG problem motivated Taddeo to establish the zero semantical commitment condition (ZSCC) for cognitive system designs as: "a) no form of innatism is allowed; no semantic resources (some *virtus semantica*) should be presupposed as already pre-installed; and b) no form of externalism is allowed either; no semantic resources should be uploaded from the 'outside' by some *deus ex machina* already semantically-proficient.". Other important issue for an artificial cognitive system is its capacity to adapt itself to unknown situations. As a consequence the system architecture should be capable to expand its own cognitive structure. This capacity is captured by the Autonomous Mental Development (AMD) paradigm proposed by Weng: "With time, a brain-like natural or an artificial embodied system, under the control of its intrinsic developmental program (coded in the genes or artificially designed) develops mental capabilities through autonomous real-time interactions with its environments (including its own internal environment and components) by using its own sensors and effectors. Traditionally, a machine is not autonomous when it develops its skills, but a human is autonomous throughout its lifelong mental development." Facing those artificial cognitive system design issues the Piaget's theory about the human intelligence development seems not only to fulfill those premises, but also pointing to architectures based on the bottom-up cognitive complexity approach. Particularly, Piaget named as sensory-motor stage the initial development period. This stage prepares the cognitive apparatus to be capable to deal with symbols in a latter stage. Thus no symbolic representation or symbol usage by the apparatus is assumed by the sensory-motor development theory. The conformity of the piagetian theory with the ZSCC and the AMD seems to show a promising path to construct guidelines for cognitive system architectures focused on bottom-up approaches. When thinking in a cognitive system architecture from the bottom-up approach a new question arises: how a system interacting with its external environment exclusively through its sensory-motor signals can start to interact to the entities it imagines to be the cause of the signals it perceives and be affected by the actions it generates?

The basis for an artificial autonomous cognitive development systems architecture designs capable to extrapolate from signals interaction to object-concept interaction seems to be a relevant open issue.

Round table 4

Information, Context and Structure in Cognition.

João Eduardo Kogler Junior (USP/Poli – coordinator)

Marcos Fernando Lopes (USP/FFLCH).

Paulo Eduardo Santos (FEI).

Renato Teodoro Ramos (USP/FM).

a) Information: a claim for meaning

Renato Teodoro Ramos.

(School of Medicine – Department of Psychiatry - University of São Paulo).

The objective of this presentation is to discuss the concept of meaning in information theory from a neuro-cognitive perspective. This topic is of special interest for neurosciences because several neurological and psychological models conceive human brain as an information-processing machine. These approaches implicitly suggest a parallel between brains with other devices, like computers, for which the concept of information was developed. The seminal Shannon's proposal of informational entropy is a good example of this approach. In this model, the concept of information is related to the probability of occurrence of a given message in a communication system constituted by information source, transmission channel, and receiver. The main limitation for the use of this model for studying brains and behaviors is the assumed irrelevance of the message meaning. How information acquires meaning is a very complex question associated to the definition of semantic information. Despite the lack of consensus, semantic information has been defined in function of "well-formed, meaningful, and truthful data". What is not clearly stated in these semantic approaches is that the process that defines information as something significant occurs in the receiver component of the Shannon information system. The following propositions will be discussed: - The meaning of a message emerges in the receiver and any other stimuli running through the information system that is not capable of modifying the receiver's state is not information at all. - A measure of semantic information is essentially a measure of influence between agents. - The validity of a message is not a property of isolated agents or of the message itself. The ascription of trueness of information depends on the selection of influences according to some criteria. In biological systems, like human brains, evolutionary processes has imposed utilitarian constraints to select informational contents. - Brains "use" information to construct representations, predict future events, and improve survival chances. - The sophisticated psychological constructs classically associated with the concept of mental representation are essentially of the same nature of interactions of simple biological or computational elements.

b) Dictionaries' Core Defining Words Are More Frequent and Have More Meanings

Marcos Fernando Lopes

(Department of Linguistics, FFLCH, University of São Paulo).

From a dictionary's graph of defined and defining words one can compute a Grounding Kernel (Kernel) (about 10% of the dictionary) and Kernel Core (Core) (about 70% of the Kernel)



from which all the rest of the words can be defined (Massé et al., 2008; Picard et al., 2009). For the Longman Dictionary of Contemporary English, several of the lexical semantic properties of the Kernel (and especially the Core) words differ significantly from the rest of the words in the dictionary. Other studies had shown that these words are learned earlier. Focusing exclusively on nouns, we now find that they have more senses, are more frequent in written corpora, more familiar, and more similar to one another internally. These emerging special properties of the Kernel and Core may cast some light on why the meanings of the rest of the words in the dictionary are grounded in this small subset from which they can be reached through definition alone. The present work was written in collaboration with: Alexandre Blondin-Massé, Mélanie Lord, Odile Marcotte, Philippe Vincent-Lamarre (Université du Québec à Montréal) and Stevan Harnad (Université du Québec à Montréal and Canada Research Chair in Cognitive Science).

c) Slicing Space with a Semantic Knife-Edge

Paulo Eduardo Santos.

(Artificial Intelligence in Automation Lab., Department of Electrical & Electronics Engineering – Centro Universitário FEI.)

The aim of this work is to investigate a representation and reasoning formalism capable modeling the vagueness, polysemy and ambiguity present in spatial descriptions of scenes using natural languages. The absence of precise specification (or vagueness) is present in various terms used for spatial descriptions, for instance, one of the first term a child learns to describe its environment (that is also a term that occurs in all languages [2]), the spatial demonstrative “that”, expresses no precise location, apart from saying that the object in question is further from the speaker. The second issue of interest here (polysemy) is a characteristic of any natural language, since there are fewer spatial relations to express a large range of situations in any of the existing languages [3]. Finally, ambiguity can be exemplified by recent research on cognitive psychology that indicates that, in everyday human communication, people mix perspectives without signaling to the interlocutor [6]; besides, sketches of scenes constructed from verbal descriptions not always agree with the actual described scenes [4]. These issues are overlooked most of the time by human agents in normal speech, in fact they seem to be part of our understanding of the world. It may be the case that scene understanding from verbal descriptions presupposes the existence of a kind of constraint satisfaction and model building system in our minds that solves possible the inconsistencies in spatial descriptions. The development of algorithms for constraint satisfaction in spatial domains is at the kernel of the development of spatial algebras [5], that is within the interests of Qualitative Spatial Reasoning (QSR) [1], a subfield of Knowledge Representation in Artificial Intelligence. The aim of Qualitative Spatial Reasoning is to provide rigorous logical formalisms for the representation of spatial relations from elementary entities using qualitative relations. However, these formalisms are built upon very abstract notions that have no relation to the actual use of spatial expressions in natural languages. An opportunity thus emerges to investigate the construction of a QSR formalism whose semantics is capable of handling vagueness, polysemy and ambiguity, as present in the natural language descriptions of scenes. In order to construct such formalism we need to, first, list and compare the various findings from cognitive linguists that point to the way spatial expressions are used in common languages; second, find a common structure underlying our understanding of spatial expressions and, third, describe this common structure as an algebraic structure that provides the semantics for the spatial relations in a QSR formalism.



d) Geometry, information and action in the explanation of cognitive and perceptual processes

João Eduardo Kogler Junior.

(Polytechnic School of Engineering, Department of Electronic Systems, University of São Paulo)

Cognitive and perceptual processes are considered here as transformations operating on sensorial and internal data in order to detect and extract information useful for prediction for immediate or future use in the modulation of decision processes that generate actions. In this work, we argue about the role of invariants under such transformations relating them to context, in the search of a geometrical explanation for the relational structure underlying the mutual constraining among interacting components participating in the inferential mechanisms embedded in a cognitive/perceptive agent. The encoding of information and knowledge is related to this geometry, which will be claimed to meet requirements imposed by the interfaces between the agent and the external world, essentially concerning to its adherence to affordances, in the sense of the situated cognition paradigm. Some questions and issues related to this view will be discussed, considering the role of evolutionary and developmental processes as of paramount importance in the construction of this theoretical approach for explaining some aspects of cognition.

Round table 5

Machine Learning and Probabilistic Modelling of Cognition and Behavior

Edson Satoshi Gomi (USP/Poli)

João Ricardo Sato (UFABC)

Nestor Caticha (USP/IF)

Peter M. E. Claessens (UFABC)

a) Why Bayesian Modeling?

Nestor Caticha

(Instituto de Física University of São Paulo)

Once we decide to model cognition using mathematics the natural question that emerges is: among the many mathematical structures at our disposal, which should be used? Cognition is a typical situation of incomplete information, since just as an example, sensorial information arises from just a subset of the possible information about the external world. It might happen that several possible states of the real world are compatible with the sensorial state. A few common sense demands lead to a mathematical structure that includes the theory of probabilities. These demands are: (D1) Transitivity: Under conditions D, if an agent believes in $A|D$ more than in $B|D$, and in $B|D$ more than in $C|D$, then the belief on $A|D$ should be larger than that on $C|D$. (D2) If the belief on an assertion can be calculated in more than one way, demanding that the results are the same should avoid manifest inconsistencies. (D3) For all A, the belief in $A|A$ should be the same and for all B mutually exclusive to A, the belief in $A|B$ should be the same. (D4) There must be some function G that permits obtaining the belief about the logical product $AB|D$ in terms of some subset of beliefs that include $A|C$, $A|BC$, $B|C$ and $B|AC$ but not necessarily all. (D5) There must be another analogous function F for the logical sum $A+B|C$. Implementation of these demands leads to probability theory or simple monotonical regratuations. It leads to Bayes theorem, permitting the introduction of prior knowledge and to take into account structural information about the architecture of the cognitive system. Of course this approach is not constrained to cognition, but has founded extended use including machine learning and data analysis in general. More generally, Bayesian Inference can be shown to be a special case of Entropic Inference.

b) "What Machines can learn from Doctors and Doctors from Machines: Lessons from Bayes Nets as Diagnostic Decision Support Systems in Tinnitus"

Peter M. E. Claessens* ; Jangholi, Nargess; Ghodrati Toostani, Iman; Ganz Sanchez, Tanit

(* UFABC)

Medical doctors, through training and experience, attain high levels of efficiency and accuracy in diagnosis, in a process of probabilistic reasoning that narrows down a set of potential causes based on a limited amount of observable data. While medical symptoms or test results are individually generally insufficient to isolate the etiological basis of a complaint, in combination they provide sufficient information to identify a cause in a procedure that is not unlike sensor fusion. A normative model for determining hidden causes in a set of probabilistically dependent and interacting variables is provided by the class of Bayes nets, or Bayesian belief networks. This formalism, which combines elements of probability and graph



theory, is therefore an interesting reference for comparison with human diagnostic decision making, not only for the final decision on the etiology of a case, but also in the intermediate steps chosen to reach the diagnostic conclusion. In this talk, virtues and cognitive shortcuts in medical decision making will be reviewed. A short introduction in causal inference using Bayes nets will be given, after which a study on the construction of a diagnostic decision support system for the differential diagnosis of tinnitus, a common disorder producing physical or subjective ringing or buzzing noises, will be presented. The formal analysis of decision under uncertainty as provided by Bayes nets point towards interesting points of convergence and divergence with human medical decision making. As basis for diagnostic support systems, Bayes nets have large potential but a few challenges to solve in implementation, as will be discussed.

c) Learning Representations through Deep Learning

Edson S. Gomi

(University of São Paulo (USP), Polytechnic School, Department of Computer Engineering)

The performance of machine learning algorithms has been highly dependent on a previous choice of abstract features obtained from the raw data. In order to enable the development of machine learning algorithms that identify features automatically, Deep Learning uses several composition and transformation layers to learn an appropriate representation for a given data. Successful representations have been obtained in Deep Learning experiments of recognition and classification tasks using text, speech, and image data. This talk will present the basic concepts and application examples, in order to give an overview of Deep Learning and its relationship with Neural Computation.

d) Brain networks maturation and psychopathology: an interdisciplinary approach

João Ricardo Sato

(UFABC)

In this lecture, we present recent findings in brain imaging and neurodevelopment in humans. The main focus is on the brain networks maturation during late childhood and pre-adolescence. We discuss about the emergence of functional networks and how they can be analyzed using statistical and computational methods. Findings based on developmental curves, graph theory metrics, signal processing and machine learning are presented. Finally, we demonstrate the association between neurodevelopmental disruptions and manifestations of psychopathology.

