A New Class of Multivariate Prior Distributions with an Application to Reliability Engineering

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Bayesian decision framework

Bayesian framework

- Let X be the underlying observation with PDF $f_{\boldsymbol{\theta}}(x)$.
- $\boldsymbol{\theta}$ represents the unknown parameter.
- $\boldsymbol{\Theta}$ the set of states, $\boldsymbol{\theta} \in \boldsymbol{\Theta} \subseteq \mathbb{R}^n, n \in \mathbb{N}, n \geq 1$.
- Let $\boldsymbol{\pi}$ be the specific prior state of knowledge over $\boldsymbol{\Theta}$ with PDF $\pi(\boldsymbol{\theta})$.
- Let $\boldsymbol{\pi}_{\mathbf{x}}$ be the posterior state of knowledge after observing data, $\mathbf{x}$, with PDF given by

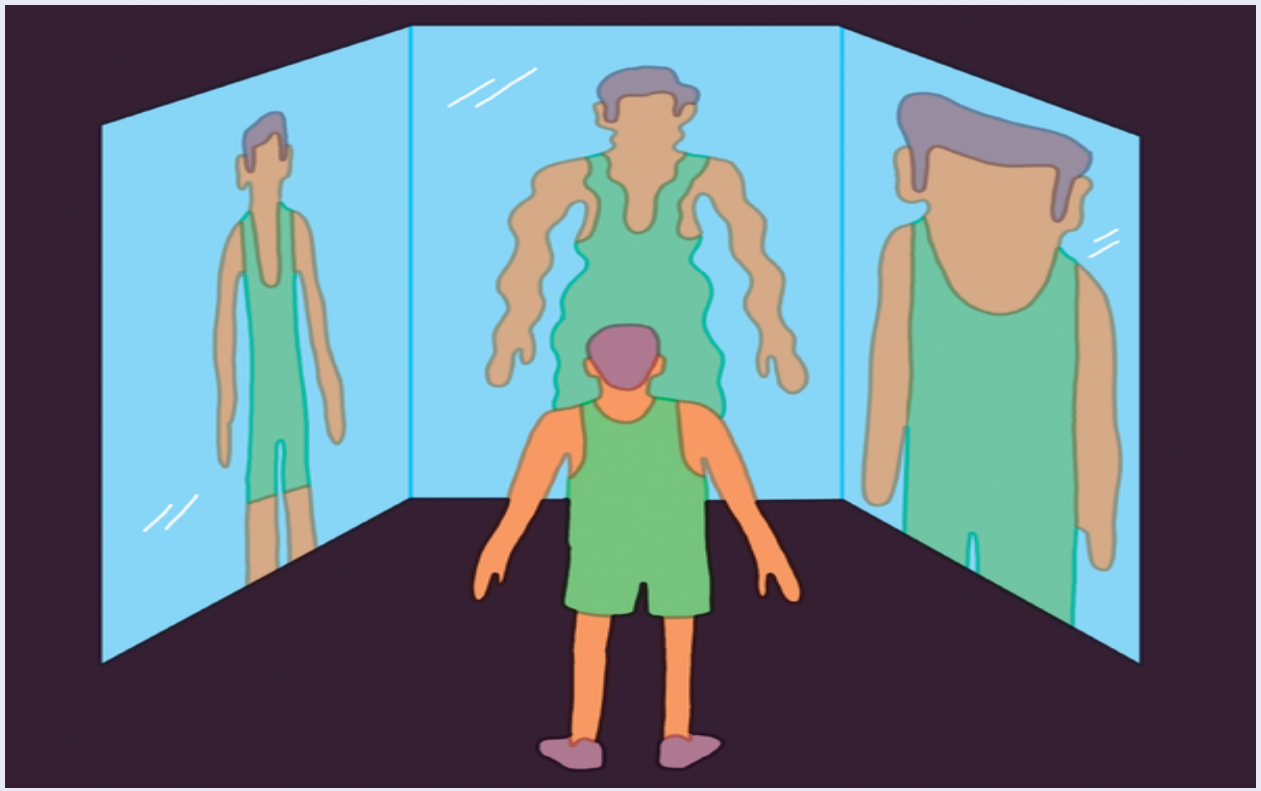
$$\boldsymbol{\pi}_{\mathbf{x}}(\boldsymbol{\theta}) = \frac{l(\boldsymbol{\theta} \mid \mathbf{x})\boldsymbol{\pi}(\boldsymbol{\theta})}{m_{\boldsymbol{\pi}}(\mathbf{x})},$$

  where $l(\boldsymbol{\theta} \mid \mathbf{x})$ and $m_{\boldsymbol{\pi}}(\mathbf{x})$ denote the likelihood function and the marginal density, respectively.
- OBJECTIVE: To make inference in some quantity of interest by using $\boldsymbol{\pi}_{\mathbf{x}}$.

Bayesian sensitivity

The classical criticism

Why a unique prior? A Bayesian analysis is robust if it does not depend sensitively on the initial assumptions -Bayesian sensitivity-.



- A solution. Beliefs will be modelled by a particular class of priors Γ.

An invitation to see our research

HEY, YOU!!

I hope to see you and tell you all details!!!