

# Chi Zhang

Portfolio: [hardzc123.github.io](https://hardzc123.github.io)  
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## PROFESSIONAL EXPERIENCE

- Aptiv** Wuppertal, Germany  
*Software Engineer - ML Planner* October 2024 - Present
  - Imitation Learning:** Enabled fully data-driven autonomous driving decision-making and planning by integrating imitation learning into a modular ML-based planning stack, including fine-tuning, loss function implementation and data collection.
  - ML Model Deployment Optimization:** Ensured real-time performance of ML data-preprocessing and inference on embedded platforms by optimizing execution efficiency. Achieved this by conducting performance testing, flattening nested data structures, optimizing memory usage, and reducing redundant computations in C++.
  - System Development:** Enhanced system reliability by detecting anomalies through real-time analysis of Ethernet and CAN signal packets. Achieved this by developing a system health monitoring tool in Rust, processing data from various sensors and service modules.
- Momenta** Stuttgart, Germany  
*Software Engineer - ML Planner* November 2021 - May 2024
  - Imitation Learning:** Contributed to the development of imitation learning to enhance data-driven autonomous decision-making. Fine-tuned models using German driving data, assisted in data preprocessing and model adaptation for traffic light start-stop behavior, and developed and tested loss functions tailored to Germany-specific traffic regulations.
  - DAgger (Dataset Aggregation):** Reduced distribution shift and improved trajectory prediction accuracy in autonomous vehicles by applying Dataset Aggregation to refine imitation learning models. Achieved this by iteratively enhancing training data with expert interventions and developing high-quality data collection strategies to guide human drivers in generating diverse and challenging driving scenarios.
  - Pipeline and Automation:** Reduced manual effort and improved data reliability in expert imitation learning by developing tools for automated data mining and cleaning, utilizing ROS bag processors and Python Elastic Search scripts.
  - Feature Development:** Developed a hybrid planning approach combining A\*-based rough search on the ST graph and OSQP-based longitudinal speed optimization to implement Germany-specific ACC functionalities, including traffic light start-stop, non-overtaking from right), and speed reduction before curves.
- Volkswagen** Wolfsburg, Germany  
*Software Engineer, Intern* June 2019 - November 2019
  - 3D HMI Development:** Designed and implemented VR simulation and AR software using Unity, enabling immersive and interactive validation of new HUD product. Worked closely with UX designers and other departments to refine user interactions and validate concepts through experimentation.

## ACADEMIC PROJECTS

- VR-Gamified Robotic Rehabilitation for Stroke Patients (RWTH 2021):** Developed a VR-based rehabilitation system integrated with a robotic manipulator to enhance upper limb motor recovery in stroke patients. Designed and implemented a gamified VR environment, incorporating goal-setting, feedback mechanisms, and adaptive difficulty to improve patient motivation.
- Autonomous Driving and Real-Time Systems (RWTH 2019):** Applied Kalman Filters for sensor fusion of IMU and GNSS, enabling precise real-time vehicle localization and waypoint navigation. Designed PID and MPC controller, validated via Model-in-the-Loop (MIL) and Hardware-in-the-Loop (HIL) testing.

## SKILLS SUMMARY

- Languages:** Python, C++, Bash, Rust
- Frameworks:** PyTorch, ROS, langchain
- Tools:** Docker, GIT, Gitlab CI, Isaac Sim
- Platforms:** Linux, Windows, AWS

## EDUCATION

- RWTH Aachen University** Aachen, Germany  
*M.Sc. Automation Engineering* October 2016 - August 2021
- Huazhong University of Science and Technology** Wuhan, China  
*B.Sc. Mechanical Engineering* October 2010 - June 2015

## PERSONAL PROJECTS

- Imitation Learning for Autonomous Driving in the CarRacing Simulation:** Demonstrated an imitation learning framework in Gymnasium's CarRacing-v3 simulation, training autonomous driving agents using Behavior Cloning (BC) with expert data from human operations or PPO. Enhanced model robustness through iterative refinement with DAgger.
- LLM-based Decision Making Strategy for Autonomous Driving:** Replicated and enhanced an open-source project utilizing the LangChain framework to enable LLM-driven observation, reasoning, and memory for autonomous driving. Implemented adaptive decision-making, including speed adjustments and lane-changing strategies.
- LLM-based Chatbot Integration for Portfolio Website:** Developing a large language model (LLM)-powered chatbot integrated into my portfolio website to automate responses to visitor inquiries. Utilizing fine-tuning and Retrieval-Augmented Generation (RAG) techniques to tailor the chatbot's responses based on my personal information and professional background, ensuring accurate and relevant answers.