Round table 6

Computational Intelligence and Cognition

Emilio Del Moral Hernandez (USP/POLI – coordinator)

Francisco Javier Roperro Pelaez (UFABC)

João Henrique Ranhel Ribeiro (UFPE)

a) From Neuron Cells to Cognition: a Review

João Henrique Ranhel Ribeiro

(Federal University of Pernambuco, Department of Electronics and Systems)

Nervous systems give rise to animals' intelligent behavior and can make them cognitive agents. This presentation reviews the intelligence and the cognition concepts. A central topic in cognition is 'learning', meaning the agent's ability to modify its behavior during its lifetime, what is quite different from inborn stereotyped responses. Then, it is briefly discussed the learning types (supervised, unsupervised, reinforced and deep learning) and the biological neural bases underlying such learning mechanisms. I intend to show a new model of artificial spiking neural network that allows us to simulate the main natural mechanisms (neural plasticity and astrocytes). Two main issues is proposed for debate: first, how close can artificial neural networks be from biological networks? Second, to what extent is it important to mimicry natural neural networks? While deep-learning and other machine learning technics have obtained great success in many areas of Artificial Intelligence, we may ask if scientists can create different and more efficient cognitive machines than those based on biological neural mechanisms.

b) Rate-code neurons versus spiking neurons: where and when using each one

Francisco Javier Roperro Pelaez

(Federal University of ABC)

Although spiking-neurons models seems faithfully mimic real neurons' behavior, we believe that in many cases, neurons' spikes are dispensable. The reason is that spikes are, in most neurons, a means for modulating analog voltage-signals at the neuron's soma for allowing a faithful transmission of these signals along neuron's axon. Nowadays, one popular method of signal transmission is Pulse Density Modulation (PDM), which modulates analog signals in exactly the same way neurons modulates soma voltage-signals. The reason for modulating analog signals is avoiding attenuation and interference through a channel. As in artificial models there is no a physical transmission channel, there is neither attenuation nor interference and, therefore, there is no need of modulating processes like PDM or spikes. In most cases, rate-code models are simpler and faster than spiking models. Despite all these reasons, there are sophisticated brain processes in which temporal sequences are important and in which spiking neurons are necessary. Thalamic encoding processes and temporal binding in apical dendrites are examples of these sophisticated processes. The conclusion is that, for an efficient computation of biologically inspired networks, a rationale for where and when using rate-code and spiking neurons should be considered.

c) Diversity of Model Neurons and Implantable Electronic Devices

Emilio Del Moral Hernandez

(Polytechnic School of Engineering, Department of Electronic Systems University of São Paulo)

Spiking Model Neurons and Rate Coding Model Neurons are some of the most important directions in the current scenario of research in Artificial Neural Networks, and application, having produced important systems and devices, which are very relevant for automatic pattern recognition, fusion of heterogeneous multidimensional information, control, support for automatic decision, as well as, more recently, for the area of Brain-Machine-Interfaces and implantable devices for diagnosis and rehabilitation. At the same time, the enormous evolution of electronic systems and microelectronics observed in the recent decades, have allowed scientists and developers to conceive extremely compact systems, based on integrated circuits, signal processing, micro sensors and micro actuators, with huge potential for powerful information processing, sensing and control, conjugated with high adaptability to the environment changes and its variations. This talk addresses some of the important current issues in artificial neural networks in the context of electronic implementation for implantable devices and the potential impacts in terms of the future scenario of human to machine communication, medicine and neuroscience.

Round table 7

Linguagem, comunicação e cognição

André Leclerc (UFC/CNPq)

Leland McCleary (FFLCH/USP)

Evani Viotti (FFLCH/USP)

William Alfred Pickering (CLE/Unicamp)

Walter Teixeira Lima Junior (U.Metodista)

a) Spontaneous linguistic understanding

André Leclerc

(UFC/CNPq)

First, I will delimitate the concept SPONTANEOUS LINGUISTIC UNDERSTANDING, contrasting what it represents with hermeneutic practices, reflexive and inferential in nature, and with the understanding in a language not fully mastered. After that, I will criticise the epistemic view of linguistic understanding. Finally, I will try to develop the idea that linguistic understanding depends upon a more primitive form of understanding that I call the understanding of situations. This is why we understand so easily deviant sentences, ungrammatical or incomplete sentences, nonsenses, malapropisms, etc.

b) Linguistics in search of a semiotics of interaction

Leland McCleary (FFLCH/USP)

Evani Viotti (FFLCH/USP)

Saussure's famous binary options — langue over parole and synchrony over diachrony — laid the intellectual foundation for a linguistics that has been virtually impervious to increasing evidence from sister disciplines (including, but not limited to cognitive science) that language must share with life, and in particular with social life, the quality of being a self-organizing, dynamic complex system. The Chomskyan turn toward a 'cognitive' linguistics, with its option for the study of 'ideal speaker' competence to the exclusion of performance, further isolated linguistics from a view of language as an intrinsic feature of human sociality. Even versions of usage-based cognitive linguistics that have emerged in the wake of the 'embodiment' phase of cognitive science have remained committed to the binary Saussurean sign of 'signifier-signified' (e.g. Langacker, 2008), while at the same time arguing for the dissolution of such traditional distinctions as lexicon vs. grammar and word meaning vs. encyclopedic meaning. Thus, within linguistics there is currently a disconnect between established semiotic theories and those tendencies most inclined to incorporate (and contribute to) advances in the cognitive and social sciences, specifically theorizations of language originating at the interface with sociology, anthropology and psychology on such topics as multimodality and co-speech gesture, distributed agency and cognition, and interactional alignment and sequential organization across multiple time scales. Recently, these threads have been given theoretical coherence within a dynamic, neo-Peircean semiotics, in which semiosis is understood as an ongoing process which emerges in and through every interaction, including, but not limited to, the linguistic (Kockelman, 2005, 2013; Enfield, 2013). We hope to be able to illustrate the advantages of this dynamic, multimodal view of semiosis by analyzing excerpts of face-to-face interaction.

c) Linguistics and self-organization theory

William Alfred Pickering

(CLE/Unicamp)

Within linguistics, there has been a significant growth of interest in the theory of self-organization over the last twenty years. In my presentation at the EBICC 2015 meeting I will present concepts from the theory of self-organization, and indicate several important similarities between self-organizing complex systems and human languages. Through this comparison, I try to show the general plausibility of considering human languages as self-organizing complex systems. The implications of this approach for linguistics will be discussed, and I will argue that self-organization theory can bring unity and coherence to the understanding of various linguistic phenomena.

d) Social Communication, Cognition and Neuroscience

Walter Teixeira Lima Junior

(Metodista)

Social Communication has undergone huge influence of Sociology since its primordia as scientific field. In the last 60 years, the discipline has experimented various phases based on analysis of behavior through mass media artifacts. Media is the unique place to study the mass



communication phenomena. With the same focus, psychology and linguistics, more strongly anchored in semiotics, has helped the field of Social Communication advances to understand how language processes are structured from media consumer behavior analysis. However, the behavior as theoretical edifice, behaviorism, was eclipsed in the 1980 and 1990, when neuroscience finally managed to advance beyond the use of the analogies to understanding the communication black-box. Advancing in concept that Language is systematic, and so it can be described in terms of rules and general principles, the neuroscience can help the Social Communication the understand the understanding how language interacts with other cognitive processes. This scientific field has advantage to be tested experimentally, helping to complement the theoretical scope in order to comprehend how the communication transfers information from media to person.

Round table 8

The mind-body problem: reductive and nonreductive physicalisms

Alfredo Pereira Jr. (Unesp/Botucatu)
Jonas Gonçalves Coelho (Unesp/Bauru)
Osvaldo Pessoa Jr. (FFLCH/USP – coordinator)

a) The hydro-ionic wave: a new model of cognitive and affective processing in the brain

Alfredo Pereira Jr.
(Department of Education – Bioscience Institute – Univ Estadual Paulista (UNESP), campus Botucatu, SP.)

Beyond the "Neuron Doctrine" formulated by Ramon y Cajal – proposing that neurons are the structural and functional unit of the mind/brain – our current theoretical framework has been updated to include neuro-glial interactions. In recent years, there is a debate as to how the astroglial network modulates neuronal activity, influencing cognitive, affective and behavioral processes. The hypothesis of modulation by means of gliotransmitter release by astrocytes, activating a synchronous neuronal assembly was not confirmed 'in vivo'. Other transmitters have been proposed for this modulatory function, such as the cholinergic and purinergic ones. Another possibility is the "Hidro-Ionic Wave": a continuous energy exchange mechanism that traverses the neuro-glial arrangement. Inside astrocytes, it has the form of a "calcium wave"; in the extracellular medium, it changes to a potassium current that changes the pattern of organization of the aqueous gel, which interacts with the neuron membrane and modulates the pattern of neuronal activation.

b) The placebo effect according to double sided approach to the mind-body relation

Jonas Gonçalves Coelho.

(School of Architecture, Arts, and Communication – Univ Estadual Paulista (UNESP), *campus* Bauru, SP.)

My aim in the present paper is to interpret the placebo effect according to the “double sided approach” of the mind-body relation. I am therefore accepting the challenge made by the researchers Donald D. Price, Damien G. Finniss & Fabrizio Benedetti in the paper “A comprehensive review of the placebo effect: recent advances and current thought”: “Powerful placebo effects reflect mind-brain-body relationships, and there is a need to philosophically resolve explanations of these relationships without resorting to eliminative materialism or forms of dualism that completely divide the mind from the body” (p. 586). The quotation indicates that the authors have a non-reductive physicalist view of the mind-brain-body relation, according to which neither the mind should be eliminated, nor should it be separated from the brain-body. This means that the mind, the body and the relation between the two have a fundamental role in the placebo effect, a thesis that the mentioned neuroscientists intend to prove, transferring to the philosophers the task of solving the mind-brain-body relation. To deal with the problem of the mind-brain-body relation, following the lead of the placebo effect, I will start by presenting some definitions of the placebo effect, attempting to explicate the terms in which one establishes the distinction and relation between mental (psychological) processes and cerebral/bodily (biological) processes. I will then try to show how to interpret the placebo effect from the two inseparable and irreducible sides of the mind-brain relation, i.e. “mind as brain” and “brain as mind”.

c) Non-identical versions of the mind-body identity thesis

Oswaldo Pessoa Jr.

(Department of Philosophy – FFLCH – University of São Paulo)

The presentation will begin by arguing that the mind-body identity thesis is essential to any reductive physicalist view. But a little reflection indicates that there are at least as many versions of the identity thesis as there are different monist solutions to the mind-body problem. After exploring early defenses of the view, it will be stressed that the identity thesis of U.T. Place (1956) in fact privileges the scientific description of the brain, instead of phenomenal consciousness, and that this version of materialism carries over to Smart (1959). This is clearer in Feyerabend’s (1963) version of identity theory, which eliminates mental concepts altogether. On the other hand, radical idealism also identifies mind and body, but considers that everything is mental. An intermediary version of the identity thesis was presented by Fechner (1860) and Th. Nagel (2002), following Spinoza in proposing a monist view of reality of which mind and matter are two different aspects or perspectives. But returning to reductive physicalism, one may also adopt the identity thesis while privileging the phenomenal subjective quality of consciousness (described as sense data, raw feels or qualia). This results in what might be called “qualitative physicalism” (or “colored-brain thesis”), proposed by Case (1888) and suggested by Boring’s (1933) formulation of the identity thesis, and which will be further explored.

Round table 9

Cognitive Neuroscience of Art: Dialog among Human, Biological and Exact Sciences

Ronald Ranvaud (USP/ICB – coordinator)

Mirella Gualtieri (USP/IP)

Maira Monteiro Fróes (UFRJ)

Patrícia Vanzella (UnB & UFABC)

a) Artistic Experience, Expression and the Brain

Mirella Gualtieri.

(Institute of Psychology - University of São Paulo)

We are now at an interesting time in the exploration of the relationships between neuroscience and art. Let us consider three major factors on which art is constructed: inspiration, creativity and aesthetics. From a neural point of view, inspiration is a mental experience relying on the integration of subcortical (motivation/reward, emotions) and frontal cortical areas of the brain. As an experience integrated by goal-directed behavior, inspiration can be closely related to creativity, which can come spontaneously or as a result of deliberate action. Deliberate creativity could be summarized, according to Damasio (1994), as emotional evaluation of a set of cognitive processes and its neural substrate initiates with prefrontal cortical activity, whereas the spontaneous creative processes seem to arise from temporal cortex activity. At the core of creativity, the intimate linkage between highly variable cognitive and affective features of the brain often leads to situations where the artist's work reflects a form of knowledge and insight about the world that precede scientific exploration of the same phenomena. For instance, the kinetic art of Tinguely long preceded the discovery of the cortical visual motion area (V5), but the artist already knew that color and shape did not matter when motion is the means of communication. Many artists understood how to manipulate shading to emphasize edge by creating illusory enhancements that the vision science community understands to be Mach Bands, discovered by the physicist Ernst Mach and documented physiologically only many years later. Aesthetic-related brain areas, mainly the anterior insula and prefrontal cortex, are active in response to classical beauty and are also activated when people watch elite, dynamic athletic performance, or manifestations of forces of nature, or even when presented with elegant arguments or theoretical concepts, which may be experienced as examples of loftiness or the sublime. It has been shown that the brain structures activated during experiences of beauty and of the sublime are different. The implications and importance of such neuroscientific findings regarding the arts are both wide-ranging and profound. For example, it is now possible to evaluate, from a neuroscientific perspective, the diversity of the impact of art on different individuals. For that matter, the role of experience upon the brain has also been shown to have an impact on the aesthetic experience. The judgment of consonant or dissonant pairs of tones according to the Pythagoras' ratio rules was remarkably different among musicians and non-musicians, with the level of brain BOLD response being proportional to the magnitude of the Pythagorean ratio in the musically trained but not in the untrained subjects.

b) An Artsci Science

Maira Monteiro Fróes

(Federal University of Rio de Janeiro, Centro de Ciências Matemáticas e Natureza, UFRJ).

