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Sean D. Matthews

SUMMARY

I am a driven roboticist and software engineer with a wealth of experience in providing solutions for fault-tolerant, performance critical software. Much of that experience comes from my extensive work with autonomous mobile robots that utilize complex sensor suites to collect data on the ground, in the sea, and in the air.

My varied skill set, which is especially suited for autonomous robotics but broadly applicable to most distributed software systems, allows me to provide to you certain benefits:

- *Offer key design insights for robotic systems-* design sensor suites, identify common pitfalls, estimate effort to achieve your project goals, establish effective software development processes
- *Build, mentor & lead teams-* recognize skill sets necessary to your projects, provide technical guidance, enable team growth & performance
- *Evaluate applicability of incumbent technologies-* proof-of-concepts, mitigate project risk through exploratory spike tests
- *Algorithm implementation-* translate papers to code, port existing implementations to your platform
- *System integration-* lay the pipework to connect all the pieces into a functioning whole, test & debug multi-disciplinary systems in physical & simulated environments

I seek roles that empower me to affect meaningful technological change by placing me squarely in the critical path to a project's success. I seek teams with a strong sense of culture, technical prowess, and the capacity for effective communication. I seek an innovative organization, whether within the robotics field or outside of it, with an ardent vision.

CORE COMPETENCIES

- C++11/14/17/20
- Rust
- Linux/ARM
- Motion planning
- Algorithm implementation
- Robot software architecture
- CUDA / GPU parallelization
- ROS
- Git / Docker / CI

EXPERIENCE

NVIDIA Corporation, Santa Clara CA — *Senior Software Engineer, AV,* MAR24 - PRESENT
NVIDIA is a tech giant that revolutionized gaming, AI, and high-performance computing with its leading GPUs. My role in their autonomous vehicles (AV) division involves developing & rigorously testing motion planning components for consumer vehicle semi-autonomy features.

- Exponentially scaled actuated replay test suite by automating test case sourcing & addition
- Improved lane planner recall in live drives, leading to more efficient lane selection

Exyn Technologies, Philadelphia PA — *Senior Robotics Engineer,* NOV19 - JAN24
Exyn pioneers aerial autonomous aerial robot systems for complex, GPS-denied environments. My role on the Motion Planning & Controls teams involved implementing core features to improve the robustness & speed of autonomous flight across several platforms.

- Wrote a performant B-spline library, geared toward real-time trajectory generation & optimization, to enable minimum-jerk quadcopter flight at high speeds
- Designed & implemented flight control subsystem for merging & tracking continuously generated B-splines while ensuring C4 continuity
- Enabled real-time, kinematic trajectory search, for assisted manual control, by efficiently memoizing millions of pre-generated, chainable B-spline motion primitives
- Elicited over $3M in funding via proposals to domestic & foreign government organizations

Pensa Systems, Austin TX — *Co-founder & Robotics Lead,* DEC16 - NOV19
Pensa provides timely retail shelf data, using a combination of AI and robotics, to drive growth for CPG brands. My role involved mitigating pre-seed technical risks, building the autonomy team, and spearheading the autonomy stack MVP.

- Led a team of five engineers through MVP development of an autonomous shelf-scanning quadcopter
- Offered strategic vision for the company's aerial data collection product, leading to $20 million in cumulative investment
- Architected full autonomy stack & features, including voxel-based world model, Iterative Closest Point based localization in known map, D* path planning, trajectory optimization via quintic Bezier splines, and camera-based AR tag auto-landing
- Proved out deep learning classification of on-shelf grocery items using Caffe

Goldman Sachs, New York NY — *Vice President, Commodities E-Trading,* MAR15 - FEB16
On the commodities desk at Goldman Sachs, a renowned investment bank, I developed analytical trading tools as well as portions of their commodities e-trading product.

- Implemented & deployed FIX protocol interface to Chicago Mercantile Exchange
- Developed power trading spread marking & extrapolation tool

Caterpillar Inc, Pittsburgh PA — *Senior Software Engineer,* JUL12 - SEP13
Caterpillar's Pittsburgh Automation Center (PAC) worked closely with Carnegie Mellon's Nation Robotics Engineering Consortium (NREC) to bring autonomy to their large mining vehicles. My role focused on adapting existing vehicle sensors to person detection.

- Devised real-time optical person detection for mining trucks by implementing a GPU version of Histogram of Oriented Gradients (HOG) algorithm and fusing its output with raw radar measurements

RE2 Inc, Pittsburgh PA — *Senior Software Engineer,* DEC10 - JUL12
RE2 (acquired by Sarcos) developed robotic manipulators & autonomous capabilities therefore. I was responsible for executing a DARPA program extension that would result in two national museum exhibits.

- Led development for autonomous, interactive, anthropomorphic robot installations at National Museum of American History & National Air and Space Museum
- Enabled real-time & fault-free motion planning of dual 7-DOF Barrett arms via inverse kinematic joint parameter memoization

Applied Perception Inc, Pittsburgh PA — *Senior Software Engineer,* FEB08 - OCT10
API (subsequently acquired by Foster-Miller) pushed the envelope on mobile autonomous ground robots, primarily for government customers. My first job out of graduate school, this role steeped me in a breadth of applied autonomous robotics knowledge.

- Implemented real-time dynamic crowd navigation via modified A* search, leading to a funded extension of DARPA's LAGR program
- Clustered stereo depth data for fly-by-wire robotic arm extraction of wounded soldiers
- Devised UGV leader-follower system using UWB radio time-of-flight triangulation
- Enabled GPS waypoint following & sonar-based obstacle avoidance for EOD robots

University of Florida, Gainesville FL — *Graduate Research Assistant,* JUN06 - FEB08
As a matriculating PhD student, a professor hired me as a member of the Landmine Classification Lab. I later left the program to pursue a career in robotics.

- Improved land mine classification accuracy of a feedforward neural network by fusing IMU position estimates with GPR & metal detector sensor measurements

EDUCATION

University of Scranton, Scranton PA — *BS Computer Science / MS Software Eng.*

INTERESTS

Autonomous underwater vehicles, subsea exploration, rock climbing, biomimetics, entrepreneurship