

Probabilistic Analysis of Power and Temperature Under Process Variation

Ivan Ukhov, Petru Eles, and Zebo Peng

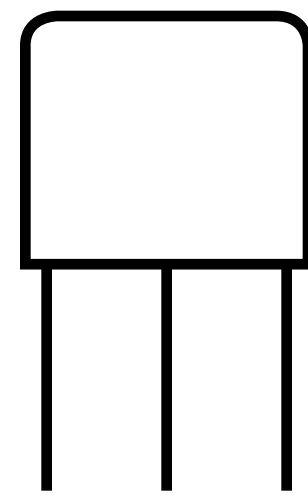
Embedded Systems Laboratory
Linköping University, Sweden

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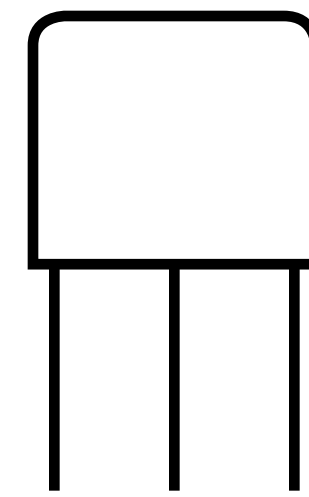
Overview

- * Process variation
- * Uncertainty quantification

Process Variation

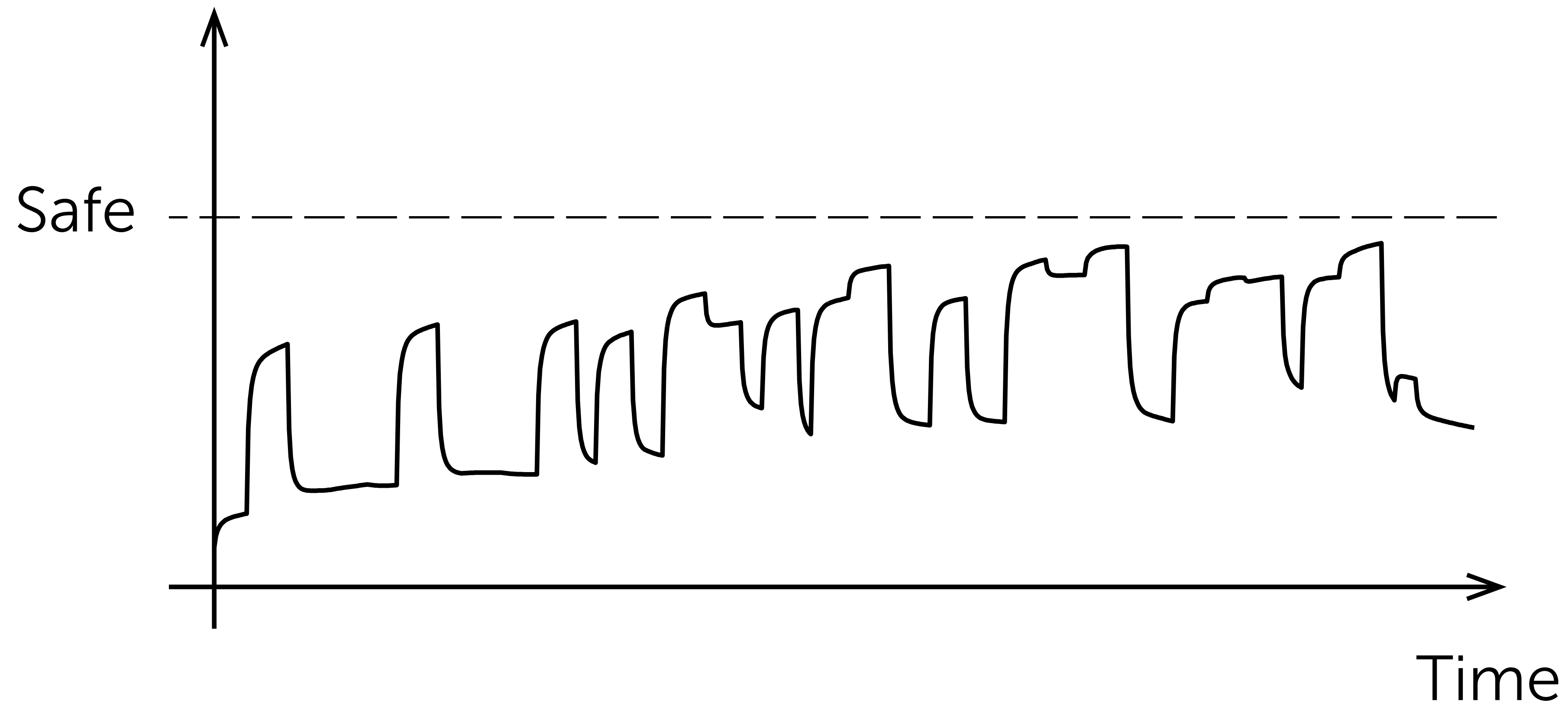


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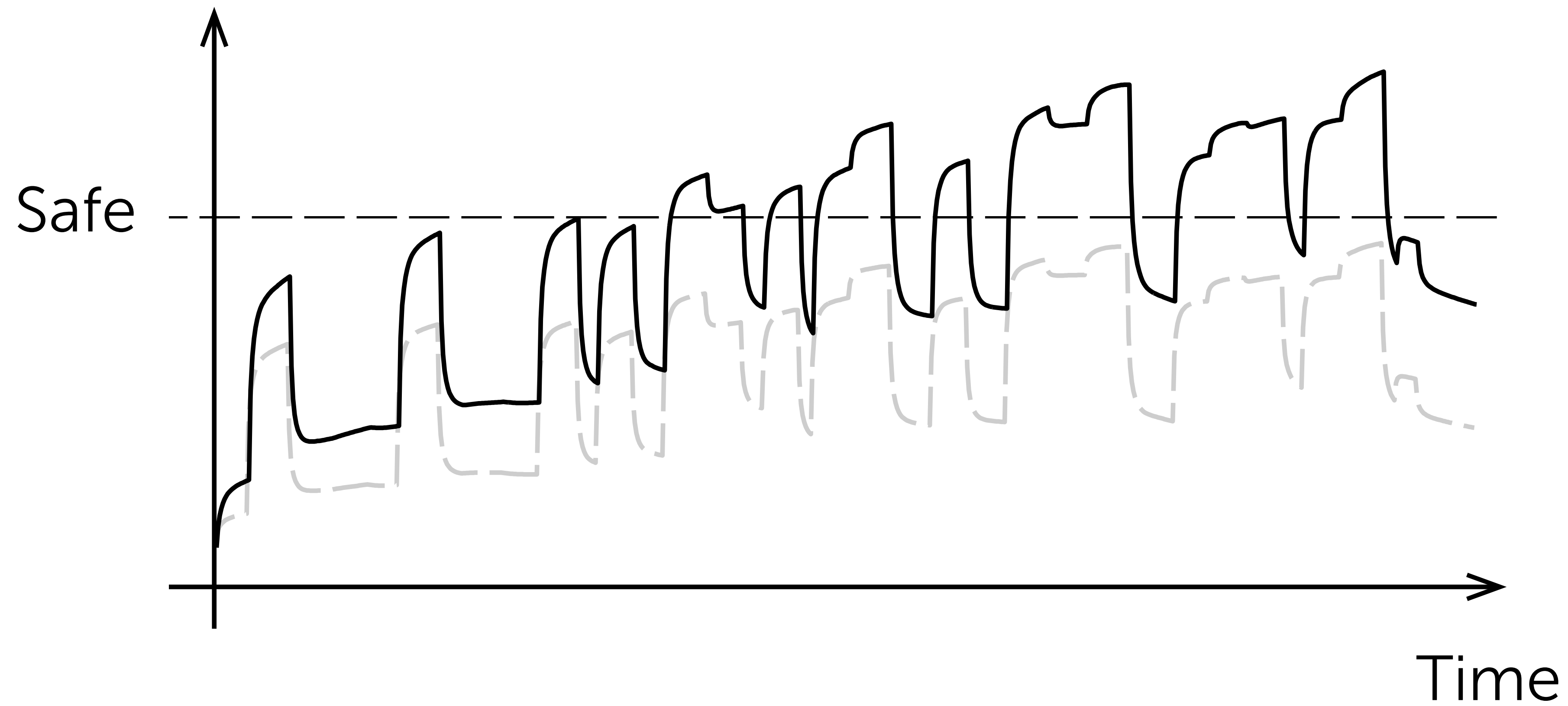
Process Variation

