# PMPC Tutorial Sheet 9

1. Everyday prediction [2]. If you heard a member of the House of Representatives had served for $Y$ years, what would you predict his total term $X$ in the House would be? Assume that $X$ has the following prior distribution

$$p(X = x) = \beta^{-2} \cdot x \cdot e^{-x/\beta}$$

(this is a special case of the Erlang distribution which itself is a special case of the Gamma distribution). Make a plot of this distribution for different values of $\beta$. Assume that the distribution for $Y$ conditional on $X$ is

$$p(Y = y \mid X = x) = \begin{cases} \frac{1}{x} & \text{for } 0 \leq y \leq x \\ 0 & \text{otherwise} \end{cases}.$$

What is the posterior distribution for $X$ given $Y$?

2. Read the paper by Griffiths and Tenenbaum (you can find it on Stud.IP). We've seen several cases where human subjects failed to respond according to the rules of probability theory, e.g. the conjunction fallacy or base rate neglect. Why do Griffiths and Tenenbaum find behavior that is in accordance with probability theory?

3. Is each subject in Griffiths' and Tenenbaum's study rational or is this a case of "wisdom of the crowd"? [1, 3]

## References


[1] F. Galton. Vox populi. *Nature*, 75(1949):450–451, 1907.

[2] T. L. Griffiths and J. B. Tenenbaum. Optimal predictions in everyday cognition. *Psychological Science*, 17(9):767–773, 2006.

[3] M. C. Mozer, H. Pashler, and H. Homaei. Optimal preditions in everyday cognition: The wisdom of individuals or crowds? *Cognitive Science*, 32:1133–1147, 2008.