UNIVERSITÄT BONN AIS

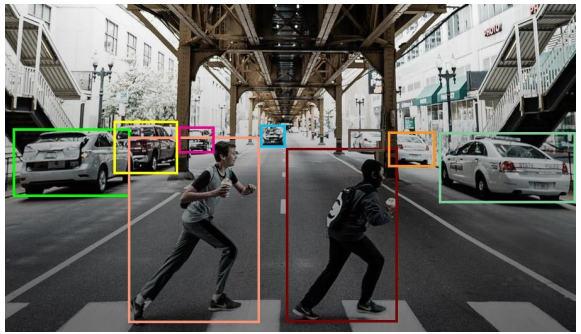
Seminar Vision Systems MA-INF 4208

10.07.2024

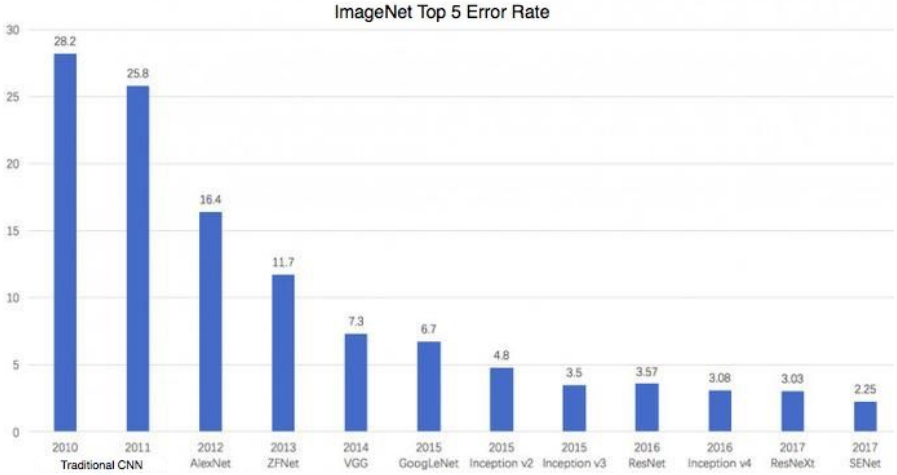
PROF. SVEN BEHNKE, ANGEL VILLAR-CORRALES

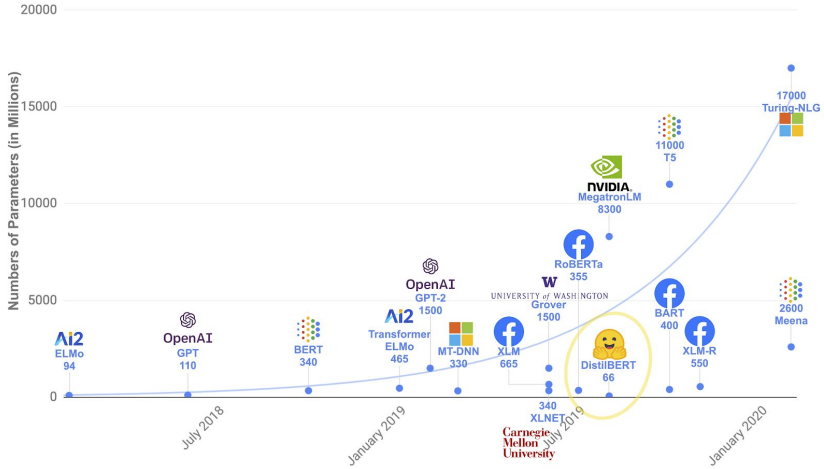
Contact: villar@ais.uni-bonn.de

The Age of Deep Learning



The Age of Deep Learning

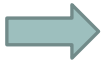




The Age of Deep Learning

In this seminar...

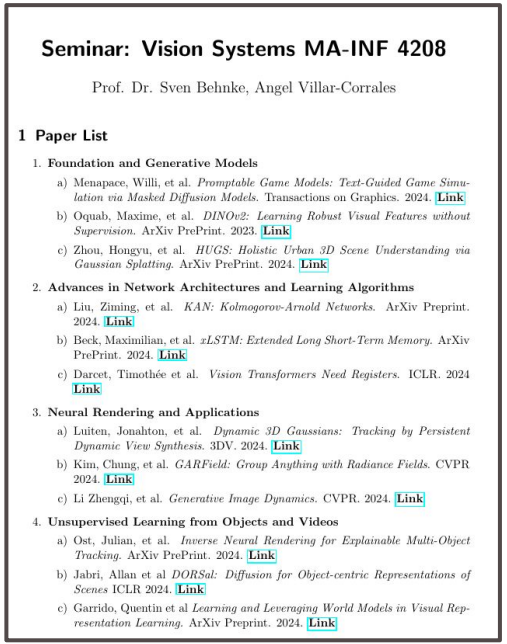
- Acquire/improve ability to:
  - deal with scientific publications (e.g. papers)
  - write a scientific report
  - present a scientific topic to an audience
  - engage technical topics



Important skills for Master Thesis!