Temperature



Process Variation

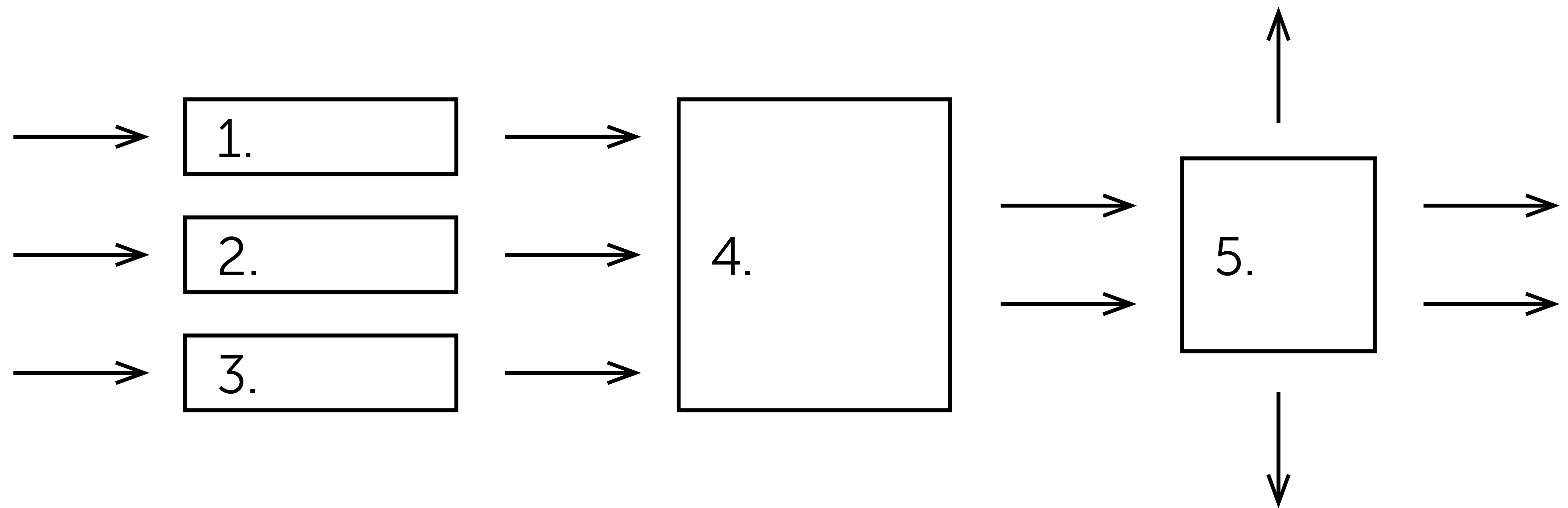
Temperature



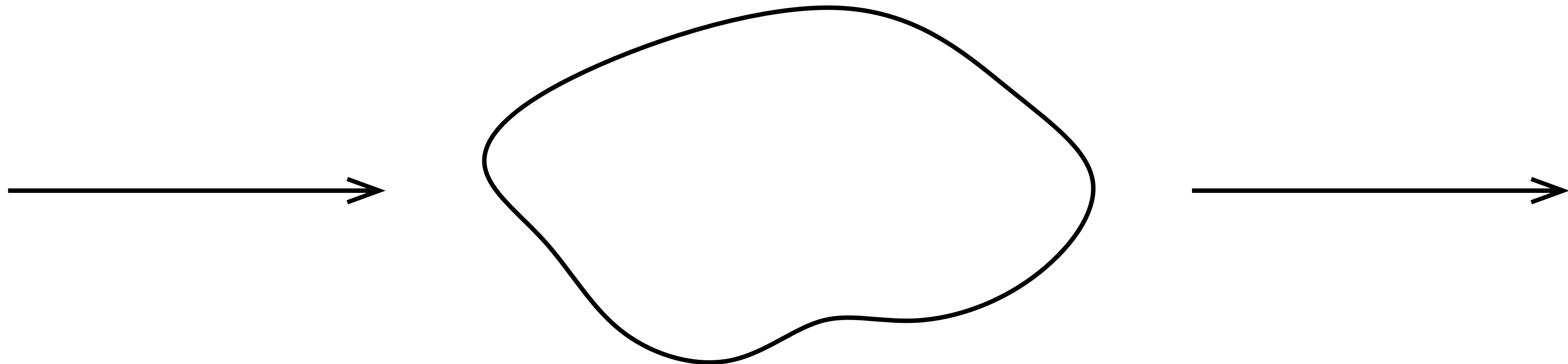
Goal

- * Power-temperature analysis
considering process variation