Would aesthetical immersion drive cognitive handling in science? This question has been systematically addressed through controlled scientific experimentation in my laboratory. In a partnership with artists, my lab has intentionally developed tools for a non-conventional aesthetical contextualization of scientific material and conjectural objects. In one of the experimental investigative fronts, distinct groups of undergraduate students from the university's schools of fine arts and life sciences (Department of Phonoaudiology) were invited to answer the Aesthesis quest, a Web questionnaire we have specially conceived. Aesthesis was designed to evaluate primary aesthetic, emotional-affective and cognitive aspects of perception developed in response to conventional and non-conventional referential anatomical images. These subjective qualifiers represent foundational aspects of human perception, as aesthetics, emotion, abstraction and analytical thought. Our results confirm our expectation that non-conventional contextualization of the anatomical object, provided by contemporary art treatment, alters aesthetical, emotional and cognitive markers of perceptual assessment. Notably, they favour our more speculative hypothesis that cognitive resources for abstraction and abstract thought itself are positively correlated with the contextualization of the scientific object by contemporary art. Our results also point to involvement of positive emotion and judgments of beauty, suggesting that, together with gains in abstraction, these might represent interrelated, indissociable aspects of a scientific objectivity impregnated by the aesthetical experience.

c) Emotion in Music from a neuroscientific viewpoint

Patrícia Vanzella (University of Brasília and Federal ABC University).

Musical behavior is a primordial and universal human characteristic. Among the most ancient artefacts encountered in archeological excavations are musical instruments, and there is no evidence of some civilization that does not engage in some type of musical activity. It is undeniable that music evokes and modulates emotions, promotes social cohesion and synchronizes both movements and states of mind. Several experimental techniques (EEG, NIRS, galvanic skin response etc) allow to measure reliably behavioral, cognitive and neurophysiological changes associated with music. From a neuroscientific point of view the challenge is threefold: to identify the varied neural mechanisms whereby music engenders such responses, to identify which of the physical parameters of the sound wave are important, and to understand how these physical parameters participate in the above neural mechanisms.

d) Cognition, Music, Plastic Arts and Literature

Ronald Ranvaud

(Institute of Biomedical Sciences, University of São Paulo)

Among the most fundamental functions of the nervous system is generating predictions as to what will happen next. This is possible by constantly monitoring the environment and relying on prior experience. Good predictions permit preparing timely and

adequate motor responses as circumstances evolve. Generating predictions is an automatic process which runs continuously, even though awareness of its operation is generally lacking. Of course, it is also possible to generate predictions voluntarily, focussing attention and reasoning on the challenge being faced at any moment, but, thankfully, under normal conditions it is not necessary to exert such effort. Generating predictions has great adaptive value, permitting proactive rather than merely reactive behavior. Generating expectations is also an essential part of cognition, as can be realized considering that the etymology of the word cognition remits to knowledge, or knowing, and further considering what knowing something means. For example, what knowing a person mean? Rather than just having information as what the name of the person is, and their address, telephone number and so on, knowing someone really means having a good idea of what the person will do under different circumstances, i.e. predicting, albeit with some limitations, their behavior. Several theories of Artistic Cognition also are based of the idea of generating expectations. According to this approach, the charm of music would result from the alternations of moments described in musical theory manuals as moments of relaxation (expectations confirmed) and moments of tension (expectations negated). These concepts can also be applied to the plastic arts and literature, and they thus form a solid basis for the neurophysiological study of artistic behaviors.

Round table 10

Some historical and evolutionary perspectives on mind, brain, and cognition

Hamilton Haddad Junior (IB-USP) (coordinator)

Maria Inês Nogueira (ICB-USP)

a) Evolution, niche construction and human cognition

Hamilton Haddad Junior

(Instituto de Biociências, Universidade de São Paulo)

The purpose of this talk is to examine some recent approaches of human mind and cognition beyond the biological processes, pushing also the boundaries of traditional computational approaches arising from the artificial intelligence. The main idea is to analyze theories that reinforce the role of niche construction on human cognition and try to conceive the mind as essentially dependent on an environmental scaffolding process. Many non-human animals modify their immediate environment, shaping it to improve fitness; these organisms in part adapt to their niche and partly build their own niche. This process of 'niche construction' (Laland *et al.*, 2000) has been postulated as an important factor in evolution. It is suggested that over the evolutionary process of human species, a scaffolding process in the cognitive domain occurred similar to that niche construction. Human ancestors epistemically modified their environments, which were inherited by subsequent generations. The cognitive abilities of these new generations depend on, and were transformed by, these new environmental resources – these resources were built, modified and preserved precisely because they improve cognitive capacities (Sterelny, 2012). This dialectical process, in which agents modify their epistemic environment which retroact over the agents, is assumed to be the cornerstone of evolution and the current mechanisms of the human mind.



b) History of the morphofunctional comprehension of the brain and its relation to cognition

Maria Inês Nogueira

(Laboratory of Neuroscience, Anatomy Department, Institute of Biomedical Sciences, University of São Paulo)

Under this heading are addressed, historically, some concepts, ideas, actions and techniques that influenced our current knowledge on the brain. Which is understood as part of the encephalon, an organized tissue composed by two basic cell types: neurons and glia, but with great variety of form function and distribution. The encephalon is the rostral part of the nervous system present in vertebrates protected by a cartilage or bone box (skull). It is comprised by the brainstem that supports the brain (tele- and diencephalon) and the cerebellum (little brain). However, the focus of this historical approach lies in the human primate, *Homo sapiens*, however keeping in mind the warning that evolution is not linear, and that the brain did not evolve just by putting new more complex structures over the less ones, and in that man occupies the top of the list. In revisiting the history of science, we seek to understand the importance attributed to the head, brain and heart as to its relevance to sustain life, thinking, feelings, actions and reactions. Where the ancient civilizations of the old and new world found the site of reason and emotions? Is it possible that only the brain is responsible for them? Which is the substrate to monism, dualism, localizationism, holism. Along the way, there is a search to identify how has the understanding of the organization and brain functions evolved and what were the competing factors for both: the main searchers, concepts and technologies relevant to the current understanding, but still incomplete, of the brain and the nervous system. How did we get to neuroscience (neural plasticity, neural communication, somatic markers) and what is its relationship to cognition. Are Artificial Intelligence models a true representation of the brain and mind relation, as some use to say like hard- and software?



Round table 11

Cognition in Peirce's Semiotic

Vinicius Romanini (USP/ECA – coordinator)

Ivo A. Ibri (PUC/SP)

João Queiroz (UFJF)

a) Everything Speaks – The Pragmatic Signs of Semiotics

Ivo A. Ibri

(Center for Pragmatism Studies – PUC/SP; Charles S. Peirce Society)

Peirce is well known as the father of Semiotics and classical Pragmatism. Nevertheless, the studies that deepened the intimate relationship between both theories still are few, which I suppose to be very essential to a fairer consideration of the systemic constitution of Peircean philosophy. One way to do such a task would be a serious study of the ontological realism as adopted by Peirce, one main axis of such system. However, such a way has been misunderstood, or even disregarded on its importance, by many scholars and, as a consequence, it is not infrequent to see nominalistic interpretations of those theories impeding the realistic connection between them. Another visible way to establish the relationship between Semiotics and classical Pragmatism is to consider what I have called categorial symmetry, a concept built throughout the passage from Peirce's phenomenology to his ontology. Such symmetry will provide an extension of the notion of language to Nature and, by doing so, enable us to consider that everything speaks. In other words, pragmatic signs are meaningful as a true saying of the natural and human inner worlds, allowing an ample concept of interpretant signs through the observation of the conduct of every being in the universe.

b) Distributed creativity in Peirce's cognitive semiotics

João Queiroz

(Iconicity Research Group; Instituto de Artes e Design/UFJF)

Charles S. Peirce can be considered an important precursor of situated mind and distributed cognition thesis. But differently from the anti-cartesianism defended by some embodied-situated cognitive scientists, which is predominantly anti-representationalist, for Peirce, mind is semiosis (sign-action) in a dialogical -- hence communicational -- materially embodied form, and cognition is the development of available semiotic artifacts. It takes the form of development of artifacts, such as writing tools, instruments of observation, notational systems, languages, and so forth. My aim here is to explore some connections between Peirce's semiotic theory of mind and the conception of distributed creativity through the notions of iconicity and semiotic niche construction, taking advantage of examples in dance and poetry improvisation. According to this approach, creativity is a property of cognitive artifact manipulation and niche construction. More specifically, creativity is distributed as opportunities for evolution in semiotic niches.

c) The Solenoid of Semiosis as a general model for cognition

Vinicius Romanini
(PPGCOM, University of São Paulo, USP)

Early in his studies, Peirce considers cognition as a particular case of representation in conscious minds and, following his ubiquitous triadic divisions in firstness, secondness and thirdness, defines its basic elements as feelings, efforts and notions. While Peirce maintains this basic structure throughout his career, his late theory of cognition broadens as he becomes an extreme realist. The sign is then defined as a “cognizable” that allows for information not only in actual but also in possible minds. Cognition is not a psychological faculty of individual minds, Peirce claims, but a logical process that can be explained by the general laws of mind that govern the development of life and even the growth of complexity in physical systems. We will present here a model, called the Solenoid of Semiosis, that analyses the action of signs in its minute logical elements and relations. I will also apply it to an example of cognition often quoted by Peirce: the information conveyed by a weathercock. Our hypothesis is that the Solenoid of Semiosis can function as a general model for cognition.

Round table 12

Logic, consequence operators, and information

Hércules de Araújo Feitosa (UNESP - FC – Bauru)
Itala M. Loffredo D’Ottaviano (CLE-Unicamp) (coordinator)
Marcos Antonio Alves (Unesp-Marília)

a) Consequence operators and consequence relations

Hércules de Araújo Feitosa
(UNESP - FC – Bauru)

At the beginning of 20th century several different logics appeared from the logic until considered the Logic. From that time we have named the Logic introduced by Greeks, with particular contribution of Aristotle, so a construction from classical world, by Classical Logic, and the other logics distinct from Classical Logic we have named non-classical logics. In 1930, Alfred Tarski tried to explicit the common aspects of all these logics. For that, he defended that the fundamental aspect of any logic is on its deductive context. Thus, the central notion is the deduction, derivation or consequence. Tarski defined the consequence operator of Tarski, a function that puts emphasis on the fundamental aspect of consequence. In a complementary way, many logic textbooks usually consider the consequence as a relation that associates or links a set of information with conclusive information. Relation is a more general concept than a function. This notion puts the inference in evidence, from which we obtain a conclusion from a collection of premises. We observe several different definitions of consequence relation in



the logical environment. In this paper, we present some of these formulations and collate these definitions. Our contribution to these analyses is to show that even though there is equivalence between some of them, a given principle is stronger than another one that occurs in another definition. This way, we observe the independence of some principles and try to expose with clarity and simplicity these basic notions of consequence. We do that in the context of universal logic, without using artificial languages, but only using set theoretical tools. In this case, we do not use the operators of negations, conjunction, disjunction and other logical operators. We only work with operators and relations that preserve the essential characteristics of a Tarski logic. Nowadays, many new logics are proposed and even the general aspects of these operators and relations are not enough to involve them. These more general notions must be investigated in the context of universal logics in future researches.

b) A quantitative-informational approach to logical consequence

Itala M. Loffredo D'Ottaviano

(Unicamp, Philosophy Department, Centre for Logic, Epistemology and the History of Science – CLE, University of Campinas, Campinas, Brazil)

In this work, we propose a definition of logical consequence based on the relation between the quantity of information present in a particular set of formulae and a particular formula. As a starting point, we use Shannon's quantitative notion of information, founded on the concepts of logarithmic function and probability value. We first consider some of the basic elements of an axiomatic probability theory, and then construct a probabilistic semantics for languages of classical propositional logic. We define the quantity of information for the formulae of these languages and introduce the concept of informational logical consequence, identifying some important results, among them: certain arguments that have traditionally been considered valid, such as *modus ponens*, are not valid from the informational perspective; the logic underlying informational logical consequence is not classical, and is at the least paraconsistent *sensu lato*; informational logical consequence is not a Tarskian logical consequence.

c) Implication and information: a quantitative-informational analysis to material implication

Marcos Antonio Alves

(UNESP, Philosophy Department, State University of São Paulo, Marília/SP, Brazil)

We show that the usual material implication does not capture the notion of information as developed in Mathematical Theory of Communication by thinkers like Shannon. Initially, we define this quantitative notion of information, and then we introduce a probabilistic semantics for the language of classical propositional logic. After that, we define the probabilistic and informational values of formulae of such language, emphasizing the implication. We present some examples where the informational value of usual material implication does not capture the quantitative notion of information. Finally, we introduce a definition of probabilistic implication, whose definition of informational value is suitable for the quantitative notion of information.



