CIMeC Seminars 2015

TRANSFER-LEARNING Seminar

When/where: 18.12.15, at 14:00, Conference Room, Mattarello

Speaker:

- Duccio Martelli

Title: **The psychology of trading**

Abstract: The workshop describes the importance of traders' psychology in financial markets. Biases and emotions are just two of the many behavioral traits, which can lead investors to lose money. The psychological element is thus a key factor in any financial decision-making process. Starting from an overview about market imperfections, which make financial markets different from what traditional finance suggests, the seminar will present main behavioral issues affecting investors' behavior.

Host: Giorgio Coricelli.

This talk is carried out within the framework of TRANSFER-LEARNING: Transfer Learning within and between brains, an ERC-funded project.

TRANSFER-LEARNING Seminar

When/where: 14.12.15 at 14:00 Conference Room, Mattarello.

Speaker:

- Giuseppe Ugazio, Post-Doctoral Fellow, University of Zurich.

Title: **Changing Social Behavior with transcranial direct current stimulation**

Abstract: To date several studies have investigated the neural correlates underlying social behaviors such as norm compliance, inequality aversion, and honesty. To date however little is known about the neural mechanisms causally necessary for such behaviors. In this talk I discuss some recent studies aimed at filling this gap using transcranial direct current stimulation (tDCS) to establish causal links between neural activity and social behavior. The talk presents first the methodological aspects of tDCS and recent findings in studies that use tDCS to change social behavior.

Host: Giorgio Coricelli.

This talk is carried out within the framework of TRANSFER-LEARNING: Transfer Learning within and between brains, an ERC-funded project.

PREMESOR Seminar

When/where: 04.12.15 at 10.00, Meeting room, II° floor ACN lab building, piazza della Manifattura 1 - Building n.14

Speakers:

- Andreea Geambasu, phd student, Leiden University Centre for Linguistics and Leiden Institute for Brain and Cognition

- Pralle Kriengwatana, post doctoral fellow, Department of Psychology, University of Amsterdam the Netherlands
- Michelle Spierings, phd student, Institute of Biology, Faculty of Science, Leiden University

Title: **Factors influencing language learning in adults, babies and birds**

Abstract: Language, in all its complexity, is an unique system in the animal kingdom. This does not mean, however, that all aspects of language perception and the cognitive underpinnings are uniquely human. Shared perceptual mechanisms between adults, infants and vocal learning bird species are being revealed more and more in recent studies. These mechanisms might be subjected to similar language learning biases.
In our comparative approach we are systematically modifying the factors, such as prosody or phoneme variability, that are prone to influence language learning strategies and abilities. We will present an overview of recent results and implications on our understanding of the development of language learning.

Host: Giorgio Vallortigara

This talk is carried out within the framework of PREMESOR, an ERC-funded project

TRANSFER-LEARNING Seminar

When/where: 09.12.15 at 14.15, Conference Room, Mattarello

Speaker:

- Sven Collette, Post-doctoral fellow in computational neuroscience at California Institute of Technology, Pasadena, USA.

Title: **Characterizing mentalizing-related computations of preference learning in the human brain**

Abstract: The ability to not only learn from own actions and outcomes, but also to integrate information from observing others is a wide-ranging phenomenon which can be a crucial survival factor in complex environments. Here, I will attempt to describe how humans learn preferences of others and subsequently integrate such mentalizing-related information into own decisions, using an inverse reinforcement learning framework and model-based fMRI.

Host: Giorgio Coricelli

This talk is carried out within the framework of TRANSFER-LEARNING: Transfer Learning within and between brains, an ERC-funded project

TRANSFER-LEARNING Seminar

When/where: 10.12.15, 11:00, Conference Room, Mattarello

Speaker:

- Andis Sofianos, Lecturer at University of Warwick, Regno Unito

Title: **Higher Intelligence Groups Have Higher Cooperation Rates in the Repeated Prisoner's Dilemma**

Abstract: Intelligence affects the social outcomes of groups. A systematic study of the link is provided in an experiment where two groups of subjects with different levels of intelligence, but otherwise similar,

play a repeated prisoner's dilemma. Initial cooperation rates are similar, but increase in the groups with higher intelligence to reach almost full cooperation, while they decline in the groups with lower intelligence. Cooperation of higher intelligence subjects is payoff sensitive and not automatic: in a treatment with lower continuation probability there is no difference between different intelligence groups.

Host: Giorgio Coricelli

This talk is carried out within the framework of TRANSFER-LEARNING: Transfer Learning within and between brains, an ERC-funded project

Seminar

When/where: 30.10.15 at 12:00, meeting room THIRD FLOOR, palazzo Fedrigotti

Speaker:

- Dr. Vincenzo Romei, University of Essex, UK

Title: **New Vistas in Neuromodulation: beyond a causal approach in the study of brain oscillations and connectivity**

Abstract: Recent and ongoing work in my lab has been largely devoted to the development of neurostimulation-based multi-method approaches to the study of brain functions in at least two directions: understanding the functional significance of (i) brain oscillations and (ii) communication between functionally interconnected brain areas.

The first line of research concerns a paradigm shift from correlation to causation in the study of brain oscillations. I will provide evidence that brain oscillations as measured with EEG can be entrained to an externally imposed rhythm (for example through rhythmic TMS and tACS), thus allowing experimental manipulation of oscillatory activity and causally test its function. Further, I will show that we can go beyond this causal approach by not only entraining natural oscillatory rhythms but also shaping oscillatory patterns away from intrinsic rhythms in directions that best predict behavioural outcome.

The second line of research will introduce a novel neurostimulation (TMS) method, namely cortico-cortical paired associative stimulation (ccPAS) based upon the Hebbian principle, by which plastic changes in connectivity between functionally interconnected brain areas can be implemented. I will show how by repeatedly activating two functionally interconnected areas in the right direction and timing it is possible to enhance the underlying function and therefore test both the malleability of the circuit as well as its causal role in a given behaviour.

CoPeST Seminar

When/where: 30.10.15, 10:30, meeting room DIPSCO FIRST FLOOR, palazzo Fedrigotti

Speaker:

- David J. Acunzo, Michelles Serres Insitute, ENS de Lyon, Francia

Title: **Investigating the interactions between visual attention and the processing of visual emotional stimuli**

Abstract: I will present a series of studies aiming at better characterising some aspects of the interactions

between visual emotional stimulus processing and visual attention. These include an eye-tracking experiment investigating how visual scene exploration is affected by emotional content; a series of ERP experiments designed to look at whether the very early latency C1 component (<100 ms) is modulated by emotional faces and covert endogenous attention; and an investigation of the biasing effects of EEG/MEG high-pass filtering on ERPs/ERFs, that may explain some of the reported very short latency interactions. This work confirms indications that emotional stimulus processing is not 'automated', but highly dependent on the focus of attention, even at the earlier stages of visual processing.

Hosted by: David Melcher
This talk is carried out within the framework of CoPeST: Construction of Perceptual Space Time, an ERC-funded project

CoPeST Seminar

When/where: 22.10.15, 11:00, meeting room THIRD FLOOR, palazzo Fedrigotti

Speaker:

- Luca Ronconi, Post-Doctoral Research Fellow, Department of General Psychology, University of Padova, Italy.

