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 quantity $X$ a kernel is $q(x)$ where $f(x) = cq(x)$
- spotting kernels useful in computing posterior distributions
- **conjugacy of normal (with known variance)**

Let $\theta \sim N(\mu_0, \sigma_0^2)$, $X | \theta \sim N(\theta, \sigma^2)$ 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