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Research Topic

Genetic Models

Research Problem

How do human beings and other biological organisms analyze complex scenes?

Problem Statement

Given a natural pattern, construct a model that is able to predict the brain's encoding of the natural pattern.

Natural Pattern: A collection of stimuli which is either visual or acoustic.

Problem Description

How do human beings and other biological organisms analyze complex scenes? One key to understanding this process is to understand how biological organisms encode sensory information. Lewicki's research focuses on modeling how the brain encodes natural patterns, which can include both visual imagery and acoustic input. Building from the idea that the brain codes signals accurately, efficiently, and robustly, the models generated are able to accurately predict the organization of the retinal field.

Computer Science Perspective

Applying principles from information theory to the problem of sensory encoding, currently proposed encoding algorithms were refined to be more robust and efficient. The theoretically optimal properties of the refined algorithm matches actual retinal data, and has produced theoretical error bounds for neuron populations the same size as the retina.

Actively Involved Disciplines

Biology, Computer Science and Neuroscience are actively involved disciplines.

Actively Involved Discipline: A discipline from which there is a member involved in the proto-type construction of testing stages of the research process.

Description of Disciplines Involved

Since this research deals with biological organisms and brain functions, both biology and neuroscience are heavily involved. The modeling itself builds off of previous work in mathematics and statistics.

References

Presenter's homepage:

<http://www.cs.cmu.edu/~lewicki/>

Center for the Neural Basis

By lajones

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