Title: **Shaping the pre-stimulus neural oscillations with auditory rhythmic stimulation improves the temporal allocation of attention**

Abstract: Temporal attention limits the amount of information that can be consciously perceived in a given time window. In the attentional blink (AB), this processing capacity limitation is represented by a deficit in reporting the second of two targets (T2) presented in close temporal succession in a rapid serial visual presentation (RSVP) stream. Recent evidence suggest that the neurophysiological correlates that differentiate blinked and non-blinked stimuli are not limited to the RSVP period but extend to the period before visual stimulation occurs.

Thus, we hypothesized that entraining ongoing oscillations with a rhythmic sequence of auditory or visual stimuli before the upcoming RSVP could reduce the AB effect. I will present behavioural and electroencephalographical findings showing that endogenous oscillations in the brain – before relevant stimuli appear – may be shaped by sensorial events in order to improve the temporal allocation of attention.

Hosted by: David Melcher
This talk is carried out within the framework of CoPeST: Construction of Perceptual Space Time, an ERC-funded project

CIMeC Seminar

When/where: October, Tuesday 20 at 10.00am, hall of the ACN lab building, Piazza della Manifattura 1 - Building n.14

Speaker:

- Eszter Szabo, Cognitive Development Center, CEU - Central European University, Budapest, Hungary

Title: **Representing the absence of objects in 18-month-old infants**

Abstract: While there is a rich literature concerning how non-linguistic creatures represent various properties of objects present in the environment, we know very little about whether and how they encode the absence of objects.While in case of encoding the presence of an object the information is directly available and perceptually salient allowing for object tracking, in contrast, encoding the absence of an

object might be realized through abstract representations. However, it is not clear which representational system might be able to encode and maintain the information about 'objects not being there'. Clear evidence that humans have the ability to explicitly represent the absence of entities (instead of just deleting an object index) is that at a specific point in language development toddlers start to refer to it using linguistic negation. In a recent study we asked whether 18-month-old infants, who are at the onset of language production, can form representations about absent entities based on negation in communication. We used a simple choice task in which there are two containers and one target object is hidden into one of the containers out of the sight of the participant (target is in A or B). After the hiding event children are told that the object is not in A. The results show that 18-month-olds can understand this form of negation —they avoided the cup about which the experimenter said the target was not. However, performance is still fragile. While infants performed well on the first trial, on consequent trials many infants (55%) showed perseveration to the previous location or side biases. Early success in such tasks points to the possibility that such abilities may already be present before the onset of language, raising the question whether they could be observed in non-linguistic animals

CIMeC Seminar

When/where: 15.10.15, 15:00, meeting room SECOND FLOOR, palazzo Fedrigotti

Speaker:

- Jakub Jonkisz - Assistant Prof. University of Bielsko-Biala, Poland

Title: **Consciousness: individuated information in action**

Abstract: It is surprising to see questions about the meaning of a central term posed alongside questions about its empirical status, yet that has been the case in consciousness studies. Within its theoretical and empirical enquiries, many different meanings associated with consciousness have appeared, leaving the term itself quite vague. Given just this, the formulation of an abstract unifying concept of consciousness is an urgent theoretical challenge.

With this in mind, it is argued that the phenomenon of consciousness is dually accessible (cognized from the inside and the outside),hierarchically referential (semantically ordered), bodily determined (embedded in the working structures of an organism) and useful in action (pragmatically functional). These four general features result in a broad view, according to which consciousness is a gradedrather than an all-or-none phenomenon. But such a conception, despite its significant explanatory advantages, may also generate some counterintuitive consequences and theoretical problems. In most cases graded consciousness is, to a significant degree,extended globally (attached to primitive organisms or artificial systems) and locally (connected to certain lower-level neuronal and bodily processes). For example, according to information integration theory (as introduced recently by Tononi and Koch), even such primitive artificial systems as photodiodes possess miniscule amounts of consciousness. Another major challenge here, then, is to set reasonable and empirically justified limits on how far the range of its possible instantiations can extend.

It is subsequently argued that conscious systems are confined globally by the ability to individuate information (individuated information is characterizable as evolutionarily embedded, socially altered and private), whereas local limitations should be determined on the basis of a hypothesis about the action-oriented nature of the processes that select states of consciousness. Using these constraints, an abstract conception of consciousness is arrived at, which, it is claimed, enables aspects of prominent neurocognitive models (e.g. IIT, GW, GNW) to be linked to major philosophical ideas (e.g. ecological, embodied and enactive conceptions), hopefully contributing to a more unified state of play within consciousness studies itself.

Hosted by: David Melcher

CIMeC Seminar

When/where: September 30 at 5pm, hall of the ACN lab building, Piazza della Manifattura 1 - Building n.14

Speaker:

- Michelle Spierings, PhD student, Insitute of Biology, Leiden Universit

Title: **The music of language: Exploring language perception in songbirds and parrots**

Abstract: TBA

Hosted by: Giorgio Vallortigara

CIMeC Seminar

When/where: September 15 at 11.00, hall of the ACN lab building, Piazza della Manifattura 1 - Building n.14

Speaker:

- Prof. Marco Bertamini, School of Psychology, University of Liverpool

Title: **Brain Activity in Response to Visual Symmetry**

Abstract: In the last ten years there has been much progress on the study of the neural basis of symmetry perception. ERP studies reliably show a sustained posterior negativity (SPN), with lower amplitude for symmetrical than random patterns at occipital electrodes, from 250 ms after onset. The SPN is an automatic and sustained response and is broadly unaffected by task. The extended symmetry-sensitive network involves extrastriate visual areas and the LOC with consistent evidence from fMRI and TMS studies. We found that reflection is the optimal stimulus for a general regularity-sensitive network that responds also to other regularities, like rotation and translation. We tested whether response to symmetry is dependent of view angle. When people classify patterns as symmetrical or random, response to symmetry is view-invariant. When people attend to other dimensions, the network responds to residual regularity. Neural response to symmetry also scales with noise: Proportion of symmetrically positioned elements predicts the size of SPN and fMRI responses. Connections between the hemispheres are not critical because SPN amplitude increases with the number of axes, and is comparable for horizontal and vertical symmetry. The same ERP response to symmetry can come from either hemisphere, but it is stronger in the right hemisphere. Overall, there is a consistent link between brain activity and sensitivity, with no single area exclusively dedicated to processing reflectional symmetry.

