Speaker: Susan Holmes, Stanford University

Title: Crowd Counting a Crowd

Abstract:
Many methods have shown promise for identifying and counting specific objects in images, cells in microscope slides, people in a crowd are typical examples. The most successful methods are based on statistical learning algorithms in a supervised situation, with training sets of sufficient quality. In this talk, I present a method to address the specialized tasks of providing training data for image object counting and localization, in particular for providing data for spatial point process analyses.

Some object recognition algorithms are designed for specific domains, e.g., pathology, face recognition, cars, pedestrians, trees, or animals. A specialized method is of no use if one wants to accurately segment images out of context. Currently, the best solution is still to manually mark each object. Our engineered solution, named DistributeEyes, uses a global workforce such as that attainable through Amazon’s Mechanical Turk to provide rapid and inexpensive manual marking. The data output from the human-computer interaction provides useful insight into successful marking strategies and quality control indicators.

We analyzed the data provided by DistributeEyes and compared it to the ground truth. We found significant differences in the level of difficulty in the various images we proposed. From a statistical perspective, the most interesting finding was that the number of true positives in trainings is beta-distributed. We were thus able to build a Bayesian model for future count estimators. We use the Gibbs sampler to provide the posterior distributions for the count estimator.

This is joint work with Adam Kapelner.