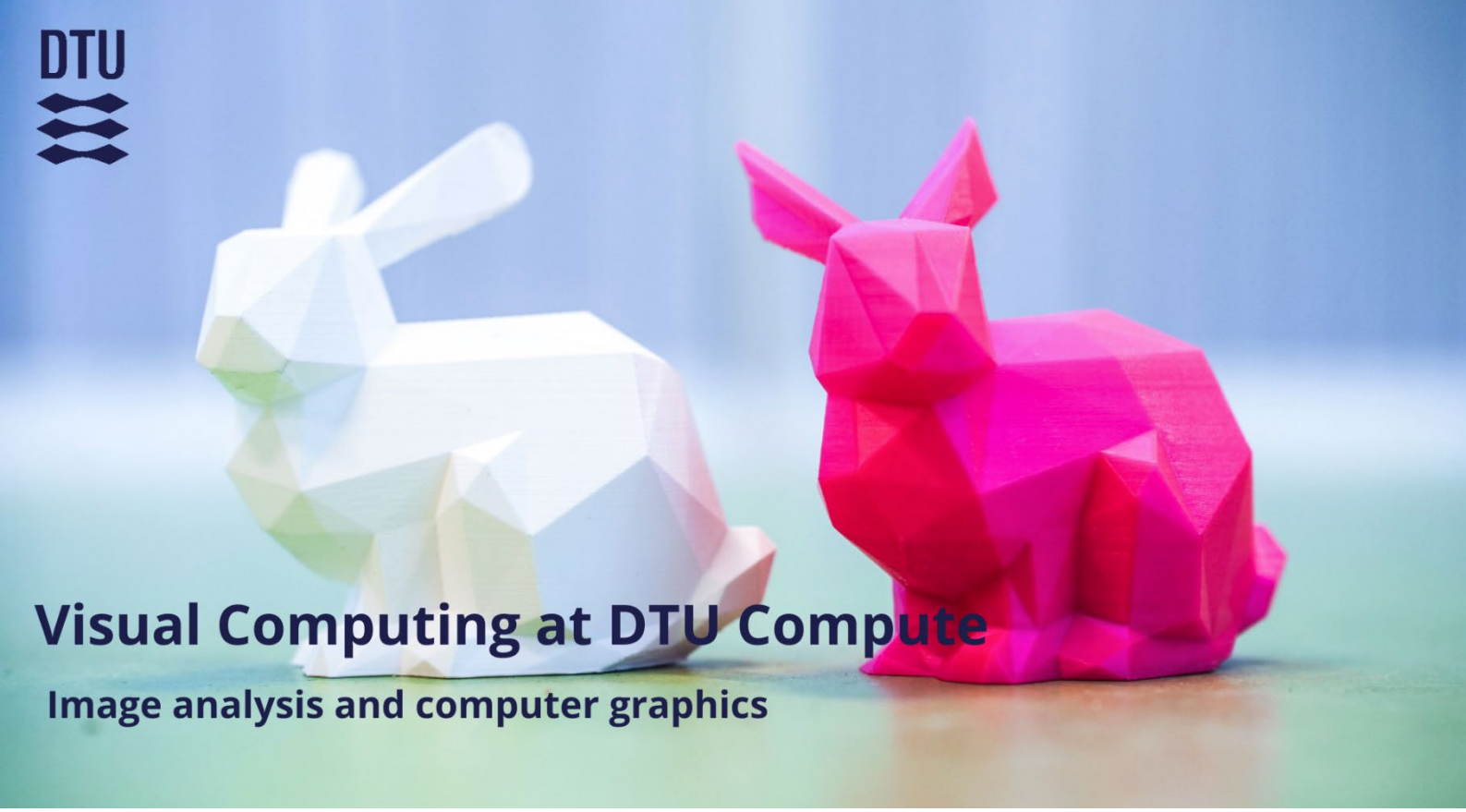


Visual Computing at DTU Compute

Image analysis and computer graphics

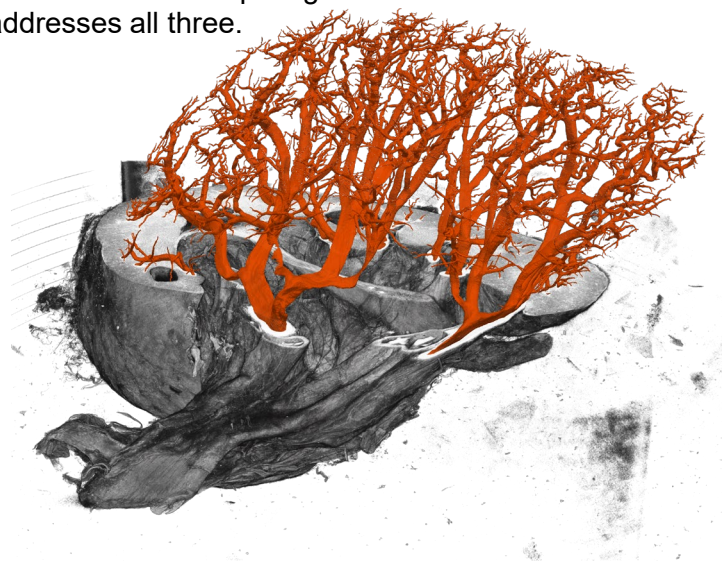
We conduct research in visual computing, spanning **computer vision** and **computer graphics**.