EBICC 2015 Accepted Papers and Posters with Abstracts

Wesley Becari, Gabriel Durante, Henrique Estanislau Maldonado Peres and Francisco Javier Ramirez-Fernandez.

Application of Support Vector Machines for adulteration detection of bovine milk

Abstract: Milk production is among the main Brazilian food sectors, with a total production about 35 billion liters in 2014. However, the supervision of the quality of those products does not keep pace with the sector production growth, which facilitates frauds. Furthermore, current technologies that check adulteration in milk are primarily chemical-analytical, performed in laboratory environment [1]. Thus, milk analysis and classification is an important way to prevent frauds. This work proposes a detection methodology of bovine milk adulteration applying Support Vector Machines (SVM) classifiers. SVM are a set of supervised learning methods used for classification, regression, recognition and prediction [2]. Through SVM it is possible to obtain higher classification accuracy and robust models [3] [4]. Three samples of Brazilian cow milk were analyzed: raw milk, UHT (Ultra High Temperature) brand Ninho and UHT brand Paulista. These samples were diluted with different proportions of usual milk adulterants such as water, hydrogen peroxide, sodium hydroxide and formaldehyde. Then, the samples were characterized by measurements of its electric impedance, pH, temperature and by the Time Domain Reflectometry (TDR) technique. Classification was performed with a 5-fold validation set, each fold with approximately 59 data obtained from the sensors. Linear and non-linear SVMs were trained with different kernels. The best results were obtained with a simple linear SVM that allowed qualifying milk samples as “unadulterated” or “adulterated”. The overall percentage of correct answers (overall accuracy) was 94.9%. Therefore, the proposed methodology is useful for classifying milk, enabling the possibilities of local and real-time monitoring systems for fraud detection in milk composition.

Vinicius Fernandes, João Sato, Lucas Trambaiolli, Renato Anghinah and André Fonseca.

Analysis Of Sample Entropy During A Resting-State Eeg Recording In Alzheimer's Disease

Abstract: Objective: Our study aimed to analyze the electroencephalogram (EEG) at rest in subjects with probable AD to test the hypothesis that regularity is higher in these subjects than in age-matched controls. Method: We recorded EEG from 34 subjects, 22 with probable AD, and 12 normal elderly. We applied spectral analysis to test whether the data present a typical activity signature (reported in literature) and then we correlated the results with sample entropy. Results: Spectral analysis was able to detect differences between the control subjects and Alzheimer's subjects; there was a decrease in the spectral power of high frequencies and an increase in slow frequencies throughout the cortex, a finding which is characteristic of the phenomenon known as waves' slowdown. By comparing the sample entropy taken from both AD subjects and healthy adults, we observed more regularity in the EEG signal from the Alzheimer's group at rest. Conclusions: The sample entropy results complemented the findings obtained using spectral analysis, an increased regularity may also be caused by the slowdown phenomenon, due to the death of cholinergic neurons. Nonlinear analysis of EEG might provide valuable information contributing to a wider view on brain dynamics in AD, which are not observable using conventional methodologies.



André Bazzoni.

Logical and Philosophical Foundations of Partial Belief Models

Abstract: This paper is an attempt to put forward a new kind of partial model for representing belief states. I first introduce some philosophical motivations for working with partial models. Then, I present the standard (total) model proposed by Hintikka, and the partial models studied by Humberstone and Holliday. I then show how to reduce Hintikka's semantics in order to obtain a partial model which, however, differs from Humberstone's and Holliday's. I finally discuss the nature of such differences, and provide motivations for using the former rather than the latter.

Lucy Mari Tabuti, Ricardo Nakamura and Ricardo Luis De Azevedo Da Rocha.

Análise das competências e habilidades de raciocínio lógico em um jogo de lógica nos meios físico e digital

Abstract: The progress of technology and its access to a large number of people, especially in mobile devices, make digital games a very popular tool, also in academic environment. Although, for digital games – mainly those of logic – to have acceptable quality in education, they must be developed in a way that skills and competences of traditional games are kept in the digital environment. This article presents a study of skills and competences of logical reasoning in a logic game both in traditional and in digital environment. The study shows that most of skills and competences of logical reasoning when developed in traditional environment are preserved in digital environment.

Beatriz Sorrentino Marques.

Presuppositions about the role of consciousness in the Agent Causation conception of agents and the problem of the Disappearing Agent

Abstract: Well-known Agent Causation theories rely on a certain conception of agency that leads to the expectation that agents play a role in the production of their action, a conscious role. According to this conception of agents, the requirement about consciousness is the ground for these theories to pose the objection of the Disappearing Agent to the Causal Theory of Action. I will argue that, in a similar way, Daniel Wegner defends the idea that consciousness is a defining mark of agency. However, Wegner is not an Agent Causationist; in this sense, he is viewed here as posing a modern version of the view that consciousness is a requirement for agency, and of the view that without consciousness playing a part in the production of action the role for the agent would be lacking in this production. I will argue that the objection of the Disappearing Agent raised by Agent Causation theories also equates lack of consciousness with lack of agential role in the production of action. This will show that the issue is grounded on a specific conception of what an agent is and what her role in producing actions should be; so, in this sense, the elements that ground the Disappearing Agent objection resemble Wegner's view. I, however, defend the claim that this conception of



agency should be revised, as well as the problem of the Disappearing Agent, because human agents cannot fulfill the requirements in question.

Charles Borges.

Brain-Body-Life: Towards a panpsychist theory of embodied cognition

Abstract: This paper develops a Panpsychist theory of embodied cognition. As a monist theory, its aim is to present a non-reductive Materialist ontology of mind as an alternative to Dualist conceptions of mind and cognition (Substance Dualism and Propriety Dualism) regarding the mind-body and the mind-mind problems.

Zhengmao Ye, Habib Mohamadian, Hang Yin and Yongmao Ye.

Integration of Fuzzy C-Means Clustering and Fast Level Set for Aerial RGB Image Segmentation

Abstract: The fuzzy level set method is proposed for aerial object recognition with respect to three RGB color components independently. Seeing that the convergence rate and robustness of the fuzzy level set are both sensitive to initialization, fuzzy C-Means clustering is employed for pixel classification in spatial initialization and parameter configuration. The level set model is then introduced to deploy active contours and formulate dynamic boundaries. This approach has been implemented on multiple sets of aerial RGB images such as sparse-distributed and dense-distributed images. Based on numerical simulation, rapid and distinct recognition of targeting objects in all four typical cases are observed in each aspect of primary color representation, with the presence of intensity inhomogeneity in aerial images.

Leonardo S Barbosa and Sid Kouider.

Repetition Probability Modulates Repetition Suppression without Perceptual Awareness

Abstract: Neural activity induced by a visual stimulus is usually reduced when it is repeated. This phenomenon, termed repetition suppression (RS), is classically held to stem from neuronal adaptation either as a consequence of bottom-up adaptations (Grill-Spector et al., 2006; Gotts et al. 2012). More recently, however, RS has been argued to derive from top-down mechanisms of predictive coding, reflecting a comparison between the expected and actual sensory evidence conveyed by the stimulus (Rao & Ballard 1999; Friston 2005; Summerfield et al., 2008). Congruent with this view, RS has been shown to increase with the probability of encountering a repeated stimulus (Summerfield et al., 2008, 2011; Todorovic et al., 2011). Nevertheless, this assumption has been challenged by a surge of recent studies arguing that this modulation of RS is restricted to a certain class of prior expectations (Kovacs et al., 2013; Larson & Smith, 2012), casting doubt as to which extent top-down mechanisms are necessary to explain RS, otherwise saying, questioning the automaticity in forming and applying prior information to sensory evidence. Here, to address this issue, we used a subliminal priming paradigm combined with EEG recordings (Henson et al., 2008). Moreover, we varied the probability of repetition between experimental blocks in order to address whether unconscious RS can be modulated by the predictive context (i.e. repetition probability). Our results show that invisible stimuli evoke RS at early stages of EEG in electrodes close to



perceptual regions. Crucially, RS was present only when a repetition was expected, and vanished when an alternation was expected, independently of consciously perceiving the prime. We argue that this provides evidence for automatic, unconscious influence of probabilistic context in RS, affecting early perceptual components.

Denis James Pereira and Leonardo Lana De Carvalho.

A modelagem multiagente como metodologia de estudos de fenômenos sociais

Abstract: Este trabalho apresenta um breve panorama histórico sobre a conceitualização das Ciências Humanas e Sociais e uma discussão acerca de novas metodologias que utilizam plataformas computacionais multiagente para o estudo de fenômenos sociais, influenciadas pela abordagem Enativa em Ciências Cognitivas. Para a conceitualização desta pesquisa, selecionamos autores consagrados da fundamentação das Ciências Humanas e Sociais e do Enativismo, e em especial pesquisadores da modelagem multiagente para estudo dos fenômenos sociais. Wilhelm Dilthey um dos principais expoentes de uma proposta de Ciências Humanas e Sociais é retomado e suas considerações são apresentadas. O sociólogo Max Weber e, mais recentemente, o antropólogo Roberto da Matta também oferecem conteúdos importantes ao debate. No entanto, defendemos que o desenvolvimento da abordagem Enativa das Ciências Cognitivas, dos autores Humberto Maturana e Francisco Varela, abre novas possibilidades para os estudos dos fenômenos humanos e sociais. As conceitualizações do enativismo extrapola a área inicial de estudos, dentro da Biologia, para renovar paradigmas nas diversas áreas do conhecimento. Plataformas para o estudo de fenômenos sociais, por exemplo, são influenciados pelo enativismo e contribuem para aumentar as possibilidades em ciências humanas e sociais. Como importante marco da modelagem computacional em ciências humanas e sociais o Modelo de Segregação Racial de Schelling é discutido, assim como são considerados para este trabalho outros pesquisadores como Nigel Gilbert, Jacques Ferber e Robert Axtell. Em conclusão, reafirmamos que a abordagem Enativa em Ciências Cognitivas influencia diversas áreas do conhecimento sem violar a autonomia de diferentes disciplinas como por exemplo a sociologia, biologia, psicologia ou linguística. Mas fornece uma coerência interdisciplinar sem reduzi-las umas às outras, fornece uma alteração de paradigma no interior das disciplinas. A modelagem multiagente traz, neste contexto, novas possibilidades aos cientistas para o estudo de fenômenos humanos e sociais por acrescentar uma outra metodologia para suas pesquisas.

Majid Rostami and Mehrnaz Piroozbakht.

A new hybrid training algorithm based on Bird Mating Optimizer (BMO)

Abstract: Bird mating optimizer (BMO) is a novel heuristic optimization method based on the mating ways of bird species for designing optimum searching techniques. It has been proven that this algorithm has good ability to search for the global optimum, but it suffers from slow searching speed in the last iterations. This paper proposes a new hybrid algorithm based on opposition approach and BMO, named Opp-BMO. In this paper a comparison of the performance of BMO and Opp-BMO in feedforward neural networks (FNNs) training is performed, based on the case study of stock price forecasting. It is proven that an FNN trained with Opp-BMO has better accuracy than one trained with BMO.



Daniel Rodrigues, Wesley Becari, Alexandre Neto, Péricles Oliveira, William Silva and Henrique Peres.

Ethanol Fuel Analysis Using Artificial Neural Networks

Abstract: Brazil is a country with a high production of automotive fuel, producing almost 29 billion liters of ethanol in 2014. However, the illegal adulteration of automotive fuel can cause numerous problems: there is the pollution resulting from irregular fuel (burning of adulterated products results in more dangerous pollution); there are health issues (methanol used to adulterate ethanol can cause death in sufficiently large doses); there are mechanical problems (adulterated fuel conduces to reduced engine lifetime); and also economic issues (tax evasion and unfair competition are consequences of adulteration with cheaper and illegal substances). Besides, usual ways of fuel analysis require relatively complex laboratory methodologies and equipment. Hence, this work proposes a classification methodology of ethanol fuel using an Artificial Neural Network (ANN) algorithm embedded in a microcontroller, using the data from four portable sensors, and testing it with water-adulterated ethanol. For analysis, the ANN utilizes a Multilayer Perceptron (MLP) model trained with backpropagation for qualifying ethanol based on four different sensing methods: time-domain reflectometry (TDR), conductivity measurement, infrared absorbance (based on spectroscopy studies), and density measurements (obtained from a pressure sensor). Sixteen samples of ethanol adulterated with various proportions of water were prepared. Nine of them were used for training the ANN (to classify samples between “approved” or “reproved”), while the other ones were used for validation of the system. The results have shown that the system was able to detect a variation of 2 % (volume/volume %) of water in the ethanol samples. Therefore, the proposed methodology can classify ethanol fuel adulteration and can be useful for in situ ethanol fuel qualification.

