Bayesian surprise as a tool for monitoring sensor networks

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Intro

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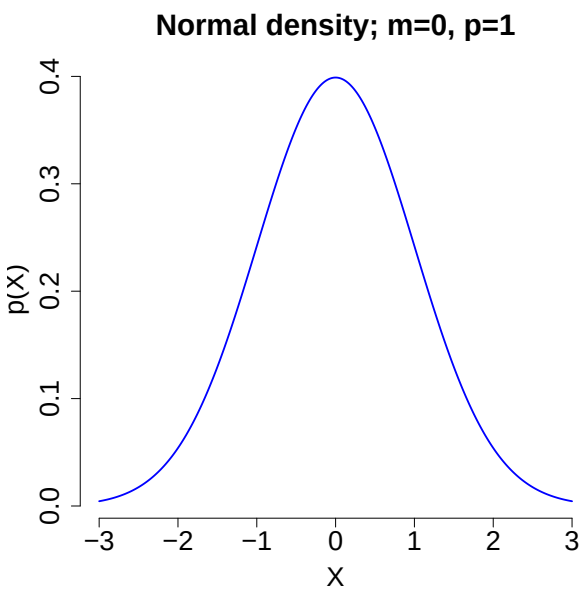
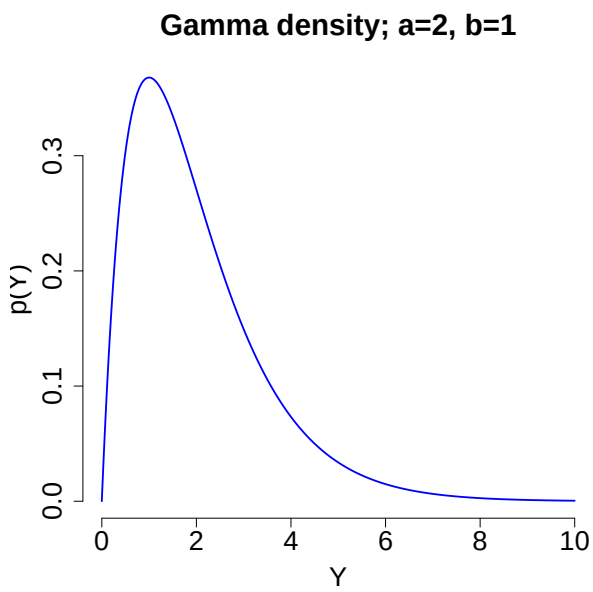
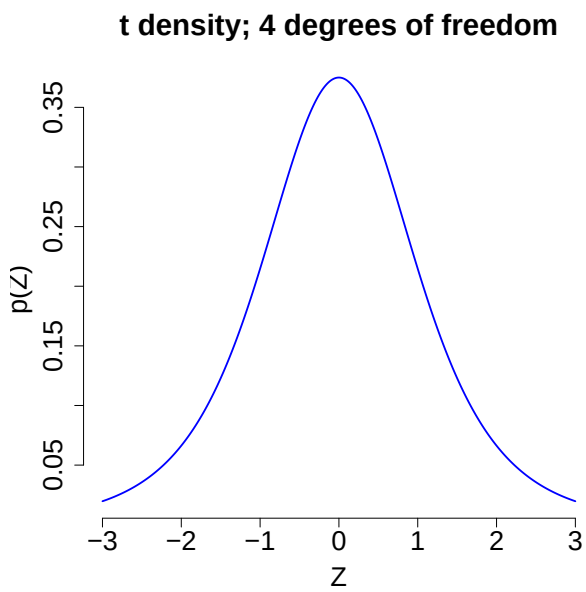
Bayesian statistics

Bayesian statistics views a probability distribution as representing our degree of belief. This idea can be applied both to our data and to the underlying data-generating model.

