Gabriele Costante

Curriculum Vitae

Education

November, 2012–18 February, 2016	**PhD in Information Engineering**, *The University of Perugia*, Department of Electrical and Information Engineering (DI), Perugia, Italy.
November, 2010–18 July, 2012	**Masters Degree in Information and Automation Engineering**, *The University of Perugia*, Department of Electrical and Information Engineering (DI), Perugia, Italy, *Mark: 110/110 cum laude*.
October, 2007–4 November, 2010	**Bachelor Degree in Information and Electronic Engineering**, *The University of Perugia*, Department of Electrical and Information Engineering (DI), Perugia, Italy, *Mark: 110/110 cum laude*.
1 September, 2002–November, 2007	**Scientific High School Certificate**, *Mark: 100/100*.

PhD Thesis

Title	*Perception for Robot Navigation: from Visual Learning to Active Vision*
Supervisors	Professor Paolo Valigi
Description	One of the key element to enhance autonomous perception is visual learning: a robot should be able to build its own representation structures to understand the world, combining past experiences or shared knowledge (*e.g.* , that comes from other systems) and model learning to generalize visual concepts, *e.g.* , objects, gesture and place categories or motion transformations. However, passive perception is not enough to guarantee robustness and long term operations. The robot needs to actively select *where to look at* and *what to perceive*. In this thesis, we propose a set of novel frameworks for robot visual navigation that exploit the learning and the active paradigms.

Masters Thesis

Title *Online Learning Techniques for Semantic Robot Localization*

Supervisors Professor Paolo Valigi & PhD Elisa Ricci

Description This thesis introduces a novel algorithm for improving loop closures detection performance by adopting a set of visual words weights, learned offline accordingly to a discriminative criterion. The proposed weights learning approach, based on the large margin paradigm, can be used for generic similarity functions and relies on an efficient online leaning algorithm in the training phase. Our experiments, conducted on publicly available datasets, demonstrate that the discriminative weights lead to loop closures detection results that are more accurate than the traditional Bag-of-Words method and that our place recognition approach is competitive with state-of-the-art methods.

Bachelor Thesis

Title *Development and Implementation of algorithms for EKF-based SLAM*

Supervisors Professor Paolo Valigi & PhD Student Thomas Ciarfuglia

Description In this work we focus on the development and the implementation of EKF-based SLAM algorithms for robotic platforms equipped with laser range sensors and wheel encoders. The experimental set shows that the provided algorithm can effectively run in real time applications, providing reliable robot pose estimate.

Experience

November, 2019–Present
Assistant Professor, DEPARTMENT OF ENGINEERING, Perugia (PG), Italy.
- ○ *Type of employment:* Assistant Professor
- ○ *Main activities and responsibilities:* Research activities on Robotics, Computer Vision and Machine Learning, Teaching activities, Supervision of research fellows and Ph.D. students.

February, 2017–Present
Lecturer in Computer Vision, DEPARTMENT OF ENGINEERING, Perugia (PG), Italy.
- ○ *Type of employment:* Teacher of the Computer Vision course within the master's degree course in Computer Engineering and Robotics, academic years 2017/2018, 2018/2019 and 2019/2020.
- ○ *Main activities and responsibilities:* Teaching activities including frontal lessons, management of examinations related to the course and support for students in preparing the exam

February, 2017–Present
Supervisor of Master's Degree Thesis, DEPARTMENT OF ENGINEERING, Perugia (PG), Italy.
- ○ *Type of employment:* Supervisor of 5 master theses in Computer Engineering and Robotics.
- ○ *Main activities and responsibilities:* Support and supervision of thesis activities