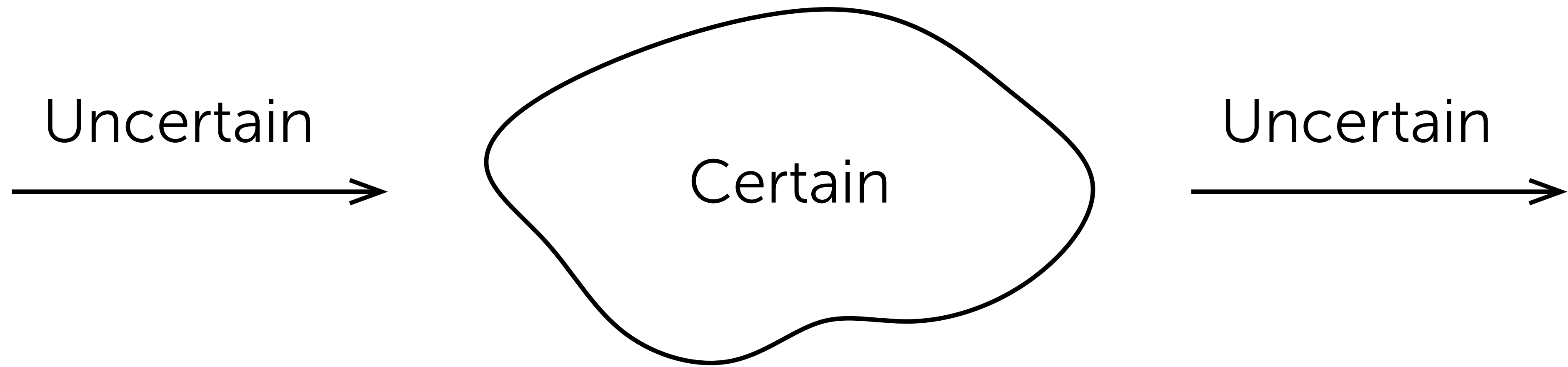
Proposed Framework



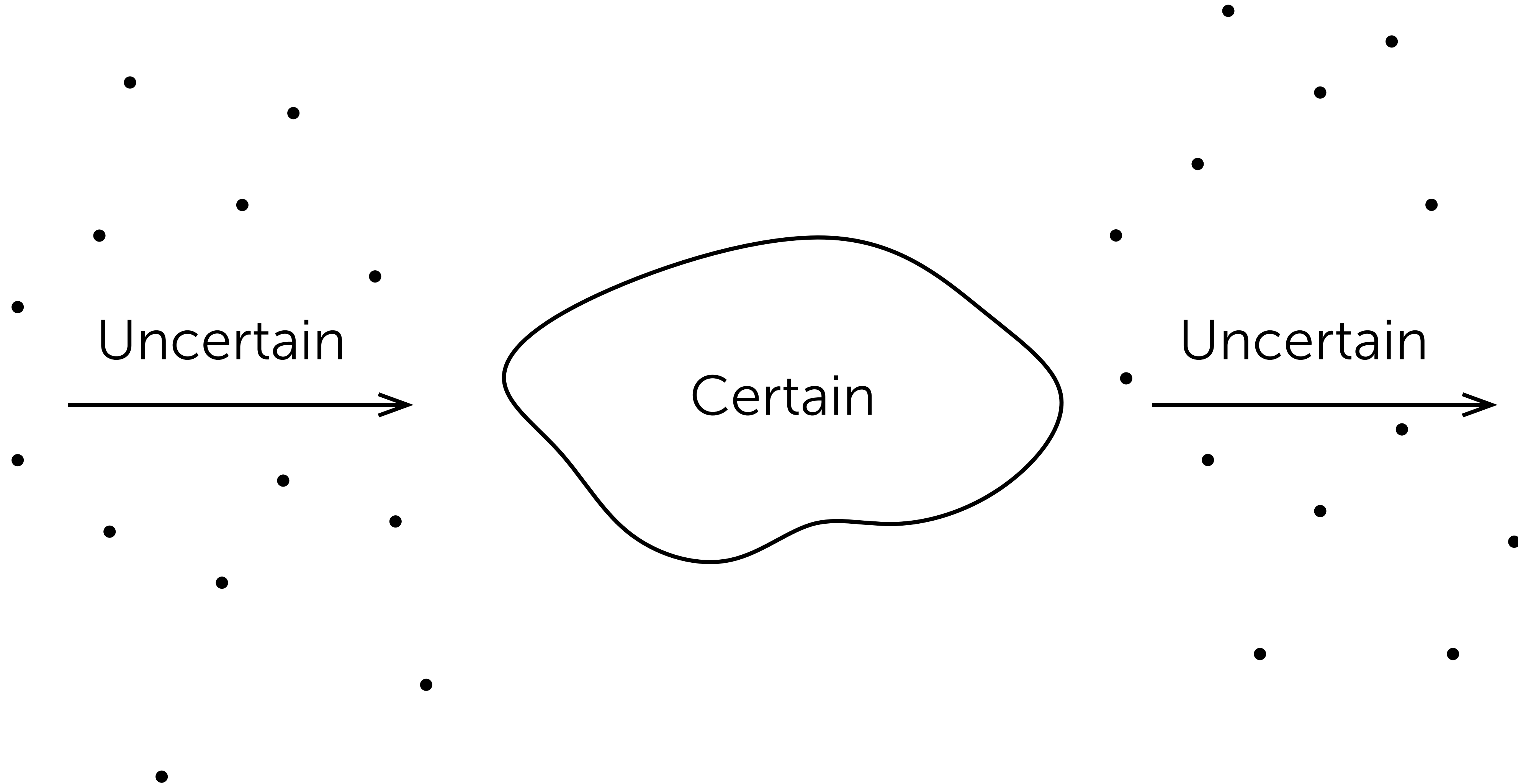
Uncertainty Quantification



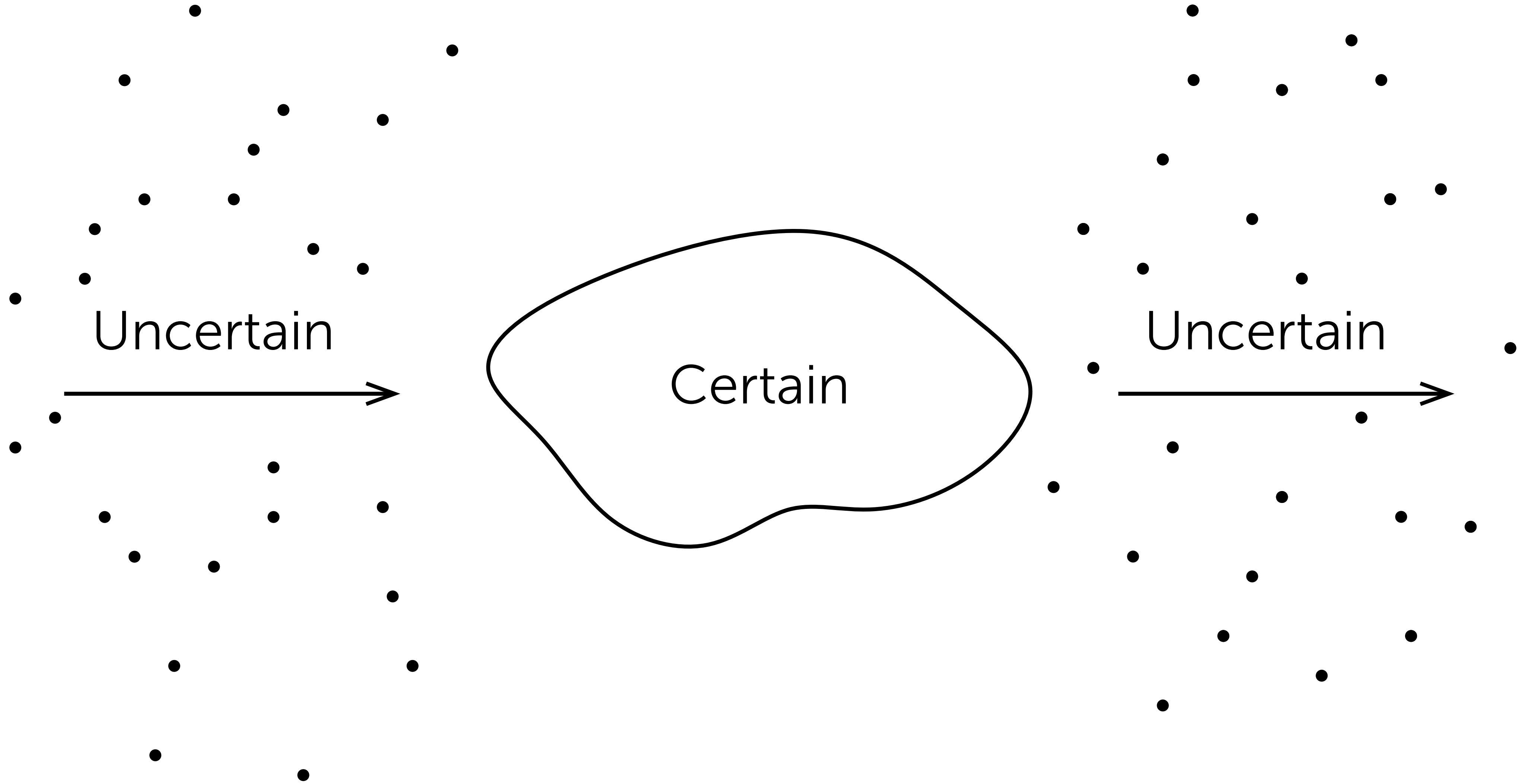
Uncertainty Quantification



