$P(\theta)$ – How to choose a prior

2 types:

- **A** Non-informative → Do not know anything about θ
- **B** Informative → External info can be included

- How to choose in practice?

(1) Decide on a distribution for $P(\theta)$

- Consider parametric space $\mathcal{H}$ of θ → e.g.
  - $\theta = \sigma^2$, $P(\theta) \sim N$? No! Variance cannot be negative!
  - $\theta \in [0,1]$, $P(\theta) \sim$ Beta? Yes!
  - $\theta \in \mathbb{R}$ { $P(\theta) \sim$ Beta? / $P(\theta) \sim N$ } In theory both possible but Beta will restrict par. space to $[0,1]$. Do you want this?

(2) Set the corresponding parameters

$\theta \in \mathbb{R}$ { $P(\theta) \sim N(0, 10^5)$ / $P(\theta) \sim N(0,1)$ } → Which is non-informative? It depends → e.g. if you expect θ mostly in $[-0.1, 0.1]$ then $P(\theta) \sim N(0,1)$ is also non-informative (vaguely) → sensitivity analysis!

(3) Mathematical convenience! → Use conjugate priors, if they can interpret your prior belief!