- Examples of the three distributions used in this work:
  - $X \sim \text{Normal}(\mu = 0, \tau = 1)$
  - $Y \sim \text{Gamma}(\alpha = 2, \beta = 1)$
  - $Z \sim \text{t}_{\nu=4}(\mu = 0, \sigma^2 = 1)$

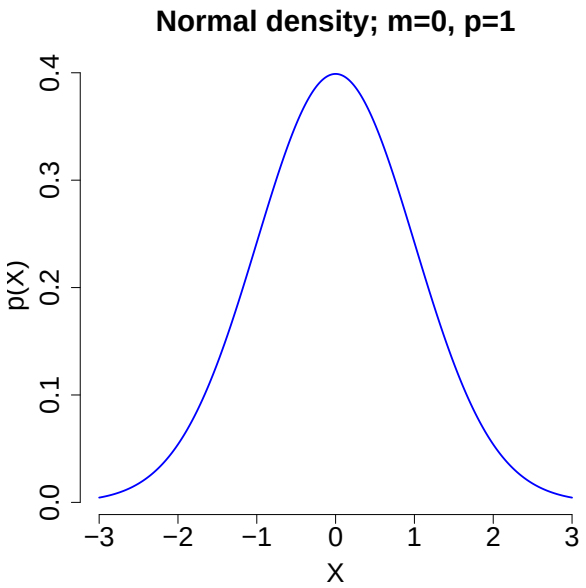


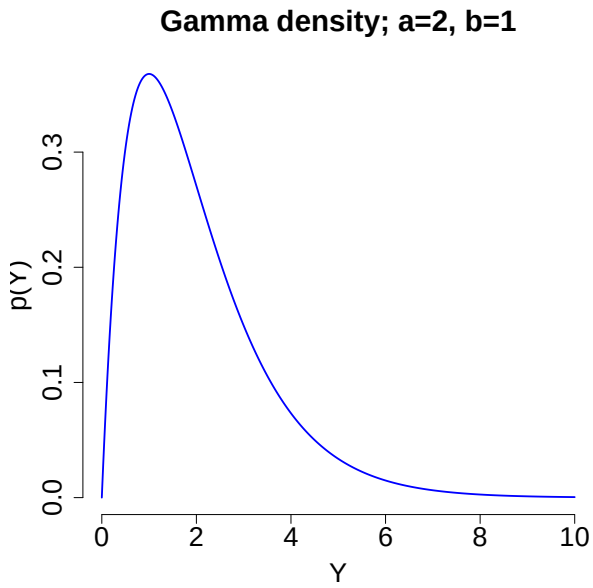


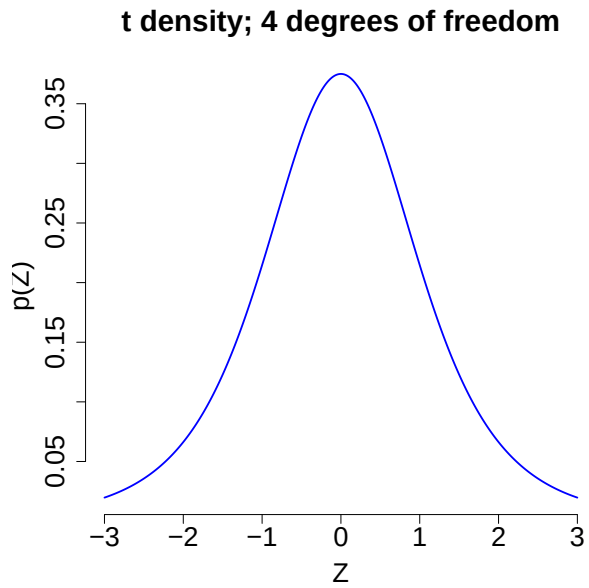


Hierarchical models

- A hierarchical model has more than one random element
- Randomness at one level feeds into the next







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The surprise model

- $Y \sim \text{Normal}(m, p)$ Where m is the mean and p is the precision.
- $m \sim \text{Normal}(\mu, p)$
- $p \sim \text{Gamma}(\alpha, \beta)$

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