

LINEAR-TIME PROBABILISTIC SOLUTIONS OF BOUNDARY VALUE PROBLEMS

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State of the art
Linear-Time Probabilistic Solutions of Boundary Value Problems
Novelty
Important & difficult to solve

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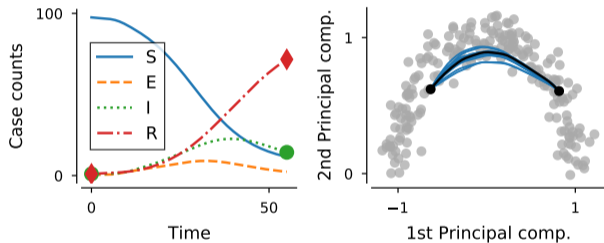
What is a boundary value problem?

Differential equation:

$$\dot{y}(t) = f(y(t), t)$$

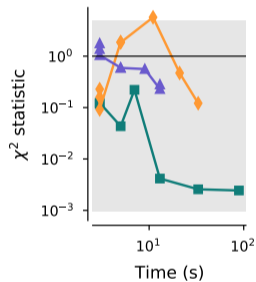
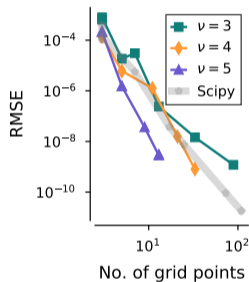
Fixed boundary values:

$$y(0) = y_0, \quad y(1) = y_1$$



Why is the task not obvious?

- ▶ BVPs are weirdly both local and global
→ Iterated Kalman smoothing
- ▶ We know it is a *boundary* value problem
→ Gaussian bridge priors
- ▶ Too many unknowns
→ Expectation maximisation
- ▶ We need efficiency
→ Mesh refinement



Thanks to Philipp Hennig

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Paper:

Linear-Time Probabilistic Solutions of Boundary Value Problems.

Nicholas Krämer and Philipp Hennig.

NeurIPS 2021. Preprint: <https://arxiv.org/pdf/2106.07761.pdf>

You might also like:

A Probabilistic State Space Model for Joint Inference from Differential Equations and Data.

Jonathan Schmidt, Nicholas Krämer and Philipp Hennig.

NeurIPS 2021. Preprint: <https://arxiv.org/pdf/2103.10153.pdf>