Mariana Vitti-Rodrigues.

Information and Complexity in the Study of Cognition

Abstract:

The objective of this project is to analyze the relationship between information and cognition, from the perspective of the Theory of Complex Systems. The central research question is: "What is the role of information in abductive reasoning?" Our approach will be to analyze the concept of information, focusing on its semiotic aspects, as defined by Charles S. Peirce (1839-1914), and the notion of abductive reasoning. Three hypotheses will guide the work: H1. Information about objects indicates their characteristics or predicates; H2. The unveiling of information in the context of problem solving is the “fuel” of abductive reasoning and, in turn, of the process of cognition; H3. The Theory of Complex Systems provides relevant conceptual resources for study of the relationship between information and abductive reasoning. In short, we intend to analyze, from the perspective of the Theory of Complex Systems, the role of information in the development of abductive reasoning, which (we hypothesize) sheds lights in the process of cognition.



Marcelo Taddeo and Roberto Ivo Da Rocha Lima Filho.

An Event-Related Analysis Of The Traders Decision-Making By Using ICA

Abstract: The objective of this article is to identify, with the aid of an electroencephalogram (EEG) and by using a multivariate statistical tool called independent component analysis (ICA), the areas of the brain and their interconnection associated to the Traders' decision-making process. In order to assess such activity, a sample of forty (40) experienced traders were used, both divided equally into 50% male and 50% female. In Lima Filho (2014), it was found through brain mappings that such traders tend to make decisions by using an associative based rule process instead of any of analytical form, as posed by much of the classical financial literature. **METHODOLOGY:** Volunteers participated in a simulation of investments on the São Paulo Stock Exchange - BM & FBovespa - whilst electroencephalogram (EEG) epoch was recorded. The total simulation time lasted 50 minutes, also subdivided into 25 minutes, primarily related to a bull market and then a down market. Thus, the purpose was to characterize brain activity patterns associated with the purchase, sell or hold decision of a set of shares comprising two experimental portfolios (called A – Upward Market and B - Downward Market). According to Onton and Makeig (2006), "electrode locations are at best quite crude indicators of the locations of even the strongest underlying cortical sources", resulting into EEG recordings with 'low spatial resolution.' Since we aim to isolate the areas of the brain that were activated, a way of tackling this problem is making use of the Independent Component Analysis (ICA). They decompose the data (input) into a set of components which are independent and explain the data itself and its variability by writing them as a linear combination of such factors. **RESULTS:** Traders group proved to have a more heterogeneous decisions, given high standard deviation, with even negative values. It is also worth mentioning that the average decision time this group was fast, a total of 49.2 seconds/decision. This may also suggest a time discount regarding the expected reward, as advocated by Muller and Cohen (2001), since the activation of the decision-making process occurred late in the frontal cortex and prefrontal right. Additionally, this indicates an heuristic / associative system domain. The most interesting was the fact that the purchase and sale orders have triggered different neuronal circuits, even in a predictable market, as explained by Rocha (2013).

Roberto Ivo Da Rocha Lima Filho.

Traders' Decision-Making Processes: Results From An Investment Simulation Monitored With An EEG

Abstract: The objective of this article is to identify, with the aid of an electroencephalogram (EEG), that traders use different areas of the brain (and therefore different levels of neuronal activity) in their decision-making process when it comes to making a financial investment. A sample of forty (40) experienced traders was used, divided equally into 50% male and 50% female. Some findings through brain mapping indicate that these operators in the financial market tend to make decisions using an associative based rule process (anchored to historical or intuitive data); rather than any form of analytical based rule, as the classical financial literature on this issue suggests. From an economic standpoint, this work is distinct from the classical theories of Finance - Efficient Markets Theory and Modern Portfolio Theory - to the extent that it not only employs assumptions of behavioural finance, but also encompasses studies of neurocognitive processes.



Marek Vanzura.

What can a drone operators' PTSD tell us about embodied and extended mind?

Abstract: For a long time, academics are discussing ethical aspects of use of unmanned aerial vehicles, also known as “drones” in the warfare, especially the notion of remote killing. However, out of sight is another highly important perspective concerning drones, which is interesting mainly for philosophy of mind and cognitive science. It is the impact of drone use on their very pilots or operators. So far drone operations are not completely autonomous and at least all the important decisions are still made by human operators; in many cases, these men and women control unmanned vehicles almost all the time. So the perspective of what impact have drone operations on their remote pilots is still waiting for its analysis. Luckily, in recent years there emerged first studies, which promise a huge potential for important and interesting research.

The starting points for philosophical exploration of this topic are studies on existence of Post-Traumatic Stress Disorder (PTSD) among drone operators. The very existence of this issue among people, who are physically distant from war-zones, is disturbing and so far not sufficiently explained. I am offering a potential explanation. I propose to think about this topic in framework of the extended mind theory. If we use this explanatory framework on drone operators' PTSD problems, we get not only quite satisfying look on what causes this problem with mental health of remote pilots, but we also get a lot of epistemologically relevant consequences.

According to the extended mind theory, the PTSD among drone operators is caused by the fact that their minds (and also cognition and even emotions, as I propose) are embodied and extended not only into their biological bodies, but also into external non-biological artifacts, such as ground control station and the remote drone itself. Because of that, their mind is physically exposed to stressful conditions of war-zones and thus, drone operators experience everything almost the same way as pilots sitting in the manned airplanes. Cognitive processes and emotions are embodied and extended as well. This concept explains, why there is a PTSD present among people, who are sitting in safe and air-conditioned cubicles, while all discomfort connected to war is on the other side of the globe. If we accept this view, we will face serious epistemological, as well as ethical consequences. Drones are a picture perfect example of teleoperations, so we can find here a whole group of epistemological (in this case teleepistemological) problems concerning acting and acquiring information in distance. First difficulties spring from the skeptical view that we could be deceived. It would be, for example, possible that situations presented via monitors at ground control station are computer-generated simulations that do not mirror reality in any sense, which drone operators do not know. In this case, it would mean that PTSD among operators is caused by non-existent situations, or at least by situations existing in very different and strange ontological sense. In other words, this would mean that mind, cognition and emotions are embodied and extended into computer simulations and potentially into something that does not exist. It seems that it is sufficient as a drone operator to think that I am causally active in a sequence of operations to embody and extend a mind into computer simulation. Ethical perspective on this situation is as follows. If we consider mind as embodied and extended into external artifacts and relationship between internal biological components and external non-biological components as reciprocal and causally active, then it would be possible to change ground control station's interface in a way that it would, for example, make every situation funny, insignificant or so. In this case, the perception of drone operators would change dramatically and the PTSD problem would eventually disappear. The mental health of these men and women would be again all right, but



drones' engagement in war would be completely changed. To summarize, the fact that there is a PTSD among drone operators, who do not face any real discomfort connected to war, raises question why is it that. I propose to look at this problem through lens of the extended mind theory, which will offer us useful explanatory tool to grasp this topic. If we then think more deeply about epistemological problems of this notion, it will offer us, on the one hand, important questions for ontology, philosophy of mind and cognitive science, and on the other hand, another major ethical consequences.

Luiz Augusto Rosa

The relation between James and Damasio: the body loop of emotions and feelings

Abstract: James (1884) argue that contrary to the natural way of looking at emotions as triggering bodily changes, "the bodily changes follow directly the PERCEPTION of the exciting fact, and that our feeling of the same changes as they occur IS the emotion" (JAMES, 1884, p. 189-190). So, according to James, when we see a predator we do not feel fear before running, but we feel fear as we run. Damasio (2010) argues that even agreeing largely with James' theory of emotion, he disagrees about one point: James fused emotion and feeling. For Damasio feeling and emotion are not the same thing, feeling is the conscious experience of an unconscious emotion. Thus what James define as emotion is in fact feeling. Besides this problem, Damasio see other difficulties in James approach of emotion. One of them is that James restricts the cognitive aspect of emotion to the perception of the stimulus and bodily activity, different on the nowadays prevalent view according to which the stimulus goes through stages of evaluation, filtering and channeling in the brain, even if unconsciously, that is, James' vision that the perception of the stimulus directly triggers the body activity is no longer supported. However, his idea of the mechanism of emotions and feelings is very much the same as Damasio's theory on the body loop. For Damasio (2010), emotional feelings are composed by both the particular state body during an emotion and the change of cognitive states with the use of mental scripts. And the emotional feelings are processed by areas responsible for creating the images, such as the brainstem and cortex. In the cerebral cortex the area that stands out in the processing of feelings is the insular cortex. This area is responsible for processing the feelings of disgust, for example, important for survival, as well as being associated with visceral functions (representation of the viscera), and, together with the somatosensory cortex, is also responsible for the production of body maps. Thus, Damasio shows the importance of brain areas responsible for processing signals arising from the body in the study of emotions and feelings. **CONCLUSION :** Both Damasio and James point out the importance of the body in the biological studies of the emotions and feelings.

João Pedro Prospero Ruivo, Tupã Negreiros, Marcos Barretto and Bruno Tinen.

A Model for Facial Emotion Inference Based on Planar Dynamic Emotional Surfaces

Abstract: Emotions have direct influence on the human life and are of great importance in relationships and in the way interactions between individuals develop. Because of this, they are also important for the development of human-machine interfaces that aim to maintain a natural and friendly interaction with its users. In the development of social robots, which this work aims for, a suitable interpretation of the emotional state of the person interacting with



the social robot is indispensable. The focus of this paper is the development of a mathematical model for recognizing emotional facial expressions in a sequence of frames. Firstly, a face tracker algorithm is used to find and keep track of faces in images; then the found faces are fed into the model developed in this work, which consists of an instantaneous emotional expression classifier, a Kalman filter and a dynamic classifier that gives the final output of the model.

Kae Leopoldo, Diego Decleva, Maarten Kamermans and Christina Joselevitch.

Gain Control at the First Visual Synapse

Abstract: Vision at different light levels depends both on how retinal circuits are connected and on adaptive mechanisms that enable these circuits to transmit information optimally as the mean luminance changes. This work investigates how the convergence between rods and their post-synaptic partners, the bipolar cells, affects the transmission of rod signals.

Ana Gomes and Joao Fernando Marar.

Phineas Gage and ADHA. Some related aspects.

Abstract: Comparing personality change due to a brain injury and symptoms of ADHA, we find many similarities as well the same brain area involved in both cases. We expect to obtain more knowledge about cognitive process with this study.

Cacilda Vilela.

Face-to-face interaction and the minimal enchronic unit

Abstract: We propose a new unit of practice for face-to-face interaction, called the minimal enchronic unit (MEU). Based on concepts from Conversation Analysis, Nonverbal Communication and Gestures Studies and the Enfield's notion of enchrony, we qualitatively analyze semi-spontaneous face-to-face interaction. We observe that participants have a practice inside the current-speaker's turn that allow them, collaboratively and in a jointly commitment, dealing with possible moves that could compromise the projectable trajectory of the interaction in progress. Working in the micro level of interaction, MEU allows not only a better understanding of language in use such as how higher levels of sequence organization can be produced in order to search for the preferred social-agreement pact, but also it can help other areas of research such as the Artificial Intelligence to build artificial agents to behave in a more "natural" way.

Paulo Uzai.

A crítica de Armstrong à noção searleana de background

Abstract: O background é um dos conceitos mais importantes na intencionalidade de John Searle. Por ser o fundamento de toda intencionalidade, o filósofo argumenta que não é possível que tal noção seja, ela mesma, intencional. Contudo, apesar de seu aparente



externalismo, o background ainda é um conceito mental. Com efeito, por Searle considerar os estados e processos mentais ontologicamente irreduzíveis, o background transforma-se, assim, também num conceito irreduzível. Porém a não redução e não intencionalidade do background não é compartilhada por alguns filósofos, dentre eles David Armstrong. Para este, Searle se equivoca quando argumenta a favor dessas duas teses acerca do background (irreduzibilidade e não intencionalidade). Armstrong acredita que o background pode ser também intencional, desde que ele seja redefinido em termos diferentes. Com isso o filósofo procura definir a intencionalidade enquanto sistema funcional, dizendo que o background nada mais seria que um sistema funcional mais básico. Ele utiliza o conceito dennettiano de homúnculo, argumentando que cada nível do sistema poderia ser encarado como um homúnculo cada vez mais estúpido, conforme formos descendo os níveis sistêmicos. Apesar de julgar a crítica interessante, Searle não acredita que a noção de homúnculo pudesse dar certo, a não ser no nível da mera analogia. Para ele a intencionalidade intrínseca só faz sentido no nível mental, e não em sistemas inferiores. Concordamos com Searle nesta questão, porém destacamos que a crítica que Armstrong faz, e sua formulação alternativa para o problema do background, é muito interessante se quisermos ainda continuar dentro do naturalismo. Ora, a questão que Armstrong levanta é que se a intencionalidade é um fenômeno natural, então muito provavelmente ela também deve existir em outros níveis, e não apenas no nível mental.