Hosted by: Giorgio Vallortigara

Brain Plasticity and Deafness Seminar
When/where: Monday 14th September at 3pm - Palazzo Fedrigotti, 3rd floor, Rovereto

Speaker:

- Douglas E. H. Hartley

Title: **Cortical cross-modal plasticity: a predictor of variable speech outcomes in cochlear implant users?**

Abstract: It is well known that speech outcomes vary widely amongst cochlear implant (CI) users. Emerging evidence suggests that cortical plasticity could be an important variable in understanding and predicting how much benefit an individual will receive from their CI. Specifically, cortical areas that would

usually process auditory information can become more sensitive to the intact senses, such as vision, following deafness. Indeed it has been shown that individuals with a CI rely on a heightened synergy between audition and vision. These findings emphasize the importance of understanding how the brain responds to auditory and visual stimulation before and after cochlear implantation. Unfortunately, the measurement of cortical responses in CI recipients using traditional imaging techniques has been challenging. Many established methods for non-invasive brain imaging in humans can be plagued by electrical and magnetic artifacts generated by CI stimulation.
Functional near-infrared spectroscopy (fNIRS) is a non-invasive imaging technique which, owing to its optical nature, is fully compatible with a CI. Furthermore, it is essentially silent, which is advantageous for auditory research. Together, these advantages indicate that fNIRS may provide a powerful tool to explore cortical plasticity following deafness and subsequent cochlear implantation.
At the NIHR Nottingham Hearing Biomedical Research Unit, we are using fNIRS to examine cortical plasticity associated with deafness and cochlear implantation from multiple perspectives. One strand focuses on the development of fNIRS as a tool to measure 'low-level' cross-modal plasticity, specifically how auditory brain regions can become more responsive to visual and touch stimulation in deaf people compared with hearing controls. Another strand uses fNIRS to examine how the brain responds to auditory and visual components of speech before and after an individual receives their CI. The aim of this longitudinal study is to understand how perceptual improvements in an individual's ability to understand speech with their CI relate to changes in cortical responsiveness. We are also using fNIRS to examine the mechanisms through which the brains of normal hearing listeners combine information across the senses, and to understand the potential impact of auditory deprivation and cochlear implantation on these mechanisms. By developing fNIRS as a tool to study how the brain responds to multisensory stimulation before and after cochlear implantation, we aim to provide insights into the reasons for variable CI outcomes, and to develop a clinically useful prognostic tool. We also hope that this technique may provide a useful adjunct to help program speech processors, particularly for recipients who are difficult to assess using behavioral testing, such as children with complex needs.
This work is supported by the University of Nottingham, the MRC and the NIHR.
Author affiliations:
- Department of Otolaryngology, University of Nottingham, UK
- NIHR Nottingham Hearing Biomedical Research Unit, Nottingham, UK
- MRC Institute of Hearing Research, Nottingham, UK

NeuroInt Project Seminar
When/where: 18/08/15 at 11.40 conference room, First Floor, Palazzo Fedrigotti

Speaker:

- Ram Frost (The Hebrew University of Jerusalem)

Title: **Statistical learning as an individual ability: Splitting the variance of performance in a visual task**

Abstract: What determines individuals' efficacy in detecting regularities in visual statistical learning? Our theoretical starting point
assumes that the variance in performance in statistical learning can be split into variance related to efficiency in encoding representations within modality, and variance related to the relative computational efficiency of detecting distributional properties of the encoded representations. Using a novel methodology we dissociated encoding from higher-order learning factors, by independently manipulating exposure duration and transitional probabilities in a stream of visual shapes. Our results show that the encoding of shapes and retrieving their transitional probabilities are not independent and additive processes, but interact to jointly determine SL performance. The theoretical implications of these findings for a mechanistic explanation of SL will be discussed.

Hosted by: Uri Hasson
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

NeuroInt Project Seminar
When/where: 18/08/15 at 11am conference room, First Floor, Palazzo Fedrigotti

Speaker:

- Noam Siegelman (The Hebrew University of Jerusalem)

Title: **Measuring statistical learning capacity: merging online and offline measures**

Abstract: Most research in Statistical Learning (SL) has focused on mean success rate of participants in detecting statistical contingencies at a group level, overlooking the variance in performance between individuals. In recent years, however, a growing number of studies focused on individual abilities in SL, either aiming to predict other cognitive capacities or as a tool for understanding the mechanism underlying SL. Despite this growing interest, two important issues remain unchallenged: (1) Current SL tasks are not suitable for measuring individual differences, as current SL tasks were originally designed for group-level studies, and (2) current SL measures are based on performance in offline tests. In this talk, we present two ongoing projects that deal with these issues. First, we present a new visual SL task specifically tailored for individual differences research. In particular, the new task is designed to provide information about a bigger part of the population, and to better discriminate between individuals. In the second project, we present a series of novel tasks, all measuring SL abilities online throughout the familiarization phase. We argue that these tasks have both psychometric and theoretical importance, as in addition to improved reliability they also provide insights about the determinants of SL performance and its dynamics. Finally, we discuss ways of merging offline and online measures of SL, towards maximal reliability and validity.

Hosted by: Uri Hasson
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar

When/where: 30th July at 14.30, Conference Room of the Maso building in Mattarello

Speaker:

- Thibaud Griessinger, University: École Normale Supérieure (ENS), Paris, France.

Title: **Inter-individual differences in strategic learning during repeated social interactions: a behavioral investigation**

Abstract: Repeated interactions are ubiquitous in social settings. The mechanisms of human learning in social contexts are far from being understood. On the one hand recent studies in neuroeconomics suggest that humans dynamically incorporate in their learning process a belief-based representation of the opponent's adaptive behavior (Hampton et al 2008; Zhu et al 2012; Devaine et al 2014). On the other hand experimental studies show behavioral responses that systematically deviate from the game theoretical prescription of equilibrium in beliefs, therefore questioning the general human ability to engage in such sophisticated strategic process (Costa-Gomes et al 2001). We conducted a behavioral experiment on Humans in order to investigate individual differences and adaptive behavior to opponents' strategies in repeated two-players constant sum games (i.e., a variation of an inspection game, with asymmetric payoffs). Participants (N=64) were engaged with two different opponents in two successive blocks of 100 repetitions of the stage game. Preliminary econometrics and computational analyses replicated previous results suggesting that, at the population level, players behavior was best captured by a sophisticated strategic learning algorithm (Hampton et al 2008). However careful investigation of these results revealed important heterogeneity in the way previous choice outcomes - and more crucially information relative to the opponent choices - were incorporated in the participants decision process. Furthermore a lack of consistency was found in the level of strategic learning engaged across the 2 blocks. To investigate these inter-individual differences in learning we tested several computational models: from simple model-free to more sophisticated variants of reinforcement learning algorithms (Sutton & Barto 1998; Li & Daw 2011), to EWA (Camerer & Cho 1999), fictitious play (Fudenberg & Levine, 1998) and different orders of strategic thinking in the Influence model (Hampton et al 2008; Devaine et al 2014). Those models previously introduced in both the economics and cognitive neurosciences literature hierarchically differ in the depth of reasoning about how one's own past behavior has influenced the behavior of the other. We identified for each participant a model that both best fitted choices captured key aspects of their choice behavior.
Our results indicate that the subjects differ in the strategic complexity of their learning computation, with a majority being best modeled by high order (i.e. sophisticated) models (i.e. Influence levels 1 and 2

models) but also for a significant proportion of them by lower levels of strategic learning (e.g. simple reinforcement learning models). When comparing individual behavior between the two trial blocks we found a change in both the relative weight and the level of the information incorporated in their decision process throughout the game. Together with additional investigations on individual strategic thinking and cognitive ability our results suggest inter-individual differences in the strategic learning process implemented during strategic interaction that might depend on both individual propensity to engage in high level of strategic and the dynamic of the opponent's behavior.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar

When/where: 29th July at 14.30, Conference Room of the Maso building in Mattarello

Speaker:

- Matteo Bertucco, Department of Biomedical Engineering, University of Southern California

Title: **The Tuning of Human Motor Responses to Risky Environments**

Abstract: All movements by humans are performed in a risky environment with mostly unknown and unpredictable dynamics. Awareness, prediction, and avoidance of risk are so fundamental to natural movement that we expect our movement to change when, for instance, we carry a cup of hot coffee, walk near a cliff, or move our arm between glassware on a table. Risk depends on the coincidence of high-cost states and uncontrollable or unpredictable components of movement (which might include noise, perturbations, or unknown dynamics).

