Nikolaas M C Bender

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Education:

University of Colorado Boulder
Graduated: May 2021
Degree: BA – Computer science
Focus: Robotics

University of California Santa Cruz
Expected graduation: June 2023
Degree: MS – Electrical and computer engineering
Focus: Field robotics

Work Experience:

Graduate Researcher; Citris crop disease monitoring   September 2021 – Present
- Building payload for hyper spectral imaging and image processing of crops from UAV
- Developing standardized RTCM correction system for UAV and UGV research on UCSC campuses
- Collaborating on novel localization methods for UAVs
- Developing hyper spectral SLAM pipeline based on GTSAM
- Managing team of 3 graduate and 4 undergraduate researchers
- Determining tasks and setting objectives to deliver appropriate products and updates throughout the course of development

Graduate Researcher; Smartbases continued   September 2021 – Present
- Modifying traffic camera data acquisition system to comply with military security standards
- Collecting unique military specific traffic data for deep learning
- Web data scraping and processing for deep learning object detection
- Exploring failure modes of commercial object detection systems when used on military data

Undergraduate Research Assistant I; DARPA SubT team MARBLE October 2019 – August 2021
- Constructed and developed remote management tools for robotic fleet in accordance with the needs of the human operator
- Designed and upgraded visualization to better understand where artifacts and robots exist in adversarial environments environments
- Identified and cataloged issues to formulate the most optimal solutions
- Supported team by driving a truck with all of our resources to Washington state for urban competition
- Dedicated almost all time during urban competition to fixing bugs and adding features necessary for competition while removing other features deemed unnecessary

Undergraduate Researcher; Smartbases   May 2020 – August 2021
- Headed team on RADAR sensor modality for use in autonomous cars and buses
- Utilized properties specific to RADAR for the purposes of identifying, tracking, and predicting movement of objects
- Developing online sensor alignment tools in software to assist sensor fusion

- Learned, in depth, signal processing, system architecture, CAN bus networking, data visualization, object tracking, classification
- Supported human factors research by being present at testing location and collecting data on both the human riders and the vehicle

Software development intern; ObjectRocket, Austin TX   May 2019 – August 2019
- Built faster next generation database control platform
- Automated deployment and maintenance of databases
- Reduced database build time by 75%
- Doubled the number of available database kinds (Cockroach db, Mongo, Postgress, etc)
- Built modules, upgraded existing modules, and expanded modules as prescribed by Jira cards on a weekly basis in SCRUM architecture

Software development intern; IQVIA, New Brunswick NJ   May 2018 – August 2018
- Built tool to automatically deploy hundreds of SQL scripts to a desired database
- Reduced execution time from 2 hours to 20 seconds
- Automatic error catching, rollbacks, and notifications for developers to see what needs to be fixed

Applicable classes: algorithms, software development tools and methods, advanced robotics & special topics in computer science (robotics), computer systems, data structures, linear dynamics, numerical computation, fundamentals of quantum computing, mechantronics, feedback controls

Deep learning: Pytorch, Open CV, AWS, Google Compute Platform
Software development: Python, C, C++, JavaScript, HTML, C#
Robotics: Python, ROS, C++, JavaScript, Pytorch, Arduino, MPLabX
Hardware: Analog signal processing, GPS, LORA, TensorRT

Projects:
Capable Octopus | Autonomous robot
- Used Clearpath Jackal as robotics platform for its high availability and relatively high top speed of 4.5mph
- Use of Intel Realsense cameras for mapping and perception with gps and imu for loop closure
- Leveraged Deeplab v3+ semantic segmentation neural network trained on cityscapes dataset for gradient descent controller to keep vehicle on sidewalks
- Lessons learned
  - deployment of neural networks on edge hardware
  - system integration
  - Code management in rapid development environment
  - efficient centroid calculation

Comma AI coding challenge | Deep learning for estimating velocity based on dashcam footage
- Expanded given dataset through OpenCV to meet the need for more training data
- Constructed a saimese convolutional neural network for processing images then combining feature vectors for processing by single set of linear layers ultimately predicting velocity
- Experimented with different convolutional network architectures including xception, alexnet, 6d input, and single resnet before settling on saimese resnet152 networks for feature vector generation then further experimentation and analysis for linear layers to make prediction eventually settling on 5 linear layers for velocity inference
- Leveraged CUDA libraries in Pytorch for accelerated gpu training