In this seminar

- Discuss trending topics in deep learning and computer vision
- We will cover the following topics
  - Foundation Models and Scene Understanding
  - Advances in Neural Networks
  - Neural Rendering and Applications
  - Unsupervised Learning from Objects and Videos



Seminar: Vision Systems MA-INF 4208

Prof. Dr. Sven Behnke, Angel Villar-Corrales

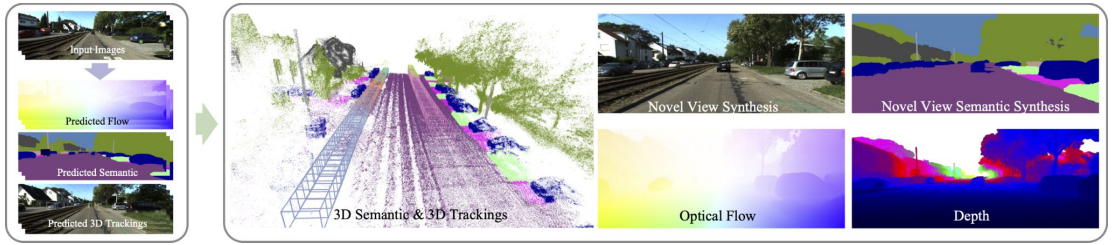
1 Paper List

1. **Foundation and Generative Models**
   a) Menapace, Willi, et al. *Promptable Game Models: Text-Guided Game Simulation via Masked Diffusion Models.* Transactions on Graphics. 2024. Link
   b) Oquab, Maxime, et al. *DINOv2: Learning Robust Visual Features without Supervision.* ArXiv PrePrint. 2023. Link
   c) Zhou, Hongyu, et al. *HUGS: Holistic Urban 3D Scene Understanding via Gaussian Splatting.* ArXiv PrePrint. 2024. Link
2. **Advances in Network Architectures and Learning Algorithms**
   a) Liu, Ziming, et al. *KAN: Kolmogorov-Arnold Networks.* ArXiv Preprint. 2024. Link
   b) Beck, Maximilian, et al. *xLSTM: Extended Long Short-Term Memory.* ArXiv PrePrint. 2024. Link
   c) Darcet, Timothée et al. *Vision Transformers Need Registers.* ICLR. 2024 Link
3. **Neural Rendering and Applications**
   a) Luiten, Jonahton, et al. *Dynamic 3D Gaussians: Tracking by Persistent Dynamic View Synthesis.* 3DV. 2024. Link
   b) Kim, Chung, et al. *GARField: Group Anything with Radiance Fields.* CVPR 2024. Link
   c) Li Zhengqi, et al. *Generative Image Dynamics.* CVPR. 2024. Link
4. **Unsupervised Learning from Objects and Videos**
   a) Ost, Julian, et al. *Inverse Neural Rendering for Explainable Multi-Object Tracking.* ArXiv PrePrint. 2024. Link
   b) Jabri, Allan et al *DORSal: Diffusion for Object-centric Representations of Scenes* ICLR 2024. Link
   c) Garrido, Quentin et al *Learning and Leveraging World Models in Visual Representation Learning.* ArXiv Preprint. 2024. Link

Paper List: https://www.ais.uni-bonn.de/SS24/SeminarVision/PaperList.pdf

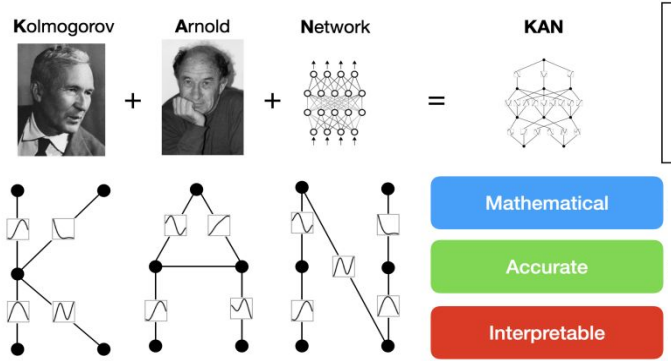
Foundation Models and Scene Understanding

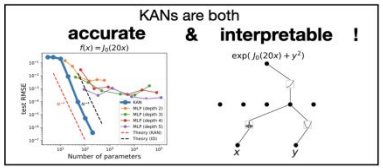
- Models trained on internet-scale data with broad generalization capabilities
- Applications such as:
  - Playable Video Generation
  - Representation Learning
  - 3D Understanding