January, 2019– November, 2019	**Research fellow**, Department of Engineering, Perugia (PG), Italy.
	○ *Type of employment:* Research fellow in the project: Machine learning strategies applied to robotics and automation
	○ *Main activities and responsibilities:* Research activities on Robotics, Machine Learning, Computer Vision and Control Theory. Management and supervision of thesis and internship activities Management and supervision of research projects with companies on Robotics, Machine Learning, Computer Vision and Control Theory
November, 2015–Present	**Management and coordination of research and development projects**, Department of Engineering, Perugia (PG), Italy.
	○ *Main activities and responsibilities:* Management, coordination and implementation of research and development projects in collaboration with companies and research institutions.
November, 2018–Present	**Management and coordination of research and development projects**, Department of Engineering, Perugia (PG), Italy.
	○ *Main activities and responsibilities:* Management, coordination and implementation of work packages in the European project E-Brake "Design, Manufacturing and Qualification up to TRL5 of Innovative Electro-Mechanical BRAKE actuation System for SAT Application". The project is funded within the Clean Sky 2 Joint Undertaking (CS2JU) by the European Union. Project number: 821079.
September, 2016–Present	**Co-Founder at Weedea s.r.l.**, Weedea s.r.l., via Mario Donati Guerrieri 16, 06132, Perugia (PG), Italy.
	○ *Type of employment:* Co-founder
	○ *Main activities and responsibilities:* Promotion of corporate activities. Management and supervision og Machine Learning projects. Development of algorithms for big data analysis.
06/06/2019	**Teaching**, Sistemi Formativi Confindustria Umbria (SFCU).
	○ *Type of employment:* Teaching
	○ *Main activities and responsibilities:* Teaching in the module Big Data Management & Machine Learning within the course Digital Transformation Manager
December 2015– 14 December 2018	**Research Fellow**, Department of Engineering, Perugia (PG), Italy.
	○ *Type of employment:* Research fellow in the project: Development of transfer learning and domain adaptation methodologies for intelligent systems in domotic applications.
	○ *Main activities and responsibilities:* Research activities on Robotics, Machine Learning, Computer Vision and Control Theory. Management and supervision of thesis and internship activities Management and supervision of research projects with companies on Robotics, Machine Learning, Computer Vision and Control Theory
December 2015– December 2017	**Management and coordination of research and development projects**, Department of Engineering, Perugia (PG), Italy.
	○ *Main activities and responsibilities:* Management, coordination and implementation of work packages in the project SMART SEAL Smart domotics for safe and Energy-aware Assisted Living. Project funded by MIUR.
06/06/2019	**Teaching**, Department of Engineering, Perugia (PG), Italy.
	○ *Type of employment:* Teaching
	○ *Main activities and responsibilities:* Invited lecturer for the workshop Computer vision for robotic and UAV applications within the international PhD school IEEE Advanced course for graduated students and industrial research

06/06/2019	**Research Internship**, Robotics and Perception Group, University of Zurich, Zurich, Switzerland.
	○ *Main activities and responsibilities:* research activities on vision-based navigation for MAVs.
November 2012– February 2016	**PhD student**, Department of Engineering, Perugia (PG), Italy.
	○ *Main activities and responsibilities:* Research activities on Robotics, Machine Learning, Computer Vision and Control Theory. Management of thesis and internship activities

Reviewer for conferences and journals

Reviewer for the following conferences: IEEE International Conference on Robotics and Automation (ICRA), IEEE International Conference on Intelligent Robots and Systems (IROS)

Reviewer for the following journals: IEEE Robotics and Automation Letters, Autonomous Robot, Robotics and Autonomous System, Journal on Intelligent Service Robotics, Engineering Applications of Artificial Intelligence, Computer & Graphics, IEEE Sensors

14 February, 2020 - Present	Associate Editor of the IEEE Robotics and Automation Letters (IEEE RA-L)

Awards

28 February, 2020	2020 Robotics Travel Award for the research activity – Awarded by the journal Robotics - MDPI
01 November, 2018	Outstanding Reviewer Award, awarded by the journal Elsevier, Robotics and Autonomous Systems
May, 2016	Best vision paper award – Finalist for the paper entitled "Exploring Representation Learning With CNNs for Frame-to-Frame EgoMotion Estimation" within the IEEE Internation Conference on Robotics And Automation (ICRA) 2016
27 November, 2012	Best Graduate Student in Engineering, University of Perugia, Italy

Publications

Conferences

2021	**Tire-road friction estimation and uncertainty assessment to improve electric aircraft braking system**, *Crocetti, F.; Costante, G.; Fravolini, M. L.; Valigi, P.*, IEEE 28th Mediterranean Conference on Control and Automation (MED), 2021.
2021	**A Robust Data-Driven Fault Diagnosis scheme based on Recursive Dempster–Shafer Combination Rule**, *Cartocci, N.; Napolitano, M.R.; Costante, G.; Crocetti, F.; Valigi, P.; Fravolini, M. L.*, IEEE 28th Mediterranean Conference on Control and Automation (MED), 2021.

