

Sinan Karahan, Ph.D.

Robotics Engineering Leader | State Estimation, Sensor Fusion & Control for Humanoid and Mobile Robots

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EXECUTIVE SUMMARY

Engineering leader who builds and runs the teams that give robots reliable state estimation, sensor fusion and control, focused on humanoid and mobile robots, and autonomous driving. Directed a 12-engineer Ph.D./M.S. algorithms organization with two managers at TDK InvenSense, led a 20-engineer autonomous-driving team at XPeng, and today leads localization for Gatik's autonomous trucks. Robotics depth spans a 6-DOF physical-therapy robot, surgical-catheter kinematics and industrial-manipulator control; shipped the first production 9-axis sensor fusion on iPhone. Owns roadmaps, hiring and delivery.

LEADERSHIP HIGHLIGHTS

- **Built and ran an algorithms organization:** 12 Ph.D./M.S. engineers and two managers at TDK InvenSense; owned hiring, performance reviews, promotions, staffing, roadmap and milestones.
- **Led autonomous-driving development end to end:** technical lead for 20 engineers spanning sensor fusion, perception, planning, navigation and control through vehicle testing at XPeng.
- **Shipped at scale:** the first production 9-axis sensor fusion on iPhone; real-time fusion and calibration on InvenSense IMU chips across multiple product lines; production localization on Gatik's autonomous trucks at 2 cm (RTK) and 10 cm (GNSS-degraded) accuracy.
- **Owned technical roadmaps across robotics domains:** manipulators, medical robots, autonomous vehicles, spacecraft GNC and consumer sensing — the foundations a humanoid program needs.
- **Develops technical talent:** taught a graduate robotics sequence at Santa Clara University; mentors Ph.D.- and M.S.-level engineers; advisor to two startups.

CORE STRENGTHS

- **Leadership:** team building and hiring, performance management, technical roadmaps, resource planning, cross-functional delivery with hardware, vehicle and systems teams, research-to-production transition
- **Technical domains:** state estimation and sensor fusion (EKF, UKF, particle filters), robot kinematics and dynamics, force-based and model predictive control, trajectory planning, sensor calibration, localization and navigation, perception fusion, GNC
- **Platforms & practice:** C++, ROS/ROS 2, embedded real-time systems, simulation and hardware-in-the-loop validation, ISO 26262 functional safety

PROFESSIONAL EXPERIENCE

Gatik — Santa Clara, CA | Technical Lead, Mapping and Localization Sep 2024 – Present

Owns localization for the autonomous-truck program: architecture, implementation, validation strategy and cross-functional integration.

- Lead the localization product, fusing GNSS, IMU, LiDAR, camera and wheel odometry for autonomous trucks.
- Met accuracy targets of 2 cm with RTK GNSS and 10 cm with degraded or no GNSS by bringing LiDAR, camera and wheel-odometry measurements into the production navigation filter; code runs daily on the truck fleet.
- Introduced out-of-sequence measurement fusion for delayed sensor signals, improving localization accuracy.
- Set validation strategy, using ROS/ROS 2 data pipelines to characterize fusion, localization and map-matching performance.

Karahan Consulting — Menlo Park, CA | President Oct 2023 – Sep 2024

- Advised clients on sensor fusion, calibration, estimation, GNC, control, AR/VR and autonomous-driving systems.

E-Space — Los Gatos, CA | Director, GNC Sensors & Actuators Aug 2022 – Aug 2023

Owned the roadmap, resources and technical direction for GNC sensor and actuator hardware and algorithms.

- Selected, tested and deployed the IMU, magnetometer and GNSS suite for a commercial communications satellite; led characterization and validation.
- Directed development of attitude-control and estimation algorithms and sensor bias and temperature calibration.

TDK InvenSense — San Jose, CA | Director, Algorithms Apr 2019 – Aug 2022

12 direct reports (Ph.D./M.S.), including two managers. Owned hiring, performance reviews, promotions, mentoring, staffing, roadmap and milestones.

