Tavis Shore

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AI & Computer Vision PhD researcher developing navigation systems for GNSS-denied environments using satellite imagery as a reliable positioning reference. I have built real-time ML pipelines in both academic and industry contexts and delivered policy research for governmental organisations. My work has been published at conferences including IROS & WACV, featured in national news and television, and presented globally from the USA to China with competitive grant funding.

Languages: Python (PyTorch, TensorFlow, NumPy, Scikit-learn, OpenCV, etc.), C, C++, SQL, R, JavaScript, MATLAB, Bash
ML/CV: CNNs, Transformers, GNNs, RNNs/LSTMs, LLMs/VLMs, YOLO, Object Detection, Segmentation, SLAM, OpenCV, ONNX
Tools: Docker, Git, AWS (EC2, S3, etc.), GCP, Linux, HPC, HTCondor, SLURM, OpenGL, Jupyter, Ray, DVC, Conda, ROS, CMake

Education

Ph.D. **University of Surrey**, AI & Computer Vision — Jul 2022 – Jul 2026

- Developed monocular localisation using CNNs, GNNs, and Transformers for GNSS-denied navigation.
- Published peer-reviewed research at premier computer vision and robotics conferences across UAE, USA, and China.
- Awarded PhD Foundership and prototype funding; completed ICURe & ConceptionX commercialisation programmes.
- Led F1Tenth autonomous racing team, deploying real-time ML models on NVIDIA Jetson for international competition.
- Taught engineering labs, mentoring students with writing/learning, & grading coursework.

M.Sc. **University of Surrey**, Data Science — Sept 2019 – Nov 2021

- Dissertation: ML ensemble to optimise LoRaWAN gateway positioning, published in AINTEC 2022.
- Core Modules: Machine Learning, Statistics, Computational Intelligence, Image Processing.

B.Eng. **University of York**, Electronic Engineering — Sept 2016 – Jul 2019

- Dissertation: Transmission line simulation tool recognised by BT as highly valuable for industrial use.
- Core modules: Calculus, Numerical Methods, Accounting, Digital Circuits, Digital Signal Processing.

Employment Experience

Locus Robotics — AI & Computer Vision Engineer (PhD Researcher) — Jun 2025 – Jan 2026

- Developed localisation solutions for 16,000+ autonomous robots across 300+ global sites.
- Extended COLMAP with 6-DoF pose priors and integrated ORB into Hloc for feature-sparse reconstruction (PRs pending).
- Deployed optimised edge AI models enabling real-time re-localisation and continuous autonomous operation.
- Curated and annotated 10k+ image dataset from production environments for model training and validation.

Vysion Technologies — Co-founder: AI & Electronics Engineer — Oct 2020 – Mar 2022

- Co-founded AIoT startup deploying ML for real-time water anomaly detection and predictive maintenance.
- Engineered full-stack IoT platform: PCB design, C++ embedded firmware, and AWS cloud infrastructure.
- Designed system architecture supporting 1000+ IoT sensors with real-time data aggregation and alerting.
- Reduced model inference time by 60% through quantisation and pruning while maintaining 95%+ accuracy.
- Raised £75k+ through angel investment, Innovate UK grants, and innovation competitions.

QinetiQ — Graduate Data Scientist — Sept 2020 – Apr 2021

- Built real-time object detection system processing 30+ FPS for item identification in controlled environments.
- Conducted AI policy research for government clients, delivering 4+ reports on data provenance and societal impacts.
- Performed stress testing and failure analysis across 1k+ test cases to identify and mitigate detection vulnerabilities.
- Guided research priorities and technical roadmap for data analytics team across multiple concurrent ML projects.

National Physical Laboratory — Software Engineer Intern — Jun – Sept 2018

- Developed embedded software for NPL-grade radiation thermometer providing temperature standards 1000-2750°C.
- Implemented real-time PID thermal control achieving <0.1% measurement uncertainty for high-temperature metrology.
- Contributed to precise optical instrument enabling traceable calibration for aerospace and materials industries.

Select Publications

VICI: VLM-Instructed Cross-view Image-localisation — *first author* — Jul 2025
A two-stage retrieval and VLM re-ranking approach for the UAVM 2025 Challenge, achieving 30.21% R@1 and 63.13% R@10 accuracy - becoming the latest benchmark state-of-the-art. UAVM 2025

PEnG: Pose-Enhanced Geo-Localisation — *first author — presented on TV* — Apr 2025
Combines cross-view geo-localisation with relative pose estimation to achieve sub-metre precision, reducing median localisation error by 96.90% to 22.77m through a two-stage approach that predicts city-scale graph edges then estimates precise position within them. RA-L 2025

SpaGBOL: Spatial-Graph-Based Orientated Localisation — *first author* — Mar 2025
Introduces graph-structured dataset and GNN architecture for cross-view geo-localisation, achieving 50% improvement in Top-1 retrieval accuracy through spatial connectivity modelling. WACV 2025

BEV-CV: Birds-Eye-View Transform for Cross-View Geo-Localisation — *first author* — Dec 2024
Transforms ground-level images into semantic Birds-Eye-View representations for cross-view geo-localisation, achieving 24% improved recall with 33% reduced computational cost. IROS 2024

Constrained Machine Learning for LoRa Gateway Location Optimisation — *first author* — Dec 2022
Proposes an ML ensemble combining clustering and neural networks to optimize LoRaWAN gateway placement, reducing device-to-gateway distances by up to 51% while improving RSSI by 3%. AINTEC 2022

Recent Projects & Grants

Financial Statement ML Parsing & Prediction — GitHub Project — Sept 2025 – Present
ML credit risk assessment analysing business financial health to support data-driven lending decisions. The goal is to optimise capital allocation by accurately predicting default risk and potential returns.

- ETL: SEC 10-K python ingestion via EDGAR $\rightarrow$ LLM parsing $\rightarrow$ structured data for 50+ firms.
- LSTM forecasting with domain-informed regularisation: identity loss, balance sheet constraints, and seasonality weighting for projection of revenue, margins, and cash flows etc.
- S&P rating prediction using XGBoost ranker on historical ratios, model-forecasted financials, and qualitative signals; SHAP explanations for transparency.

PhD Foundership Award — University of Surrey — Jul 2025

- Commercialisation support: £5k prototyping funding, patent searches, and market research.

ICURe Discover — InnovateUK SETSquared — Jun 2025

- £2.5k grant for market research - attended trade shows in Tokyo, Paris, and London.

Project X: Cohort 8 — ConceptionX — Jan 2025

- UK's leading PhD deep-tech venture programme, 9-month commercialisation scheme.

Quantitative PhD Grant — G-Research — Oct 2024

- Grant supported international travel to present PhD's 2^{nd} paper in Arizona, USA.

Miscellaneous

Media Autonomous vehicles without GPS, *That'sTV* news interview regarding publication *PEnG*

Memberships 2025–present: Member of Royal Institute of Navigation (RIN)
2020–present: Member of Institute of Electrical and Electronics Engineers (IEEE)
2016–present: Member of Institute of Engineering and Technology (IET)

University IEEE Student Branch - Founding Member, *Vice-President*
Dissertation supervising. Topics include: Gaussian Splatting, SLAM, Navigation, & Semantic Segmentation
Student Panel Member in Academic Quality Services for MSc Courses

Certificates Bloomberg Market Concepts (BMC)

Reviewer Conference on Computer Vision and Pattern Recognition (CVPR), IEEE International Conference on Computer Vision (ICCV), IEEE International Conference on Robotics and Automation (ICRA)

Languages English (Native), Mandarin (Beginner)