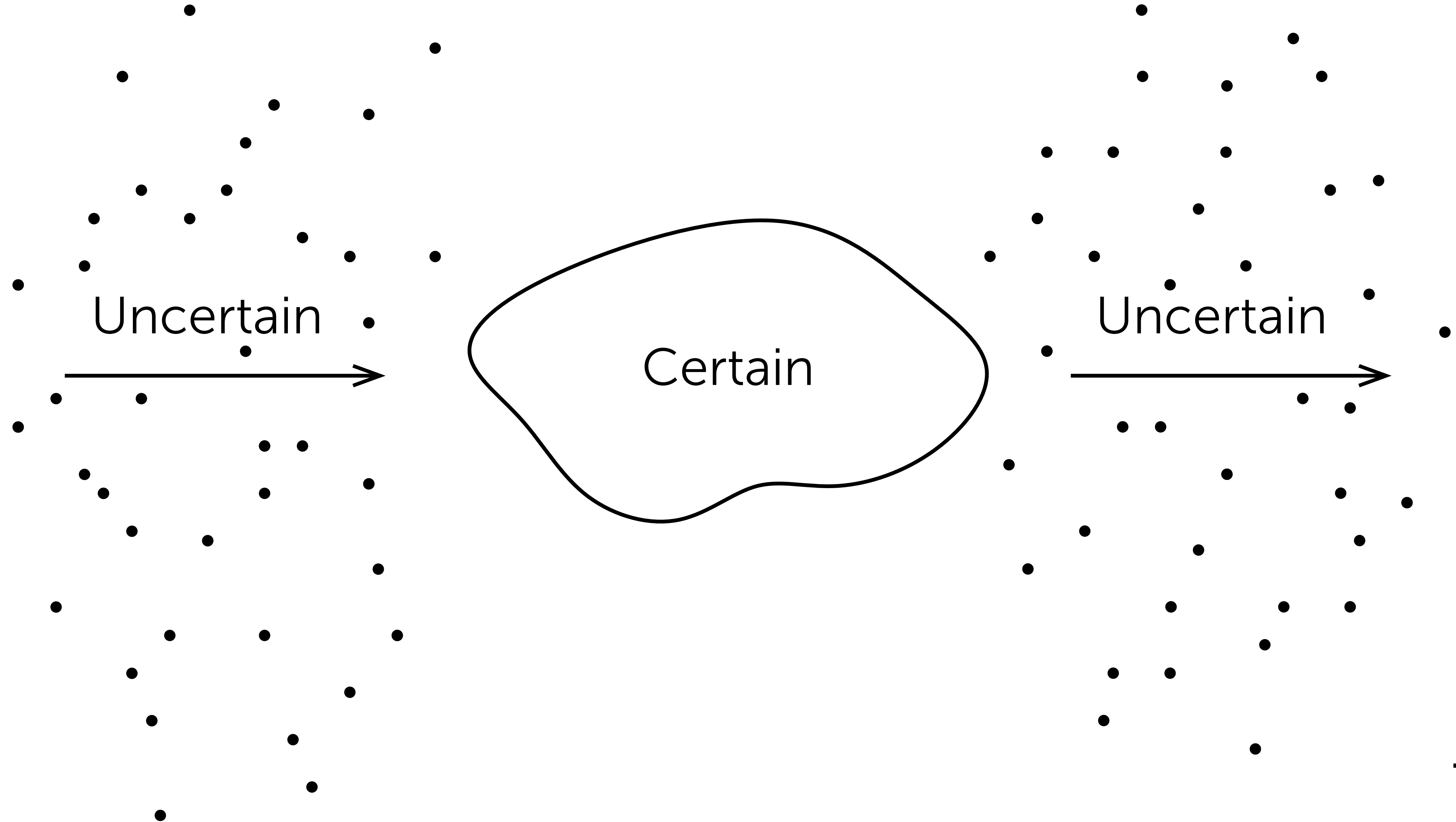
Monte Carlo



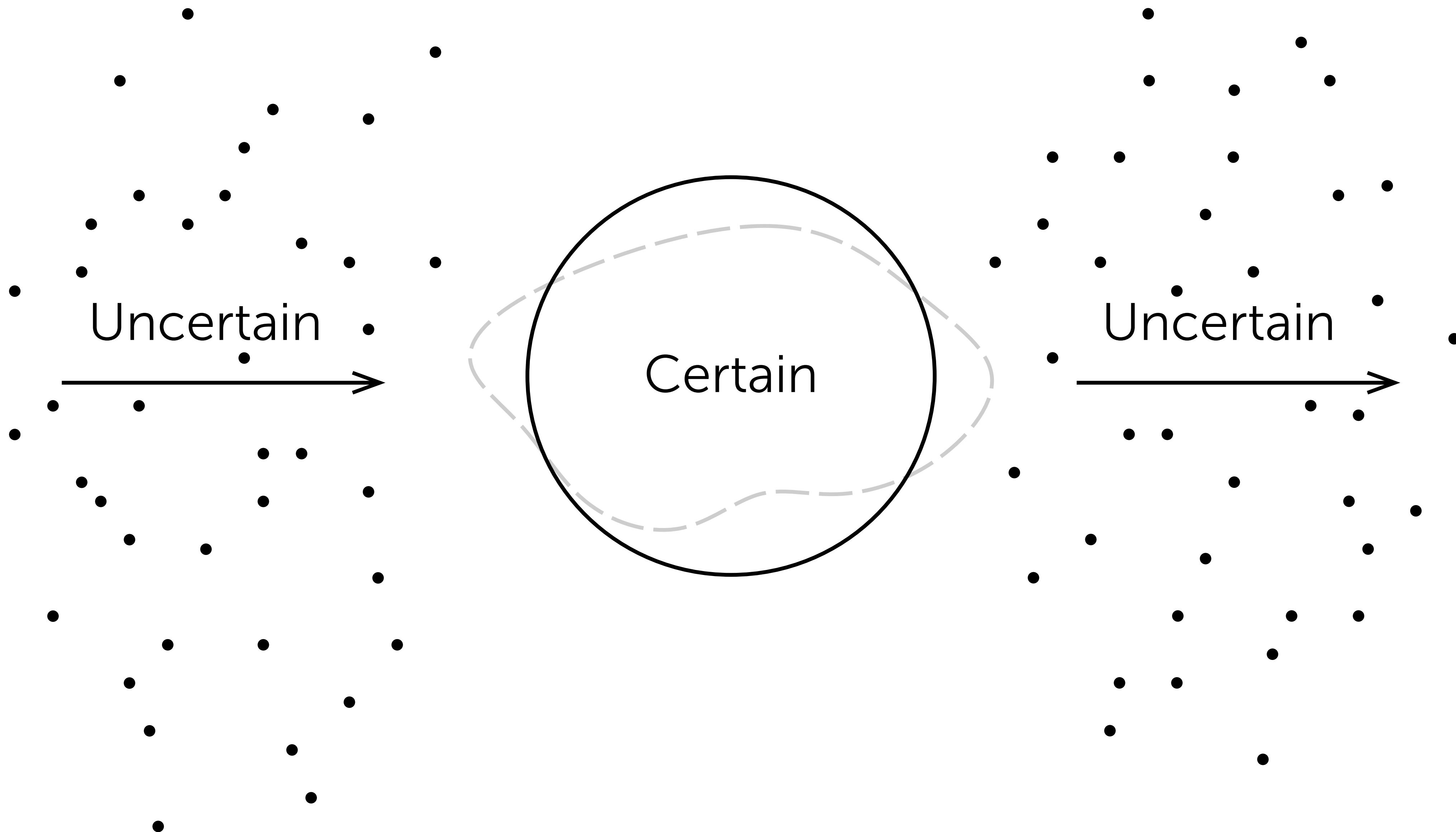
Monte Carlo



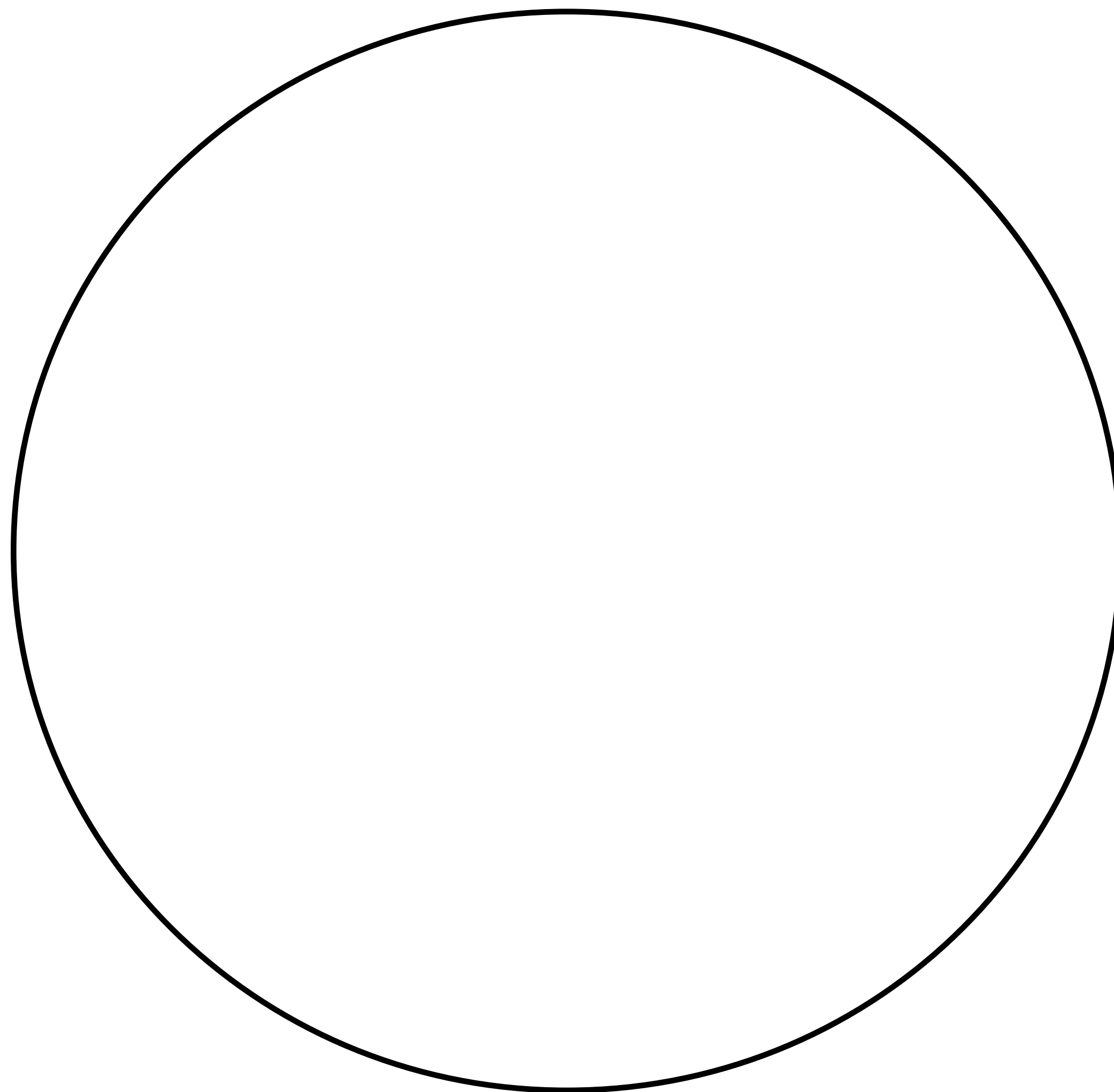
Monte Carlo



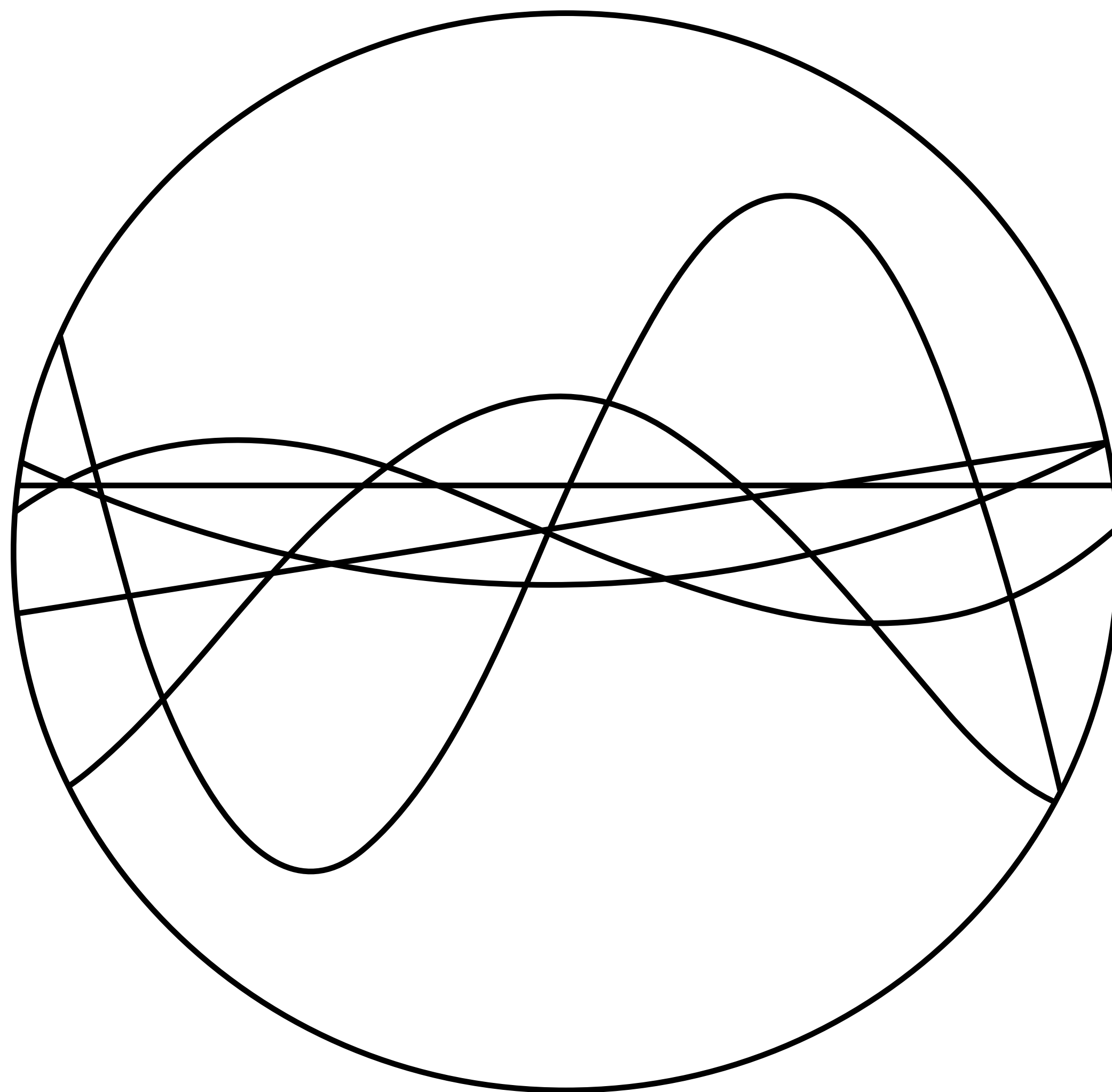
