43075-01 Shape modelling and analysis

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Exercise sheet 4: Building a GP Model

Introduction: 21. March 2023

Discussion: 28. March 2023

Introduction

In this exercise, we aim to provide you with a first understanding of the Bayesian workflow, its objectives, and how it can benefit your project. To accomplish this, you will read the original paper by Gelman et al.:

- https://arxiv.org/pdf/2011.01808.pdf

Please be aware that you may encounter unfamiliar terminology throughout the paper. Don't be concerned about grasping every detail; instead, focus on grasping the core concepts. As you progress through the course, these details will become increasingly clear.

1. Bayesian workflow: Goals and motivation

Read the abstract and section 1 of the paper. Answer the following questions:

- What is the target audience of the article?
- Why do the authors think such a workflow is needed?
- What are the main differences between Bayesian inference, Bayesian data analysis, and Bayesian workflow?
- What is the difference between a workflow and a method?
- What are the main steps in the workflow?
- Why are there so many arrows that point backwards to previous steps? Why is the workflow not a linear sequence of steps?

2. Bayesian workflow: Before fitting a model

Read section 2 of the paper. Answer the following questions:

- What is a model (in this article)?
- What are generative models? What types of generative models are distinguished in the article
- Why are generative models useful?
- What is the purpose of prior predictive checking in Bayesian analysis?
- The article mentions that a Bayesian model is built from *modules*. Why is this important?

3 Theory (Shape modelling)

Work through the theory parts of week 4 of the online course

- https://shapemodelling.cs.unibas.ch/ssm-course/week4/

You can add questions and topics that you would like to discuss in class to the Etherpad on Adam:

- https://adam.unibas.ch/goto_adam_xpdl_1553025.html

Note, you don't have to work through the practical parts of the online course. We will work through it together in class.