Computer Vision

Computer vision focuses on extracting information from images – similar to how humans interpret the world visually. But unlike human vision, computer vision goes far beyond our natural limits: it measures precise dimensions, reveals structures invisible to the human eye, captures details outside the visible spectrum, and even looks inside objects without cutting them open.

AI in Visual Computing

Artificial Intelligence – especially deep learning – is at the core of our research. We develop new deep learning algorithms for visual computing and apply state-of-the-art methods to solve challenging problems in computer vision and graphics. Progress in deep learning depends on three key elements: advanced algorithms, large datasets, and high-performance computing – and our research addresses all three.



Computer Graphics

Computer graphics works in the opposite direction from computer vision: creating images from information. Just as we imagine and sketch pictures, graphics algorithms generate visual representations – but with far greater realism and speed than any human could achieve. Today's graphics produce lifelike scenes and complex visualizations in seconds.

Responsible AI

AI reflects the data it learns from, inheriting any biases present in training sets. Our research focuses on developing trustworthy AI methods to ensure fairness, explainability, and safe deployment in critical areas like medical imaging. We study how these algorithms fail and link uncertainty in AI models to failure modes, providing tools to predict when systems may be unreliable. This approach not only improves safety but also extends naturally to generative AI models, where trustworthy solutions are still scarce.

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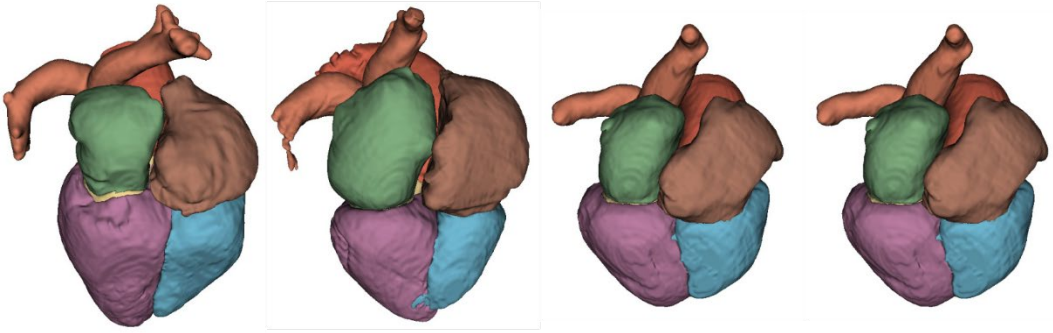
DTU

Technical University of Denmark

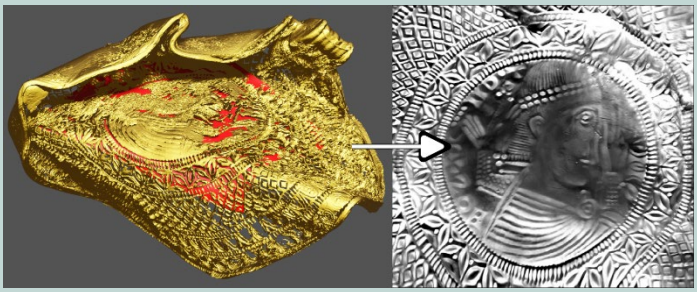


Focus Areas of Research

We specialize in:

- Medical image analysis
- Video analysis
- Analysis of 3D point clouds
- 3D micro-CT image analysis
- Geometry modeling
- Image rendering

Our innovations are driven by applications that current methods cannot handle. For example, we develop techniques to assess heart function from sequences of clinical CT scans. By segmenting heart chambers and modeling their dynamics, we provide insights into cardiac performance – information that cannot be obtained by simply looking at the scans.



Micro-CT Analysis

We host the QIM Center, dedicated to quantitative analysis of 3D micro-CT data in collaboration with the large-scale research facilities MAX IV and ESS in Lund, Sweden.

The QIM Center develops fast, accurate methods for quantifying 3D microstructures from large volumes and supporting experimental collaborations. Since image analysis is often the bottleneck in publishing results, we maintain a high-performance computing platform for collaborative processing. In addition, we create deep learning tools for segmentation and quantification to significantly reduce the time from experiment to publication.

Qim | Center for Quantification of Imaging Data from MAX IV

Modeling from 3D Points

Our research focuses on segmenting 3D point clouds to enable interaction with the environment and on using point clouds to model geometry and physical behavior – for example, simulating how a tree responds to wind.

Hospital Collaboration

We collaborate extensively with hospitals researchers and clinicians. And as part of the new Technical University Hospital of Greater Copenhagen (TUH), we have joint affiliations with expertise in medicine and visual computing.

Benchmark Data

We provide benchmark datasets to advance deep learning research, including 2D photographs for image retrieval, photos and point clouds for surface reconstruction like neural fields and Gaussian splatting, and many more.