Sean D. Matthews

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ABOUT ME

I am a driven roboticist with over a decade of experience in providing solutions for autonomous mobile robots traversing ground, sea, and air, in commercial, educational, and military settings.

My broad experience in forming autonomous robotics solutions, and working alongside the teams necessary to accomplish this, allows me to provide to you certain benefits:

- *Offer key design insights for robotic systems–* designing sensor suites, identifying common pitfalls, estimating effort to achieve your project goals, establishing effective software development processes
- *Build, mentor & lead teams–* recognizing skill sets necessary to your projects, providing technical guidance, and enabling team growth & performance
- *Evaluate applicability of incumbent technologies–* proof-of-concepts, mitigating project risk through exploratory spike tests
- *Algorithm implementation–* translating papers to code, porting existing implementations to your platform
- *System integration–* laying the pipework to connect all the pieces into a functioning whole, testing & debugging 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.

COMPETENCIES

- Algorithm implementation
- Robot software architecture
- Motion planning
- Systems design & engineering
- CUDA / GPU parallelization

- C++11/14/17/20
- Rust
- Linux/ARM
- ROS (Robot Operating System)
- Git / Docker / CI

EDUCATION

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

INTERESTS

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

EXPERIENCE

Exyn Technologies, Philadelphia PA — *Senior Robotics Software Engineer,* NOV19 – NOW

- 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 planner-generated B-splines, while ensuring higher-order smoothness & 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, Brooklyn NY / Austin TX — *Co-founder & Robotics Lead,* DEC16 – NOV19

- Offered strategic vision for the company's drone data collection product, and led a team of eight engineers through MVP development of an autonomous shelf-scanning quadcopter, leading to $20 million in cumulative seed 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

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

Freelance Robotics Consultant, Brooklyn NY — *Self-Employed,* JAN14 – DEC16

- Developed proof-of-concept detection & tracking of on-road vehicles from sparse lidar data using RANSAC ground plane segmentation, K-means clustering object segmentation, and EKF tracking

Caterpillar, Pittsburgh PA — *Senior Software Engineer,* JUL12 – SEP13

- 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

- 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

- Implemented real-time dynamic crowd navigation via modified A* search, leading to a funded extension of DARPA's LAGR program
- Aided fly-by-wire wounded warfighter extraction program by using Expectation Maximization for clustering stereo depth data
- 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

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