## Conjugate priors

5/6 points (83%)

Quiz, 6 questions

<b>~</b>	Congra	atulations! You passed!	Next Item
	<b>~</b>	1 / 1 points	
	1. Prior is	s said to be conjugate to a likelihood function if:	
	the posterior would stay in the same family of distribution prior		ons as
			lie in
		the prior, the likelihood function and the posterior would same family of distributions	d be in a
		the prior lies in the same family of distributions as the lil	kelihood
		the prior is from the same family of distributions as the	likelihood
	<b>~</b>	1/1 points	
	2. Finding	g a conjugate prior is useful because:	
		We can perform analytical inference and find posterior of instead of taking point MAP estimate	distribution

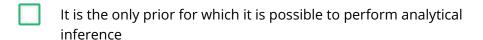
Correct

Since posterior lies in a known family of distributions, we will be able to perform analytical inference

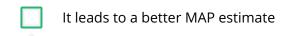
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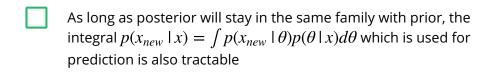
Quiz, 6 questions



**Un-selected is correct** 



**Un-selected is correct** 



#### Correct

This integral is called the evidence and it can be computed analytically if prior, likelihood and posterior are known



1/1 points

3.

Out of the following pairs of priors and likelihood functions, choose those that are conjugate:



**Un-selected** is correct

$$\Gamma(\sigma_1^2 \mid \alpha, \beta)$$
 prior over parameter  $\sigma_1^2$  of  $\mathcal{N}(X \mid \mu_1, \sigma_1^2)$  likelihood

**Un-selected is correct** 

## Conjugate prioris example was discussed in a lecture

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$$\Gamma(\lambda \mid \alpha, \beta) \text{ prior over parameter } \lambda \text{ of } Exp(x \mid \lambda) \text{ likelihood (}$$

$$\Gamma(x, \mid \alpha, \beta) = \frac{\beta^{\alpha}}{\Gamma(\alpha)} x^{\alpha - 1} e^{-\beta x} \text{ and } Exp(x \mid \lambda) = \lambda e^{-\lambda x} \text{)}$$

#### Correct

Multiplying these distribution and grouping the terms will lead to gamma distribution again



1/1 points

4

Which of the following prior distributions over parameter  $\sigma^2$  are conjugate to likelihood  $\mathcal{N}(x \mid \mu, \sigma^2)$ ?

Scaled inverse chi-squared with pdf  $f(\sigma^2 \mid \nu, \tau) = \frac{(\tau^2 \nu/2)^{\nu/2}}{\Gamma(\nu/2)} \frac{\exp\left(-\frac{\nu \tau^2}{2\sigma^2}\right)}{(\tau^2)^{1+\nu/2}}$ 

#### Correct

Multiplying these distribution and grouping the terms will lead to normal distribution

 $Exp(\sigma^2 \mid \lambda) = \lambda e^{-\lambda \sigma^2}$ 

#### **Un-selected** is correct

Inverse gamma with pdf  $p(\sigma^2 \mid \alpha, \beta) = \frac{\beta^{\alpha}}{\Gamma(\alpha)(\sigma^2)^{-\alpha-1} \exp\left(-\frac{\beta}{\sigma^2}\right)}$ 

#### Correct

Multiplying these distribution and grouping the terms will lead to normal distribution

# Conjugate priors Un-selected is correct

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<b>~</b>	1 / 1 points			
5. Choose	e the correct statements:			
	For some problems conjugate prior may be inadequate			
Correct That's true				
	For arbitrary likelihood and prior pair, we can always perform inference and compute posterior analytically			
Un-se	elected is correct			
	Although not for every pair of prior and likelihood there is an analytical expression for posterior, we can always find a conjugate prior in some simple family and compute posterior analytically			
Un-se	elected is correct			
	Putting initial knowledge into prior distribution is an advantage of Bayesian approach			
<b>Corre</b> That	ect 's the one			

×

0 / 1 points

6.

Imagine that you want to pat your friend's cat Becky. Cats are really random creatures.

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Quiz, 6 questions

Becky might get grumpy and scratch you with probability p or curl up and start purring (with prob. 1-p). You don't know Becky well yet, so you estimate prior on p to be distributed as Beta(2,2). Within one evening, Becky has scratched you 6 times and only 2 times she purred. What will be the parameters for posterior distribution over p? What is the MAP-estimate for p?

Enter your answers separated by comma: e.g. if you think that correct answer is Beta(1,0.2) and MAP is 3, you should enter 1,0.2,3. Express real numbers as decimals with dot as delimiter.

4,8,3

**Incorrect Response** 

