

# Recent Applications of Machine Learning

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IPVS

MLS: Machine Learning and Simulation Lab

Deep learning has been successfully applied in a wide range of applications involving visual and textual data. Modern machine translation systems and search engines, for example, are using language models trained on large text corpora. Deep generative machine learning models are used to generate art such as the image depicted on the right.



Increasingly, deep learning is applied to problems arising in science and engineering and is also used as a technology at numerous startups. For instance, deep generative models are used to create new images and to develop chat systems that can converse with humans and create written text and code. Other applications of deep learning can be found in chemistry, the biomedical sciences, drug discovery, and engineering disciplines, where use cases range from drug-protein interaction prediction to modeling fluid dynamics. Since machine learning and specifically deep learning will be increasingly used in science and engineering as well as in commercial products, this seminar's goal is to provide an overview of applications, to give students a deeper understanding of recent work, and to have an opportunity to learn how to read, analyze, and engage with scientific papers.

## Target group

Participants of the seminar are expected to have completed the course "Introduction to AI", "Mathematics for Computer Science" and/or related courses.

## Organization

Students of the **English-speaking** seminar are encouraged to select their own presentation topic, typically based on 1-2 papers and/or a blog post. Alternatively, students can choose from a list of pre-selected topics. In addition to presenting the concrete application of DL, the student will give a brief introduction to the deep learning method used in the paper. Students will give *English* presentations in the weekly seminar. 2 weeks before the presentation, the structure of their presentations will be discussed with the lecturers. After the presentations and before the end of the summer term, the seminar reports must be handed in. Final reports are written as **blog posts** and if the students agree, can be published. The seminar is organized by Mathias Niepert who has extensive experience developing (deep) machine learning methods and applying these methods to problems from the biomedical and medical sciences.