Lecture 9

Finding hyper parameters

Target: Mean = 1000

SD = 300

Then by properties of ex-Gaussian, we have

$$\mu + \tau = 1000$$
$$\sigma^2 + \tau^2 = 300^2$$

Let $\mu = 800$ and $\tau = 200$. Then

$$\sigma^2 = 300^2 - \tau^2$$
$$= 90000 - 40000$$
$$= 50000$$

$$\rightarrow \quad \sigma = 223.6$$

So, subject parameters will be drawn from

$$\mu_i \sim \text{Normal}(800, 150)$$
$$\sigma^2 \sim \text{InvGamma}(\ ?\ )$$
$$\tau \sim \text{InvGamma}(\ ?\ )$$

What params for InvGamma?

Fact: for $X \sim \text{InvGamma}(\alpha, \beta)$

$$E(X) = \frac{\beta}{\alpha - 1}$$

α = shape

β = scale

So, pick α, β so that

- Distribution has correct "shape"
- $\frac{\beta}{\alpha - 1}$ = expected value for σ^2 or τ

These will work: for variance σ^2

- want $\sigma^2 = 50000$ (on average)

so $\frac{\beta}{\alpha - 1} = 50000$

play around until see correct shape

Pick $a > 1$. If $\alpha = 3$, then $\beta = 50000 \times 2$

$= 100000$

Thus, assume $\sigma^2 \sim \text{InvGamma}(3, 100,000)$

Do same thing for τ!