- Directed the algorithms organization delivering sensor fusion, calibration, filtering, machine learning and activity detection for handhelds, wearables, robots and industrial sensors.
- Led release of motion and calibration algorithms across multiple product lines.

- Delivered a random-forest acoustic/vibration classifier for Industry 4.0 wafer dicing that doubled defect detection; co-invented U.S. Patent 11,680,823 on sensor calibration for mobile-robot navigation.

XPeng Motors (XMotors.ai) — Mountain View, CA | Principal Research Scientist, Autonomous Driving / Team Lead **Feb 2018 – Mar 2019**

Technical lead for 20 engineers. Owned roadmap, resources and delivery for sensor fusion, navigation, perception, control and deployment on vehicle hardware.

- Led the team through implementation and vehicle testing on AutonomouStuff platforms.
- Architected loosely and tightly coupled GNSS-IMU fusion with map matching, and radar/LiDAR/camera fusion for perception.

SF Motors (SERES) — Sunnyvale, CA | Lead Research Scientist, Autonomous Driving **May 2017 – Feb 2018**

- Led sensor fusion, perception and localization development using IMU, camera, radar, LiDAR and map data; tested on prototype vehicles.
- Developed MPC-based lane-change and lane-following planning; selected and built simulation with CarMaker, CarSim and CARLA.
- Completed ISO 26262 functional-safety certification.

Carbon Robotics — San Francisco, CA | Director of Robotics and Algorithms **Jan 2017 – May 2017**

3 direct reports. Owned hiring, roadmap and cross-functional delivery.

- Led kinematics, dynamics, trajectory planning, control and vision development for an articulated industrial robot, modeled and simulated in ROS.

Startup Engagements — Palo Alto / San Jose, CA | Algorithm Lead **Apr 2016 – Jan 2017**

- **Nixie:** camera/IMU navigation and hover-stabilization filters for a quadcopter, deployed on flight hardware.
- **NextInput:** nonlinear force-touch correction algorithms, deployed on mobile hardware.

InvenSense — San Jose, CA | Principal Engineer and Director, Advanced Algorithms **Oct 2012 – Apr 2016**

4 direct reports. Owned hiring, performance, roadmap, staffing and delivery milestones.

- Led development of 6- and 9-axis fusion and calibration algorithms running in real time on IMU chips, shipped across multiple product lines.
- Led indoor-positioning development using particle filters, map matching, Wi-Fi/Bluetooth beacons and pedestrian dead reckoning.
- Built the team's patent portfolio in calibration, orientation prediction and low-power attitude generation; three issued as U.S. patents.

Apple — Cupertino, CA | Research Scientist / Motion Algorithms Lead **Nov 2010 – Jan 2012**

- Shipped the first production 9-axis Kalman-filter sensor fusion on iPhone, plus compass calibration and Core Motion / Core Location features.

EARLIER CAREER

Principal Algorithm Scientist, Sensor Platforms • Principal Research Scientist, NASA Ames Research Center • Robotics engineer, Hansen Medical (surgical catheter robot) • Spacecraft Engineer, Octant Technologies • Robotics Software Engineer, The Motion Factory • Principal Algorithm Engineer, Sensys Instruments / Therma-Wave • Simulation Group Leader, Integrated Systems

EDUCATION

- **Ph.D., Mechanical Engineering, University of California, Davis** — nonlinear systems, control, estimation, robot kinematics and dynamics, optimization; NIH-funded 6-DOF physical-therapy robot.
- **M.S., Mechanical Engineering, University of California, Davis**
- **B.S., Mechanical Engineering, Middle East Technical University**

ADVISORY, TEACHING & PROFESSIONAL ACTIVITIES

- Board of Advisors: TuringSense; Lumo Body Tech.
- Adjunct Professor, Santa Clara University: three-quarter graduate robotics sequence.
- 4 issued U.S. patents and 9 U.S. patent filings in sensor fusion, attitude estimation and calibration.
- Industrial Vice Chair, IFAC Symposium on Nonlinear Control Systems (NOLCOS 2016).
- Member: IEEE, ASME, Sigma Xi.