

Previously on MA40189:

- **conjugate family**: with respect to a likelihood, prior and posterior in the same family
- with respect to the Binomial likelihood, the Beta distribution is a conjugate family

Today on MA40189:

- tossing coins and drawing pins: effect of **strong** and **weak** prior on the posterior when the likelihood is the **same**
- **kernel of a density**: for a random variable X a kernel is $q(x)$ where $f(x) = cq(x)$
- spotting kernels useful in computing posterior distributions
- **conjugacy of normal** (with known variance)
- $\theta \sim N(\mu_0, \sigma_0^2)$, $X | \theta \sim N(\theta, \sigma^2)$ then $\theta | x \sim N(\mu_1, \sigma_1^2)$ where

$$\frac{1}{\sigma_1^2} = \frac{1}{\sigma_0^2} + \frac{1}{\sigma^2}; \quad \mu_1 = \left(\frac{1}{\sigma_0^2} + \frac{1}{\sigma^2} \right)^{-1} \left(\frac{\mu_0}{\sigma_0^2} + \frac{x}{\sigma^2} \right)$$

- posterior precision is the **sum** of the prior precision and the data precision
- posterior mean is a **weighted average** of prior mean and data, weighted according to their respective precisions