

Robert F. Murphy

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Research Topic

Computational Biology

Research Problem

How can we use computers to learn things about proteins that people can't?

Problem Statement

Given a set of labeled images of different proteins, construct a hierarchy of the different proteins where the hierarchy constructed groups proteins so that proteins appearing nearby in the tree are more closely related than proteins appearing in different locations.

Images are images of a cell with the locations of a particular protein illuminated. Each image is labeled with the particular protein it displays.

Problem Description

Dr. Murphy doesn't want biologists to do biology research; he thinks computers are better at it. Dr. Murphy takes thousands of images, each showing the locations of a single protein in a single cell type. A prediction model is created to predict the protein from the image. Using this model, a family tree of proteins is constructed. People can't do this. This kind of analysis is only possible with computers. An additional goal is to use active learning to be able to request specific pieces of additional data in order to improve either the tree-structure or the prediction accuracy.

Computer Science Perspective

This project involves a wide variety of standard computer science problems from computer vision and image segmentation to machine learning and artificial intelligence.

Actively Involved Discipline:

A discipline is an actively involved discipline if there is an actively involved individual who belongs to that discipline.

An actively involved individual is an individual who has received credit in any related publications or presentations or who is mentioned by the principal investigators, either through verbal or written communications, online or offline, digital or analog.

Disciplines actively involved

Biomedical Engineering

Computational Biology

Machine Learning/Data Mining

Description of Disciplines Involved

Biology

Computer Science

References

Presenter web page:

<http://www.andrew.cmu.edu/user/murphy/>

Presenter's lab group:

<http://murphylab.web.cmu.edu/>

Joint CMU-Pitt Ph.D. Program in Computational Biology

<http://www.compbio.cmu.edu/>

Ray and Stephanie Lane Center for Computational Biology

<http://lane.compbio.cmu.edu/>

By Jfolson

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