

ARMAN NEYESTANI, Ph.D.

COMPUTER VISION & MACHINE LEARNING RESEARCH ENGINEER

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PROFESSIONAL PROFILE

Computer Vision and Machine Learning researcher/engineer working at the intersection of visual AI, geometric vision, measurement science and digital twins. Experience spans vision-based structural monitoring, UAV/UUV localization, monocular VO/VIO, sensor fusion, 6-DoF tracking, object detection and segmentation, metric learning, underwater vision, photogrammetry and time-series modeling. A distinctive strength is treating computer-vision output as an engineering measurement - with calibration, reference validation, uncertainty, repeatability, robustness and failure analysis - rather than only as a model prediction.

CORE EXPERTISE

Computer Vision & Deep Learning: Detection, segmentation, classification, tracking, metric learning, image/video processing, data curation, augmentation and model evaluation.

Geometric & 3D Vision: Camera calibration, lens distortion, homography, projective geometry, PnP, 6-DoF pose estimation, essential matrix, photogrammetry and image-to-world mapping.

Localization & Robotics: Monocular visual odometry, visual-inertial odometry, GNSS-denied localization, RANSAC, trajectory validation and camera/LiDAR/IMU/altimeter sensor fusion.

Measurement & Metrology: Measurement uncertainty, sensitivity analysis, Monte Carlo methods, repeatability, reference-system validation, ground truth and calibration error analysis.

Structural & Marine Monitoring: Vision-based displacement/deformation measurement, crack detection/verification, marker-based tracking, underwater VO, marine environmental modeling and digital twins.

PROFESSIONAL & RESEARCH EXPERIENCE

Research Fellow - Computer Vision for Structural Health Monitoring | Nov 2025 - Present

CeSMA, University of Naples Federico II | Naples, Italy

- Develop non-contact vision-based measurement pipelines for structural displacement and deformation using video tracking, camera calibration, geometric conversion, filtering, temporal alignment and reference-sensor validation.
- Investigate propagation of lens distortion, viewpoint, blur, occlusion, lighting, scale assumptions, synchronization and tracking quality into physical measurements and confidence bounds.
- Build repeatable Python/OpenCV workflows for laboratory and field measurement, visual QA, experiment comparison and uncertainty-aware interpretation.

Doctoral Researcher / Research Fellow - Computer Vision for Measurement | Jan 2022 - Oct 2025

LESIM Laboratory, University of Sannio | Benevento, Italy

- Conducted research on computer vision for measurement and digital twins across structural monitoring, UAV/UUV localization, underwater vision, marker-based tracking and marine environmental sensing.
- Developed monocular VO/VIO pipelines, uncertainty and sensitivity studies, UAV crack detection/segmentation, triplet-loss crack verification and low-cost ArUco/DeepTag 6-DoF tracking systems.
- Research included civil-structure monitoring and digital-twin reconstruction within externally sponsored and NATO-supported activity.

Visiting Researcher - Underwater Vision & Visual Odometry | Apr 2024 - Nov 2024

Universitat Politècnica de Catalunya (UPC), OBSEA Lab | Vilanova i la Geltrú, Spain

- Developed the calibrated SUBVO underwater dataset and evaluated preprocessing, feature extraction/matching, essential-matrix estimation, RANSAC, pose recovery and trajectory validation under challenging underwater imaging conditions.

Computer Vision Specialist | 2020 - 2022

Independent Projects

- Built applied CV/ML prototypes in image-based measurement, HMI, driver monitoring, medical-image classification, pose/landmark processing and autonomous-driving simulation.

AI Specialist - Photogrammetry & Image Processing | 2015 - 2019

ArshinKooH Co.

- Applied photogrammetry, feature extraction, geometric analysis and image-based measurement in engineering workflows.

EDUCATION

Ph.D. in Information Technology for Engineering | 2022 - 2025

University of Sannio | Benevento, Italy

- Dissertation: "Measurement and Sensor Information Processing for Digital Twins."
- Research scope: vision-based structural monitoring; monocular VO/VIO; UAV/UUV visual localization; measurement uncertainty; marker-based tracking; crack detection/verification; underwater vision; marine digital twins.

