2012 TDLC Boot Camp

Boot Camp is designed to provide Center fellows with training in the broad research agenda of the Center, offering background in each network's research as well as instruction in modeling and the use of the Motion Capture facility. It is a full-time, two-week program with lectures and lab training the first week, and an intensive weeklong research project the second week. All TDLC fellows (undergrads, graduate students, and postdocs) are encouraged to apply! For out of town fellows, the Center will provide your accommodations and reimburse you for meals during travel days, and your plane flight.

Overview
The Boot Camp schedule and training are demanding. During the first week, days will be filled with lectures and labs on a specific research area from each of the four Center research networks, plus a day each of computational modeling and motion capture/EEG. There will also be optional evening tutorials on various subjects, ranging from Python to Neural Networks (on demand). The second week will be devoted primarily to weeklong research projects (the results from which will be presented on the last day of Boot Camp), with lunchtime research talks from Center faculty and fellows. *Breakfast and lunch will be provided daily to all participants.*

One final note: It is important for all fellows who participate in Boot Camp to realize that they are expected to attend every scheduled activity (except for the optional evening tutorials). A commitment by all participants to the continuity and cooperative nature of the experience is necessary for everybody to get full benefit from this program.

2012 TDLC Summer Fellows Institute (SFI) - Schedule

WEEK 1 (Aug. 6-11) instruction and lab sessions will take place in the Computer Science and Engineering Building (EBU3B) room 4140, **UNLESS NOTED OTHERWISE BELOW**
WEEK 2 (Aug. 13-17) talks will take place (**NOTE VENUE CHANGE!**)
in the Computer Science and Engineering Building (EBU3B), room 4140

Breakfast: Daily, 8:30-9:00(Aug. 6-17 in CSE 4140; **UNLESS OTHERWISE NOTED BELOW**

Lunch: 12:15-1:15 (Location: "Stone Bear" Courtyard – outside of the CSE Building **UNLESS OTHERWISE NOTED BELOW**)
During the lunches, trainees will give a brief presentation of their research interests (schedule here)
The SFI project presentations will take place on Saturday, August 18, from 9:00 am – 12:15 pm,
in the Computer Science and Engineering Building (EBU3B), room 1202

WEEK 1		
Date/Location	**Morning Session: 9:00 - 12:15**	**Afternoon/Evening Session: 1:30 - 5:30 (w/ possible evening tutorial)**
Mon, Aug 6 CSE 4140	**9:00 – 9:15 Gary Cottrell, Director, TDLC Welcome** **Interacting Memory Systems** **9:15 – 10:15 – Robert Clark**: The Multiple Memory Systems of the	**Lab** **1:30: Mike Mozer:** Spacing effects **3:00: Robert Clark, TA: Jena Hales** Comparative Neuroanatomy.

	Brain **10:15 – 11:15 – Michael Mozer:** Theories of the Spacing Effect **11:15 – 11:30 – BREAK** **11:30 – 12:30 – Andrea Chiba:** Perpetual plasticity and the dentate gyrus	**Evening Tutorial (7:00-8:30)** **Akin Omigbodun** Room 4140 Linear Algebra (7 mb)
Tues, Aug 7 **CSE 4140**	**Social Interaction** **9:00 – 9:40 – Deborah Forster:** SIN Overview **9:40-10:40 Kaya de Barbaro**: Collecting and analyzing data for understanding the development of triadic attention **10:45-11:00 Break** **11-11:40 - Gwen Littlewort:** Methods for facial expression analysis: ELAN, CERT and FACS **11:40-12:00 - Jake Whitehill**: An Optimal Control Approach to Affect-sensitive Automated Teaching	**Lab** Collection and representation of multimodal features of human behavior. Using CERT, ELAN and other labeling tools and discursis to analyze video data **Evening Tutorial (7:00-8:30)** **Akin Omigbodun** Room 4140 Matlab
Wed, Aug 8 **CSE 4140**	**Sensorimotor** **9:00-10:00 - Virginia de Sa**: Perception and Psychophysics **10:00-11:00 - Alex Simpkins**: Towards methods for robotic systems capable of human-level dexterity in manipulation and locomotion **11:00 – 11:15 – BREAK** **11:15-12:15 - Emo Todorov**: Optimal control of movement in animals and robots	**Labs** **Alex Simpkins**: Robotics Systems, Signals, and Hardware **Jason Trees and Markus Plank**: Movement and memory in a virtual radial maze **Evening Tutorial (7:00-8:30)** **Cory Rieth**: **Python file** **R file**
Thurs, Aug 9 **CSE 4140**	**Modeling and Analysis** **9:00-10:00 - Gary Cottrell**: Neural Network Models **10:00-11:00 - Mike Mozer**: Bayesian models **11:15-12:15 - Angela Yu**: Diffusion Models of decision making and reaction time	**Labs** **1:30**: **Gary Cottrell**: PCA/ICA Matlab neural net demo **3:00: Cory Rieth:** MVPA **4:30: Janet Wiles**: Discursis **Evening Tutorial (7:00-8:30)** **Ian Greenhouse**:

		Transcranial Magnetic Stimulation (TMS)
Fri, Aug 10 CSE 4140	**Perceptual Expertise** **The Time Scale of Perceptual Expertise** **9:00-10:00 - Jim Tanaka**: Becoming an Expert, One Day at a Time **10:00-11:00 - Tim Curran**: Expertise, Millisecond by Millisecond **11:15-12:15 - Iris Gordon**: What ***is*** perceptual expertise, anyway?	**Lab** **Iris Gordon**: Photoshop exercises in morphing and holistic perception **Evening Tutorial (7:00-8:30)** **Ruixin Yang:** Eye Tracker Tutorial
Sat, Aug 11 SDSC B234E	**Motion Capture** **(PLEASE NOTE DIFFERENT VENUE!: We will be meeting at the Motion Capture Facility, San Diego Supercomputer Center B234E)** **8:30 – 9:00 - BREAKFAST (SDSC B234E)** **9:00 – 12:15 - Howard Poizner, Marcus Plank, and Jason Trees**: Introduction to the Motion Capture Lab **12:15 – 1:15 – LUNCH (SDSC B234E)** **MEG and MRI** **(We will carpool to the facility in Sorrento Valley – if you are a local participant, we would appreciate you offering to carpool those from out of town)** **1:30 – 6:00 PM** **Tim Brown**: Introduction to MEG and fMRI	
Sun, Aug 12	**DAY OFF** **Field Trip: San Diego Zoo**	
WEEK 2		
Date	**Morning Session (CSE 4140): 9:00-12:15**	**Afternoon/Evening Session: 1:30**
Mon, Aug 13 CSE 4140	**- Talks -** **9:00 –Bob Clark** Disambiguating Memory deficits from Perceptual deficits **10:00 - Victor Minces and Alex Khalil** Gamelan project: Exploring the	**Week-Long Project**

	connection between music, timing, and cognition **(15 min. break)** **11:15 – Paula Tallal:** The role of temporal dynamics in hemispheric specialization	
Tue, Aug 14 **CSE 4140**	**- Talks -** **9:00 – Javier Movellan** An atheist a priest and a Jew walk into a lab **10:00 – Markus Plank** EEG dynamics during planning of spatially-directed 3d limb movements **(15 min. break)** **11:15 – Howard Poizner** Sensorimotor control in Parkinson's disease	**Week-Long Project**
Wed, Aug 15 **CSE 4140**	**- Talks -** **9:00 - Dave Peterson** Nested time scales in basal ganglia mediated learning **10:00 - Rankin Williams McGugin** High-resolution imaging of expertise reveals reliable object selectivity in the FFA related to perceptual performance **(15 min. break)** **11:15 - Braden Purcell** Simulating the behavioral and neural dynamics of perceptual decisions	**Week-Long Project**
Thu, Aug 16 **CSE 4140**	**- Talks -** **9:00 - Marlene Behrmann** Psychological and neural processes underlying face perception: insights from normal and atypical populations	**Week-Long Project**

	10:00 - Gary Cottrell What can computational models tell us about face processing? **(15 min. break)** **11:15 – Gedeon Deák** Play Time: How We Learn To Share, Take Turns, and Cooperate	
Fri, Aug 17 **CSE 4140**	**9:30 - 10:00 - Breakfast** **- Talks -** **10:00 - Marni Bartlett** Sensorimotor learning of facial expression: A novel intervention for children with autism **(15 min. break)** **11:15 - Gary Cottrell** Efficient Coding: From Retina Ganglion Cells To V2 Cells	**Week-Long Project**
Sat, Aug 18 **CSE 1202**	**Week-Long Project Presentations** **CSE 1202** **Breakfast: 8:30 - 9:00** **Talks: 9:00 am - 12:15 pm** **Lunch Follows** **Party At Gary's House!!!** **6:30 PM**	

2012 TDLC Summer Fellows Institute (SFI) - Week-Long Project Descriptions

Motion Capture and EEG

EEG patterns during planning reaching movements to spatial targets (Supervisor: Dr. Markus Plank) There have been few EEG studies examining the neural dynamics associated with naturalistic movement. In this project, you will conduct a pilot study on EEG correlates of planning targeted reaching movements. You will use the Biosemi 70 channel EEG system to measure macroscopic brain dynamics during target encoding, motor planning and execution, and the PhaseSpace motion capture system to record the 3D kinematics of that reach. After removing muscle and other artifacts from the EEG using ICA, you will perform event-related and time-frequency analyses of the EEG and see what aspects of the upcoming movement (such as direction, speed, accuracy) you are able to predict from the EEG recorded prior to the movement.

