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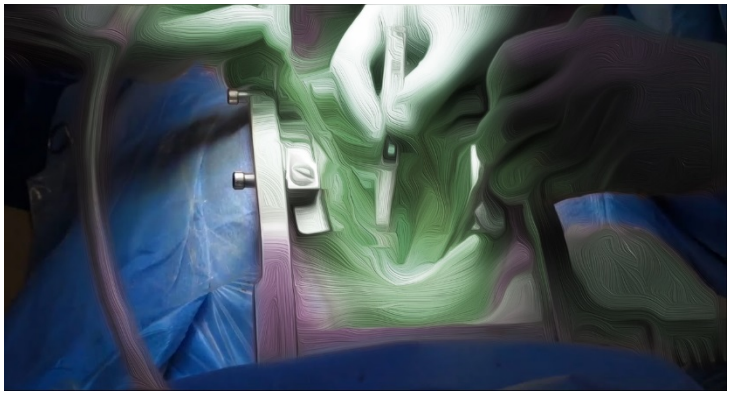
Master Project "Visual Analytics"

Sommer Term 2019 – Computer Graphics Systems

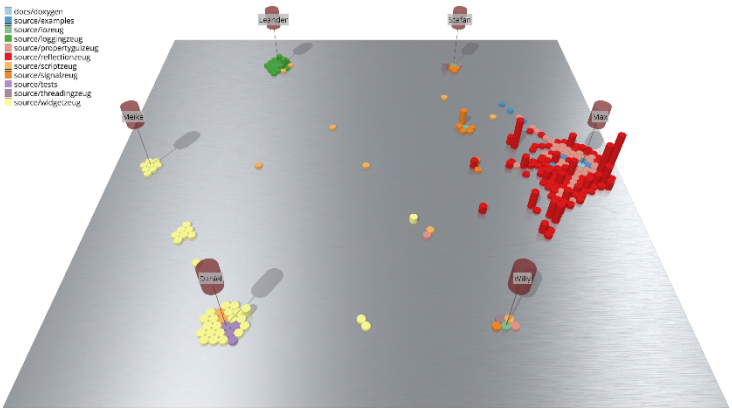
Visual Analytics becomes a key enabling technology in most industries–it allows for analyzing, exploring, and transforming data by means of real-time visual computing. This master project offers two topics:

ML-Based Visual Analytics for "Blocking Sensitive Contents" in Visual Media



User-generated contents, in particular photos and videos, dominate the web; the contents sometimes –willingly or accidentally– contain sequences that are considered to be *sensitive*, e.g., offensive or touching privacy. This project aims at using machine learning (ML) to define and detect elements in visual media considered to be offensive and to visually abstract those parts based on a set of aesthetic options. The project takes advantage of state-of-the-art ML computer graphics frameworks (e.g., Yahoo's or Google's NSFW deep neural networks; deep-learning based style transfer), which allows the participants to concentrate on building the core engine for handling sensitive visual contents, e.g., by means of a W3C browser extension using HMTL5 and JavaScript.
For details, contact matthias.trapp@hpi.de.

Interactive Visual Analytics for Hypotheses Exploration on Large, Multi-Variate Data Sets



Video Demo: https://owncloud.hpi.de/index.php/s/hcAEf32fIQwk0wQ

Large, multi-variate data are almost everywhere: Financial data, client data in enterprise systems, medical data, etc. The *Dust-&-Magnet metaphor* (D&M) represents one of the most powerful, yet still largely unused approaches of visual analytics, where virtual *magnets* are placed on a plane and exert forces on data entities represented as *dust particles*, thereby clustering these entities. D&M becomes a powerful engine to uncover and verify hypotheses constructed through the right selection of magnets and a suitable magnet layout. This project aims at implementing a real-time Dust-&-Magnet engine as SaaS. Server-side data preprocessing and continuous simulation is combined with browser-based rendering using WebGL to ensure an interactive experience on a broad range of devices. It requires real-time particle simulation and collision detection (C++, AVX), GPU-based simulation (OpenGL, OpenCL, CUDA), as well as fast, low-latency client-server communication (WebSocket).
For details, contact robert.henker@hpi.de and *jan.vollmer@hpi.de.*

Both topics are suited for further scientific research, e.g., master thesis or future doctoral thesis; there are also options for being employed in related research projects.