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 humanoid and mobile robots and autonomous vehicles reliable state estimation, sensor fusion, and control. 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 most recently led 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; and is an 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 **Sep 2024–Oct 2026**

Technical Lead, Mapping and Localization

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

- Led 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 ran daily on the commercial truck fleet.
- Introduced out-of-sequence measurement fusion for delayed sensor signals, improving localization accuracy.
- Set the validation strategy, using ROS/ROS 2 data pipelines to characterize fusion, localization, and map-matching performance.

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

President

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

E-Space — Los Gatos, CA **Aug 2022–Aug 2023**

Director, GNC Sensors & Actuators

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 its characterization and validation.
- Directed development of attitude-control and estimation algorithms and sensor bias and temperature calibration.

TDK InvenSense — San Jose, CA **Apr 2019–Aug 2022**

Director, Algorithms

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 the 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 **Feb 2018–Mar 2019**

Principal Research Scientist, Autonomous Driving / Team Lead

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 **May 2017–Feb 2018**

Lead Research Scientist, Autonomous Driving

- 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 using CarMaker, CarSim, and CARLA.
- Completed ISO 26262 functional-safety certification.

Carbon Robotics — San Francisco, CA **Jan 2017–May 2017**

Director of Robotics and Algorithms

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 **Apr 2016–Jan 2017**

Algorithm Lead

- 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 **Oct 2012–Apr 2016**

Principal Engineer and Director, Advanced Algorithms

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 **Nov 2010–Jan 2012**

Research Scientist / Motion Algorithms Lead

- Shipped the first production 9-axis Kalman-filter sensor fusion on iPhone, along with 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 (2014-2016); Lumo Body Tech (2015-2016).
- 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.