Evaluating and comparing models

Marcel Lüthi, Departement of Mathematics and Computer Science, University of Basel

Is the posterior model any good?

Obtaining a good looking 3D reconstruction is easy.

 But does it also explain the data and the uncertainty?

Posterior predictive checks

Repeat prior-predictive checks, but with posterior distribution

1. Take samples $\theta_1, \dots, \theta_n$ from posterior $p(\alpha|C)$
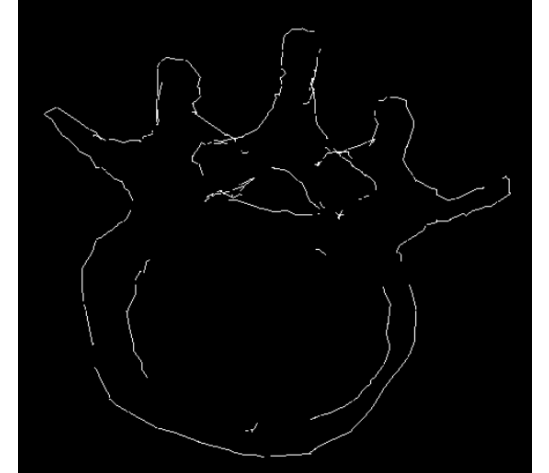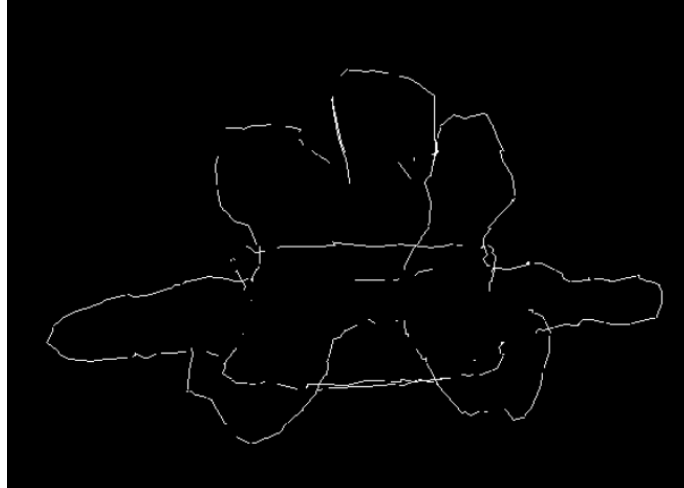2. Generate data (contours) and compare them to target

Cross-validation

Use parts of the data

- Use different subset of contour
- Use different (generated) contours (if full-shape is available)
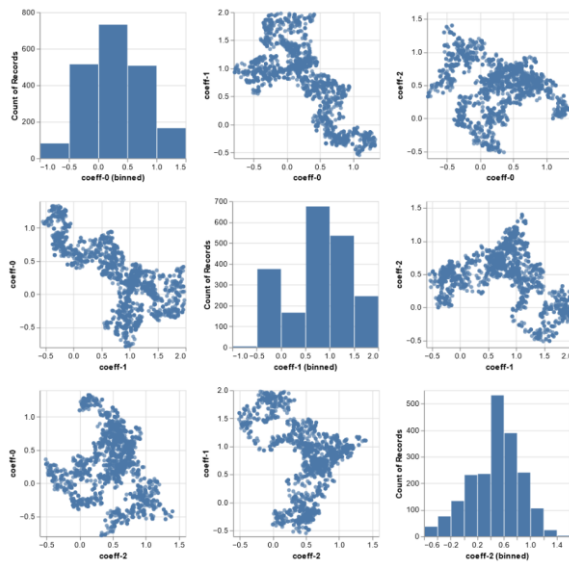
Question:
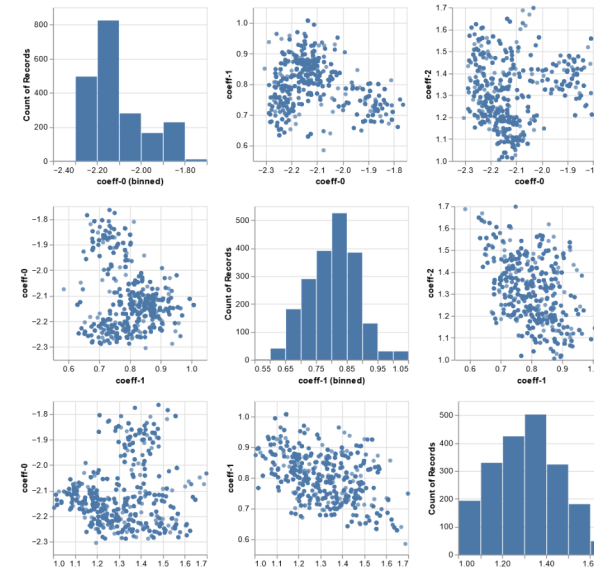- Which subset of the data does affect the prediction most?

