10-708: Probabilistic Graphical Models 10-708, Spring 2012

23 : Indian Buffet Process

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Review of Lecture on The Dirichlet Process

The *Dirchlet Process* is a distribution over *probability distributions over infinitely many atoms*. It is a generalization of the *Dirichlet Distribution*. An analogy using dice rolls is:

- A sample from a $Multinomial(p_1, p_2, p_3, \ldots, p_n)$ is like rolling a die.
- A sample from a $Dirichlet(\alpha_1, \alpha_2, \ldots, \alpha_k)$ returns a $p.m.f$ which is a multinomial over a fixed set of atoms.
- A sample from a $DP(\alpha, H)$ returns a distribution over an infinite set of atoms.

Dirichlet processes allow us to construct infinite mixture models. For a finite mixture model problem, we can use EM to solve a Gaussian-Mixture-Model problem or we could use some model choice method (BIC, Cross-Validation and so on) but for the infinite mixture models case, this doesn't work. This is where the ***Chinese Restaurant Process*** comes in: