

# SDS 383D, Bayesian Inference in Simple Conjugate Families

Jan-Michael Cabrera

February 22, 2019

## A: Beta prior with Bernoulli sampling distribution

$$p(w) = \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} w^{a-1} (1-w)^{b-1} \quad (1)$$

$$p(D|w) = \binom{n}{y} w^y (1-w)^{n-y} \quad (2)$$

$$p(w|D) = p(w) \frac{p(D|w)}{p(D)} \propto p(w) p(D|w) \quad (3)$$

$$p(w|D) \propto w^{a-1} (1-w)^{b-1} w^y (1-w)^{n-y} \quad (4)$$

$$p(w|D) \propto w^{a+y-1} (1-w)^{n+b-y-1} \quad (5)$$

$$w|d \sim \text{Beta}(a+y, n+b-y) \quad (6)$$