Perception, Attention, and Motor Behavior

Thursday, Jun 21: 10:30 AM - 11:45 AM
Oral Sessions
Thursday - Oral Session

Presentations

2847: Learning Transferable and Generalizable Neural Encoding Models for Natural Vision

10:30 AM - 10:42 AM
Recent studies have shown the value of using deep learning models for mapping and characterizing how brain represents information for natural vision. However, modeling the relationship between deep learning models and the brain (or encoding models), requires measuring cortical responses to large and diverse sets of natural stimuli from single subjects. Here, we developed new methods to transfer and generalize encoding models across subjects. To train encoding models specific to a target subject, the models trained for other subjects were used as the prior models and were refined efficiently with a limited amount of data from the target subject. To train encoding models for a population, the models were progressively trained and updated with incremental data from different subjects.

Presenter

Haiguang Wen, Purdue University

2766: Cortical sampling of visual space is modulated by both spatial and feature-based attention

10:42 AM - 10:54 AM
While the visual world is abundant in detail, the human's visual system can only represent part of it at any one time. The brain must therefore select important information at the expense of the remainder. This selection process, often referred to as attention, can be based either on spatial locations or specific visual features (e.g. color or motion). Covertly attending a location in the visual field is thought to increase visual resolution at that location by shifting spatial receptive fields towards that location (Anton-Erxleben and Carrasco 2013). It is of yet unclear whether this resampling of visual space occurs independently of feature-based attention. However, as feature-based attention operates throughout visual space (Treue and Trujillo 1999) and relatively early in time (Hayden and Gallant 2005), it is possible that it biases spatial attention to those locations containing the attended feature (Burnett et al. 2016). More specifically, it has been suggested that changes in the sampling of visual space induced by spatial attention are adjusted to optimally sample the attended feature at the attended location (Barbot and Carrasco 2017). Together, these findings imply that the cortical sampling of visual space is not only modulated by an attended location, but is also dependent on the attended feature at that location.

Presenter

Daan van Es, Vrije Universiteit Amsterdam

2804: The brain's mind eye in absence of visual experience: topographic mapping of the soundscape-space

10:54 AM - 11:06 AM

Studies showed recruitment of the visual cortex in blind subjects that were trained to use sensory substitution devices (SSDs) which convey the visual information through a different sensory modality (e.g. audition). Though lack visual experience, skilled participants in visual-to-auditory SSDs were able to recognize various 'visual' objects and even body shapes and faces. Corresponding specific activations were found in the known categories in the high-order visual streams[1–4]. But how is this learned experience integrated in the brain? Does the visual-to-auditory input follow similar organizational principles as the natural senses (i.e. topographic maps such as retinotopy and tonotopy orderly representing the perceived sensory input)? To this aim we studied a proficient EyEMusic-SSD[5] congenitally blind user (male, 46 years old) using population receptive field (pRF) mapping, a methodological practice employed for imaging and analysis of visual retinotopic [6] and higher-order cognitive topographic[7] maps in the brain.

Presenter

Shir Hofstetter, The Hebrew University

2796: Electrocorticographic Responses to Vowel Sequences in Awake and Anesthetized States

11:06 AM - 11:18 AM

Understanding patterns of hierarchical processing of sensory information that track changes in consciousness states has become a major focus in neuroscience (Mashour, 2013; Raz et al., 2014). Clinically relevant conditions include drug-induced sedation and loss of consciousness (LOC) under general anesthesia, natural sleep, and minimally conscious and chronic vegetative states. Non-invasive studies using propofol as a means to induce LOC have shown differential effects on auditory cortical activity, with a greater impact on non-primary and auditory-related areas compared to primary auditory cortex (Dueck et al., 2005; Davis et al., 2007). Electrocorticography (ECoG) provides unprecedented spatiotemporal resolution that can help inform and interpret results of non-invasive studies (Nourski & Howard, 2015). ECoG work has demonstrated regional heterogeneity within Heschl's gyrus (HG) in the modulation of responses to click train stimuli by propofol (Nourski et al., 2017). Here, we utilized more complex stimuli (vowel sequences), presented in an active target detection task, to characterize changes in cortical responses during induction of general anesthesia.

Presenter

Kirill Nourski, MD, PhD, The University of Iowa

2849: Dynamic coordination in scene processing network

11:18 AM - 11:30 AM

Recent neuroimaging studies have shown that the representation of spatial geometry and scene content is distributed within the major nodes of the scene processing network. The spatial layout information about "openness" is represented in the parahippocampal place area (PPA), whereas scene content information about "naturalness" is represented in the lateral occipital complex (LOC) (Park 2011). However, how multiple scene processing areas dynamically coordinate within the network to construct a coherent visual experience of real-world scenes is still unknown. How would the PPA and LOC dynamically coordinate with each other to integrate the spatial and content information about a scene? A possible neural mechanism for communication between the PPA and LOC is through coherent rhythmic brain activity in the PPA and LOC ("communication through coherence ", Fries 2005). If PPA and LOC dynamically communicated with each other through neural coherence, then we would observe rhythmic brain activity in the PPA and LOC, and furthermore, these rhythmic brain activities would exhibit coherent phase relationship between each other. Here, we combined a recently developed time-resolved experimental design (Landau 2012; Fiebelkorn 2013; Song 2014) with fMRI repetition paradigm (Grill-Spector 2001) to reveal the dynamic coordination in scene process network.

Presenter

Zhengang Lu, University of Pennsylvania

2710: The relationship between digit areas and myelin distribution in human primary somatosensory cortex)

11:30 AM - 11:42 AM

Similar to better-known cytoarchitecture (Broadmann, 1909), myelo-architecture also reflects the functional segregation of cerebral cortex (Nieuwenhuys, 2013). More recently, a cutting-edge neuroimaging study demonstrated that myelin and cortical thickness information estimated from non-invasive MRI data could contribute architectural information to a cortical parcellation (Glasser et al., 2016). However, it is unclear the extent to which in vivo myeloarchitecture reflects the finer-scale functional organization. Penfield & Boldrey (1937) showed that human primary somatosensory cortex (S1) represents the somatotopic organization. In addition, recent functional neuroimaging studies demonstrated fine-grained representation within S1 of somatotopic finger areas (Sanchez-Panchuelo et al., 2012; Kolasinski et al., 2016). Thus, we investigated the relationship between the relative myelin content estimated from MR images and the individual digit areas in human S1.

Presenter

Sho Sugawara, National Institute for Physiological Sciences