M.Sc. in Mechatronics Engineering - Human-Machine Interaction | 2018

Islamic Azad University

- Thesis: facial expression identification using deep convolutional neural networks and transfer learning (GoogleNet-based).

B.Sc. in Robotic Engineering | 2014

Islamic Azad University

SELECTED RESEARCH & ENGINEERING PROJECTS

Vision-Based Displacement & Deformation Measurement for Structural Health Monitoring | Current - CeSMA

- Non-contact structural motion measurement using camera setup/calibration, target or feature tracking, filtering, temporal alignment, coordinate conversion and synchronized reference comparison.
- Focuses on measurement uncertainty caused by geometry, distortion, blur, occlusion, illumination, synchronization, scale, viewpoint and tracking degradation.

Low-Cost Vision-Based Dynamic Structural Testing | Structural dynamics / vibration measurement

- Synchronized video and accelerometer reference sensing for free-decay and steady-state tests; compares vision-derived dynamics with conventional contact measurements.

DeepTag / ArUco 6-DoF Tracking for 3D-Scaled Masonry Models | Geometric vision / SHM

- Implemented marker detection, homography-based ROI rectification, camera calibration and PnP-based 6-DoF pose estimation for structural monitoring.
- Validated against a 6-DoF motorized reference system; published DeepTag characterization reported maximum expanded orientation uncertainty of about 0.29° and maximum segment-distance IQR of about 0.12 mm.

UAV-Based Concrete Crack Detection & Segmentation | Deep learning / civil infrastructure

- Prepared and curated annotated infrastructure imagery and YOLO-based transfer-learning workflows; evaluated model-size, compute and field-variability trade-offs for automated inspection.

Triplet-Loss Concrete Crack Verification | Metric learning / SHM

- Built a Siamese verification system with a ResNet-101 feature extractor and triplet loss; prepared anchor/positive/negative workflows and reproducible evaluation.
- Published benchmark reported 97.36% accuracy and 95.77% precision; positive samples were transformed versions of anchors, so results are interpreted as image-verification rather than longitudinal field tracking.

SUBVO - Submerged Monocular Visual Odometry Dataset | Underwater vision / VO

- Captured 220 sequential 1280×720 images along a measured 5.8 m underwater path with camera calibration and frame-aligned positional ground truth.
- Compared AKAZE, ORB, SIFT, BRISK, KAZE and FAST; best reported trajectory RMSE was about 0.0704 m with AKAZE after underwater preprocessing and GA-based RANSAC threshold tuning.
- Received 3rd Place in the IEEE I2MTC 2025 Student Best Paper Award.

Visual-Inertial Odometry Sensitivity Analysis for UAV | UAV navigation / sensor fusion

- Modeled uncertainty from camera, LiDAR, IMU and altitude/range information and applied Monte Carlo analysis to study how sensing, environmental and algorithmic choices affect pose-estimation reliability.

Measurement-Uncertainty Model for Monocular UAV Visual Localization | Metrology / visual localization

- Developed a GUM-oriented uncertainty model for monocular VO-based UAV localization and compared feature-detection alternatives in a simulated GNSS-denied scenario.

ADDITIONAL ENGINEERING & AI PROJECTS

Significant Wave Height Forecasting for Marine Digital Twins | Time-series ML / environmental sensing

- Developed multivariate GRU forecasting with TensorFlow/Keras; published Tarragona evaluation reported MAE 0.0955 m, RMSE 0.208 m and Pearson $r = 0.9354$, with additional evaluation on Barcelona and EMSO-OBSEA data.

Blue Crab Segmentation & Metric Dimension Estimation | Marine CV / 3D measurement

- Fine-tuned YOLO segmentation and used aligned depth, camera intrinsics, back-projection and PCA/SVD axes for metric object-extent estimation; repository explicitly separates demonstration dimensions from metrologically validated accuracy.

