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Autonomous Vision Group
MPI for Intelligent Systems
University of Tübingen

Learning Interpretable Representations
PhD Position in Computer Vision / Machine Learning

The Autonomous Vision Group at the Max Planck Institute for Intelligent Systems and the University of Tübingen is looking for a highly motivated PhD student interested in basic research at the intersection of computer vision and machine learning. The PhD student will work on state-of-the-art research in computer vision and machine learning. The conducted research is expected to highly impact both science and industry in the short and long term.
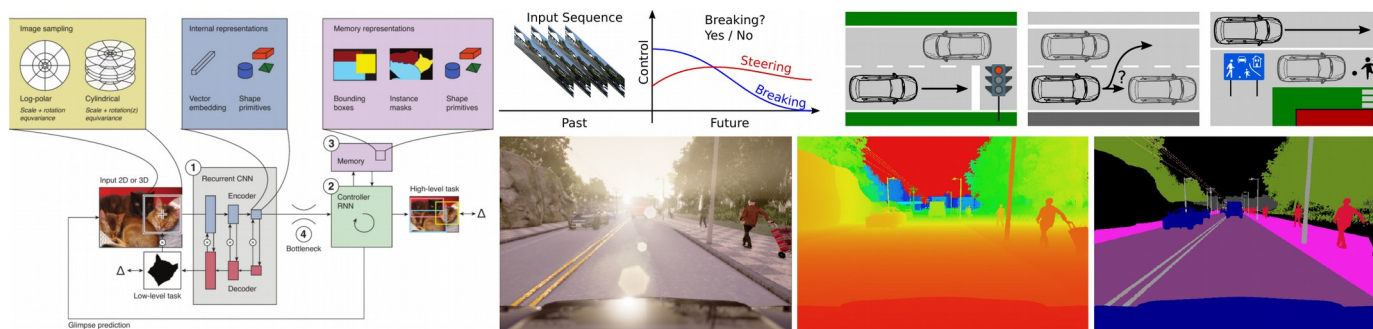
About the project: Within the last five years, artificial deep neural networks (DNNs) have fundamentally transformed a large number of research fields including computer science and neuroscience. While DNNs have demonstrated super-human performance on some tasks, they have also proven vulnerable to out-of-distribution samples and adversarial attacks, which is particularly problematic for safety-critical applications like autonomous driving.
To increase the robustness and generalization performance of DNNs, a better understanding of their inner workings is required. Unfortunately, DNNs are still poorly understood. It remains unclear how decisions are formed within a deep hierarchical representation and which intermediate representations are most useful for achieving a certain task. While much contemporary work focuses on black box network visualizations that lead to relatively little insight, the goal of this project is to develop neural network architectures which are interpretable by design. Towards this goal, interpretable bottlenecks are developed. Examples include top-down attention models that limit the network's perception by foveated image sampling and integrate top-down feedback, thus mimicking the human perceptual process. Another example are compact, primitive-based 3D shape and motion representations which force the network to abstract in physically plausible ways. Using recurrent neural networks, the goal is to consider increasingly difficult visual tasks ranging from object detection to simple control decisions in the context of autonomous driving.

Applicants should hold a Master's degree in computer science, mathematics, physics, or engineering. Successful candidates will typically have ranked at or near the top of their classes and are highly proficient in written and spoken English. Very good computer science skills as well as a good mathematical background are required. Prior research experience in computer vision or machine learning is a plus.

Max Planck Institutes are internationally renowned and regarded as the foremost organization for fundamental research in Germany. The Max Planck Institute for Intelligent System studies perception, action and learning. The **University of Tübingen** has been a place of excellent research for more than 500 years and has a strong focus on neuroscience, computer vision and machine learning. Embedded in this interdisciplinary environment, the **Autonomous Vision Group** conducts state-of-the-art research, giving students access to unique research facilities, outstanding infrastructure and great research freedom. Our working language is English. Our culture is international.

Your application: Please send your full application materials (see http://www.cvlibs.net/applications.php) including your research statement, transcripts and CV to avg-apply@tue.mpg.de.