Dominik Engel

curious mind with a passion for efficiency and problem sovling

Personal info

- October 3rd, 1994
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Links

- dominikengel.com
- GitHub
- Google Scholar

Skills

- Python
- C++
- CUDA, GLSL
- Mojo
- PyTorch
- Docker
- Linux
- Git
- Cloud
- LaTeX

Grade scale: (1) very good ≈91%-100%, (2) good ≈81%-90%, (3) satisfactory ≈66%-80%, (4) sufficient ≈50%-65%, (5) failed ≈0%-49%

Work Experience

Ulm University
Full-time, Research Associate, PhD Student
Dec 2018 – May 2024 Ulm (Germany)

- 3 first-author publications at the intersection of Deep Learning and Scientific Visualization (IEEE VIS, TVCG)
- Various co-authorships (CVPR, TVCG, CGF)
- Co-operation with international research groups
- Setup & Administration of GPU Cluster (≈ 20 GPUs)
- Teaching in Deep Learning
  - Lecture *3D Deep Learning*
  - Lecture *Deep Learning for Graphics and Visualization*
  - Several Theses, Projects and Seminars

Daimler TSS
Part-time, Working Student
Sep 2013 – Nov 2018 Ulm (Germany)

- 6D Object Detection using Deep Neural Networks (MSc Thesis)
- Traditional Image Processing for Welding-robot defect recognition
- Live monitoring and visualization of robots and their task progress
- Visualization of 6-DoF Robot Motion Paths (BSc Thesis)
- Web-Development with Angular, CI with Docker

Education

Master Media Informatics, Ulm University
Oct 2016 – Nov 2018 Ulm (Germany)

Degree	Master of Science (Graduate)
Grade	1.5
Thesis Subject	6D Object Detection
In-Depth study	Deep Learning, Computer Vision, Computer Graphics

Bachelor Computer Science, Ulm University
Oct 2013 – Sep 2016 Ulm (Germany)

Degree	Bachelor of Science (Undergraduate)
Grade	1.5
Thesis Subject	Visualization of 6-DoF Robot Motion Paths

Publications

Leveraging Self-Supervised Vision Transformers for Segmentation-based Transfer Function Design
IEEE Transactions on Visualization and Computer Graphics 2024

Dominik Engel, Leon Sick, Timo Ropinski

We utilize pre-trained 2D vision foundation models, like DINO, to extract features from slices of volume data, before fusing the features to a 3D feature volume. By point-querying this feature volume we design transfer functions for visualization of the volume. Our work greatly simplifies the user interaction and allows for interactive segmentation and visualization of volumetric data using only sparse point annotations.

Publications

Monocular Depth Decomposition of Semi-Transparent Volume Renderings

IEEE Transactions on Visualization and Computer Graphics 2023

Dominik Engel, Sebastian Hartwig, Timo Ropinski

We extend monocular depth estimation approaches to de-compose semi-transparent scenes with multiple visible surfaces into a layered representation. This layered representation splits the scene at relevant surfaces and extracts what lies before and behind them. This allows to take existing semi-transparent visualizations, even from screenshots or print media, and modify them afterwards while respecting the composition and transparency of the scene.

Deep Volumetric Ambient Occlusion

IEEE Transactions on Visualization and Computer Graphics 2021

Dominik Engel, Timo Ropinski

We train a 3D U-Net to predict ambient occlusion for volume rendering. One main challenge tackled in our approach is the injection of global information into the network efficiently.

Spatially Guiding Unsupervised Semantic Segmentation Through Depth-Informed Feature Distillation and Sampling

under review

Leon Sick, **Dominik Engel**, Pedro Hermosilla, Timo Ropinski

Recent approaches in unsupervised semantic segmentation work by correlating features from images across a dataset in order to cluster them into a set of classes. We improve on this process by further enforcing a correlation between features and their distances in 3D space.

Projects

Inviwo Visualization Framework

2018 – 2024

Inviwo is an open-source framework for interactive visualization of scientific data written in C++ and OpenGL. Inviwo enables visualization of geometry, scalar fields, vector fields, molecules and more. I have contributed to the core framework, text and video documentation, testability, CI, Python integration, as well as several modules to introduce deep neural networks to the framework.

torchvtk

2020 – 2022

torchvtk is a PyTorch-based framework for efficient loading, caching and transformation of volumetric data, addressing common challenges like IO bottlenecks. I started this project with a colleague and used it for my research. The project is no longer in development as many alternatives emerged in the recent years.

Dominik Engel

Languages

- German (Mothertounge)
- English (Proficient)
- French (Intermediate)
- Spanish (Basic)

Hobbies

- Weight Lifting
- Cycling
- Skiing
- Coffee Nerdery
- Cooking & Baking