Influence of Prior information

- Does changing the prior distribution affect the results?
  - Refit with multiple different priors
- Simple test: Shrinkage
  - How does posterior of parameter shrink the prior information
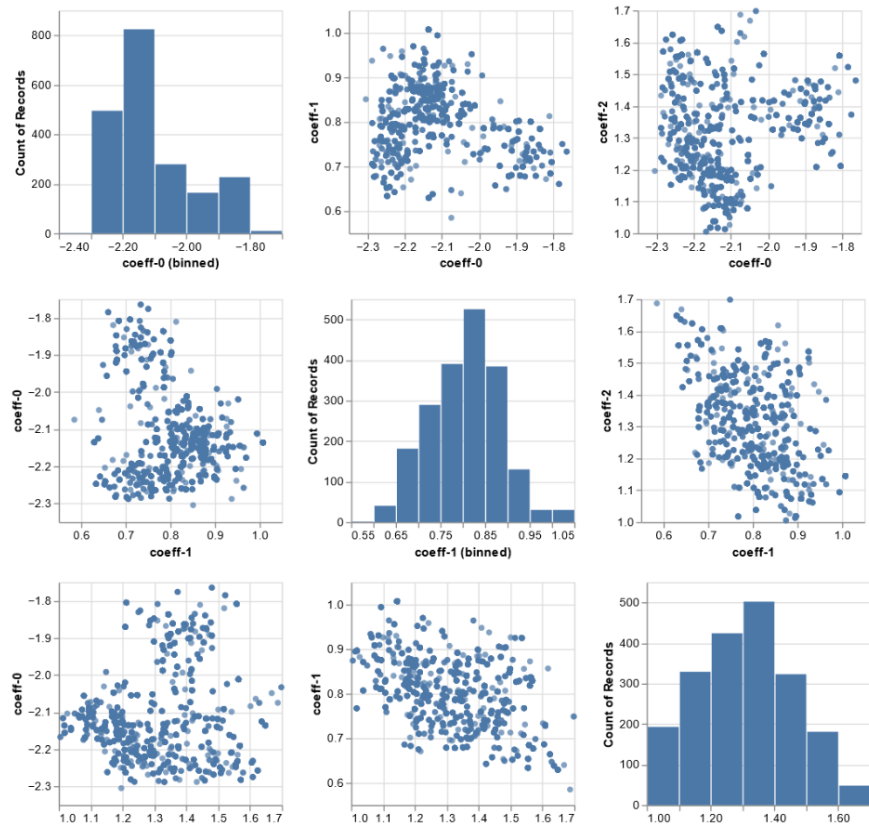

Prior

Posterior

Uncertainty

Whenever we do inference there is uncertainty!

- How big is the uncertainty?
    - Is it expected in this range?
    - Are we overconfident or is uncertainty too large?

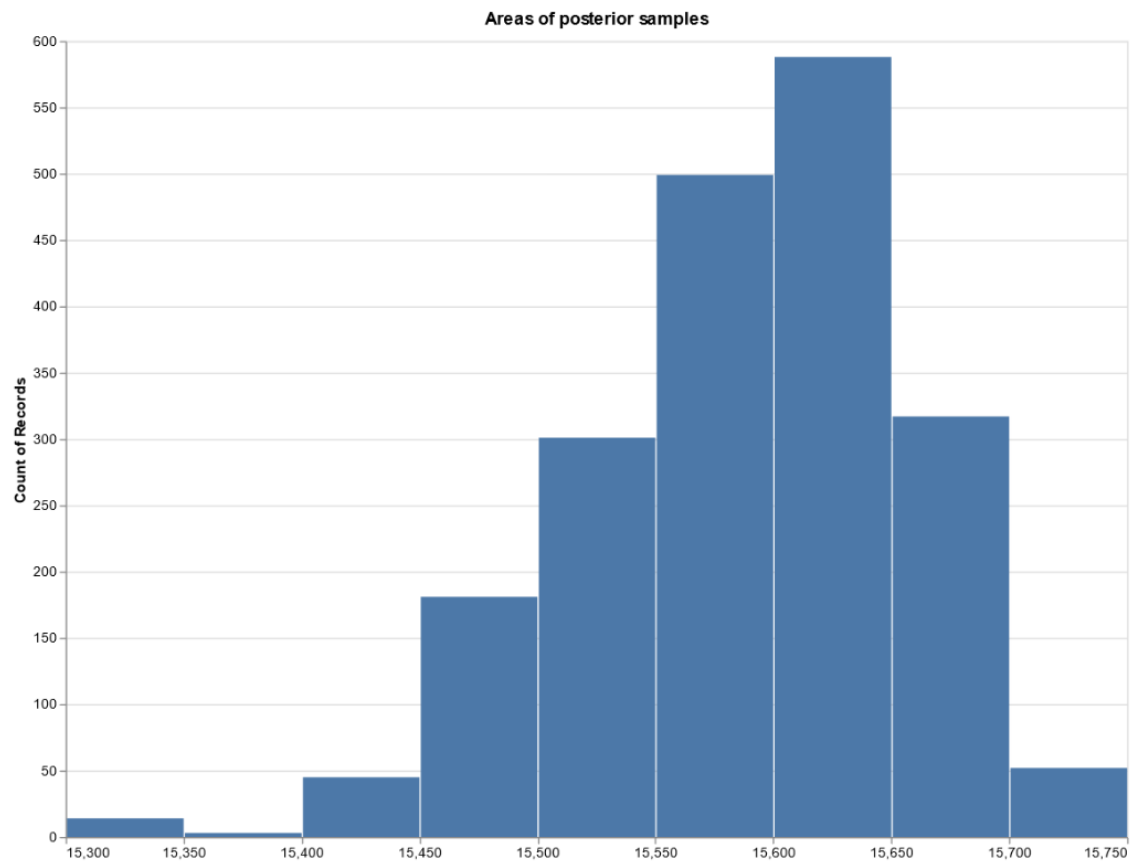- What does it imply for the inference?