MAR Rover - Vision-Guided Precision Agriculture | Applied CV / robotics

- Developed outdoor semantic segmentation for plant, sky, soil and trunk classes and derived image-space crop-row guidance cues for an amphibious rover developed with SeTeL.

Solar-Powered Sensor-Based System for Tree Health Monitoring | Edge AI / IoT

- Raspberry Pi-based concept integrating environmental and tree-health sensors, RGB imaging with AI-assisted processing, weather/air-quality sensing, wildlife/motion monitoring and fire detection; awarded 3rd Place in the IEEE I&M Society Student Contest 2025.

TryOnAI | AI product / full-stack prototype

- Built a user-facing virtual try-on web product with image inputs, AI generation, authentication, usage limits, payment integration and serverless web workflows.

TECHNICAL SKILLS

Programming: Python (strong); C++ (familiar); OOP; scripting; reproducible research code; AI-assisted coding and prototyping.

Computer Vision: OpenCV; detection; segmentation; classification; tracking; feature detection/description; matching; registration; motion estimation; pattern recognition.

Deep Learning: PyTorch; TensorFlow/Keras; YOLO family; CNNs; Siamese networks; triplet loss; ResNet; transfer learning; GRU/LSTM; model evaluation.

Geometry / 3D: Intrinsics/extrinsics; chessboard calibration; distortion; homography; PnP; 6-DoF pose; essential matrix; pose recovery; photogrammetry; depth back-projection.

VO / VIO / Sensor Fusion: Monocular VO; VIO; GNSS-denied localization; RANSAC; scale ambiguity; trajectory validation; camera/LiDAR/IMU/altimeter fusion.

Measurement Science: Uncertainty and sensitivity analysis; Monte Carlo methods; repeatability; expanded uncertainty; calibration; ground truth; reference comparison and error budgets.

Scientific Python & Data: NumPy; Pandas; SciPy; scikit-learn; Matplotlib; dataset design/curation; augmentation; metrics; time-series analysis; reproducibility.

Edge & Systems: NVIDIA Jetson; Raspberry Pi; Linux; Git/GitHub; edge-aware compute trade-offs and limited-compute prototyping.

AWARDS & HONORS

- 3rd Place - Student Best Paper Award, IEEE I2MTC 2025, for "SUBVO Dataset: Analyzing Feature Extraction for Underwater Monocular Visual Odometry."
- 3rd Place - IEEE Instrumentation & Measurement Society Student Contest 2025, for "Solar-Powered Sensor-Based System for Tree Health Monitoring."
- 1st Place - Young Researchers Program, IEEE MetroXRaine 2024, Classification Accuracy Performance category, St Albans, UK.

ACADEMIC SERVICE & PROFESSIONAL ACTIVITIES

- Special Session Convener / Organizer - IMEKO World Congress 2027, Special Session 16: "Data-Driven Models for Vision-Based Measurement Systems," with Mauro D'Arco and Ihsane Gryech.
- Session Chair - IEEE MetroLivEnv 2026, University of Cambridge, Session #01: "Metrology for Sustained Quality of Life (I)."
- Presenter and participant at international IEEE and IMEKO conferences in instrumentation, measurement, AI, living environments, marine sensing and digital transformation.
- Experience preparing research proposals and concept notes on trustworthy and uncertainty-aware visual AI for structural health monitoring and digital twins.

LANGUAGES

English - C1 (professional / academic) | **Persian** - Native | **Italian** - Working proficiency

