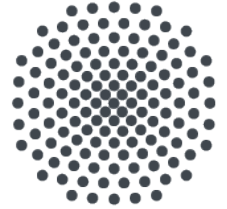


Hauptseminar

Image-Based & Neural Rendering



View synthesis from 16 photographs (© Debevec, 1997), modern splatting (© Huang, 2024), and a light field display (© Looking Glass, 2020)

Image-based and neural rendering techniques are an alternative to traditional geometry-based techniques for novel view synthesis. Instead of modeling every detail of our real world, a collection of photographs or videos is used to form a novel view by resampling pixels. The digitized world allows us to travel in time and space, analyze, and reconfigure it. This field involves vision, graphics, and hardware technologies to collect photographs and videos efficiently, formulate the digitization process, and display the optically correct digital double (See the teaser figure).

By exploring this topic, students can uncover ray-based image resampling techniques, deep neural networks for visual computing, computational imaging and displaying technologies, and their challenges.

This seminar provides a platform to investigate the theoretical and practical foundations of image-based and neural rendering. Students will explore topics such as:

- **Light field rendering:** Ray-based representation of a scene
- **Multi-layer image rendering:** Efficient data format
- **Neural rendering:** Volumetric rendering with neural nets and analysis by synthesis for trainable 3D scene
- **3D/2D Gaussian Splatting:** Volumetric points and directional colors
- **Single-view view synthesis:** View synthesis from one single shot
- **Generative view synthesis:** Text prompts to 3D scenes and best guess for un-seen areas
- **360 view synthesis:** Immersive scene rendering
- **Augmented reality-supported photography:** User navigation by informative visual guidance
- **Computational imaging and enabling hardware:** Obtaining 3D information from multi-view, defocus, etc.
- **Computational display and enabling hardware:** Multi-pannel displays and panel image computation
- **Uncertainty analysis for efficient data collection:** Identifying uncertain areas and points
- **View registration:** Camera pose and parameter estimation in large or very sparse photo collection
- **Applications:** Tourism, narratives, inspection, virtual/augmented/diminished reality, etc.

Language

English

Dates

The seminar will take place in the winter semester 2025 at the VISUS building in room 00.012 on Monday at 9:45am starting on October 13th. There will be no preparation meeting, topics will be assigned during the first seminar class.

Contact

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