

MCN Schedule

Sunday Aug 2: Greeting and welcome pizza dinner in Loeb lab, 6.00pm.

Week 1: Information Theory and Neural Coding (Aug. 3-7)

Day 1 Introduction (Aug. 3)

M1: Michael Berry – Introduction to course; “computational tools of the brain”; examples of computational modules (1 hour)

M2: Adrienne Fairhall – general overview of neural coding; encoding vs. decoding; functional models; LN models; adaptation (2 hours)

A1: Matlab tutorial and assign groups (TAs)

A2: Problem sets: receptive fields, LN models, covariance analysis

E: Bill Bialek – physical limits to sensory perception (2 hrs)

Day 2 Population Coding and Retina (Aug. 4)

M1: Jonathan Pillow – functional models and max likelihood (1.5 hours)

M2: Michael Berry – population codes in retina; correlation & heterogeneity (1.5 hours)

A1: Rava da Silveira – tutorial on information theory

A2: Problem sets: entropy, mutual information, maximum likelihood

E: Rava da Silveira – Fisher information and population codes (2 hrs)

Day 3 Higher Level Vision (Aug. 5)

M1: Jim DiCarlo – Population coding in the ventral visual stream (1.5 hours)

M2: Roozbeh Kiani – Clustering responses in IT cortex (1.5 hours)

A1: Elad Schneidman – maximum entropy (1+ hours)

A2: Problem sets

E: Markus Meister – adaptation in the retina (1.5 hrs)

Day 4 Whisker System and Active Sensation (Aug. 6)

M1: Ehud Ahissar – Whisker system and active sensation (1.5 hours)

M2: David Kleinfeld – Feedback and dynamics in whisker system; spectral analysis (1.5 hours)

A: David Kleinfeld -- Spectral analysis; tutorial on Chronux

E: Dinner with faculty

Day 5 Audition (Aug. 7)

M1: Bill Spain – auditory brainstem: delay lines and intrinsic properties (1.5 hours)
M2: Marcelo Magnasco – Hair cells and auditory representation (1.5 hours)

A1: *Problem sets*

A2: *Group presentations of problem sets (4 pm)*

Sunday Aug 9: Welcome party, Directors' house, 6pm

Week 2: Dynamical Systems and Attractors (Aug. 10-14)

Day 1 Single Neuron Dynamics (Aug. 10)

M: Bard Ermentrout – dynamical systems and phase plane analysis (3 hours)

A: *Bard – XPP tutorial, problem sets*

E: Adrienne Fairhall – reduced models of ion channel dynamics, adaptation (1+ hour)

Day 2 Ion Channel Diversity and Dynamics (Aug. 11)

M1: Dan Johnston – ion channel biophysics: variety and timescales (1.5 hours)

M2: Charlie Wilson – basal ganglia (1.5 hours)

A: Boat trip

E: Eve Marder – STG and ion channel homeostasis (1+ hour)

Day 3 Dendritic Computation (Aug. 12)

M1: Bartlett Mel – computational properties of dendrites (2.5 hours)

M2: Michael Häusser – experiments on dendritic excitability (1 hour)

A1: *Bartlett Mel/Mike Pesavento – introduction to NEURON*

A2: *Problem sets*

E: Michael Häusser – recent results (1+ hour)

Day 4 Persistent Activity (Aug. 13)

M1: Emre Aksay – neural integrators (1.5 hours)

M2: Mark Goldman – theory of neural integrators, eigenvalues (1.5 hours)

A1: Mark Goldman – robustness (1 hour)

A2: *Problem sets*

E: Dinner with faculty

Day 5 Network Oscillations (Aug. 14)

M1: Gyorgy Buzsaki – experiments on mechanism of gamma band oscillations (1.5 hours)

M2: Nancy Kopell – models of network oscillations (1.5 hours)

A1: *Problem sets*

A2: Group presentations of problem sets (4 pm)

E: Sara Solla – properties of attractor networks; current work with cortical slices (1+ hour)

Sunday Aug 16: Barbecue, Directors' house, 6pm

Week 3: Learning (Aug. 17-20)

Day 1 Synaptic Plasticity (Aug. 17)

M1: Karel Svoboda – synaptic plasticity, experiments (1.5 hours)

M2: Larry Abbott – synaptic plasticity, computational consequences (1.5 hours)

A: Prepare project proposals

E: Harvey Karten – overview of brain anatomy & learning (1.5 hours)

Day 2 Network Learning (Aug. 18)

M1: Sara Solla – perceptrons (1.5 hours)

M2: Haim Sompolinsky – tempotron, network capacity (1.5 hours)

A: Project proposals/computer lab

E: Larry Abbott – temporal pattern learning with chaotic networks (1+ hour)

Day 3 Motor Learning I (Aug. 19)

M1: Bence Olveczky – motor sequence generation and learning in the songbird (1.5 hours)

M2: Ila Fiete – model of learning in songbird (1.5 hours)

A: Computer lab

E: Ila Fiete – Models of grid cells

Day 4 Motor Learning II (Aug. 20)

M1: Reza Shadmehr – The computational problem of motor control (1.5 hours)

M2: Emo Todorov – motor control and Bayesian learning (1.5 hours)

A: Computer lab

E: Dinner with faculty

Week 4+: Special Topic: Optimization in Brain Function (Aug. 21-28)

Fri 3pm: Simon Laughlin – energy, information, and design in fly vision (2+ hrs)

Sunday Aug 23: Final party, Directors' house, 6pm

Talks will be at 4pm.

Mon: Mitya Chklovskii – optimal wire length, optimal synapse volume (1+ hour)

Tues: Mike Shadlen – neural basis of decision-making (1+ hour)

Wed: Leslie Osborne – sensory origins of motor noise (1 hour)

Wed evening: debate over pizza and beer about optimization

Fri: presentation of individual projects

Friday pm: Course banquet