MAXIMUM A POSTERIORI (MAP) ESTIMATION

For a hidden random variable X that we are inferring, and given observation $Y = y$, we have been talking about computing the posterior distribution $p_{X|Y}(\cdot|y)$ using Bayes' rule. The posterior is a distribution for what we are inferring. Often times, we want to report which particular value of X actually achieves the highest posterior probability, i.e., the most probable value x that X can take on given that we have observed $Y = y$.

The value that X can take on that maximizes the posterior distribution is called the *maximum a posteriori* (MAP) estimate of X given $Y = y$. We denote the MAP estimate by $\widehat{x}_{\text{MAP}}(y)$, where we make it clear that it depends on what the observed y is. Mathematically, we write

$$\widehat{x}_{\text{MAP}}(y) = \arg\max_{x} p_{X|Y}(x|y).$$

Note that if we didn't include the “arg" before the “max", then we would just be finding the highest posterior probability rather than which value–or “argument"–x actually achieves the highest posterior probability.

In general, there could be ties, i.e., multiple values that X can take on are able to achieve the best possible posterior probability.

Homework due Oct 05, 2016 at 21:00 UTC

Notation Summary (Up Through Week 3)

Mini-project 1: Movie Recommendations (Week 3)
Mini-projects due Oct 12, 2016 at 21:00 UTC