SELECTED & PEER-REVIEWED PUBLICATIONS

1. Neyestani, A.; Picariello, F.; Tudosa, I.; Monaco, M.; De Vito, L.; D'Arco, M. *Vision-Based Displacement Measurement for Structural Health Monitoring: A Metrology-Oriented Review of Uncertainty Quantification*. Buildings 16(13), 2659 (2026). [Link](#)
2. Ahmed, I.; Balestrieri, E.; Neyestani, A.; Picariello, F.; Rapuano, S. *Image Segmentation Techniques for Morphometric Measurement of Fish Blood Cells: A Comparative Study*. Measurement: Sensors 38, 101654 (2025).
3. Neyestani, A.; Picariello, F.; Ahmed, I.; Daponte, P.; De Vito, L. *From Pixels to Precision: A Survey of Monocular Visual Odometry in Digital Twin Applications*. Sensors 24(4), 1274 (2024). [Link](#)
4. Picariello, F.; Monaco, M.; Neyestani, A. *A Low-Cost Vision-Based Monitoring System for Dynamic Testing of a Cantilever Beam*. IEEE MetroSustainability, 2025.
5. De Vito, L.; Neyestani, A.; Picariello, F.; Rapuano, S.; Tudosa, I. *Sensitivity Analysis of a Visual Inertial Odometry-Based Navigation System for UAV*. IEEE I2MTC, 2025.
6. Neyestani, A.; Picariello, F.; Toma, D. M.; Falahzadeh, A.; Daponte, P.; del Río Fernandez, J.; De Vito, L. *SUBVO Dataset: Analyzing Feature Extraction for Underwater Monocular Visual Odometry*. IEEE I2MTC, 2025.
7. Neyestani, A.; Tudosa, I.; De Vito, L.; Khalesi, F.; Rapuano, S. *Quantum Communications for Distributed Measurement Systems: Current Situation and Research Trends*. IMEKO TC-6 M4DConf, 2025.
8. Khalesi, F.; Tudosa, I.; Picariello, F.; Neyestani, A.; Rapuano, S. *Quantum Channel Characterization in QKD: A Metrological Perspective*. IMEKO TC-6 M4DConf, 2025.
9. Neyestani, A.; Picariello, F.; Tudosa, I.; Daponte, P.; De Vito, L. *Triplet Loss-Based Concrete Crack Verification for Structural Health Monitoring and Digital Twin Applications*. IEEE MetroXRaine, 2024, pp. 837-842.
10. Neyestani, A.; Toma, D. M.; Falahzadeh, A.; Daponte, P.; del Río, J.; De Vito, L. *A Significant Wave Height Data-Driven Modeling for Digital Twins of Marine Environment*. IEEE MetroSea, 2024.
11. Daponte, P.; De Vito, L.; Tudosa, I.; Neyestani, A.; Picariello, F. *Development and Evaluation of a Novel Marker-Based Tracking System for 3D-Scaled Masonry Models Using DeepTag*. XXXIII International Scientific Conference Electronics (ET), 2024.
12. Daponte, P.; De Vito, L.; Iannuzzo, A.; Monaco, M.; Neyestani, A.; Picariello, F. *Low-Cost Marked Tracking Monitoring System for 3D-Scaled Masonry Models*. IEEE MetroLivEnv, 2024, pp. 172-177.
13. Daponte, P.; De Vito, L.; Neyestani, A.; Picariello, F.; Tudosa, I. *Measurement Uncertainty Model for Relative Visual Localization of UAV by a Monocular Camera*. IEEE TechDefense, 2023.
14. Neyestani, A.; Ahmed, I.; Daponte, P.; De Vito, L. *Concrete Crack Detection and Segmentation in Civil Infrastructures Using UAVs and Deep Learning*. 7th International Conference on Internet of Things and Applications (IoT), 2023, pp. 1-6.
15. Neyestani, A.; Picariello, F.; Basiri, A.; Daponte, P.; De Vito, L. *Survey and Research Challenges in Monocular Visual Odometry*. IEEE MetroLivEnv, 2023.

Preprint: Basiri, A.; Mariani, V.; Neyestani, A.; Glielmo, L. *Improving Visual SLAM by Combining SVO and ORB-SLAM2 with a Complimentary Filter to Enhance Indoor Mini-Drone Localization Under Varying Conditions*. Preprints.org (2022), Version 1; non-peer-reviewed.

REPOSITORIES & PROFESSIONAL LINKS

GitHub: github.com/A8neyestani

Google Scholar: scholar.google.com/citations?user=JxJSu5UAAAAJ&hl=en

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LinkedIn: www.linkedin.com/in/a8neyestani/

IMEKO 2027 Special Session: imeko2027.org/special-sessions/special-session-16/