43075-01 Shape modelling and analysis

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Exercise sheet 6: Building a GP Model

Introduction: 4. April 2023

Discussion: 11. April 2023

Introduction

This is a short exercise sheet, due to the upcoming easter festivities.

1 Theory

1.1 Fitting a model to data Work through the theory parts of week 6 of the online course

- https://shapemodelling.cs.unibas.ch/ssm-course/week6/

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.

1.2 Evaluating and using a fitted model

Read chapter 6 "Evaluating and using a fitted model" of the Bayesian workflow paper

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

Think about how the discussion could apply to shape modelling.

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

2 Project

In case you find some time over easter to work on the project, you can start writing the report. Use the latex template that you find on Adam.

- Report template (Latex)

Start with writing an abstract and the introduction. Write a short section about the data that were given to you for this project. In particular, report the measurements that were made as part of the exercises.

Write a paragraph in the methods section that describes how you built the GP model of the Femur. Briefly introduce the necessary theoretical concepts where this seems necessary to understand your arguments. You may want to add a separate (sub-)section for introducing these theoretical concepts.

Describe the experiments you performed, what values of the parameters you chose and how you validated the model. Was your model in agreement with prior information you had about femur shapes?

It is important to note that for the model you built from only 1 femur, using an analytically defined Gaussian process, it is neither necessary nor possible that all the generated shapes are anatomically plausible. This is something we will fix later. It is important, however, that anatomically valid femur bones are reasonably likely under your model, and are not ruled out by it.