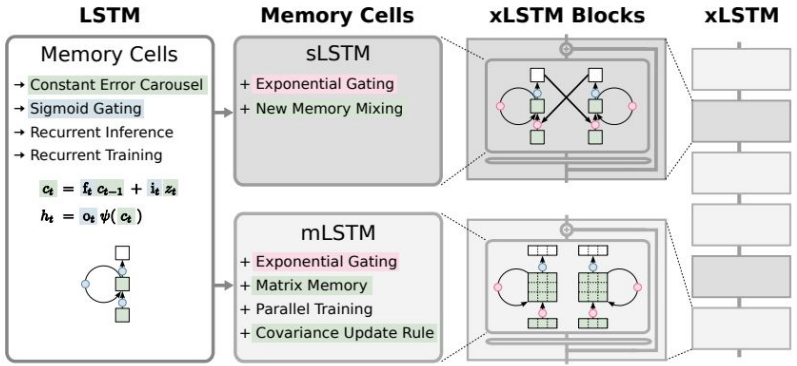


Advances in Deep Learning Models

- Novel neural network architectures
  - Kolmogorov-Arnold Networks
  - xLSTM
- Improved training techniques and understanding
  - Vision Transformers need Registers

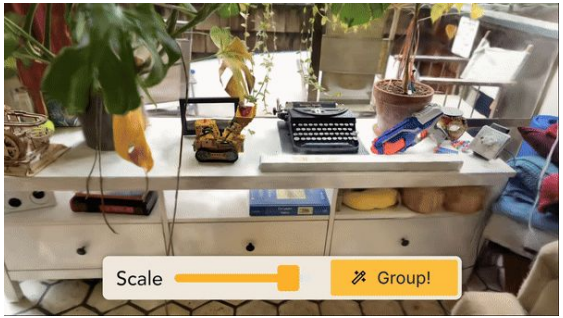


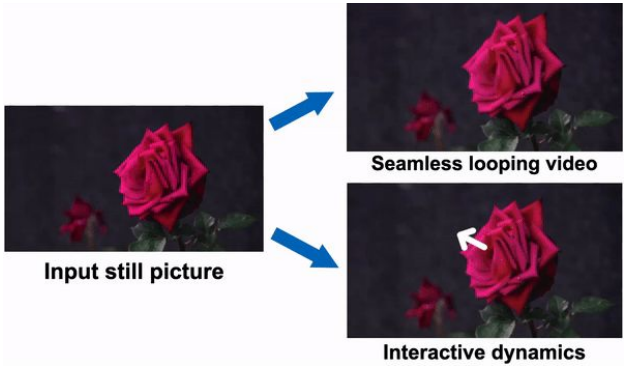


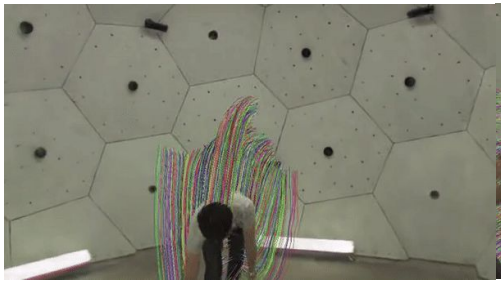


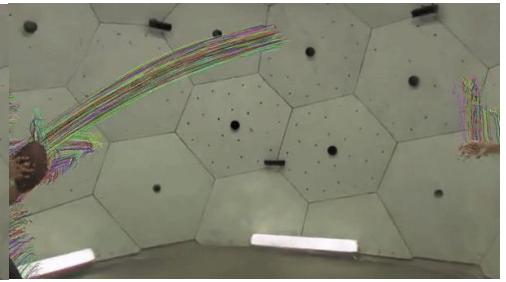
Neural Rendering and Applications

- Learning 3D-aware representations of a scene given a set of posed images
- Applications such as:
  - Spatio-temporal scene decomposition
  - Generative dynamics
  - Novel-view Synthesis and 3D tracking