We tested the hypotheses that planning and control of goal-directed aimed movements in speed-accuracy trade-off emerges from a combination of cost and likelihood of missing the target, and we also considered the hypothesis that humans actively and continuously estimate both the probability of failure and cost of failure in a dynamic environment, and make feedback-control corrections to movement based on these estimates, even without failure occurrence.

The results demonstrate that not only do we consider probability and cost of failure either when initially planning a movement, but that we continuously estimate risk in dynamic environment under feedback-control corrections, even if failure has not yet been experienced. Therefore, awareness of risk guides all of our motor actions, and this is essential for our survival in an unpredictable and potentially hostile environment.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

MADVIS Project Seminar

When/where: July 27nd at 11.00 am, 3rd floor Seminar Room, Palazzo Fedrigotti, Rovereto

Speaker:

- Amir Amedi, Associate Professor of Medical Neurobiology, Hebrew University of Jerusalem.

Title: **The origins of category selectivity for reading, numerals, objects and the body image**

Abstract: Deep in the occipitotemporal cortex lie two functional regions, the visual word form area (VWFA) and the number form area (NFA), which are thought to play a special role in letter and number recognition, respectively. In the lateral occipital two additional functional areas the lateral occipital complex (LOC) and the visual extra-striate body area (EBA) are thought to play a special role in object and body image. In the talk I will review recent progress made in characterizing the origins of these symbol form areas in children or adults, sighted or blind subjects, and humans or monkeys. We (with Stan Deheane group; See also Hannagan T, Amedi A et al. Trends Cogn Sci. 2015) propose two non-mutually-exclusive hypotheses

on the origins of the Selectivity: the presence of a connectivity bias, and a sensitivity to shape features. I will assess the explanatory power of these hypotheses, describe their consequences, and offer several experimental tests.

Hosted by: Olivier Collignon
This talk is carried out within the framework of MADVIS - MApping the Deprived VIsual System: Cracking function for prediction, an ERC-funded project

Transfer-Learning Project Seminar

When/where: 17 July at 14.30, Conference Room of the Maso building in Mattarello

Speaker:

- Doris Pischedda, Bernstein Center for Computational Neuroscience Berlin, Berlin, Germany

Title: **Rule-guided Behaviour: How and where rules are represented and processed in the human brain**

Abstract: Much of our behavior is guided by rules defining associations between meaningful stimuli and proper responses. The ability to flexibly switch between rules to adapt to a continuously changing environment is one of the main challenges for the human cognitive system. Investigating how different types and combinations of rules are encoded and implemented in human brain is crucial to understand how we select and apply rules to guide our behavior and react flexibly to a dynamic environment. In this talk, I will address the issue of where in the brain different types of rules are represented and how they are processed. Behavioural paradigms, functional magnetic resonance imaging, and multivariate pattern classification were combined to shed light on the cognitive mechanisms underlying rule processing and to identify brain areas encoding the contents of such processes. Using a priming paradigm, the first study assessed which types of associations (conditional, disjunctive, spatial, or quantified) could be activated automatically and trigger unconscious inferences. Itproved that Modus Ponens inference is carried out unconsciously. The second study demonstrated that a condition-action rule instructed on a trial-by-trial basis and immediately marked as irrelevant causes significant interference effects when involuntarily triggered by target stimuli matching the condition in the rule. In the third study, using complex rule sets, we showed that rules at different level in the hierarchy of action control are encoded in partially separate brain networks. In the fourth study, we used rules composed using different logical connectives to expand the set of associations considered and to assess possible differences in rule representation and processing between rules with distinct logical forms. We found that separate brain areas encoded task rule information during rule representation and evaluation and that the involvement of these areas depended on the specific rule active in a trial. Taken together, our results suggest that conditional rules hold a special status in the human cognitive system, contributing to our knowledge on rule-guided behaviour.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar

When/where: 17 July at 11.00, Conference Room of the Maso building in Mattarello

Speaker:

- Prof. Carlo Reverberi, Department of Psychology, Università Milano - Bicocca, Milano, Milan Center for Neuroscience

Title: **Representation of multiple task features in human frontal cortex**

Abstract: Humans are able to flexibly devise and implement rules to reach their desired goals. In some situations, we can use simple rules, such as "if traffic light is green then cross the street." In most cases, however, more complex rule sets are required, involving the integration of multiple layers of control. In a series of multivariate pattern analysis experiments we showed that the neural representation of complex

rules is "compositional", i.e. built on the neural representation of their constituent rules or features. Complex rules are thus "decomposed" in their elementary features. The constituent features are then represented in different brain structures, depending on the type of information to be stored. In particular, we found that right ventro-lateral prefrontal cortex (BA47) consistently encoded the relevant low-level (stimulus-response) rules. By contrast, pre-motor cortex encoded higher-level modifying rules, controlling the how the low-level rules should be applied. Left inferior frontal gyrus (BA44) is involved in the encoding of the logical relations holding between the constituents of complex rules. Finally we found that medial prefrontal cortex encodes features relevant for new, yet to be implemented, rule sets. We argue that compositionality, "decomposition" and information-guided representation are general features of prefrontal cortex functional organization.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

CIMeC Seminar
When/where: 17th July at 10.30, Aula Magna di Palazzo Istruzione

Speaker:

- Prof. David Crewther, Swinburne University of Technology, Australia

Title: **"Causal Visual Processes in Autism"**

Abstract: There is growing evidence of a common visuotypy related to the degree of autistic tendency, even across the "normal" population, via Baron-Cohen's Autistic Spectrum Quotient (AQ) [1]. This flies in the face of rather low correlations between the triad of core symptoms of autism in clinical populations. Both electrophysiological and psychophysical evidence will be presented showing that autistic vision is characterized by an afferent magnocellular pathway abnormality – specifically neural recovery after stimulation is impaired as measured by higher amplitude second order Wiener kernels for multi-focal flash VEP. We predicted and found lower flicker fusion frequencies for low temporal contrasts in those with high cf low AQ score. Such an abnormal magnocellular function should also affect saccadic suppression, as saccades have been reported to selectively suppress magnocellularly driven perception [2]. The prediction of a lower degree of suppression in those with low vs high AQ was borne out, with no significant difference in suppression of low (0.3 cpd) and high (2.0 cpd) spatial frequencies for those low in AQ score. With several saccades per second and each episode giving suppression for ~150 ms, it appears that in those with high AQ, high spatial frequencies – or "detail" is being refreshed at the expense of low spatial frequencies. Thus it appears that the saccadic suppression differences with autistic tendency are causal in promoting local over global percept in those with high autistic tendency.

[1] Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J. & Clubley, E. 2001 The autism-spectrum quotient (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. J Autism Dev Disord 31, 5-17.

[2] Burr, D.C., Morrone, M.C. & Ross, J. 1994 Selective suppression of the magnocellular visual pathway during saccadic eye movements. Nature 371, 511-513..