Edilson Rodrigues, Paulo E. Santos and Marcos Lopes.

A Qualitative-Spatial Account for the Brazilian Portuguese Preposition “em”

Abstract: This paper presents a formal definition for some applications of the Portuguese preposition "em" (usually translated as "in") as used in Brazil. Our goal is to establish a mathematical model using Qualitative Spatial Reasoning formalisms and an extension of supervaluation semantics.

Aura Forero.

Integration of the basal ganglia connectivity and structural information to enhance the default mode network detection perturbed by motion artifacts

Abstract: The basal ganglia are subcortical structures important for motor, cognitive and emotional processing. [4]. The default mode network is one of the most studied networks in resting state. Using noninvasive techniques of imagenology, such as fMRI, it is possible analyze the structural, functional and effective connectivity in the brain. sc-fcMRI data are useful for observing functional organization within the human basal ganglia [4]. Based on the anatomical and functional organization of the basal ganglia as prior information, the approach of this work is to perform a new method to detect the default mode network with more robustness. Taking into account that the basal ganglia has been studied since different levels (histological, anatomical, topological and functionally) [2][4][5] and has been demonstrated that the patterns of connectivity with the cerebral cortex and the spatial constraints are two properties of the basal ganglia divisions that facilitate identification with noninvasive neuroimaging methods [1]. The challenge of this work is to use the information from the structural and effective connectivity and present a multiscale [7], multivoxel and statistic method which allows a robust detection of the default mode network in images with artifacts due to



movement. The methodology proposed includes a preprocessing of fMRI images using FSL, registration based on an atlas of the basal ganglia [6]. Independent component analysis and anisotropic filtering based on the direction of the connectivity information. Finally, the importance of the research and analysis of structural and functional connectivity in the brain is highlighted. Also, is important indicate that the method proposed could be helpful for the analysis of cases which involves troubles with memory and learning like Autism spectrum disorder. But specially for diagnosis, control and treatment of pathologies where patients move due their stage such as Alzheimer and Parkinson.

Ricardo Tiosso, Marcelo Benvenuti and Christina Joselevitch.

Behavior Analysis and Neuroscience: Exploring frontiers for a new neuroscientific model

Abstract: The nature and basic processes that underlie behavior and cognition is under constant scrutiny [1]. Experimental Analysis of Behavior (EAB) provides a methodological and theoretical framework that allows the study of the neural bases of behavior without the need to separate behavior processes of learning from basic cognitive processes [2, 3]. According to this school, behavior can be acquired and maintained in either of two ways: by consequences (i.e. positive reinforcement or aversive stimuli trigger the desired behavior), or by association (i.e. an innate physiological stimulus is triggered by the conditional stimulus). However, this framework is underused: EAB does not seek to explain the physiological basis of these behaviors, even though it could [4, 5]. In this context, Neuroscience and EAB can offer each other complementary information. This work reviews the literature in both areas as regards different learning processes and how they can be integrated to research with neural stimulation and reinforcement pathways to seek common grounds for interfaces. Our scientific effort is to investigate how learning and its neural bases can interact in the generation of complexity, without judgment as regards the investigative approach.

Ágnes Urbin and Beáta Korcsok.

Etho-robotics - an insight

Abstract: As service robots gain more ground compared to industrial robots, the field of robotics needs to face new challenges regarding Human-Robot Interaction. Etho-robotics offer a new approach based on human-dog interaction in comparison to the previous approaches mainly based on human human interaction. Etho robotics research integrates ethological principles and methods, mathematical modelling and robotic applications. The interdisciplinary system built up from these helps to create coherent behavior models. The main contribution of this paper is to show an introduction to the mechanism of etho robotics researches showing how can these scientific fields work together in order to support the unavoidable changes in the field of robotics.



Luiz Carlos Vieira and Flavio S Correa Da Silva.

Assessment of Fun in Interactive Systems: a Survey

Abstract: Fun is a fundamental aspect of life that fosters interaction and learning. Hence, it is an important factor for engagement with digital artefacts. The design of engaging artefacts is not a trivial task since fun is subjective: it is context dependent and relies upon the preferences and history of users. A designer must choose the best approach to maximize the chances of an artefact to generate fun. In this process, assessment is an important aspect. Traditional methods involve observation of users interacting with artefacts and questionnaires to ask what users felt while doing so, while more recent methods involve data collection and physiological measurements. This paper presents a survey on the existing methods for the assessment of fun, considering its constituent elements - attention, flow, immersion and emotions.

Luciana Campos, Ronald Dickman, Frederico Graeff and Henrique Borges.

A concurrent, minimalist model for an embodied nervous system

Abstract: The nervous system has inspired many computational simulations modeling systems capable of learning through interactions with their environment. We propose a minimal model of a nervous system operating in a concurrent manner, capable of maintaining behavior homeostasis of a virtual organism. The model nervous system includes subsystems which, according to the functions performed, may be classified as sensory, effector, cognitive or emotional. These subsystems, while autonomous, exchange messages between one another. The organism is endowed with innate behaviors of exploration, approach, eating and resting; the nervous system affords the possibility of learning through evaluation and memory of experiences associated with these behaviors, interacting with a virtual environment. These experiences influence the selection of subsequent actions, to promote self-regulation, and thereby, survival of the organism. The proposed model is concurrent, asynchronous and non-deterministic. We simulate a simple realization of the model. Our results show that the expected behaviors of establishing food preferences in fact emerge. We conclude that the model is functional and robust and that learning increases longevity.

Wallas Pereira, Angelo Loula and Joao Queiroz.

Pointing gesture for communication between robots

Abstract: Communication has an important role among social animals, being a fundamental trait for their organization and survival, nevertheless, its origin and evolution still holds several open questions. One of the many studied forms of communication are gestures, used as symbolic conventions and also to support verbal communication. A particularly interesting gesture is human pointing, for it does not present a unique meaning, contrariwise, it provides contextual information (deictic) by directing attention to an object of mutual interest establishing shared and joint attention. The pointing gesture is an indispensable precursor to social learning among humans. One of the most significant difficulties to the studies of the origins and evolution of the communication is the lack of empirical data, once such processes do not leave fossils, with which one could perform observations and analysis, and the established systems come from many generations, in such a way that that, adopting a new



system is not interesting for their users [4]. Computer models and simulations are a way to circumvent these issues, giving a great contribution on this subject. Computational approaches allow to express theories and hypotheses as computer programs, granting a way of defining different scenarios with the possibility of manipulating several aspects, which permits the investigation of the influence of many of them in a given subject. Many models and simulations involve agents in an environment, which are meant to perform a given task or a set of particular tasks, for which they can obtain any kind of benefit by using communication. Individuals are evaluated, not directly in relation to their communicative capacity, but, by the benefits brought by the development of their capacities for communication. We propose to investigate conditions for the emergence of pointing gesture interpretation among robotic agents, applying a computational modeling approach. As pointing gestures have referential properties, we bring forth the theoretical framework of C.S. Peirce semiotics, to define the pointing gesture as an index, such that the pointing gesture is connected to its referent by means of a relation of physical contiguity, holding no resemblance or symbolic relation to it. Accordingly, the interpreter must rely on spatial temporal relations to determine the referent for such gesture. As an initial experiment a community of simulated robotic agents are evolved to recognize a pointing gesture, performed by one robot agent and seen by another one. The ability to interpret the gesture and determine its referent is not pre-defined, but we apply techniques of artificial evolution to adapt the neural cognitive architecture of the robot, which are equipped with cameras as inputs. Objects with different colors are randomly placed in the environment and robots are evaluated according to their ability of identifying the pointed object in the scenario. Simulations of this experiment indicate that agents can successfully interpret the pointing gesture by returning the color of the pointed object. This is a work in progress with initial results. We plan the next experiments to allow the emergence of both the gesture producing and gesture interpretation and further analysis of how the indexical relations are established in the cognitive architecture of the agents.

Camila Agostino and Yossi Zana.

Long-term time perception: A Pilot Study

Abstract: Patterns of intertemporal choice were explained by biases in the temporal perception. However, methodological limitations in the time perception estimations suggest a necessity for new measurements. The aim of this work was to estimate the temporal perception in relation to objective time in the scale of month units. Six adult participants were allocated in three groups, two in each: (I) Temporal estimation followed by numeric estimation; (II) Temporal estimation followed by numeric estimation with feedback; (III) Numeric estimation. The temporal estimation consisted of the presentation of a specific time interval between today and 36 months followed by a 180 mm line. The participants were instructed to indicate, with a click on the line, the length that corresponds to the perceived temporal distance. Three blocks with 10 time intervals each were presented in a pseudorandom order. The numeric estimation task had the same procedures, but instead of presenting time intervals (number and month unit), only numbers were presented. The numeric estimation task with feedback was identical to the numeric estimation task, with the addition of a visual mark indicating the correct length and a beep tone when the deviation was greater than 2.6 mm. Temporal perception was linearly correlated with calendar time with $R \geq 0.98$ for all four subjects with $P < 0.00$. Numerical estimation was linearly correlated with line length with $R \geq 0.97$ for all four subjects with $P < 0.00$. Numerical estimation with feedback



was linearly correlated with line length with $R \geq 0.98$ for all two subjects with $P < 0.00$. This pilot study results suggest that the paradigm commonly used to measuring time perception should be revised, thus justifying a full-scale study.

Thales Estefani, Pedro Atã and João Queiroz.

E-picturebooks and Cognitive Niche Construction

Abstract: This research project, which is still in its initial steps, introduces a theoretical framework for investigation of the cognitive and semiotic impacts of digital storytelling. Our approach is based on recent approaches in situated cognitive science and cognitive semiotics -- distributed cognition and cognitive niche construction -- that reconsider the relation between human cognition and the environment. The notion of distributed cognition has challenged the relevance of skin and skull as clear spatial boundaries of mental activity. Niche Construction Theory re-frames the discussion on evolution, moving the co-influence between organism and environment, from a peripheral position to the center of the evolutionary process. Cognitive niche construction can be characterized as evolution of cognitive abilities through a feedback cycle between problem spaces and cognitive artifacts. Initial modifications in the artifacts available in the environment alter problem-spaces that pressure for further developments in the artifacts and so forth, specializing cognitive activities. We analyze e-picturebooks (digital picturebooks) as cognitive artifacts and their role in cognitive niche construction. As we are dealing with cognitive niche construction, our framework can be applied to cultural evolution in general, such as in other types of recent transformation in interactive media (computer games, audiobooks, digital photography, hyperliterature). We investigate (i) how the problem space of storytelling is structured on cognitive artifacts, (ii) what are the specific semiotic features of e-picturebooks and how these features can alter storytelling production and interpretation, and (iii) how these alterations influence cognitive abilities regarding storytelling tasks. Answering question (i) requires an operational definition of storytelling as a problem space and identification of specific artifacts and semiotic features which produce effects that are observable and relevant for that problem space. Answering question (ii) requires analysis of examples and comparison between e-picturebooks and other forms of storytelling (digital or not). Answering question (iii) requires a model of the integration of the semiotic features identified in the answer (ii) and the inference of probable effects of these features in the storytelling niche. In the following paragraph we present an initial plan for the investigation on the cognitive-semiotic nature of e-picturebooks and some of its most salient features. The task, or problem, that the term 'problem space' refers to in the first question (how the problem space of storytelling is structured on cognitive artifacts?) is that of story. How do people produce and interpret stories to make sense of the world? The problem space (and the set of possible problem states) can be described as the possible causal links between semiotic entities and processes and high level structures (defined as boundary conditions or organizational principles) that influence these links. The "boundary conditions" have a downward effect on the spatiotemporal distribution of lower-level semiotic items [9]. Cognitive artifacts are the devices that allow navigation through the problem space (i.e., transition between problem states). What are the specific semiotic features of e-picturebooks and how these features can alter storytelling production and interpretation? Specific semiotic features of e-picturebooks include gestural repertoire, superposition of non-linear interactive elements, tendency of gamification, navigation conditioned to a specific interaction, multimodal textual forms, multimedia resources (video, animation, audio).

José Francisco Santos Neto and Paulo Rogério Miranda Correia.