Visualizing uncertainty (I)

Visual assessment: Pair plots

Visualizing uncertainty (II)

Histograms of intuitive measurements (such as area, volume, etc.) can help to understand what uncertainty implies.
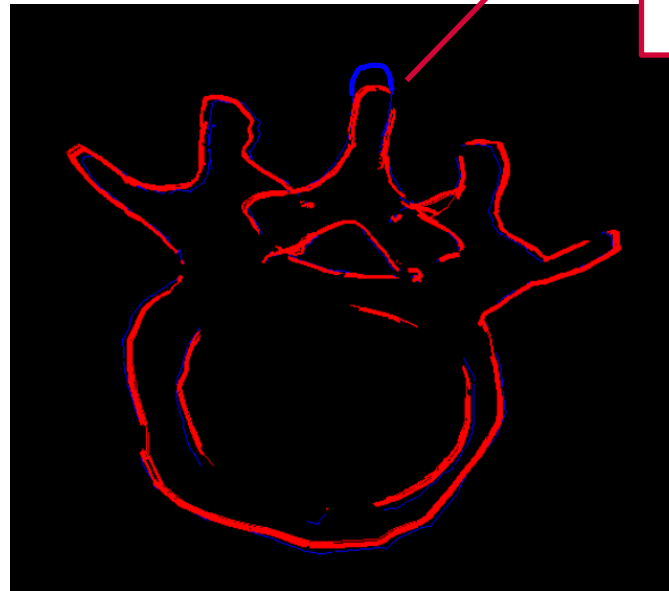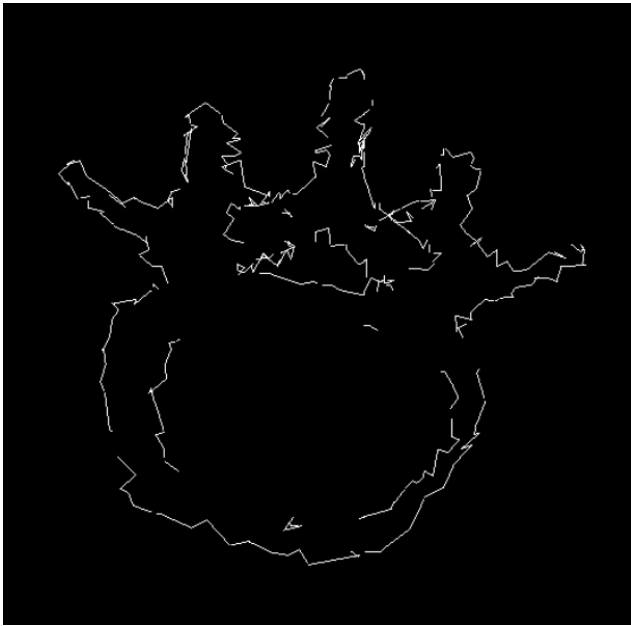

Areas of posterior samples

Inspecting the data model

What is the influence of the chosen likelihood function (data model)

- Is the noise model okay
- Did we account for bias or correlation in noise?

Model cannot explain shape

Comparing multiple models

- Which factors to include as parameters, which are fixed?

- Is posed fixed? Is sensor-distance fixed?
- Is noise level fixed?
  - Does modelling additional factors affect the result?