NSF Neuro 2007
Two slides

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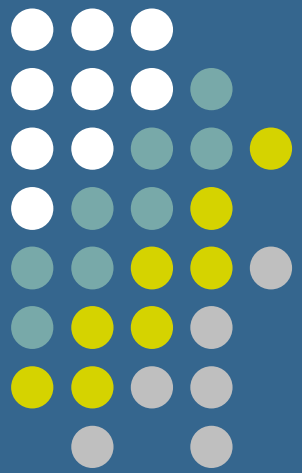
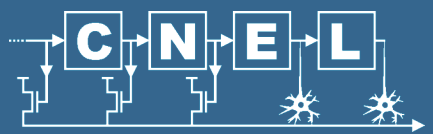
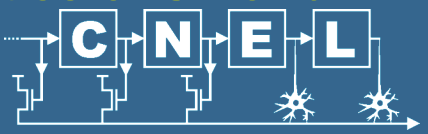


Brain-Machine Interface Project



Functional Relationships between Local Field Potentials and Spike Trains

- Brain is a multiscale system; therefore, reverse engineering to build Brain Machine Interfaces (BMI) etc., requires proper representations at each level.
- For BMIs, how do LFPs and Spike Trains complement each other in representing behavior?
  - ST is specific to neuronal function, but we can not possibly tap on all the neurons and may lose info of network state!
  - LFPs translate the electrical field changes in a local volume of brain tissue and can reflect stage changes of thousands of neurons.
- Are there better techniques to experimentally record, model, and derive function from their relationship?
  - Preliminary work in the CNEL shows that it is hard to relate the two. What are the properties of ST and LFP that provide the link? Synchronization?



Shared Architectures for BMIs

- What is the proper role of man-made controllers/learning models for integrating neuromodulation in the design of advanced BMIs?
  - Presently BMIs are mostly passive. Brain signals drive the BMIs, wasting the adaptive properties of neural systems to control external devices to interact with the environment. How can neural interfaces take a more active role in the integration?
- How to fuse in a principle manner brain information and artificial intelligence in a BMI?
  - Should the BMI architecture be simply biologically plausible and execute commands? Should the spike trains augment point processes representations created by the BMIs? What should be the principle to fuse the two representations? Prediction? Learning?