

## Contributed Discussion on Article by Chkrebtii, Campbell, Calderhead, and Girolami\*

Comment<sup>1</sup> by François-Xavier Briol<sup>2,3</sup>, Jon Cockayne<sup>4</sup>, and Onur Teymur<sup>5</sup>

**Abstract.** We commend the authors for an exciting paper which provides a strong contribution to the emerging field of probabilistic numerics. Below, we discuss aspects of prior modelling for differential equations which will need to be considered thoroughly in future work.

**Keywords:** probabilistic numerics, uncertainty quantification, numerical analysis.

### Introduction

The majority of probabilistic numerics (PN) solvers, including the present paper, take a Bayesian viewpoint and hence require several modelling choices including prior specification. As with any inference problem, there exists a trade-off between representing prior beliefs and choosing a prior which is convenient and/or readily interpretable mathematically. We believe that the consequences of these assumptions are often discussed in too little detail and therefore highlight below several issues to consider.

### Computational Complexity

Of interest was the discussion into reduction of the computational complexity by exploiting compactly supported covariance function. The authors note in Section 3.2 that while such a choice will yield a method involving inversion of a sparse matrix, this is not explored further – though this will have an effect on the rate of convergence of the estimator. We believe that a study of the extent of this effect is of some importance, as there is a clear trade-off here between steps desired to achieve a required tolerance, and the computational cost of each step.

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