2020 **A Data-Driven Slip Estimation Approach for Effective Braking Control under Varying Road Conditions.**, *Crocetti, F.; Costante, G.; Fravolini, M. L.; Valigi, P.*, IEEE 28th Mediterranean Conference on Control and Automation (MED), 2020.

2020 **PCA Methods and Evidence Based Filtering for Robust Aircraft Sensor Fault Diagnosis.** , *Cartocci, N.; Costante, G.; Napolitano, M. R.; Valigi, P.; Crocetti, F.; Fravolini, M. L.*, IEEE 28th Mediterranean Conference on Control and Automation (MED), 2020.

2019 **Experimental Prediction Intervals for Monitoring Wind Turbines: an Ensemble Approach**, *Cascianelli, S.; Astolfi, D.; Costante, G.; Castellani, F.; Fravolini, M.L.*, IEEE International Conference on Control, Automation and Diagnosis (ICCAD), 2019.

2019 **Data-Based Desing of Robust Fault Isolation Residuals Using LASSO Optimization**, *Cascianelli, S.; Crocetti, F.; Costante, G.; Valigi, P; Fravolini, M.L.*, IEEE International Conference on Control, Automation and Diagnosis (ICCAD), 2019.

2018 **Visual Localization in the Presence of Appearance Changes Using the Partial Order Kernel**, *Abdollahyan, M., Cascianelli, S.; Bellocchio, E.; Costante, G.; Ciarfuglia, T.A.; Bianconi, F.; Smeraldi, F; Fravolini, M.L.*, IEEE 26th European Signal Processing Conference (EUSIPCO), 2018.

2016 **Fast robust monocular depth estimation for Obstacle Detection with fully convolutional networks**, *Mancini, M.; Costante, G.; Valigi, P.; Ciarfuglia, T.A.*, IEEE/RSJ International Conference on Intelligent Robotcs and Systems, 2016.

2016 **SmartSEAL: A ROS based home automation framework for heterogeneous devices interconnection in smart buildings**, *Bellocchio, E.; Costante, G.; Cascianelli, S.; Valigi, P.; Ciarfuglia, T.A.*, IEEE International Conference Smart Cities Conference, 2016.

2016 **A robust semi-semantic approach for visual localization in urban environment**, *Cascianelli, S.; Costante, G.; Bellocchio, E.; Valigi, P; Fravolini, M.L.; Ciarfuglia, T.A.*, IEEE International Conference Smart Cities Conference, 2016.

2016 **Exploring Representation Learning With CNNs for Frame-to-Frame Ego-Motion Estimation**, *Costante, G.; Mancini, M.; Valigi, P; Ciarfuglia, T.A.*, IEEE International Conference on Robotics and Automation, 2016, Best Vision Paper Finalist.

2014 **Personalizing Vision-based Gestural Interfaces for HRI with UAVs: a Transfer Learning Approach**, *Gabriele Costante, Enrico Bellocchio, Paolo Valigi and Elisa Ricci*, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Chicago, U.S.A..

2014 **Personalizing a Smartwatch-based Gesture Interface with Transfer Learning**, *Gabriele Costante, Lorenzo Porzi, Oswald Lanz, Paolo Valigi, Elisa Ricci*, European Signal Processing Conference (EUSIPCO), Lisbon, Portugal.

2014 **Exploiting transfer learning for personalized view invariant gesture recognition**, *Gabriele Costante, Valerio Galieni, Yan Yan, Mario Luca Fravolini, Elisa Ricci, Paolo Valigi*, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Florence, Italy.

2013 **Transfer Learning for Visual Place Classification**, *Costante, G.; Ciarfuglia, T.A.; Valigi, P. and Ricci, E.*, RSS Workshop on Robots in Clutter: Preparing robots for the real world. 2013.