Hosted by: Luca Turella e Simona Monaco

CIMeC Seminar

When/where: Aula Magna, Palazzo Istruzione, Corso Bettini 84, Rovereto

Speaker:

- Prof. Paolo Fusi, Columbia University, Center for Theoretical Neuroscience

Title: **"High dimensional neural representations"**

Abstract: Single-neuron activity in prefrontal cortex (PFC) is often tuned to mixtures of multiple task-related aspects. Such mixed selectivity is highly heterogeneous, seemingly disordered and difficult to interpret. Because of its prominence in PFC, it is natural to ask whether such heterogeneity plays a role in subserving the cognitive functions ascribed to this area. We addressed this question by analyzing the neural activity recorded in PFC during an object sequence memory task. We show that the recorded mixed selectivity neurons offer a significant computational advantage over specialized cells in terms of the repertoire of input-output functions that are implementable by readout neurons. The superior performance is due to the fact that the recorded mixed selectivity neurons respond to highly diverse non-linear mixtures of the task-relevant variables. This property of the responses is a signature of the high-dimensionality of the neural representations. We report that the recorded neural representations have actually the maximal dimensionality. Crucially, we also observed that this dimensionality is predictive of animal behavior. Indeed in the error trials the measured dimensionality of the neural representations collapses. Surprisingly, in these trials it was still possible to decode all task-relevant aspects, indicating that the errors are not due to a failure in coding or remembering sensory stimuli, but instead in the way the information about the stimuli is mixed in the neuronal responses. Our findings suggest that the focus of attention should be moved from neurons that exhibit easily interpretable response tuning to the widely observed, but rarely analyzed, mixed selectivity neurons. We will finally discuss how to estimate dimensionality using fMRI.

Hosted by: Jim Haxby and Alfonso Caramazza

Transfer-Learning Project Seminar

When/where: 30th June at 16.00, Conference Room of the Maso building in Mattarello

Speaker:

- Andrea Brovelli, Institut de Neurosciences de la Timone, CNRS & Aix, Marseille Université, France

Title: **"Characterisation of cortical networks and interactions mediating arbitrary visuomotor mapping"**

Abstract: Adaptive behaviours are built on the arbitrary linkage of sensory inputs to actions and goals. Although the sensorimotor and associative fronto-striatal circuits are known to mediate arbitrary visuomotor mappings, the underlying cortico-cortico dynamics remain elusive. In my talk, I will present an approach exploiting gamma-band neural activity to study the human cortical networks and interactions mediating arbitrary visuomotor mapping. Single-trial gamma-power time courses were estimated for all Brodmann areas by combing MEG and MRI data with spectral analysis and beamforming techniques. Linear correlation and Granger causality analyses were performed to investigate functional interactions between cortical regions. The performance of visuomotor associations was characterized by an increase in gamma-power and functional connectivity over the sensorimotor and fronto-parietal network, in addition to medial prefrontal areas. The superior parietal played a driving role in the network, exerting Granger causality on the dorsal premotor. Premotor areas acted as relay from parietal to medial prefrontal cortices, which played a receiving role in the network. Link community analysis further revealed that visuomotor mappings reflect the coordination of multiple subnetworks with strong overlap over motor and fronto-parietal areas. We put forward an associative account of the underlying cognitive processes and cortico-cortical interactions. In the final part of my talk, I will present preliminary results on the study of Functional Connectivitiy dynamics (FCD) computed on a novel parcellation model of cortical and subcortical brain areas based on single-subject anatomy. Overall, our approach and results provide novel perspectives towards a better understanding of how distributed brain activity coordinates adaptive behaviours.

Hosted by: Giorgio Coricelli

This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar

When/where: 30th June at 14.30, Conference Room of the Maso building in Mattarello

Speaker:

- Mateus JOFFILY, BAP E, CNRS, GATE Lyon St Etienne

Title: **"The emergence of emotional valence under active inference"**

Abstract: Previous work has suggested that emotional valence – the positive or negative attribute of affect, emotions and their associated feelings – could be formally defined as the rate of change of free energy or surprise (Joffily and Coricelli, 2013). An apparent paradox emerged regarding how 'positive surprises' and 'negative expectations' can be accounted for within this scheme. I will present how these two forms of affective states naturally emerge when the agent performs active inference. Active inference rests on the active sampling of outcomes that minimize variational free energy (Friston et al, 2015). Based on simulation results for a two-armed bandit task, it will be shown that the valence of outcomes can be described as the difference between the current and the expected free energy under a (predictive) generative model of future states and outcomes, while the surprise of outcomes is formulated as the free energy of posterior beliefs about their hidden causes.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar
When/where: 26th June at 11.30, Conference Room, Palazzo Fedrigotti, Rovereto

Speaker:

- Marcel Zeelenberg, Tilburg University

Title: **"Towards an Economic Psychology of Greed"**

Abstract: Greed is an important economic motive: it is seen as both productive (a source of ambition; the motor of the economy) and destructive (undermining social relationships; the cause of the late 2000s financial crisis). However, relatively little is known about what greed is and does. I will present recent research in which we first tried to establish what greed is, using a prototype analysis (Seuntjes, Zeelenberg, Breugelmans, & Van de Ven, in press), and follow-up reserach in which we developed tested the 7-item Dispositional Greed Scale (DGS)(Seuntjens, Zeelenberg, Van de Ven & Breugelmans, 2015). I discuss evidence for the construct and discriminant validity of the DGS in terms of positive correlations with maximization, self-interest, envy, materialism, and impulsiveness, and negative correlations with self-control and life satisfaction. I also present further evidence that Dispositional Greed predicts economic behavior in various dilemma situations. Our findings shed light on the importance of greed in economic behavior and provide directions for future studies.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Win2Con Project Seminar
When/where: July 10th at 11.30 am, 3rd floor Seminar Room, Palazzo Fedrigotti, Rovereto

Speaker:

- Daniel Baldauf, McGovern Institute for Brain Research, MIT

Title: **Spatial and non-spatial top-down biasing signals in the brain**

Abstract: I will present two recent studies, in which we investigated the mechanisms of spatial and non-spatial attention. In order to understand the neural mechanisms that control non-spatial attention, such as feature-based, object-based, or modality-based attention we use signal processing tools in temporally high-resolving MEG signals to identify the inter-areal communication, through which large-scale attentional networks orchestrate the enhanced neural processing of attended properties. In particular, we investigate interactions by means of synchronous, coherent oscillations of neuronal activity. Applying those methods allowed us identifying a fronto-temporal network that biases neural processing on a high, object-class level of neuronal representation. In particular, an area in the inferior part of frontal cortex, the inferior-frontal junction (IFJ), seems to be a key source of non-spatial attention signals, selectively engaging in coherent, high-frequent oscillations with the respective neuronal ensembles in IT. When combining spatial and non-spatial cues in an attentional cueing paradigm, we found different control structures in frontal and parietal cortex to provide different types of top-down signals. Our results suggest that attention networks in frontal cortex may be subdivided in dorsal and ventral subnets providing spatial and non-spatial attention biases, respectively.

Hosted by: Nathan Weisz

This project is funded within the framework on Win2Con, an ERC funded project.

