Marco Legittimo

Date of birth: 18/05/1995 | **Nationality:** Italian | **Gender:** Male | **Phone number:** (+39) 3497351459 (Mobile) | **Email address:** marcolegittimo@outlook.it |

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About me:
I have master degree in computer engineering with a particular interest in DeepLearning and Computer Vision.

WORK EXPERIENCE

01/09/2020 – 30/06/2021 Perugia, Italy
SCHOLARSHIP HOLDER UNIVERSITÀ DEGLI STUDI DI PERUGIA

Postgraduate scholarship winner entitled "Machine Learning tools and techniques for characterising models for precision agriculture"

01/07/2021 – 30/06/2022 Perugia, Italy
ACADEMIC RESEARCHER UNIVERSITÀ DEGLI STUDI DI PERUGIA

Research grant winner entitled "Development and testing of algorithms for localization, SLAM and navigation of mobile robots: application in agricultural and urban contexts"

01/09/2022 – 31/08/2024 Perugia, Italy
ACADEMIC RESEARCHER UNIVERSITÀ DEGLI STUDI DI PERUGIA

Research grant winner entitled "Visual odometry and obstacle avoidance approaches based on geometric and deep learning techniques for localization and navigation of MAV-class drones in unstructured environments"

EDUCATION AND TRAINING

20/10/2014 – 27/10/2017
BACHELOR'S DEGREE IN COMPUTER AND ELECTRONIC ENGINEERING Università degli Studi di Perugia

07/11/2017 – 08/06/2020
MASTER DEGREE IN COMPUTER AND ROBOTICS ENGINEERING Università degli Studi di Perugia

Level in EQF EQF level 7

29/07/2020 – CURRENT
QUALIFICATION TO PRACTICE AS AN ENGINEER, SECTION A

01/11/2020 – CURRENT
PHD STUDENT Università degli Studi di Perugia

Level in EQF EQF level 8

LANGUAGE SKILLS

Mother tongue(s): **ITALIAN**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C1	C1	B2	B2	B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

ADDITIONAL INFORMATION

PUBLICATIONS

S. Felicioni, M. Legittimo, M. L. Fravolini and G. Costante, "GOLN: Graph Object-based Localization Network," 2021 20th International Conference on Advanced Robotics (ICAR), 2021

– 2021

In the last decades, robotic localization has been mainly addressed with Visual Odometry (VO) or Simultaneous Localization and Mapping (SLAM) approaches, which usually provide an accurate metric precision. Despite the impressive results, these approaches have some shortcomings such as the amount of memory they require and the lack of robustness in non-ideal environments. Inspired by the human capabilities, in this paper we present a novel framework, named Graph Object-based Localization Network (GOLN), to address the topological localization problem with a novel approach, characterized by low memory requirements and robustness with respect to appearance. GOLN is based on a topological map, i.e., a graph, which is fed to a Graph Network (GN) along with global visual features of the environment and returns the estimation of the position node where the robot is located. Experiments have been performed in Unreal Engine (UE4) environments with a simulated ground robot, equipped with a monocular camera

M. Legittimo, S. Felicioni, F. Bagni, A. Tagliavini, A. Dionigi, F. Gatti, M. Verucchi, G. Costante, M. Bertogna, "A benchmark analysis of data-driven and geometric approaches for robot ego-motion estimation"

– 2022

In the last decades, ego-motion estimation or visual odometry (VO) has received a considerable amount of attention from the robotic research community, mainly due to its central importance in achieving robust localization and, as a consequence, autonomy. Different solutions have been explored, leading to a wide variety of approaches, mostly grounded on geometric methodologies and, more recently, on data-driven paradigms. To guide researchers and practitioners in choosing the best VO method, different benchmark studies have been published. However, the majority of them compare only a small subset of the most popular approaches and, usually, on specific data sets or configurations. In contrast, in this work, we aim to provide a complete and thorough study of the most popular and best-performing geometric and data-driven solutions for VO. In our investigation, we considered several scenarios and environments, comparing the estimation accuracies and the role of the hyper-parameters of the approaches selected, and analyzing the computational resources they require. Experiments and tests are performed on different data sets (both publicly available and self-collected) and two different computational boards. The experimental results show pros and cons of the tested approaches under different perspectives. The geometric simultaneous localization and mapping methods are confirmed to be the best performing, while data-driven approaches show robustness with respect to nonideal conditions present in more challenging scenarios.

HONOURS AND AWARDS

28/09/2020

Third prize for the "Pegaso 2000 award for the best degree theses related to computer engineering and digital technologies". – Pegaso 2000

MASTER DEGREE THESIS

Study and Implementation of Visual Odometry Techniques using approaches based on Recurrent Convolutional Neural Networks for Autonomous Robotics Applications

In this thesis, a neural network was designed to allow a system to locate itself in space. It was trained using a *self-supervised* approach, thus overcoming the problem of excessive and expensive use of IMU/GPS sensors.

INTERNSHIP

Internship at the University of Perugia

The training was divided into two projects: 'Improvement of Images Subjected to Random Light Changes Using a Neural Network' and 'Study of Visual Odometry Techniques Based on Recurrent Convolutional Networks for Autonomous Robotics Applications'.