Kumar Manas

Autonomous System PhD Student

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PhD researcher specializing in AI for robotics and autonomous systems, with expertise in integrating large language models (LLMs) into prediction, planning, and knowledge formalization. Proven experience in uncertainty-aware trajectory prediction, reinforcement learning, and rule-based AI for real-world applications in autonomous driving.

Education

2022–2025 **PhD, Mathematics & Computer Science**, *Freie Universität Berlin*, Germany.
- **Advisor:** Prof. Dr. Adrian Paschke
- **Affiliation:** Professor, Institute of Computer Science, Freie Universität Berlin and Head of Data Analytics and AI, Fraunhofer FOKUS
- **Research Focus:**
  - Automated Knowledge Formalization for Robotics using LLM
  - Knowledge Formalization & Representation for manipulation and driving task
  - Trajectory Prediction for Automated Driving & Foundation Models
  - Integration of Formalized rules as additional knowledge for prediction and planning

2018–2021 **M.S., Electrical & Computer Engineering**, *Chemnitz University of Technology*, Germany.
- **Advisor:** Prof. Dr. Gangolf Hirtz

2010–2014 **B.S., Electrical and Electronics Engineering**, *Visvesvaraya Technological University*, Karnataka, India.

Industry and Research Experience

Nov 2021–July 2025 **Research Engineer**, *Continental Automotive*, Berlin, Germany.
- Conduct research in artificial intelligence and machine learning for automotive applications
- Develop and implement solutions for the autonomous driving planners and predictor
- Collaborate with cross-functional teams to integrate AI technologies into Continental's product portfolio
- Lead research initiatives in knowledge formalization and representation for autonomous driving

Jan 2021–Aug 2021 **Research Assistant**, *elevait GmbH & Co. KG*, Dresden, Germany.
- Developed CNN-based meta-learning framework for noisy image classification and template matching
- Implemented intelligent feature extraction using meta-learners and transformers for few-shot learning
- Designed novel distance functions in deep metric space for improved classification
- Achieved robust performance on unbalanced and noisy image datasets

Nov 2020–Dec 2020 **Research Assistant**, *Fraunhofer Institute for Integrated Circuits (IIS)*, Erlangen, Germany.
- Developed deep learning-based artificial nose sensor for edge devices
- Optimized model architecture for efficient edge deployment
- Implemented time series analysis for smell detection

Jun 2019–Oct 2020 **Graduate Research Assistant**, *Chemnitz University of Technology*, Chemnitz, Germany.
- Developed 3D image reconstruction algorithms for computer vision applications
- Implemented deep learning-based segmentation and object detection algorithms
- Created plugins for depth sensing and object tracking

Oct 2014–Sep 2018 **Software Engineer**, *Accenture*, Bengaluru, India.
- Led development of automation solutions for finance domain
- Implemented and maintained large-scale Automation frameworks

Publications

In Conference Proceedings

2025 **Kumar Manas**, Christian Schlauch, Christian Wirth, Adrian Paschke, and Nadja Klien. Uncertainty-aware trajectory prediction via rule-regularized heteroscedastic deep classification. In *Under Review*, 2025.

2024 **Kumar Manas**, Stefan Zwicklbauer, and Adrian Paschke. TR2MTL: LLM based framework for metric temporal logic formalization of traffic rules. In *2024 IEEE Intelligent Vehicles Symposium (IV)*, 2024.

2024 **Kumar Manas**, Stefan Zwicklbauer, and Adrian Paschke. CoT-TL: Low-resource temporal knowledge representation of planning instructions using chain-of-thought reasoning. In *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024.

2023 **Kumar Manas** and Adrian Paschke. Semantic role assisted natural language rule formalization for intelligent vehicle. In Anna Fensel, Ana Ozaki, Dumitru Roman, and Ahmet Soylu, editors, *Rules and Reasoning*, pages 175–189, Cham, 2023. Springer Nature Switzerland.

2023 **Kumar Manas** and Adrian Paschke. Legal compliance checking of autonomous driving with formalized traffic rule exceptions. In *Workshop on Logic Programming and Legal Reasoning in conjunction with 39th International Conference on Logic Programming (ICLP)*, 2023.

Patents

2023 Daniel Bär, Raffael schön, Stefan Zwicklbauer, and **Kumar Manas**. System and method for translating natural language traffic rules into formal logic for autonomous moving vehicles, 2023. EU Patent No. EP4332824A1 (Published).

Book Chapters

2025 **Kumar Manas, Ya Wang** and Adrian Paschke. Optimierung der entscheidungsfindung in autonomen fahrsystemen mit neuro-symbolischem wissen. In Knut Hinkelmann, Thomas Hoppe, and Bernhard G. Humm, editors, *Hybride KI mit Machine Learning und Knowledge Graphs*. Springer Vieweg Wiesbaden, 2025.

Reviewing and Service

2025 **Conference Reviewer:** ICLR, IROS, ICRA, IV, ITSC
Summer School: Organizing Committee Member, Declarative AI Summer School,2022

Technical Skills

Programming & Development	**Languages:** Python, MATLAB, Bash, CUDA **Frameworks:** TensorFlow, PyTorch, scikit-learn, NumPy, Unsloth **Web Technologies:** HTML5, React
AI & Machine Learning	**Areas:** NLP, LLM training and fine-tuning, Computer Vision, Formal Logic **Specialties:** Trajectory Prediction, Planning and verification, Multimodality **Simulation:** CARLA
DevOps & Tools	**MLOps:** Docker, Git **Cloud:** AWS (EC2, S3) **Databases:** SQL, Neo4j, Ontology

References

Prof. Adrian Paschke
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Dr.-Ing. Ana Cecilia Perez Grassi
Faculty of Computer Science
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