# Machine Learning (2016.10.26)

[EM]

* Pictorial View
  + Changing distribution, make KL 0. So that they can now converge
    - Make q = p
  + If the blue line does not lift anymore 🡪 then we are done with the training set which means we have reached to 100% accuracy
* Convergence
  + Increasing the likelihood functions
  + At some point we won’t be able to increase it any more
* Very Powerful Result
  + If you can write the complete data likelihood, you can use EM
  + The algorithm will always converge
* Likelihood of data P(x|theta) = L(q, Theta) = sum(p(x,z|theta) / q(z))
* General EM
  + E Step
    - We may need to approximate the values
  + M Step
    - Maximization may require multiple steps, optional constraints

[Graphical Models]

* Combination of probability theory and graph theory
  + Standard algorithms for solving graph problems
  + Represent a complex system as a graph
* Representation
  + Nodes
    - Random variables (discrete or continuous)
  + Edges
    - Connections between two nodes
    - Indicates a direct relationship between two random variables
    - Note: the lack of an edge is very important
      * No direct relationship
  + We assume that the graph is DAG 🡪 No cycle
* Directed Graphs
  + Missing links say we don’t have to care 🡪 so that it’s independent