Nathan Corral

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Computer Engineer with a master's specialization in AI and 3+ years of experience in robotics and software engineering, seeking a full-time role in AI/ML development.

Job Experience

Humanoid Robots Lab – University of Bonn 09.2021 – 09.2022
Research Assistant Bonn, Germany

- Contributed to research and publications in personalized robot navigation.
- Programmed the ROS interface for 3D localization of humans from an RGBD camera using deep learning and implemented this on a real robot for autonomous navigation.
- Used the photo-realistic simulator iGibson (PyBullet backend) to generate data for a deep reinforcement learning-based path planning algorithm.
- Conducted a user study evaluating human-robot-interaction in a VR headset, with a follow-up on real robot hardware.

Head Rush Technologies 12.2019 – 04.2020
Contract Engineer Boulder, USA

- Contracted to code the firmware on a ATmega328PB Microchip for a proof-of-concept system.
- Programmed an interrupt triggered gear tooth sensor, RS485 communication, a PWM powered brake, and finite state machine logic.
- Completed field tests and project documentation.

Aqronos 11.2018 – 12.2019
Software Engineer Denver, USA

- Designed ROS nodes for visualization of the company's LiDAR prototype.
- Structured UDP packets and coded both ends of sending and receiving modules.
- Interacted with a REST API to set parameters on an embedded system.
- Filtered point clouds and grouped objects using the C++ Point Cloud Library.

Education

Rheinische Friedrich-Wilhelms-Universität Bonn 10.2020 – 09.2023
M.Sc. *Computer Science* Note: 1.7
Thesis: ***Stochastic Transformer for Prediction of Multiple Futures***

- Developed a novel transformer-based predictor architecture, able to learn a distribution over potential futures.
- Detailed comparison against other stochastic-based models in video prediction, boasting higher structural similarity in frame-wise comparisons.
- Applied in the domain of human pose prediction, generated 8 seconds of continued walking after the initial 0.3 seconds of seed motion.

University of Illinois Urbana-Champaign 08.2013 – 05.2017
B.Sc. *Computer Engineering* GPA: 3.55/4.0

Projects

ROS 2 Whisper 2024
Maintainer Video, Source

- Extended this open source project to support boarder-less, live transcription.
- Implemented the C++ code to place special attention on code efficiency and scalability.

ROS 2 Computer Vision 2024
Author Video, Source

- Designed a ROS 2 pipeline to run multiple Computer Vision (CV) tasks (Object Detection, Per-Pixel Segmentation) in parallel.
- Automatically download modern CV models (such as DETR, Maskformer).
- Re-index the model output labels, which may be trained on different datasets, into a universal database.
- Run the pipeline on both live camera feed and a dataset, which allowed time comparisons between the asynchronous running of multiple models.

Semantic Search using Facebook AI Similarity (FAISS) 2024
Author Source

- Implemented the first steps in Retrieval-Augmented Generation (ending before "Generation").
- Programmed web-scraping, dataset embedding, and similarity comparisons to recover matches in the dataset from a natural language query.

Publications

J. de Heuvel, **N. Corral**, et al. "Learning depth vision-based personalized robot navigation from dynamic demonstrations in virtual reality" *IROS*, 2023

Skills

Languages	· English (Native) · German (fluent, C1 self-assessed)
Strengths	· Problem Solving · Cross-Team Collaboration · Reliable · Technical Documentation · Hard Working
Coding	· C++ · Python · Bash · C · LaTeX · Java · Go
Software	· Linux/Ubuntu · GitHub · Docker · ROS/ROS2 · QEMU · Hyperstack · AWS EC2
Libraries (C++)	· std · chrono · Point Cloud Library · nlohmann/json · curl
Libraries (Py)	· PyTorch · Hugging Face · TensorFlow · Matplotlib · Pandas · OpenCV · NumPy · Scikit-learn
Knowledge	· Agile · REST API · Test-driven Development · POSIX · Object Oriented Programming · Data Structures
Robotics	· Forward/Inverse Kinematics · SLAM · Path Planning · PID / Model Predictive Controllers · Kalman (Bayes) Filters
Deep Learning	· Computer Vision · Generative AI · Large Language Models · Gradient Descent Optimization · Retrieval-Augmented Generation · Reinforcement Learning · Point Cloud Processing · CUDA
Simulators	· CARLA · iGibson · (Py)Bullet · Gazebo · Webots
Microcontrollers	· UART/I2C/SPI · Systems on Chip · Real-Time Systems · Interrupt Triggers · Discrete Signal Processing

Signature: 
Date: December 4, 2024
Place: Bonn, DE