Mathematics and CS Seminar

Expectation Propagation for linear estimation models

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Linear estimation (LE) models consist in the solutions of an under-determined system of equations with extra constraints. Many interesting problems arising from signal acquisitions and processing, biology etc. are standardly modeled as LE. One of the most effective approaches relies on the Bayesian inference, where the original problem can be rephrased in a probabilistic framework. Here, marginalizing the a posterioridistribution of certain variables, given a partial knowledge of the system, provides the key ingredient to determine a solution to a LE. Unfortunately, in most of the cases, these probability densities are difficult to estimate and to marginalize as they would require impractical computations. In this talk I will present an iterative algorithm, the Expectation Propagation (EP) approximation, that is able to accurately estimate marginal probability densities of intractable distributions. EP is an approximation scheme developed in the computer science community as well as in statistical mechanics with the name of Expectation Consistent. As a matter of example of the advantages carried by this method, I will explain the problem of determining the feasible space of metabolic fluxes and I will compare EP results to the estimates of astate-of-the-art sampling technique, Hit-and-Run Monte Carlo (HR). Not only EP is tremendously faster then HR, but it is able to accommodate additional constraints over fluxes (for instance, fixing the marginal probability of a specific flux to an experimental profile) without affecting the computational cost.

Tuesday, May 23, 2017 02:00pm - 03:00pm
Evolutionary Biology Room (I01.1OG - Zentralgebäude)

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