

$$p(\theta, w | \mathbf{y}) \propto p(\mathbf{y} | \theta, w) p(\theta | w) p(w)$$

$$p(\theta | w, \mathbf{y}) = \frac{p(\theta, w, \mathbf{y})}{p(w, \mathbf{y})} = \frac{p(\theta, w | \mathbf{y}) p(\mathbf{y})}{p(w | \mathbf{y}) p(\mathbf{y})} \\ \propto p(\mathbf{y} | \theta, w) p(\theta | w)$$

$$p(\theta, w | \mathbf{y}) \propto \underbrace{w^{(n+d+1)/2-1} \exp \left(-\frac{w}{2} \left(\mathbf{y}^\top \mathbf{y} + \kappa \mu^2 + \eta - \frac{(n\bar{y} + \mu\kappa)^2}{n + \kappa} \right) \right)}_{\Gamma(\dots)} \underbrace{\exp \left(-w(n + \kappa) \frac{\left(\theta - \frac{n\bar{y} + \mu\kappa}{n + \kappa} \right)^2}{2} \right)}_{\mathcal{N}(\dots)}$$

$$p(\theta | w, \mathbf{y}) \propto \exp \left(-w(n + \kappa) \frac{\left(\theta - \frac{n\bar{y} + \mu\kappa}{n + \kappa} \right)^2}{2} \right) \\ \propto \exp \left(-\frac{1}{2} \left(\frac{\theta - \frac{n\bar{y} + \mu\kappa}{n + \kappa}}{\sqrt{(w(n + \kappa))^{-1}}} \right)^2 \right)$$