

# Cheatsheet of some Bayesian models

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This is an example of a cheatsheet of Bayesian models, the students should complete it and extended with their own comments.

## Beta-Bernoulli model

Likelihood	$Y \theta \sim \text{Bernoulli}(\theta)$
Conjugate prior	$\theta \sim \text{Beta}(\alpha, \beta)$
Interpretation of hyperparameters	$\alpha - 1$ : number of prior successes $\beta - 1$ : number of prior fails
Noninformative prior from interpretation	$\theta \sim \text{Beta}(1, 1)$
Posterior	$\theta \mathbf{Y} \sim \text{Beta}(\alpha_n, \beta_n)$ $\alpha_n = \alpha + \sum_{i=1}^n y_i, \beta_n = \beta + n - \sum_{i=1}^n y_i$
Posterior predictive	$Z = \sum_{i=1}^{\tilde{n}} \tilde{Y}_i, Z \mathbf{Y} \sim \text{Beta-Binomial}(\tilde{n}, \alpha_n, \beta_n)$
Jeffreys prior	$\theta \sim \text{Beta}(1/2, 1/2)$

## Gamma-Exponential Model

Likelihood	
Conjugate prior	
Interpretation of hyperparameters	
Noninformative prior from interpretation	
Posterior	
Posterior predictive	
Jeffreys prior	

## Gamma-Poisson Model

Likelihood	
Conjugate prior	
Interpretation of hyperparameters	
Noninformative prior from interpretation	
Posterior	
Posterior predictive	
Jeffreys prior	

## Normal Likelihood with Mean Unknown and Variance Known

Likelihood	
Conjugate prior	
Interpretation of hyperparameters	
Noninformative prior from interpretation	
Posterior	
Posterior predictive	
Jeffreys prior	

$$\mu_n =, \quad \tau_n^2 =$$

## Normal Likelihood with Mean Known and Variance Unknown

Likelihood	
Conjugate prior	
Interpretation of hyperparameters	
Noninformative prior from interpretation	
Posterior	
Posterior predictive	
Jeffreys prior	

$$\nu_n =, \quad \sigma_n^2 =$$

## Normal Likelihood with Mean and Variance Unknown

Likelihood	
Conjugate prior	$\mu \sigma^2 \sim$ $\sigma^2 \sim$
	$\mu \sim$ $\sigma^2 \mu \sim$
Interpretation of hyperparameters	
Noninformative prior from interpretation	
Posterior	$\mu \sigma^2 \sim$ $\sigma^2 \sim$
	$\mu \sim$ $\sigma^2 \mu \sim$
Posterior predictive	$Y \mathbf{Y} \sim$
Reference prior	$\mu \sigma^2 \sim$ $\sigma^2 \sim$

$$\mu_n =$$

$$\kappa_n =$$

$$\nu_n =$$

$$\nu_n \sigma_n^2 =$$

$$s^2 =$$