Transfer-Learning Project Seminar

When/where: 23rd June at 15.30, Conference Room of the Maso building in Mattarello

Speaker:

- Nora Preuss, Department of Psychology, University of Bern, Switzerland

Title: **"Vestibular stimulation as method of non-invasive brain stimulation in decision neuroscience"**

Abstract: Vestibular stimulation techniques such as caloric vestibular stimulation (CVS) have traditionally been used in the assessment of neurological disorders. However recent evidence suggests that CVS can also be used to non-invasively stimulate vestibular cortical areas. Vestibular stimulation can further be induced when two electrodes are placed on the left and right mastoids behind the ears. This procedure is called galvanic vestibular stimulation (GVS). Both vestibular stimulation techniques (CVS and GVS) activate a broad cortical network including the insula, the temporoparietal cortex and the anterior cingulate cortex and are able to modulate a wide range of cognitive processes such as attention, mood, belief and somatosensory representation. Based on previous findings, the aim of my research project was to further examine the effect of vestibular stimulation on decision-making and emotion processing. We were able to show that CVS modulates affective control as well as decisions in a purchase decision-making task. Furthermore, in a recent study we found a modulating effect of GVS on the framing effect during decision-making. We conclude that vestibular cortical areas share subcomponents with the emotional network and that vestibular stimulation can be used to modulate emotion processing as well as decision-making

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar

When/where: 22nd June at 15.30, Conference Room of the Maso building in Mattarello

Speaker:

- Michele Fioretti , Department of Economics, UCS, University of Southern California

Title: **"Suboptimal dishonesty: rationality in the absence of strategic behavior in honesty experiments"**

Abstract: Recently neuroscientists have shown an increased interest in the brain mechanisms shaping social economic interactions. Auctions model very simple markets that can be used to analyze social decision making. Yet, there is no consensus on what drives the strong evidence of overbidding in experimental auctions.
In auctions, like in other games of incomplete information, the ex-ante best action is likely to differ from the ex-post favorite option (after feedback). Thus, agents could play to reduce the unpleasant feeling associated with this mismatch (regret), rather than optimizing utility. As several studies suggest that regret plays a central role in out-of-equilibrium bidding, this research investigates the behavioral and neural correlates of bidding with respect to regret avoidance. In particular, the aim of this study is to further validate the results in Ozbay and Ozbay (2007) by employing a within subjects design, while building a more precise model using fMRI data in conjunction with behavioral outcomes.
As overbidding is a pervasive phenomenon in the real word, the findings may contribute to studies in related areas such as market crushes and bank runs.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

MADVIS Project Seminar

When/where: June 22nd at 11.00 am, 3rd floor Seminar Room, Palazzo Fedrigotti, Rovereto

Speaker:

- Elizabeth Huber, Department of Psychology, University of Washington

Title: **Auditory perception and cortical plasticity after long-term blindness**

Abstract: Early onset blindness is associated with enhanced auditory abilities, as well as plasticity within auditory and occipital cortex. In particular, pitch discrimination is found to be superior among early-blind individuals, although the neural basis of this enhancement is unclear. In this talk, I will present recent work suggesting that blindness results in an increased representation of behaviorally relevant acoustic frequencies within both auditory and occipital cortex. Moreover, we find that individual differences in pitch discrimination performance can be predicted from the cortical data. The functional significance of group and individual level differences in frequency representation will be discussed, along with the relative importance of auditory and occipital cortical responses for acoustic frequency discrimination after long-term blindness.

Hosted by: Olivier Collignon
This talk is carried out within the framework of MADVIS - MApping the Deprived VIsual System: Cracking function for prediction, an ERC-funded project

Transfer-Learning Project Seminar
When/where: 19 June at 15.30, Conference Room, Palazzo Fedrigotti, Rovereto

Speaker:

- Etienne Koechlin, Ecole Normale Supérieure, INSERM, Université Pierre et Marie Curie, Paris

Title: **Adaptive behavior and decision-making in the human prefrontal cortex**

Abstract: I will present our recent work from our lab combining computational modeling, experimental psychology and fMRI describing how the prefrontal cortex subserves inferential processes in the service of decision-making and adaptive behavior. I will show how the ventromedial, dorsomedial, lateral

and polar prefrontal regions along with the striatum forms an unified system combining learning, inferential and creative abilities for efficient behavior in uncertain, variable and open-ended environments.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

CIMeC Seminar

When/where: June 12 at 10.30, hall of the ACN lab building, Piazza della Manifattura 1 - Building n.14

Speaker:

- Massimo Piattelli Palmarini, Professor of Cognitive Science, Department of Linguistics, Department of Psychology and Cognitive Science Program, University of Arizona

Title: **"Steps to the physics of language"**

Abstract: The study of complex systems seems to affirm the Thompson-Turing claim that "some physical processes are of very general occurrence." Notably, those involving Fibonacci-based "golden" forms, ubiquitous in nature, and a number of mathematical models standard in modern physics (matrix representation of operators, with associated eigenvalues and eigenvectors expressing directional stability, models from Quantum Field Theory). This lends immediate interest to the observation that the repeated structural motif in the human syntactic system, the X-bar schema, is likewise a "golden" form (Piattelli-Palmarini and Uriagereka 2008, Medeiros 2008, Piattelli-Palmarini and Vitiello submitted) and leads us to inquire whether whatever is behind the natural ubiquity of such phenomena, in other domains, might possibly be at work in language as well. If so, some "deep" peculiar aspects of human language (recursive Merge, the Labeling Algorithm, phrase structure and the X-bar configuration) would fall under Chomsky's (2005) "third factor", a factor about language which is neither encoded in the particulars of our genome, nor learned from the environment, but determined by domain-general principles also found in physics and in biology, beyond the particular organism.

Hosted by: Giorgio Vallortigara

MADVIS Project Seminar

When/where: June 8th at 11am, seminar room First Floor, palazzo Fedrigotti

Speaker:

- Prof. Dr. Georgios A. Keliris

Title: **Computational neuroimaging approaches for studying neuronal properties and neuroplasticity in the human brain**

Abstract: An important contribution of functional magnetic resonance imaging (fMRI) in human neuroscience research is the non-invasive in-vivo measurement of the voxel-by-voxel organization of several cortical areas. Recent studies substantially advanced this field of research by using novel neuro-computational methods that can uncover neuronal properties previously only accessible by invasive electrophysiological techniques. A prime example of such methods is the estimation of population receptive fields (pRFs) in retinotopically organized visual areas. Importantly, estimating the structure of the pRF in vivo by fMRI is of great significance not only for our understanding of the functional organization of the cortex but also in studies of cortical reorganization and plasticity in patients with diseases afflicting the visual system. Population receptive field estimates are a function of: 1) the receptive field properties of single units belonging to a voxel, and 2) the scatter in the location of receptive field centers across units. In the visual domain, numerous electrophysiological and computational studies established the spatio-temporal characteristics of RFs and modeled early visual neurons in primates as Gabor filters with well-defined properties. I will present a novel approach for estimating RF sizes by fMRI that exploits the spatial-frequency sensitivity of visual RFs modeled as Gabor functions. Estimates obtained this way were compared to pRF estimates derived from additional

experiments with moving bar stimuli. RF size estimates obtained with our method increased linearly with eccentricity as expected, but were significantly smaller in comparison to standard pRF measurements (Dumoulin SO, Wandell BA, 2008). The reason is that our method is not sensitive to the receptive field scatter that happens between units belonging to the same voxel. Similar experiments performed in anesthetized macaques provided RF size estimates comparable to electrophysiological measurements of single-unit RFs. We conjecture that our method estimates for the fist time average single-unit RF sizes in the human.