Computational tool for structural analysis of concept maps for assessing mappers proficiency

Abstract: Concept maps are graphical organizers containing concepts embedded into a propositional network. Each proposition (initial concept - linking phrase -> final concept) presents a linking phrase to explicitly declare the conceptual relationship between the concepts. The meaning can be easily checked and commented for any reader due to the role of propositions as semantic units. Therefore, concept mapping is a powerful way to externalize and share meaning with clear applications in any educational setting. Other graphical organizers (e.g. mind maps) are associative in nature and the conceptual relationship is implicit at best. For example, there are several different forms to relate the concepts “cognitive science” and “field of research” and all of them can fit into an associative map. On the other hand, the concept map asks for a linking phrase (“cognitive science - is an interdisciplinary -> field of research”) to reach a precise and understandable message. The meaning of this proposition can be readily discussed by anyone interested in the mapped topic.

The creation of concept maps is a complex task because it involves the content to be represented (intrinsic cognitive load) and the procedures to set up an acceptable map (extraneous cognitive load). A training period on the technique is critical to support beginners to avoid cognitive overload. Our research group has investigated the effect on training strategies on mappers’ proficiency during the last 5 years. We observed that specific structural changes in the propositional network indicate the increase of proficiency on the concept mapping technique. The aim of this paper is to model and build a computational tool to automatize the structural analysis of concept maps and to provide a feedback about the user’s proficiency level. The effective use of concept maps in large scale (e.g. MOOCs and corporations) requires a training period that must be scaffold by experts through an automated system.

The structural analysis we developed consider 8 parameters to fully describe the propositional network morphology. The design of the computational tool consider the following steps: (a) receive the file containing the concept map, (b) validate the received file, (c) calculate the parameters related to the structural analysis, (d) select a specific feedback considering the concept map morphology and (e) show the feedback and additional instructions to keep the users improving their proficiency on concept mapping. Preliminary results will be shown during the poster presentation.

Maria Alice Leal and Angelo Loula.

Emergence of Bodily Gestural Communication among Robots

Abstract: Communication, one of the most outstanding traits in animals, has inspired interest and curiosity in researchers for a long time concerning its origin and evolution, but it is still unknown how this social phenomenon emerged or how it has been modifying itself to become what it is nowadays. One particularly important type of communication are gestures, visible body actions used to convey ‘intention, interest, feelings and ideas’ [2]. It still an open question whether gesture or vocalization came first in communication traits, or whether gesture only has a complementary role in oral communication. In fact, some [Gilliespie]



advocate in favor of a co-evolution of these two cognitive skills. Others [pollick 2007] study the possible influence of the gestures in the emergence of vocalization, as in some primates with common ancestor to human beings gestures are more developed than vocalization, suggesting gestures could be the first cognitive skill to emerge. So, it's extremely important to study gestures, to understand its nature and provide more evidence to determine which of these cognitive phenomena derived first or how they are related. As there are no fossil artifacts associated to communication and language [4], it is not possible to determine how different types of communication have emerged or which are the conditions related to its origin. Thus, computational modeling has aroused and been established as a fruitful tool to study such processes. Through computer simulation it is possible to test and run a great amount of scenarios about cognition skills evolution in a shorter time than if it was to follow its natural course. In such studies, basic cognitive principles are predefined for artificial agents, but the particular process of interest must emerge by means of adaptive or evolutionary mechanisms during agents' interactions. In many previous works, a dedicated communication channel is present (e.g. sound channel, radio frequency channel, or light color channel) We propose to study the emergence of gesture communication among robots using their body movement as the means for communication. Here we use motor skill and visual perception, as the basis for gesture communication will take place. One of the situated agents should provide movements (bodily gesture) to convey a meaning, while the other agent should perceive that movement and determine the original meaning from the first agent in the interaction. More specifically, as an initial step of this project, we have developed an experiment where robots, controlled by artificial neural networks, are evolved to perform a double task of generating different body movements depending on the scenario and also of recognizing these bodily gestures from other robots. The robots have ground sensors for color perception and proximity sensor to perceive movements from the other robot. The robots also have wheels and motor, besides a LED ring that can be lit with different colors. The speaker robot may move right or left depending on color of the ground. The interpreter robot should grasp the speaker movement with its proximity sensors and turn a given color on in its LED ring. The purpose of this initial experiment is to observe if the interpreter is able to determine the ground color perceived by the speaker, only by perceiving its movement. Initially, we have the speaker skills and actions pre-programmed, so we are evolving only the interpreter, which has input neurons with time decayed activation. This is a work in progress, and first results show that he interpreter is able to partially perform the task. We are running more tests and adjusting experimental parameters to find out why the interpreter wasn't able of recognize bodily movements in all test configurations. After that, we are going to model a more complex experiment with the evolution of both agents in a more demanding task.

Richard Hanley.

Skepticism revisited: Chalmers on The Matrix and brains-in-vats

Abstract: Thought experiments involving The Matrix, brains-in-vats, or Cartesian demons have traditionally thought to describe skeptical possibilities. David Chalmers has denied this, claiming that the simulations involved are real enough. Through an examination of kind terms I argue that, though the Chalmers view may be otherwise attractive, it is not an antidote to skepticism.



Rogério S. Teza.

The Persistence of Mental Representation and the different levels of representation

Abstract: This poster is to present a currently graduation research in philosophy of mind. The aim is to show that considering different levels of representation, there is no room for anti-representationalism.

Lucas Machado.

É a consciência uma tela que vê a si mesma?

Abstract: Resumo: Em nossa apresentação, proporemos, a partir da discussão sobre a natureza do fenômeno da percepção visual e de sua relação com a consciência, uma concepção sobre o âmbito em que o fenômeno visual se daria que, acreditamos, pode contribuir para conceber a consciência como uma tela que vê a si mesma, ou seja, como um sistema cuja informação produzida só é acessível ao próprio sistema que a produziu. Esperamos, assim, pela metáfora da tela que vê a si mesma, fazer uma pequena contribuição para a reflexão filosófica sobre o fenômeno da percepção visual e, por extensão, para a reflexão filosófica sobre a consciência e sobre o problema difícil da consciência.

Daniella de Aguiar, Pedro Atã and Joao Queiroz.

Creativity as niche construction and some examples in theatrical dance

Abstract: Creativity can be regarded as a property of semiotic resource exploration and niche construction. More specifically, and according to this perspective, creativity is distributed, in cognitive niches, as opportunities for niche-construction. Artistic cognitive niches represent established ways to exploit available artistic semiotic resources. When such opportunities are explored so that new relations between cognition and artistic semiotic resources are established (i.e., the artistic cognitive niche is constructed), then creativity is observed. This process of niche construction involves the transformation of problem spaces ("a branching-tree of achievable situations") through the exploration of cognitive artifacts design of new of artifacts (in dance, for example, softwares, techniques, equipments such as dance shoes, stage, dance and music notations). Our approach is supported by specific examples in history. In each of these examples, the introduction of artifacts changed not only how to make dance, but also the very concept of dance, opening opportunities for the exploration of new niches.

Edison De Jesus Manoel, Pedro F.V. Felicio, Roberto Gimenez, Cristiane Makida, Rafael Do Nascimento Soares and Alessandro Freitas.

Proprioceptive-visual integration and situated embodied cognition: A developmental perspective

Abstract: Knowledge and sensory-motor integration are related in situated embodied cognition. In the present paper, we investigated whether the transition between egocentric and decentred mode of thinking are associated to the development of intra-sensory and inter-



sensory integration. Thirty six children with ages between 5, 7 and 9 years performed a paramedian correspondence task with conditions requiring inter-sensory integration (visual-proprioceptive) and a problem solving task. Using a mirror perturbed the sensory judgments in the paramedian correspondence tasks. The results did not corroborate the thesis presented, nevertheless the increasing importance of proprioception in the perceptual judgments for older children suggests that although younger children maybe body centred (egocentric mode of thinking), older children seemed more able to use body to mediate their perceptual judgements.

Garri Hovhannisyan and Caleb Dewey.

Natural and Normative Dynamical Coupling

Abstract: This paper argues that cognitive systems obtain their dynamical coupling to the world through the continual realization of relevance. We establish this thesis by an induction from two premises. The first premise is that cognitive systems are autopoietic systems. To confirm this, we draw from the definition of autopoiesis found within the enactivist framework for embodied action [10][11]. We find that self-promotion, an essential component of autopoiesis, implies that cognitive systems develop normatively as well as naturally (i.e. that there are both normative and natural attractors). The second premise is that cognitive systems constitutively realize relevance via opponent processing. We draw from and elaborate on Vervaeke, Lillicrap and Richards' framework of relevance realization [12]. We note that their account does not explain how it is that cognitive agents lose and regain their dynamic coupling (which is constitutively relevance realization) with the world via the loss and reacquisition of meaning. This creates a demand for an account of dynamical coupling in terms of relevance realization, which our thesis promises to accomplish. Thus, we propose that the capacity for insight is a central function of relevance realization, comprising the cognitive agent's capacity to re-adapt to the given situation by realizing novel relevance. The capacity for insight, as well as the tendency to become fixed on irrelevant information resulting in the incapacity to address real world problems, is then illustrated in terms of a proposed theoretical learning architecture, coined the Ouroboros Learning Mechanism (OLM) [5]. The OLM explains how cognitive systems obtain their dynamical coupling to the world in terms of the continual realization of relevance, thereby confirming our thesis.

Edilene De Souza Leite.

Monism of Triple Aspect a proper concept to sustain the ontology of the nature of mind-body in Meditation

Abstract: In the West Meditation has been for so long restrict to religious issues or to spirituality. However, after the popularization and increase of the debates and researches about consciousness issues in the latter century, the interest for the topic has increased on neuropsychological e philosophical studies, because it could offer as a technique tools for stabilization of the mental states. Pragmatically some areas related to health problems had since very early already taken advantage of the practice of meditation because of its beneficial effects, as for stress relive, arousal of attention and concentration, or treatment of chronic pain. In a published article, Attention regulation and monitoring in meditation (LUTZ et al.,



2008), after monitoring neuronal activity during meditation, the authors related meditation states with very high frequencies. Beyond this there is many articles indicating that the practice of meditation affects not only the type of activity in the brain, but can also change its structure physically, strongly indicating correlation of mental activity and brain, but not enough to warranty casual correlation. Nevertheless, there is still a lot of debate about the possibility of this kind of measurement of mental activity. In addition, there is many different traditions and types of techniques for meditation, what leave us in this moment without an agreement about the concept of what is meditation and what would be a proper technique (SCHMIDT & WALACH, 2014). For some scholars meditation is the exercise of the consciousness turning it to its self. All this results, of the research on meditation, implies issues that affect many concepts of the ontological nature of the mind-body, leading to a star point where all those notions of body-mind must comply with the understanding that mind and body are an unity with complementary properties. Walach sustain that we should look for a monism where “Mind or consciousness would not have to somehow arise but it would be an original complementary aspect to matter.” (2015, p. 81), he also proposed in the book *Secular spirituality* that we could have specific access to reality through meditation, in addition to what we can learn trough perception. In this work, we aim to exposes that the PEREIRA JR 's concept of Monism of Triple Aspect could satisfy the requirements for the ontology of the nature of body-mind during meditation, and this concept could also offer a hypothesis to the relation of the practice and its effects on the behavior and in the physiology of the body.

Mariana Matulovic and Maria Eunice Gonzalez.

Self-organization and circular causality: where are we going with neo-mechanicism?

Abstract: In this paper, we investigate the role of self-organization processes in the dynamics of complex systems. Our investigation is grounded on the four principles of adaptive information processing in decentralized systems, proposed by Mitchell [2] and summarized here as: i) Global informational patterns are encoded over the system's components; ii) randomness and probability are essential to the dynamics of systems with a relatively small number of components, enabling exploration of different connection possibilities; iii) complex systems often carry out a fine-grained parallel search for possibilities; iv) the systems express continuous bottom-up and top-down systemic interactions. It is argued that a common characteristic of these four principles is the presence of feedback mechanisms applied to self-organization processes in systems that deal with situated and embodied information. In this kind of system, order parameters might emerge (at the macroscopic level) from spontaneous interactions established among elements at the microscopic level [1]. According to Haken [1], when order parameters emerge, they enslave the behavior of the elements that gave them origin, in a kind of circular causality. Our goal in this work is to provide evidence to support the hypothesis that the development of self-organized systems grounded on feedback mechanisms (expressed as circular causality) might bring about a type of neo-mechanicism. When operating in accordance with the four principles of adaptive information processing proposed by Mitchell, such neo-mechanicism could cause unpredictable outcomes in the physical, biological, and social spheres of life.



Amanda Veloso Garcia.

