2017

Kavli Summer Institute in Cognitive Neuroscience

Week 1: Computational perspectives on language prediction in the brain

Course Directors

Gina Kuperberg	T. Florian Jaeger
Tufts University &	University of Rochester
Massachusetts General Hospital	

Language presents our brains with considerable challenges. On the one hand, language processing benefits from linguistic and real-world knowledge stored in memory to predict new inputs. On the other hand, the neural systems underlying language processing must still be flexible enough to make sense of novel events and situations, and learn from these experiences to adapt to our ever-changing communicative environments. This course considers some of the computational principles and mechanisms by which our brains meet this challenge. Selected speakers from multiple areas of Cognitive and Brain sciences will discuss how computational models can yield insights into neurocognitive mechanisms engaged in probabilistic, graded prediction at multiple levels of language, ranging from speech perception to discourse comprehension. In addition, we will discuss how these principles can inform our understanding of the links between language processing and language learning in the brain.

This is a tentative schedule. Specific lectures and faculty members will be continually updated as finalized

Monday (6/26): Overview: Computational principles and neural instantiation of prediction

8:00-8:30	Breakfast
8:30-8:35	Welcome – Mangun, Giesbrecht, Miller and Gazzaniga
8:35-8:45	Introductory Remarks – Gina Kuperberg/Florian Jaeger
8:45-10:15	**Gina Kuperberg & Florian Jaeger:** Prediction and adaptation during language processing: Overview of computational and neural challenges
10:15-10:30	Break
10:30-11:45	**Tobias Egner** (Duke University): Functional instantiation of non-linguistic prediction and adaptation in the brain
11:45-1:45	Lunch
1:45-5:00	Lab Session: – Neuroanatomy – Skirmantas Janusonis (UCSB) LOCATION: Physical Sciences Building North (PSBN), Rms. 2664 and 2666 http://www.aw.id.ucsb.edu/maps/ucsbmap.html (in D5, next to Chemistry).

Tuesday (6/27): Prediction and learning in speech perception (comp; fMRI)

8:00-8:45	Breakfast
8:45-10:15	**Naomi Feldman** (University of Maryland): Prediction in speech perception & acquisition: an ideal observer computational perspective
10:15-10:30	Break
10:30-11:45	**Dave Kleinschmidt** (Princeton University): Prediction and adaptation to talker-specific statistics: linking the ideal observer perspective to brain function

| 11:45-1:45 | Lunch |
| 1:45-5:00 | Lab Session: – Neuropsychology Videos |

Wednesday (6/28): Prediction in semantic, lexical and syntactic processing

8:00-8:45	Breakfast
8:45-10:15	**Kara Federmeier** (University of Illinois): The timing of semantic, lexical and orthographic prediction in the brain
10:15-10:30	Break
10:30-11:45	**Ellen Lau** (University of Maryland): Semantic and syntactic prediction in the brain: Perspectives from multimodal imaging studies
11:45-1:45	Lunch
1:45-5:00	Lab Session: **Ralf Haefner, Dave Kleinschmidt, and Florian Jaeger:** Computational basics on prediction in the brain

Thursday (6/29): Prediction and adaptation in discourse comprehension

8:00-8:45	Breakfast
8:45-10:15	**Vera Demberg** (Saarland University): Computational perspectives on prediction in discourse comprehension
10:15-10:30	Break
10:30-11:45	**Gina Kuperberg** (Tufts University & Mass. General Hospital) & **Tamara Swaab** (University of California, Davis): Neural perspectives on prediction in discourse comprehension
11:45-1:45	Lunch
1:45-5:00	Debate Preparation (no lab)
6:30-8:00	**DEBATES: Teams 1 and 2** (fellows will be organized into teams during week 1)

Friday (6/30): Language prediction: From algorithms to neural implementation

8:00-8:45	Breakfast
8:45-10:15	**Jay McClelland** (Stanford University): Bridges between Bayesian and connectionist models: Implications for understanding prediction in language processing
10:15-10:30	Break
10:30-11:45	**Ralf Haefner** (University of Rochester): Prediction in computational neuroscience
11:45-1:45	Lunch
1:45-3:00	Lecture 11: **TBA:** Summary and discussion
3:00-5:30	Chill
5:30	**BBQ at Goleta Beach** (walking distance from campus – see map)

Saturday and Sunday: Free, to enjoy the Santa Barbara area and each other's company