Hosted by: Olivier Collignon
This talk is carried out within the framework of MADVIS - MApping the Deprived VIsual System: Cracking function for prediction, an ERC-funded project

CIMeC Seminar

When/where: June 5th at 10.30am, hall of the ACN lab building, Piazza della Manifattura 1 - Building n.14

Speaker:

- Prof. Gisela Kaplan, PhD (Arts, Monash), PhD (Vet.Sc.,UQ),hon.D.Sc.(UNE) Centre for Neuroscience and Animal Behaviour, School of Science & Technology University of New England

Title: **"Play Behaviour, Cognition and Life-histories in Birds"**
Abstract: Read here

Hosted by: Giorgio Vallortigara

CIMeC Seminar

When/where: June 3rd at 11.30am, hall of the ACN lab building, Piazza della Manifattura 1 - Building n.14

Speaker:

- Emeritus Professor Lesley Rogers, School of Science & Technology, University of New England

Title: **"Brain lateralization: its beginnings, present and future"**
Abstract: TBA

Hosted by: Giorgio Vallortigara

CIMeC Seminar

When/where: May 28th at 11am, hall of the ACN lab building, Piazza della Manifattura 1 - Building n.14

Speaker:

- Hans-Joachim Bischof, Bielefeld University

Title: **"Sexual Imprinting and Social Learning in Young Zebra Finches"**

Abstract: Sexual imprinting is the process by which a young bird learns the species specific characteristics which enable it to find a conspecific mate as an adult. Konrad Lorenz claimed that imprinting is restricted to a short sensitive period early in life and that, once learned, the acquired preference for a sexual partner is remarkably stable. In this talk, I shall present our own findings on sexual imprinting in zebra finches showing that the process of sexual imprinting occurs later in life than

previously thought, and some of our results concerning the physiological basis of imprinting including the identification of brain areas involved and the processes which can be observed in these areas as a consequence of imprinting. If there is still time, I shall also show some recent data on the influence of the early social environment on social development of zebra finches which obviously shares with sexual imprinting several characteristics like restriction to a sensitive period and stability of the acquired behavior.

Hosted by: Giorgio Vallortigara

Transfer-Learning Project Seminar

When/where: May 29th at 11am, Conference Room, Mattarello

Speaker:

- Elsa Fouragnan, Institute of Neuroscience and Psychology, University of Glasgow, UK

Title: **"Spatiotemporal characteristic of reward-based learning in humans"**

Abstract: Adaptive decisions depend on accurate outcome representations associated with potential choices. These representations can be acquired with reinforcement learning mechanisms that use the prediction error (PE) – the difference between expected and actual outcomes – as a unique learning signal to update expectations. However, these signals are characterized by their valence and salience dimensions but their relative contributions as well as their underlying networks remain debated. Here, we coupled high temporal resolution, single-trial EEG with simultaneously acquired fMRI while participants performed a probabilistic reversal learning task and inferred the full spatiotemporal dynamics of the brain networks involved in reward-based learning. We identified two temporally and spatially distinct processing stages of outcome valence: an early process driven by an automatic alertness response to negative outcomes and a later, more deliberate, assessment of the value information required for updating value expectations. Importantly, these two valence systems interact to promote switching behavior via thalamostriatal interplay. Parallel to the late valence-evaluation, we found that the brain also represents quantitative information about PE salience, largely separate from the valence systems. Crucially, we found no evidence for a signed PE at a neural level but rather an overlap between the late valence and salience networks, showing a clear summation profile, making it unlikely that a unique learning signal exists at the cortical level in humans.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar

When/where: May 28th at 3pm, Conference Room, Mattarello

Speaker:

- Prof. Luigi Marengo, Department of Management, LUISS, Roma

Title: **"The Arrival of the New"**

Abstract: In my talk I will present a number of urn models in which, contrary to standard Polya urns, the number of competing alternatives is not given from the outset but may increase with the arrival of innovations. I will begin by describing a variant of Polya urns, first introduced by Fred Hoppe, in which balls of previously non-existing colours are added with some (declining) probability. I then propose new variants in which the probability of the arrival on new colours is itself subject to adaptive change depending on the success of past innovations and discuss applications to evolutionary models of technologies and industries and present numerical results. I will then discuss applications to the selection of technologies, to signalling in games and to non Bayesian learning.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

PREMESOR Project Seminar

When/where: May 27th at 2.30pm, CIMeC Ex Manifattura, Main Hall, piazza Manifattura 1, Rovereto.

Speaker:

- Athena Akrami, PhD Brodylab, Princeton University (Neuroscience Institue and Dept of Molecular Biology), Howard Hughes Medical Institute (HHMI)

Title: **Time dependent involvement of Posterior Parietal and Prefrontal cortex in a rat auditory parametric working memory task**

Abstract: Working memory (WM) refers to the ability to store and manipulate information across time intervals of a few seconds. A particular example of working memory task is the sequential comparison of two graded stimuli separated by a delay period of a few seconds, which forces the subject to maintain an analog value in memory. This form of WM is called Parametric Working Memory (PWM) and its neural correlates have been studied in primates (Romo and Salinas 2003). The prefrontal and posterior parietal cortices (mPFC and PPC) have been proposed to be involved in working memory (Pasternak and Greenlee 2005, Harvey et. al 2012, Crowe et al. 2010), but no inactivation experiments probing whether these areas are necessary for parametric working memory have been performed. Moreover, it remains unknown whether the involvement of these brain regions is affected by memory retention time. We have developed an auditory delayed comparison task in rats, adapted from a tactile task (Fassihi and Akrami et. al 2014). In this task, rats compare two sequential auditory stimuli, 'f1' and 'f2', separated by a variable delay. Stimuli consist of broadband noise (2K-20K Hz), generated as a series of Sound Pressure Level (SPL) values sampled from a zero-mean normal distribution. The rats' task is to decide which of f1 and f2 had greater SPL standard deviation, thus requiring them to hold the analog value of f1 in memory during the delay period. Training steps were formalized into semi-automated computer code, requiring minimal human intervention. Rats show a remarkable ability to hold information about f1 stimulus in their memory for up to 10s (the longest tested). We carry out the first local reversible inactivations of cortical regions to probe their role in PWM, and we show that inactivations of either PPC or mPFC impact this auditory behavior. Interestingly, only PPC inactivation leads to delay-duration dependent impairment. To precisely chart the timecourse of PPC involvement, we optogenetically silenced it, using halorhodopsin (eNpHR3.0), during different time points of the trial. Using a logistic regression model to analyze the specific task components impacted by inactivations, together with electrophysiological recordings, our data suggest distinct roles played by PPC and mPFC in auditory PWM.