A non-linguistic analysis of information: the possibility of other forms of expression of thoughts

Abstract: With the advent of science and technology, the relation of a large portion of human beings with each other and the world has changed significantly. The exams to identify diseases and treatments increasingly specific, the possibility of communication through image and sound at any time with people from different locations, the use of Internet for different everyday tasks and even banking use, etc., have made our relations more "fast". On the other hand, the Internet has enabled to the subjects of industrialized societies - those who have access to the internet and technological resources - also the globalization, allowing knowledge and experience of different cultures of the world, which leads to the estrangement of the other and questioning himself to draw comparisons with other habits and practices. Expanding look through the information technology requires a different view of the world, since it takes the indirect contact with each other. Questions like: "My culture is actually the existing better?" or the adoption of a different culture of the local habits have become commonplace today. In a world where borders are becoming less rigid, it is necessary a new look. The great diversity of habits with which we have contact every day requires to consider the various points of view to think the current problems. And so, a view through the paradigm of complexity looks promising and convenient nowadays. The paradigm of complexity provides a view at the world through different methodological and epistemological perspectives to understand a phenomenon. Starting from the need to expand the look, the aim of this paper is to discuss the relation between the study of the thought and the presence of oral/written language as parameter to think. During the twentieth century there was a paradigmatic revolution in philosophy, which was later called "linguistic turn". This paradigm shift was made through an overvaluation of language understanding it as the center of discussions. In other words, with the linguistic turn, oral/written language came to be seen as capable of solving philosophical problems, so that the task of philosophy would be to clarify the language. From this perspective, several problems were seen as pseudo-problems to be only due to difficulties in the use of language. The linguistic paradigm spurred a series of debates around the thought and intelligence, whose researchers are busy trying to simulate machines in human mental processes to find out what is the mind. Such studies make use of linguistic rules for the simulation and linguistic expression as a criterion for evaluation of the tasks performed by machines. It is intended, in this study, discuss the limits and possibilities of linking thought to language, in order to analyze other forms of expression of thoughts. The linguistic paradigm that generates consequences for what we mean by "thought", excluding other ways of thinking, as well as some indigenous and Oriental thoughts. In this work, we will try to discuss the potential of thought expression in other forms such as painting and gesture.

Bruno J. M. De Camargo and Peter M. E. Claessens.

Dynamics of Subjective Contrast in Sequential Comparison of Gabor Patches

Abstract: In a comparison of two asynchronous and spatially-separated luminous disks, the second stimulus has a tendency to be evaluated lighter against a dark background and darker against a lighter background, suggesting a temporal context effect to the perceived contrast rather than on luminosity. The current study confirms this hypothesis by direct evaluation of contrast comparison of Gabor patches, stimuli that have intrinsic contrast.



Renata Souza.

Synchronization, self-organization and creative action: new horizons in cognitive science studies

Abstract: The goal of this paper is to investigate the notion of synchronization of rhythms and its possible contribution to the understanding of creative action in the context of cognitive science studies. The following question is therefore posed: how can the concepts of rhythm and synchronization help in understanding self-organized creative processes, in the context of human action? During the progress of human civilization and the emergence of complex social interactions that include specific routines, human beings have increasingly distanced themselves from their natural rhythms, gradually becoming dependent on specific non creative actions implemented at strategically planned times. As a result, the dynamics of synchronization of the body's rhythms to the environment has been reduced to a secondary role. In this context, we will argue that an understanding of the notions of rhythm and synchronization can provide a favorable context for creative action. In the terminology of Bohm (2011), a creative action lies in the perception of new orders underlying the organization of the environment. This order allows the creation of structures that are convergent with the characteristic of wholeness and perceived harmony. One of the main driving forces underlying creative action is given by the following dynamics: the perception of the lack of synchronization and the attempt to resolve it. This perception enables the search for ways of achieving harmonization between individuals and their environments. In our presentation, we are going to explain this dynamics in terms of processes of stabilization and rupture of habits, due to the perception of a given anomaly and the attempt to resolve it from building hypotheses that supposedly would solve the problem. This process characterizes what Peirce calls abductive reasoning (PEIRCE, 1977, p. 220). We understand that the perception of the origin of the lack of synchronization with natural rhythms may propitiate the search for ways of harmonizing individuals in their respective environments. In summary, our hypothesis is that the search for synchronization –given at different levels of analysis (social, biological, and environmental) – is one of the main driving forces underlying creative knowledge/action.

Ian Oliveira and Joao Eduardo Kogler Junior.

A software platform for adaptive systems modelling and simulation, with application to the study of cognitive processes

Abstract: We present AWARE 2.0 and propose its use in two scenarios of experimental study of cognitive processes. AWARE is a software meta-system targeted for building applications using Adaptive Finite State Machines (AFSMs). We conceived and developed AWARE intended for applications in the realm of cognitive processes expressible in AFSMs and, in this research line, we are launching two projects. Firstly, we describe some of the new features added to the original version of AWARE and then we propose the application projects, the first targeted to the understanding of the dynamics of learning by agents inside dynamic environments, and the other proposes the study and formal modelling of the topological transformation sequences that arise from the adaptations employed by autonomous systems, when these are in the process of solving a problem by interaction driven learning.

Peter Maurice Erna Claessens, Victor Gregório De Queiroz Lima and Manasses P. Nóbrega.

Learning and perception of causality

Abstract: Causality is the term used to refer the relationship between a “causative event” and a “subsequent event” that former seems to be inducing. The sense of causality is an assignment of the mind that is not immediately given by the impact of the physical world on the subject. According to Hume, the idea of causality must be derived from three basic criteria: (1) contiguity: if A causes B, then A and B are contiguous both time and space; (2) temporal succession: if A causes B, then A precedes B in time; (3) required connection: if A causes B, then B invariably occurs when A occurs. As a first approach, the principles of causality described by Hume look pretty solid, both natural and scientific inference of causation. The pioneer in scientific research on the perception of causality was undoubtedly Albert Michotte. As Gestalt psychologist, Michotte was interested in the factors that cause the sense of causality as an emergent property of visual stimulation. His experiments suggest that an important aspect in the sense of causality is the temporal contiguity. However, recent studies have been shown the relationship between voluntary action and subjective time, called intentional binding: in those situations which subjects are agents of the actions, the perceived time between action and its consequence is smaller than the subjects of passive situations. Since, many studies have been considered both the role of causality and agency in intentional binding. We present a study about the role of spatial and temporal intervals on the sense of causality in agency situations. A new paradigm centered on dynamic Poisson process as stimulus was implemented. In the pilot experiment reported here volunteers are tasked to press the mouse button at any time and position in the computer screen and to observe a presentation of random points at the monitor. Maximum distance, time intervals and the rate of points per second was controlled. After each trial the volunteer indicated his “belief” to have caused or not the event indicating a level of certainty handling a featured slider on a numerical scale at the screen, from 0: ‘certainly I did not cause’ to 100%: ‘certainly I caused’ the points presentation. The data analyzed so far indicate a systematic negative trend only in the time interval, i.e. the higher the temporal interval between the action and the appearance of the stimulus, the less the sense of causality. We also discuss how the random aspects in the presentations may have influenced the sequence of events and this is a basis for a more detailed future analysis.

Walter Lima Jr. and [J. Reinaldo Silva](#).

From Licklider to Cognitive Service Systems

Abstract: This article investigates the seminal concepts of J.C.R. Licklider about the interaction between man and computational machine and its evolution over the years after the publication of his article “Man-computer symbiosis”, in 1960, in his subsequent work. Surprisingly, Licklider work cross the time line going through epistemological cuts, distinct scientific advances, technological innovations, and survived new possibilities of relationship between human and computational machines occurred in the last 50 years. Despite technological difficulties to totally implement concepts of Man-computer symbiosis, many technological branches are advancing to accomplish the intentions foreseen by Licklider, converging from different viewpoints.



Josiane Gomes de Oliveira and Sílvia Helena Guttier Faria.

Moral action and complexity: An essay on human morality based on self-organization theory

Abstract: Based on the systemic method of analysis, we propose in this paper to investigate the concept of human morality as a product of recurrent self-organizing processes in the society. We intend to analyze how the dynamics of systemic interaction between environment and individual can affect the production of the universality of moral actions in certain social groups and, above all, we intend to interpret this dynamic as a self-organized process. We will analyze some of the key concepts that integrate science systems, taking as starting point the Theory of Complex Systems, for the purpose of we enter into our discussion of the principle of moral action on the complexity science. Generally speaking, we can say that a complex system is composed of a set of individual elements in interaction expressing an organization, which has a functionality: contribute to the system behavior. According to this idea, the society can be understood as a system in which their individuals are the elements that maintain relations with each other and are in constant interaction. Considering the possibility of crediting the systemic interactions present in society to self-organized processes, we will adopt the perspective of the theory of self-organization proposed by Michel Debrun. According to this theory, self-organizing processes are those that grow up without a center-controller and are informationally open. Therefore, we understand that in the social groups occur self-organizing processes that result from the relationship between individuals who maintain a relationship with each other. So, our central question focuses on the following hypothesis: because the society is interpreted as a system, based on the perspective of analysis of the complex systems, can be the moral action understood as a product of self-organized processes?

Luana Camila Marques and Juciane Terezinha Do Prado.

Possible solutions to the mind-body problem: Nagel and Searle

Abstract: The mind-body problem is to explain, for example, how the mind and the body can affect each other. In the twentieth century, in particular, various perspectives were proposed in order to solve such a problem. In this work, we present and compare two approaches to mind-body problem, proposed by Searle and Nagel. One goal of these thinkers is to overcome the problems attributed to the dominant approaches in the study of the mind, both the materialists versions and the dualism of substances. The proposal offered by Nagel argues that there is only one substance involved in the mind-body relationship. It is a physical substance, attributed to the brain. However, although it is the basis of the mind, the brain is equipped with a special set of properties, not physical, which no other kind of object features. They are characteristic of conscious intelligence, considered not physical in the sense that they can never be reduced or explained in terms of the concepts of habitual physical sciences. Searle, in turn, develops a new perspective to this issue, seeking to eliminate the mind/body dichotomy in the existing dualistic approaches. According to Searle, the mind-body problem has a simple solution: mental phenomena are caused by processes taking place in the brain, but can not to be reduced to it. Thereby, such thinker argues that the mind-body problem can be easily solved from a Biological Naturalistic posture. He suggests a causal relationship between the brain and mental phenomena, irreducible to it. However, it does not propose two categories of phenomena. Somehow it can be said that because the brain itself. This presents a problem with regard to causality: the cause and the effect are directed to the same object. Mental phenomena are caused by processes occurring in the brain and are at the micro level, as of



synaptic transmission between neurons, occurred in the macroscopic level. The purpose of these two proposals, the Nagel and Searle, is suggest a reasonable explanation of mind-body problem, looking suit his views in a scientific approach to mind. We going to compare these two approaches and analyze in what sense they are suitable for solving the problem of the mind body connection.

Nathália C. A. Pantaleão and Franciele Da Silva Leal.

What we're made: An analysis of the relevance of the body in cognitive processes

Abstract: The objective of this paper is to investigate the relevance of embodiment in cognitive processes from a situated and embodied perspective. For that we will use the critical by philosophers to the representative model of cognition (CLARK, 1997, 1999, 2003, 2008; CHEMERO, 2007, 2012). According to proponents of the theory of cognition situated and embodied, the process of cognition can emerge from the interaction of the physical attributes of the bodies with the environment in which these bodies are situated. Clark, one of the advocates of the approach, advocates, including the cognitive processes cannot be adequately investigated without taking into account the roles that embodiment, the action and the environment executes in such processes (1999). It is to be situated in an environment and incorporate relevant information for a given agent that is active and not just representations generator. Thus, we argue in favor of the hypothesis that the body structures in its systemic unit, play central roles, not just peripheral, in cognitive processes that involve complex skills. Thus, we will analyze what the process of acquisition and development of complex skills is not limited to the manipulation of mental representations, and what is the scope of the hypothesis of the existence of an intrinsic dynamics between agents and their environments.

Mirella Telles Salgueiro Barboni, Balázs Vince Nagy, Cristiane Maria Gomes Martins, Tina Tsai, Francisco Max Damico, Givago Da Silva Souza, Marcelo Fernandes Costa, Luiz Carlos De Lima Silveira, Jan Kremers and Dora Fix Ventura.

Physiological mechanisms underlying ON and OFF visual perception in humans

Abstract: Electrophysiological methods such as electro-retinography (ERG) and visually evoked potentials (VEPs) allow the assessment of retinal and cortical physiological mechanisms for specific visual functions that can also be assessed by psychophysical methods. The present report compares results obtained with the two methods to show that they can be relevant in understanding visual cognition.

Samuel Bellini Leite.

The Revisionist Strategy in Cognitive Science

Abstract: In this paper I provide an analysis of the frame problem in order to propose the revisionist strategy for cognitive science. Such strategy aims to describe a recipe for how cognitive science should proceed in dealing with the frame problem. The idea is that theoreticians should start by identifying various sub-instances of the frame problem (of which we provide a first list) to be used as guides for reformulating frameworks of cognitive science



and how they relate. Various approaches could follow this recipe but as an example we will see how the ideas of situated cognition can help re-think ways of dealing with these sub-instances which emerged in the classic symbolic approach. This also shows how the situated approach can be seen not as a new science but as new ideas that can shape the same science.



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