Marco Legittimo, Ph.D.

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Journal Articles

JFR 2023 — **Marco Legittimo**, Simone Felicioni, Fabio Bagni, Andrea Tagliavini, Alberto Dionigi, Francesco Gatti, Micaela Verucchi, Gabriele Costante, and Marko Bertogna. **A benchmark analysis of data-driven and geometric approaches for robot ego-motion estimation.** In *Journal of Field Robotics, volume 40, pages 626–654, 2023.*

Sensors 2023 — Giuseppe Mollica, **Marco Legittimo**, Alberto Dionigi, Gabriele Costante, and Paolo Valigi. **Integrating Sparse Learning-Based Feature Detectors into Simultaneous Localization and Mapping—A Benchmark Study.** In *Sensors, volume 23, 2023*.

Tr.ITS 2023 — Giuseppe Mollica, Simone Felicioni, **Marco Legittimo**, Leonardo Meli, Gabriele Costante, and Paolo Valigi. **MA-VIED: A Multisensor Automotive Visual Inertial Event Dataset.** In *Trans. Intell. Transport. Sys. 25, 1, 214–224*.

In Conference Proceedings

IROS 2024 — **Marco Legittimo**, Francesco Crocetti, Mario Luca Fravolini, Giuseppe Mollica, and Gabriele Costante. **LF^{2}SLAM: Learning-based Features For visual SLAM.** In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) [Accepted]. IEEE, 2024*

ICRA 2023 — Raffaele Brilli, **Marco Legittimo**, Francesco Crocetti, Mirko Leomanni, Mario Luca Fravolini, and Gabriele Costante. **Monocular Reactive Collision Avoidance for MAV Teleoperation with Deep Reinforcement Learning.** In *2023 IEEE International Conference on Robotics and Automation (ICRA).*

ICAR 2021 — Simone Felicioni, **Marco Legittimo**, Mario Luca Fravolini, and Gabriele Costante. **GOLN: Graph Object-based Localization Network.** In *2021 20th International Conference on Advanced Robotics (ICAR).*

Work Experience

CeDiPa — **Postdoctoral Research Grant entitled:** Perugia (IT) | August 2024 — Now
"**Algorithms, models, and systems for digitization, exploitation, enhancement, and maintenance of artistic, cultural and environmental heritage.**" | PyTorch, Python.
Conducting research and developing objects novel view synthesis through Neural Radiance Fields (NeRF) techniques.

University of Perugia — **PhD Research Grant entitled:** Perugia (IT) | September 2022 — July 2024
"**Visual odometry and obstacle avoidance approaches based on geometric and deep learning techniques for localization and navigation of MAV-class drones in unstructured environments.**" | PyTorch, Stable-Baseline3, Python.
A model was proposed that jointly avoids obstacles and follows a defined trajectory operating autonomously in never-seen environments during the training phase. Related results demonstrated the robustness of this approach.

University of Perugia — **PhD Research Grant entitled:** Perugia (IT) | July 2021 — June 2022
"**Development and testing of algorithms for localization, SLAM, and navigation of mobile robots: application in agricultural and urban contexts.**" | PyTorch, Python, C++, Docker.
A model that performs the VO/SLAM task has been presented by leveraging the generalization capabilities of a deep learning feature extractor. It outperforms SotA SLAM approaches in challenging environments.

University of Perugia — **Scholarship holder entitled:** Perugia (IT) | September 2020 — June 2021
"**Machine Learning tools and techniques for characterizing models for precision agriculture.**" | Bash, Docker, C++.
Benchmarking VO/VSLAM models (both geometric and data-driven) through extensive hyperparameters and scenario exploration.

Education

Doctor of Philosophy (PhD) — **University of Perugia** Perugia (IT) | November 2020 — April 2024
Computer Science & Engineering | Deep Learning, Computer Vision, Autonomous Navigation, Robotics. EQF level 8. Thesis: Exploring Deep Learning And Deep Reinforcement Learning For Pose Estimation And Collision Avoidance To Enhance Robot Navigation.

Master of Science (MSc) — **University of Perugia** Perugia (IT) | October 2017 — June 2020
Computer & Robotics Engineering | Thesis: A self-supervised approach for Visual Odometry estimation.

Bachelor of Science (BSc) — **University of Perugia** Perugia (IT) | October 2014 — October 2017
Computer & Electronic Engineering

Summer School Partecipation

IEEE RAS Summer School on Multi-Robot Systems Prague (CZ) | July 2022
International Computer Vision Summer School (ICVSS) Sicily (IT) | August 2023

Honours and Awards

Third prize (750€) Perugia (IT) | September 2020
Pegaso 2000 award for the best degree thesis related to computer engineering and digital technologies.

Research Topics

Deep Learning, Computer Vision, Deep Reinforcement Learning, Robotics, Visual Odometry, Simultaneous Localization And Mapping, 3D Reconstruction, and Exploration.

Languages

Italian (mother tongue), **English** (indepent user), **French** (basic user), **Sapnish** (basic user).

Programming Languages

Python — Expert (7 years), **Bash** — Proficient (3 years), **C++** — Familiar, **Java** — Familiar.