# Uncertainty

Himzo Tahic - 1100323

**VU VIS** 

# Table of Contents

- Point-based probabilistic surfaces to show surface uncertainty
  - Problem
  - Solution
  - Enhancement
- Flow-based Scatterplots for Sensitivity Analysis
  - Problem
  - Solutions
- Critique

### Point-based surfaces

- Problem
- Solution
- Enhancement

### Problem

- Every Measurement / Prediction can have Uncertainties
- Should be communicated
- Visualize Surfaces with uncertainties
- Displaying border information

### **Tumor Formation**



• Polygonal model

• Borders follow probabilistic pattern

• How to communicate uncertainty?

### Problem



• Pseudo-colouring

• Uncertainty encoded with coloured surfaces

• Gradient used for comparison of areas

• Only relative uncertainty visualized

### Point-based surfaces

- Problem
- Solution
- Enhancement

# Solution



- Point-based model
- displace each point on the surface
- Displacement proportional to uncertainty value at the point.
- Points randomly distributed according to the range

### Point-based surfaces

- Problem
- Solution
- Enhancement

# Enhancement



#### **Point Opacity Modulation**

## Enhancement



#### **Gaussian Point Distribution**

# Enhancement



#### **Line Primitives**

# Table of Contents

- Point-based probabilistic surfaces to show surface uncertainty
  - Problem
  - Solution
  - Enhancement
- Flow-based Scatterplots for Sensitivity Analysis
  - Problem
  - Solutions
- Critique

### Flow-based scatterplots

- Problem
- Solutions

### Problem



- Only able to show limited number of variables
- Overuse of channels makes it hardly understandable
- Difficult to communicate trends & flow of data
- No Sensitivity information

### Flow-based scatterplots

- Problem
- Solutions

# Solutions



- Data augmented with Sensitivity information
- Creates a "flow" of data
- Line segments are added to the points
- Slope indicates sensitivity of the y-variable(STAT) in the local neighborhood = "local trend"
- Dotted Line = "global trend"
- Helps understand how one variable behaves towards changes in another

# Solutions



- Sensitivity visualization for a third variable
- Communicates the behavior of a variable towards changes from a third(CRIM)
- Allows to analyze tri-variate correlations
- Attacks problem of variable-limitations
- Same data plot, different sensitivity!

### Streamlines



# Table of Contents

- Point-based probabilistic surfaces to show surface uncertainty
  - Problem
  - Solution
  - Enhancement
- Flow-based Scatterplots for Sensitivity Analysis
  - Problem
  - Solutions
- Critique

# Critique

- Point-based probabilistic surfaces to show surface uncertainty
  - "Linear" structure: Problem -> solution -> improvement
  - Put simply
  - Enough and well chosen images
  - Shows different "manifestations" of the same solution
  - Also adresses computational limitations
  - Maybe one or two other examples of usage could be elaborated

# Critique

- Flow-based Scatterplots for Sensitivity Analysis
  - A LOT of images and examples
  - Tried to put it as simply as they could
  - Also a rather linear structure
  - A bit too short
  - A lot more difficult to understand than the first paper
  - More elaborated explanations would have helped

# Table of Contents

- Point-based probabilistic surfaces to show surface uncertainty
  - Problem
  - Solution
  - Enhancement
- Flow-based Scatterplots for Sensitivity Analysis
  - Problem
  - Solutions
- Critique