

# 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 from 0 to 7 members in a 6 month period consisting of junior engineers up to senior staff.
- Architected prediction, behavior planning, motion planning, and trajectory optimization from the ground up.
- Introduced reinforcement learning 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.

### 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
- Implemented online algorithms in C for fast multi-dimensional KNN lookups
- Introduced TDD and modular software practices.

### Advanced 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 dynamic systems

### 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

- |   |                                  |
|---|----------------------------------|
| • <i>Dream in:</i>                            | Modern C++                       |
| • <i>No problem writing:</i>                  | C and Python                     |
| • <i>Once upon a time I wrote:</i>            | C++98, SQL, MATLAB, SIMULINK, Go |
| • <i>Could stack-overflow my way through:</i> | JS, JSX, R, Ruby                 |
| • <i>Maybe one day:</i>                       | 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)

### Work Style

- Self-starter - *never stop learning*
- Enjoy mentorship and leading
- Open and collaborative - *the faster we iterate, the more honest we are, and the more collaborative we are, the better the end result will be*
- Test-driven development and SOLID principles to build strong software foundations

## 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*

References available upon request