Brett Pennington

Software Engineering Manager – Robotics/AV – Planning/Prediction

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EXPERIENCE

Manager, Planning and Prediction

Rivian, Palo Alto, CA — Jan 2021 - Present

- Grew the team of 7 in 6 months; consisting of junior engineers up to senior staff.
- Architected prediction, behavior planning, motion planning, and trajectory optimization for an L3 tech stack.
- Introduced RL for improved behavior planning in complex traffic scenarios.
- Led team responsible for writing a planning stack for next generation features, finishing the prototype one year ahead of schedule.
- Co-lead the safety critical design of the ADAS application logic for L3+ autonomy.
- Designed and wrote a C++, real-time framework for extending application logic to improve development time and reduce bugs.
- Collaborated across 13,000 person organization to reduce duplicate work, define team objectives and identify opportunities for future.

Member, IEEE Working Group on AV Decision Making

IEEE SA — Oct 2020 - Present

- Reviewed for the 2846 white paper “Literature Review on Kinematic Properties of Road Users for Use on Safety-Related Models for Automated Driving Systems”.
- Contributed to 3321 “Recommended Practice for the Application of Assumptions on Reasonably Foreseeable Behavior of Other Road Users”.

Staff Planning Engineer

Rivian, Palo Alto, CA — Jul 2020 - Dec 2020

- Wrote an offline, non-convex solver for optimal paths on off-road terrain in python.
- Designed a path toolbox to store the optimal paths and load them in a dense, space-efficient representation in Matlab, Python, and C.
- Introduced TDD and modular software practices.
- Implemented online algorithms in C for fast multi-dimensional KNN lookups.

Planning & Controls Engineer

Boston Dynamics, Boston, MA — Jul 2018 - Jun 2020

- Applied optimal control techniques for multi-objective and multi-bodied systems.
- Implemented MPC/Planning for linear/non-linear systems.
- Designed proprioceptive sensing algorithms for workspace compliance and improved balancing of floating base robots.
- Introduced TDD and modular software practices for robotic systems.
- Architect planner for de-palletizing with Handle and Stretch.

Software Engineer – Motion Planning, Robotics & Controls

Automata Tech, London, UK Apr 2017 - Jul 2018

- Built custom kinematics, controls & motion planning libraries in C and modern C++.
- Designed collision detection systems in embedded MISRA compliant C with low bandwidth constrictions.
- Introduced Agile practices: Grew a team from 5 individuals into 3 cross-functional teams with 15 members in 9 months.

Software Engineer

Cubic Transportation Systems, London, UK Apr 2016 - Apr 2017

- Maintained code running the London Transit (Oyster Card) environment along other global metropolitan transit systems (SF Clipper, new NYC Metrocard, Sydney Opal).
- Correlated high-speed, time-sensitive data streams in critical systems handling payments for +6 million users daily in less than 0.3 seconds each.
- Delivered client-focused results quickly while adhering to sound development practices and refactoring a large and historic database along the way.

Controls Research Engineer

University of Alabama, Tuscaloosa, AL Jan 2011 - Dec 2015

- Designed and synchronized embedded systems to enhance our testing ecosystem
- Programmed and modeled safety-critical high performance systems
- Built adaptive and dependable systems in critical testing environments
- Researched diesel engine controls to advance sustainability and performance

ENGINEERING SKILLS

Software Languages

- *Dream in:* Modern C++
- *No problem writing:* C and Python
- *Once upon a time I wrote:* C++98, SQL, MATLAB, SIMULINK, Go
- *Could stack-overflow my way through:* JS, R, Ruby
- *Maybe one day:* Haskell, Rust

Planning

- Classical Behavior Planning (FSMs, STRIPS-based, and hierarchical FSMs)
- Classical Motion Planning Techniques (graphs, trees, and gradients)
- Learned Planners (DQN and model-based RL)
- Trajectory Optimization (shooting and collocation based for online/offline work)

EDUCATION

Ph.D. Mechanical Engineering, University of Alabama

Jan 2011 - Dec 2015

Advanced Controls Systems, Optimal Control, and Computational Analysis

B.S. Mechanical Engineering, University of Alabama

Aug 2006 - Dec 2010

Thermodynamics, Physics, and Mechanical Systems