Interacting Memory Systems

iRats and Real Rats (Supervisor: Dr. Janet Wiles) (4-5 participants max.) A study of Robot/Rodent Interactions. The iRat (intelligent rat animat technology) is a robot that is designed as a tool for studies in navigation, cognition, and neuroscientific research. iRat is the approximate size of an adult rat and has visual, proximity, and odometry sensors that are integrated with a differential drive and computer that allows the robot to navigate through a spatial environment. Real rats are also excellent at navigating through spatial environments and interacting with objects in the environment. This project is designed to evaluate how real, behaving rats will interact with each other, and with iRats under different conditions and across time. For example, how will real rats interact with an iRat that behaves in a mechanical, nonresponsive way, verses an iRat that moves in a more fluid motion and in a manner that is reactive to the real rat's behavior? Finally, there will be an opportunity to analyze neural recording in real rats that are engaged in these interactions.

Perceptual Expertise
Supervisor: Iris Gordon
The goal of this workshop is to introduce the trainees to the methods and analysis used in behavioral studies. The theoretic focus of this workshop will be the hallmark concepts of perceptual expertise; atypicality, holistic perception (inversion) and object categorization (novel, expert and common objects). Trainees will have the opportunity to design an experiment based on these concepts, and will learn to generate stimulus sets that test for the underlying cognitive mechanisms associated with each. Analysis will focus on learning d'prime, and a more in-depth understanding (plus concrete demonstration) of between/within subjects factors and repeated measures ANOVA. Trainees will also learn how to tailor behavioral experiments to fit the needs of other populations, such as children or individuals with special needs. Lastly, trainees will learn what it means to become an "expert" by exploring learning techniques in a small 5-day activity. No previous skills or knowledge required.

Sensorimotor

Social Interaction
Emotion Mirror for RUBI using CERT

In this project, we seek to develop a program for RUBI that can imitate facial expressions in real time. RUBI has a camera mounted on its forehead. Using this camera and CERT, we can perform face detection and facial expression analysis. RUBI also has an animated face, which runs on an iPad mounted in RUBI's head. RUBI face program has a series of parameters, which we can change to produce different facial expressions. However manually generating new 'natural' expressions using this set of parameters is a difficult task.

One way to automate the process of generating new expressions is to use the output of CERT to determine the location and properties of facial components in RUBI's face. The input to this system is a human face, which produces a natural facial expression. Using CERT, we can extract these components and produce a similar expression in RUBI's face:

- The position of eyebrows relative to each other and to the eyes
- The degree of which eye-lids are close
- The shape and position of the lips and mouth corners

In this project, we seek to utilize the output of CERT on human-generated expressions, to produce a similar

facial expression in RUBI. We are assuming that RUBI has no built-in expressions. It means that we want to use the exact position of face components of the human to determine the location of RUBI's face parts. To do that, we should consider the relative size and position of face components in both human and RUBI. The system will be running in real-time, which means that it gives RUBI a pseudo-interaction ability to communicate with people.

MEG

Auditory MEG/MRI experiment training

We have room for ONE trainee (due to space and time constraints) in a MEG/MRI project. The lucky trainee will gain hands-on experience with: 1) safety issues pertaining to MRI scanning, 2) how to obtain informed consent from subjects for imaging studies, 3) understand the theoretical basis for the behavioral auditory attention, discrimination and sequencing tasks we have developed for our TDLC MEG/MRI/fMRI study, 4) how to place electrodes and prep subjects for both MEG and MRI, 5) how to use the equipment to collect behavioral , MEG and MRI data and 6) get a VERY BASIC understanding about the kind of data that are derived from MEG and MRI . What we will not be able to do is to teach a trainee how to analyze MEG and/or MRI data given the complexity of doing this and Tim's time constraints.

Initiative 3

Efficient training via attentional guidance (TA: Brett Roads)

Many human activities involve visual explorations of complex environments, e.g., baggage screening, reading mammograms, matching fingerprints, military intelligence analysis of satellite images. In past work, we've shown that individuals can be trained more efficiently by cuing them where to look in a display. However, these earlier studies have used simple psychological tasks, with displays consisting of isolated letters, not naturalistic images. The goals of this project are to: (1) identify a domain of analysis (possibly fingerprints, possibly street scenes, possibly human faces), (2) determine image manipulations that are likely to guide attention to a location (contrast enhancement/suppression, saturation or color manipulation, subtle motion cues, etc.), (3) conduct an eye tracking study to show image manipulations are successful in redirecting attention, and -- time permitting, (4) showing effects on learning (when tested on novel images) from guided training.

Modeling and Analysis

"Ziggerins" are an artificial class of objects that have within-class similarity as well as between class "styles." Experiments have been performed on people learning either the class or the style. This project is to apply Cottrell's neural network expertise model to this class of stimuli and see if the model matches the data. We have already programmed versions of the model available, but variations of this project could involve using different features. The "standard" model uses gabor filters, but better versions use ICA features, and there is some reason to believe that the latter may be better at the ziggerin task. We will provide you with the model code, ziggerin stimuli as well as the original paper (linked below) with the behavioral data.