Solution



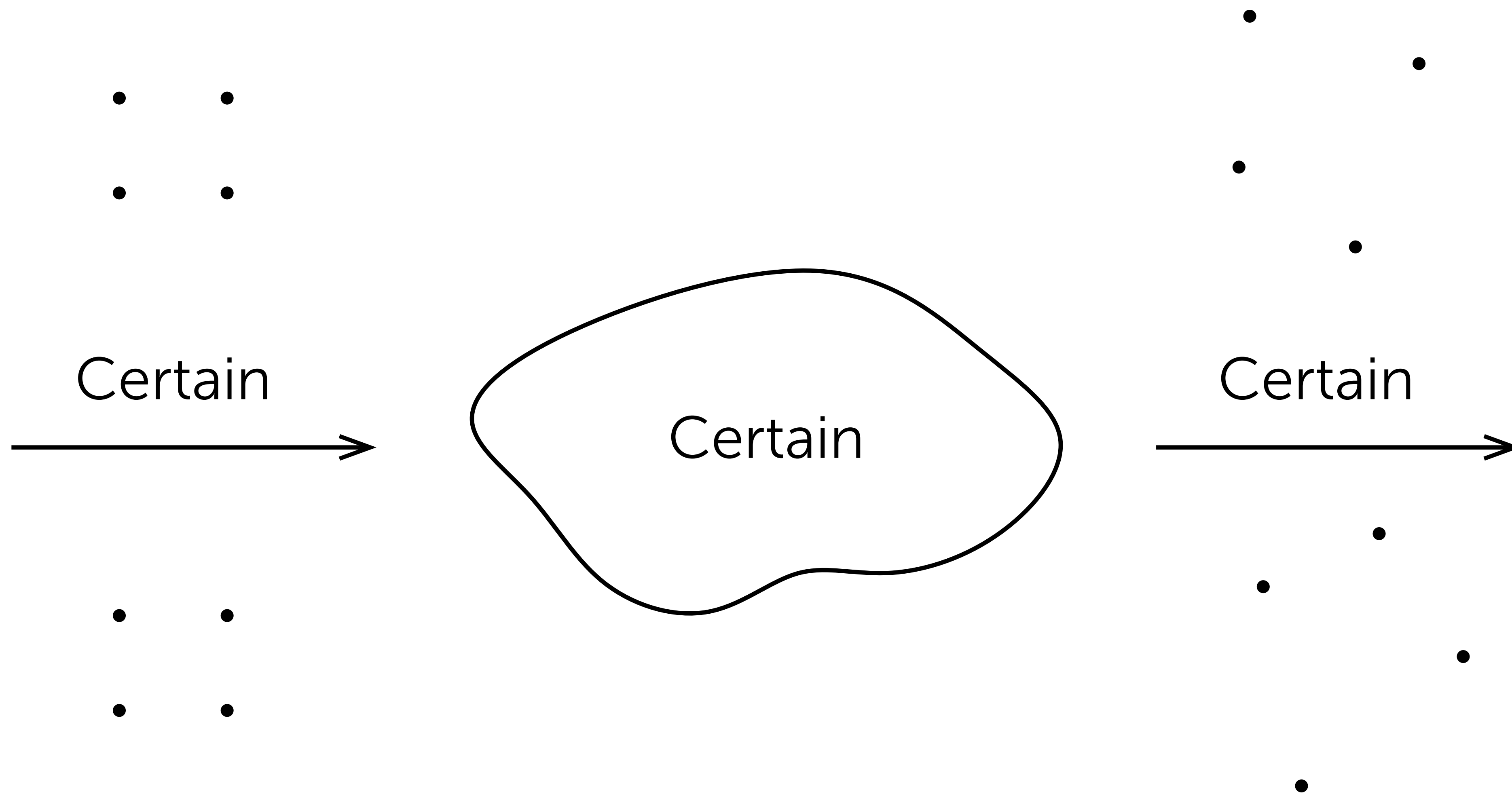
Polynomial Chaos



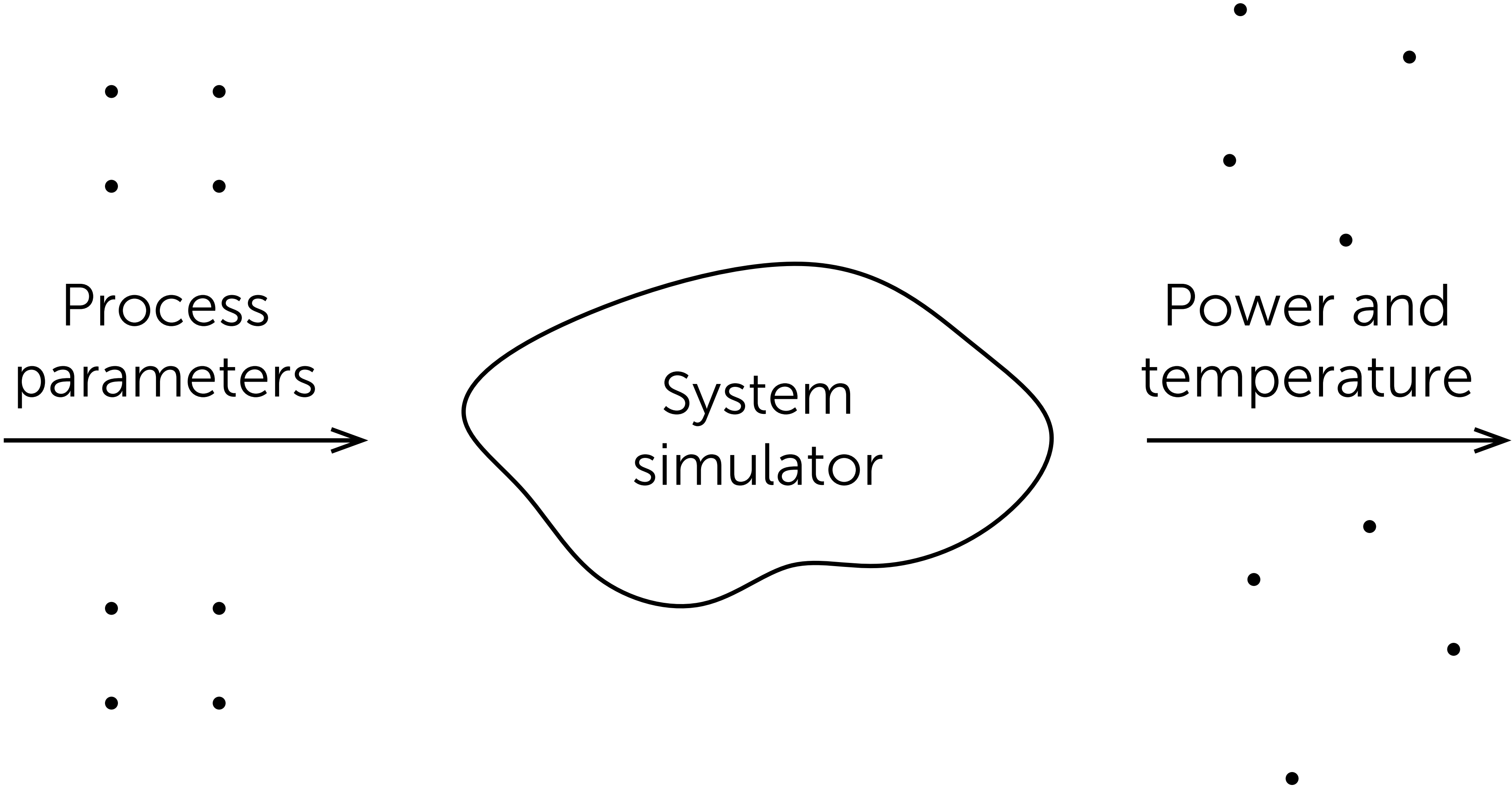
Polynomial Chaos



Polynomial Chaos



Power and Temperature

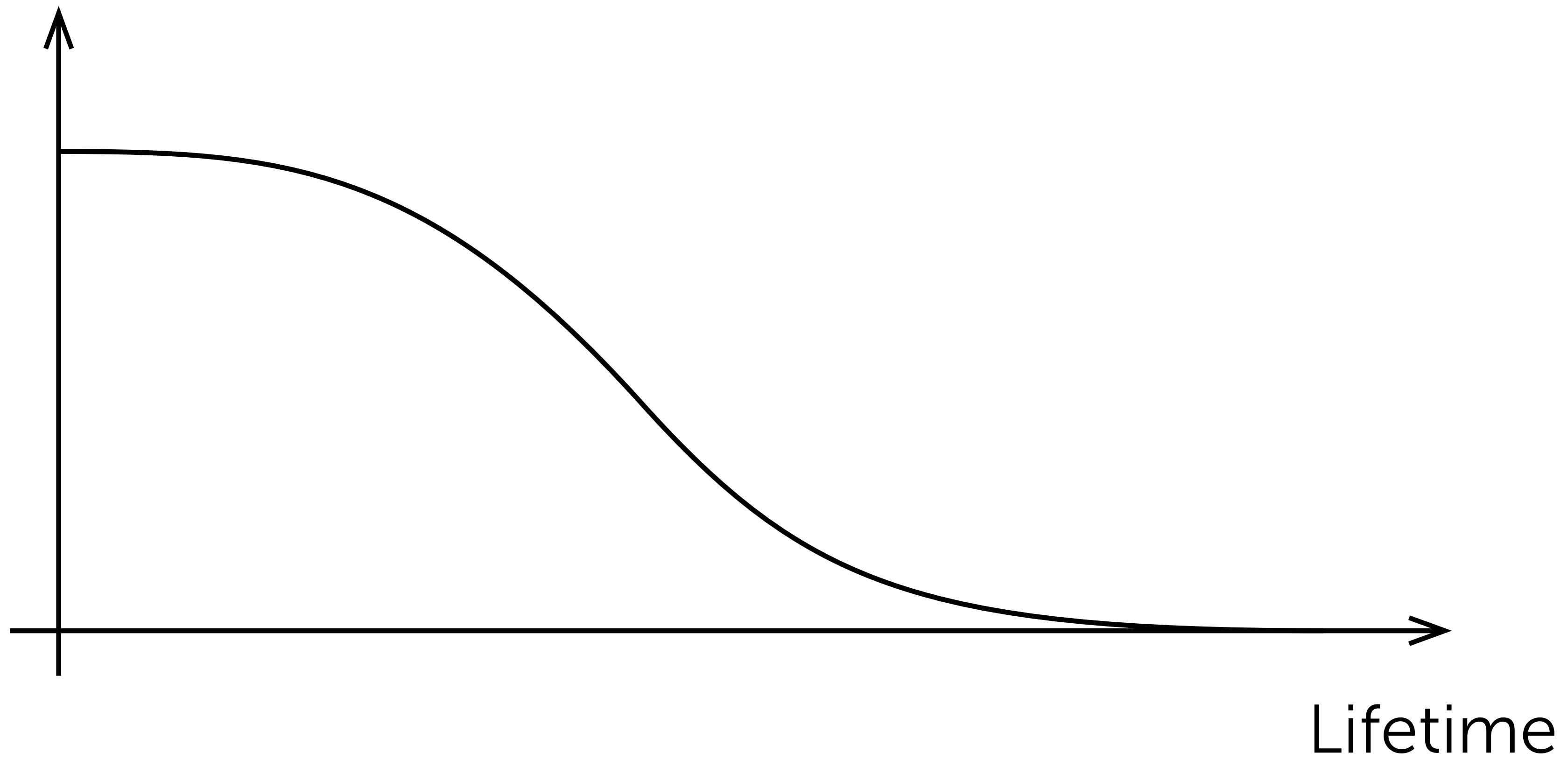


Quantities of Interest

- * $f(\text{Power})$
- * $g(\text{Temperature})$
- * $h(\text{Power}, \text{Temperature})$

Reliability

Survival function



Design-Space Exploration

Minimize:

- * $f(\text{Quantities of interest})$

Such that:

- * $g(\text{Quantities of interest})$

Thank you! Questions?

- * Ukhov *et al.*, "[Probabilistic Analysis of Power and Temperature Under Process Variation for Electronic System Design](#)," IEEE TCAD, 2014.
- * Ukhov *et al.*, "[Temperature-Centric Reliability Analysis and Optimization of Electronic Systems Under Process Variation](#)," IEEE VLSI, 2015.