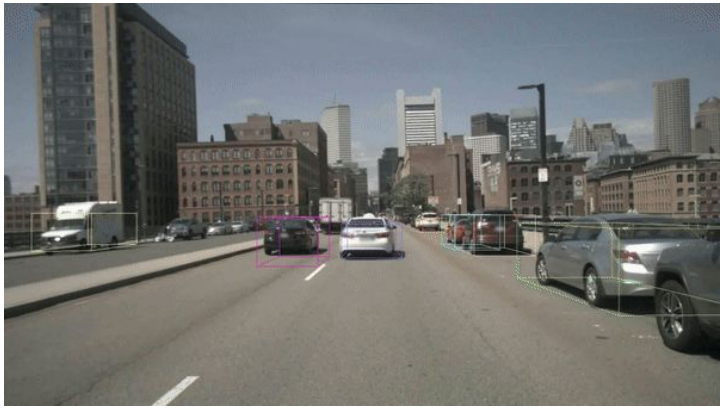


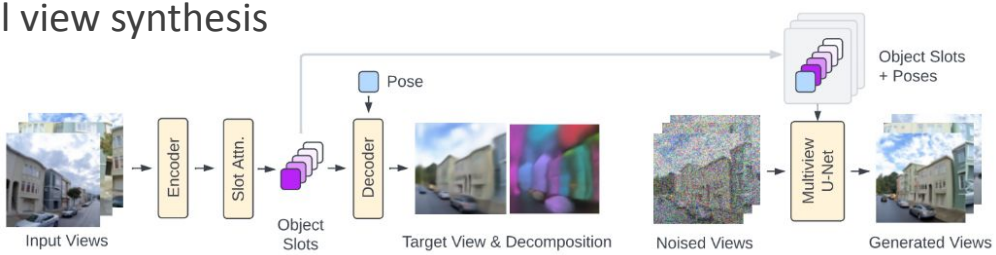




Unsupervised Learning from Videos

- Learning representations from video data without annotations
- Applications such as:
  - Unsupervised 3D object detection & tracking
  - Object-centric learning and novel view synthesis





Get a Spot and Select your Topic

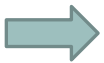
- Fill the following **form** before 15.07.2024
  - Your name & email
  - Matriculation number
  - Your three preferred papers
- Based on this form, I will and assign papers
- Upon my confirmation:
  - Register in BASIS
  - Start working on your paper

BASIS Registration opened until 31.07.2023!

Deliverables (preliminary dates)

- **Presentation**: Monday 23.09.2024
  - 30 min presentation
  - 15 min discussion

- **Report**: Monday 30.09.2024 (will be one week after presentations)
  - LaTeX template
  - 8-12 pages
  - Brief but readable and informative
  - BibTex citations



Arrange a meeting with me ≈2 weeks before the presentation to check the preliminary materials for the presentation and report.

Report

- Well structured:
  - Abstract
  - Introduction, methods, results, conclusion, ...
  - Tables and figures
  - Correct citations

- Your own scientific opinion:
  - What are the weak points of the paper?
  - What is missing?
  - Are comparisons fair and believable?
  - Possible future steps?

We don’t want a copy of the paper!

Grading

- 66.7%: Presentation
  - Quality of the presentation slides
  - Presentation skills
  - Ability to answer questions

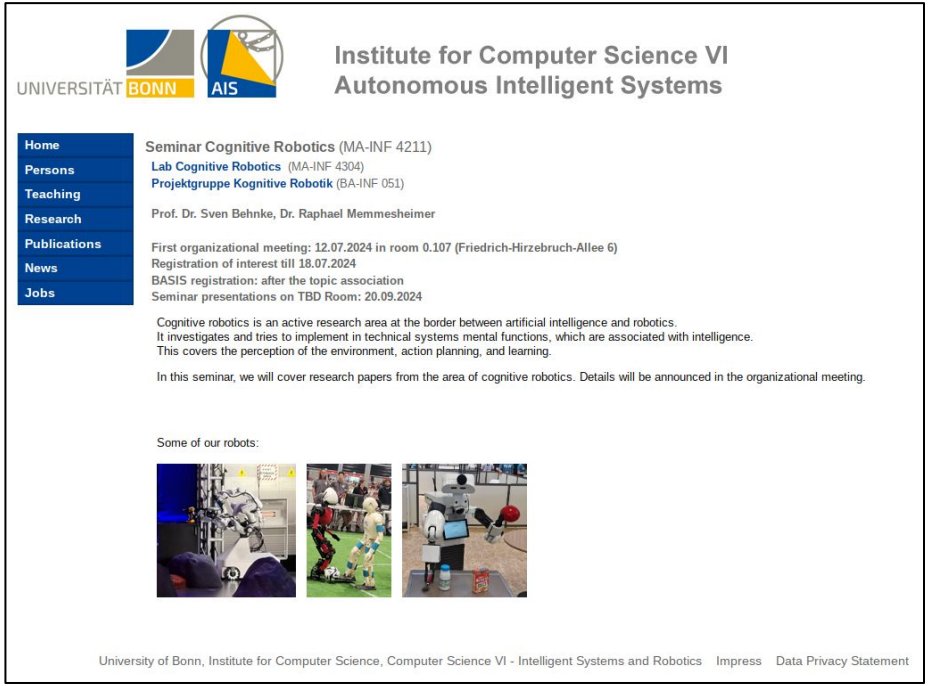
- 33.3%: Report
  - Overall quality of the report
  - Critical thinking and own discussion
  - Understanding of the concept

Seminar Alternative

Seminar Cognitive Robotics: [Link]

- Same seminar format
- Papers more robotics related:
  - Grasping and Manipulation
  - Robot perception
  - SLAM
  - Planning and Navigation

➢ Introductory meeting on **12.07.2024**



Questions?