Projects Summer Term 2019
Viscom Group
Webcam based Eye Tracking in Browsers

- Use a webcam to track where users are looking at in the browser
- Use case
  - Collect eye tracking data to evaluate visualizations
  - Use tracking data to enhance or interact with the visualization
- Existing application which should be evaluated and improved

- Technologies: JS, HTML, CSS // Python, CouchDB
Browser Plugin to visualize Gmail

- Create interesting visualizations and interaction concepts to improve Gmail.
- Existing plugin offering an example on how to interact with the Gmail API and using the data to create visualizations.

- Technologies: JS / D3.js, HTML, CSS, sqlite
Neural Renderer

- Build Renderer
  - Synthetic Training Data
  - Label Map Generation
- Train Neural Net
  - Image-to-Image Translation
  - Spatio-temporal coherence
Differentiable Geodesic Distance

- Idea: Compute distances between points based on an underlying surface
- Goal: A differentiable algorithm for geodesic distances on polygonal meshes
- Technologies:
  - Python
  - TensorFlow
  - CUDA
Scene Understanding from Panoramas

- Extraction of room layout from 360 degree Panoramas.
  - Saliency map
  - Normal map
  - Line segments
  - Object mask

- It is useful if you know:
  - Python
  - Tensorflow / Keras / Pytorch
  - OpenCV
Machine Learning with densely connected neuron clusters

Implementing and testing a new type of network layer architecture
• Connectivity
• Weight Update
• Different use cases
• Evaluation

Useful to know:
• Python
• Tensorflow


**Synchronization of Multiprojector Applications (1)**

- **Problem:**
  - Images on all projectors need to be synchronized.
  - Real-time generated images need geometric data on all PCs.
  - Geometric data includes:
    - Object(s) Position(s)
    - General: Object(s) State(s)
  - Current synchronization is general, but needs special attention.
Synchronization of Multiprojector Applications (2)

- **Idea:**
  - A more simple synchronization will make the powerwall easier to use.

- **Goals:**
  - Come up with a more simple system for most use-cases.
  - Implement the system into the current framework.
  - Implement a small application (game?) for the powerwall as an example for how to use the system.

- **Requirements:**
  - You should be able to use existing code.
  - C++, OpenGL
  - Know how to use `git`
Visualization for neurobiology

- Volume Reconstruction and Visualization from Histology Images
- Most of the projects involve a collaboration with medical experts
- Possible Technologies (not strictly limited to):
  - Python
  - C++
  - OpenGL
  - Inviwo framework

DTI Visualization

Brain Cell/Neuron Counting

Brain Registration and Atlas Mapping