Hosted by: Giorgio Vallortigara
The talk is carried out within the framework of PREMESOR, an ERC-funded project

Transfer-Learning Project Seminar

When/where: May 18h at 15.30 pm, Conference Room, Mattarello
Speaker:

- Nicola Spotorno, Frontotemporal degeneration center, University of Pennsylvania, Philadelphia, PA, 19104
-

Title: **"(In)Appropriate social interactions"**

Abstract: The complexity of the cognitive and neural basis of human social expertise becomes suddenly evident when one is confronted with patients who have severe difficulties in taking part in everyday interactions.

During this talk I will focus on patients affected by behavioral variant frontotemporal degeneration (bvFTD), a neurodegenerative condition that strongly affects their social conduct. In particular, I will present protocols on strategic reasoning and social learning. These studies have been developed in order

to (I) clarify the social and decision-making limitations of bvFTD patients; (II) contribute to the development of a cognitive and neuroanatomical model of human social expertise.

I will conclude my presentation by proposing possible future directions that entail functional studies with healthy participants and non-invasive brain stimulation protocols.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar

When/where: March 24th at 11.30 am, Conference Room, Mattarello
Speaker:

- Remi Neveu, Lyon (CRNL), UMR 5292, CNRS/INSERM, Lyon, France

Title: **The role of cognitive control brain areas during goal oriented valuation process and its consequences over decisions**

Abstract: Goal oriented valuation of foods is encoded in ventromedial prefrontal cortex (vmPFC) and is modulated by cognitive control during subsequent decisions. However, these cognitive control skills may be recruited before making a decision, during the goal oriented valuation process. Cognitive control would especially be engaged in setting the goal and adjusting the value given to foods according to this goal. Consequently, when making decisions, cognitive control involved in making goal incongruent decisions should be refrained to promote goal consistent decisions.
We have assessed patients with bulimia nervosa and healthy participants in a valuation-decision task involving foods. Bulimia nervosa is characterized by strict dieting interspersed with binge eating episodes which are characterized by large food intake within a short time and a sensation of loss of control. We will see how binge eating recruit cognitive control skills contrary to patient's sensation and more generally: i) how vmPFC encodes goal oriented valuation of taste and health of foods depending on participant's current state (i.e. strict dieting, binge or healthy controls), ii) how the different subparts of the prefrontal cortex involved in cognitive control are recruited during the valuation process, iii) how these brain areas are interacting with vmPFC, and iv) how activity in these brain areas are used during the decision part to refrain goal inconsistent decisions.

Hosted by: Giorgio Coricelli
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

PREMESOR Project Seminar

When/where: March 9th at 3.30pm, CIMeC Ex Manifattura, Main Hall, piazza Manifattura 1, Rovereto.
Speaker:

- Dr. Pierpaolo Pani, Ph.D., Dipartimento di Fisiologia Umana e Farmacologia of the University of Rome "La Sapienza "

Title: **Neural correlates of movement generation in dorsal premotor cortex**

Abstract: The generation of a voluntary movement in response to the appearance of a target has been an important topic addressed in behavioral neuroscience. In cerebral oculomotor centers (Frontal Eye Fields (FEF) and Superior Colliculus (SC)) the correlates of a gaze shift (saccade) toward a target in the visual field has been described as the result of the competition between two classes of neurons: fixation-related neurons, that reduce their activity before movement starts, and movement-related neurons, which activity grow-up surpassing a threshold before the gaze movement is generated (Munoz and Wurtz 1993). The role of movement and fixation neurons in generating saccades is strongly supported by studies that show that their activity specify whether and when a saccade will be produced(Hanes and Schall 1996; Hanes et al. 1998,Pare' and Hanes 2003). The macaque dorsal premotor Cortex (PMd) is critical for reaching movement. Neurons in this area are active both when primates maintain a static arm position as well as when they prepare to and move their hand toward different locations in space (Wise 1985; Caminiti et al. 1991). Thus it is a brain area in which patterns of activity similar to the one observed in saccadic movement and fixation related can be potentially detected. A push-pull pattern

similar to the one observed in FEF and SC have been hypothesized to occur in the cortical motor centers controlling for arm movements, but evidence are still lacking (for recent attempts see Kaufmann et al. 2010, 2012). We reinvestigated this same topic by recording single neuron activity (both by using acute and chronic recordings) from PMd while monkeys performed a task similar to the one used to investigate the saccadic system. The talk will show the findings obtained, as well as preliminary data on how the neural correlates of movement generation are affected by different cognitive task demands.

Hosted by: Giorgio Vallortigara
The talk is carried out within the framework of PREMESOR, an ERC-funded project

CIMeC Seminar

When/where: February 9th at 10am, CIMeC Ex Manifattura, Main Hall, piazza Manifattura 1, Rovereto.

Speaker:

- Dr. Edward W. Legg, University of Cambridge, Psychology and Dr. Ostoic Ljerka, University of Cambridge, Psychology

Title: **Do Eurasian jays attribute mental states to others?**

Abstract: Mental state attribution is the ability to ascribe to others an internal life like one's own. To study this ability in non-human animals we use Eurasian jays (Garrulus glandarius) as a model species because we can utilise two natural behaviours to test their cognitive abilities, namely caching and food-sharing. Like other corvids, Eurasian jays utilise a range of cache-protection strategies when there is potential that a conspecific could steal their caches. These studies suggest that cachers might be able to take into account what a conspecific can perceive. In addition, we have developed a novel behavioural paradigm to test whether jays might be able to attribute desires to conspecifics. This paradigm allows us to investigate whether male Eurasian jays respond to the changing desire-state of their female partner when sharing food with her during courtship. We will present a series of experiments investigating whether the male's food-sharing behaviour satisfies the behavioural criteria for desire-state attribution. Finally, we will present a recent study in which we attempted to integrate tests of desire-state attribution and cache-protection strategies.

Hosted by: Giorgio Vallortigara

PREMESOR Project Seminar

When/where: January 8th at 10am, CIMeC Ex Manifattura, Main Hall, piazza Manifattura 1, Rovereto.

Speaker:

- Dr.Teresa Iuculano, Ph.D., Stanford Cognitive and Systems Neuroscience Laboratory, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine

Title: **The plastic brain in numbers: evidence from neurodevelopmental and learning disorders**

Abstract: Plasticity is a fundamental characteristic of the human brain that lies at the core of its ability to learn new
information. Critically, little is known about cognitive and brain plasticity mechanisms asso ciated with skills that are essential in
todays' society, such as learning to manipulate numbers and perform arithmetic. In these studies we adopt a multi--
componential approach that combines models of neurodevelopmental and learning disorders wi th training paradigms and functional brain imaging as well as neuro--
modulation techniques to investigate the neurobiological correlates associated with the proc essing of numbers. Our results indicate that adequate numeracy skills are supported thro ugh mechanisms of plasticity in a network of multiple brain systems encompassing region s important for numerical cognition in the parietal and prefrontal cortices, as well as m emory systems in the medial temporal lobe. We also hint at the idea that better num

erical skills are engendered through enhanced plasticity in regions of the ventral temporal--- occipital cortex that are highly susceptible to functional reorganization. Finally, we show that successful training can normalize the aforementioned brain circuits in children with mathematical difficulties and that the extent of behavioral improvement depends on the degree of neural normalization.

Hosted by: Giorgio Vallortigara
The talk is carried out within the framework of PREMESOR, an ERC-funded project