Lecture 1. How can perform image labeling as statistics estimation? What types of image regions can we successfully detect in this way?

Lecture 2. What is a Markov Random Field (MRF) and how do MRFs impose constraints like spatial smoothness and impose spatial context? What is a Gibbs distribution? How can the Total-Variation norm model (Day 1) be transformed into an MRF?

Lecture 3. Briefly specify how image labeling (with two labels) can be converted into a Max-Flow task that can be solved by Ford Fulkerson algorithms (CHECK!!). Briefly specify the belief propagations algorithm, what are messages? How do they relate to the beliefs? How do the beliefs relate to the marginals of the distribution? When is belief propagation guaranteed to converge to the global solution?

Lecture 4. Describe exponential distributions. How do you learn them by maximum likelihood (ML)? How do the expected statistics of the data relate to the observed statistics? How do the statistics of derivative filters on images relate to exponential models and MRFs?

Lecture 5. What are probability models with hidden variables? What is the EM algorithm? And how is it used to learn a model with hidden variables. Is EM guaranteed to converge to the global solution?