2013 **A transfer learning approach for multi-cue semantic place recognition**, *Costante, G.; Ciarfuglia, T.A; Valigi, P.; Ricci, E.*, Intelligent Robots and Systems (IROS), 2013.

2012 **A discriminative approach for appearance based loop closing**, *Ciarfuglia, T.A; Costante, G.; Valigi, P.; Ricci, E.*, Intelligent Robots and Systems (IROS), 2012.

Journals

2021 **Enhancing continuous control of mobile robots for end-to-end visual active tracking**, *Devo, A.; Dionigi, A.; Costante, G.*, Robotics and Autonomous Systems, 2021.

2021 **A Comprehensive Case Study of Data-Driven Methods for Robust Aircraft Sensor Fault Isolation**, *Cartocci, N.; Napolitano, M. R.; Costante, G.; Fravolini, M. L.*, Sensors, 2021.

2021 **Data-based design of robust fault detection and isolation residuals via LASSO optimization and Bayesian filtering**, *Cascianelli, S.;Costante, G.; Crocetti, F; Ricci, E.; Valigi, P.; Fravolini, M. L.*, Asian Journal of Control, 2021.

2020 **Uncertainty Estimation for Data-Driven Visual Odometry**, *Costante, G.; Mancini, M.*, IEEE Transactions on Robotics, 2020.

2020 **Towards Generalization in Target-Driven Visual Navigation by Using Deep Reinforcement Learning**, *Devo, A.; Mezzetti, G.; Costante, G.; Fravolini, M. L.; Valigi, P.* , IEEE Transactions on Robotics, 2020.

2020 **Interval Prediction Models for Data-Driven Design of Aerial Vehicle's Robust Adaptive Controllers**, *Fravolini, M. L.; Costante, G.; Yucelen, T.; Napolitano, M. R.*, Journal of Guidance, Control, and Dynamics, 2020.

2020 **Combining domain adaptation and spatial consistency for unseen fruits counting: a quasi-unsupervised approach.**, *Bellocchio, E.; Costante, G.; Cascianelli, S.; Fravolini, M. L.; Valigi, P.*, IEEE Robotics and Automation Letters, 2020.

2020 **Deep Reinforcement Learning for Instruction Following Visual Navigation in 3D Maze-Like Environments**, *Devo, A.; Costante, G.; Valigi, P.* , IEEE Robotics and Automation Letters, 2020.

2019 **The Role of the Input in Natural Language Video Description**, *Cascianelli, S.; Costante, G.; Devo, A.; Ciarfuglia, T.A.; Valigi, P.; Fravolini, M.L.* , IEEE Transactions on Multimedia, 2019.

2019 **Weakly Supervised Fruit Counting for Yield Estimation using Spatial Consistency**, *Bellocchio, E.; Ciarfuglia, T. A.; Costante, G.; Valigi, P.* , IEEE Robotics and Automation Letters, 2019.

2018 **Ls-vo: Learning dense optical subspace for robust visual odometry estimation**, *Costante G., Ciarfuglia T. A.*, IEEE Robotics and Automation Letters, 2018.

2018	**J-MOD2: Joint Monocular Obstacle Detection and Depth Estimation**, *Mancini M., Costante G., Valigi P., Ciarfuglia T. A.*, IEEE Robotics and Automation Letters, 2018.
2018	**Full-GRU Natural Language Video Description for Service Robotics Applications**, *Cascianelli S., Costante G., Ciarfuglia T. A., Valigi P., Fravolini M. L.*, IEEE Robotics and Automation Letters, 2018.
2018	**Exploiting photometric information for planning under uncertainty**, *Costante G., Delmerico J., Werlberger M., Valigi P., Scaramuzza D.*, Robotics Research, 2018.
2017	**Towards Domain Independence for Learning-Based Monocular Depth Estimation**, *Mancini, M.; Costante, G.; Valigi, P.; Ciarfuglia, T.A.; Delmerico, J; Scaramuzza, D.*, IEEE Robotics and Automation Letters, 2017.
2016	**Exploring Representation Learning With CNNs for Frame-to-Frame Ego-Motion Estimation**, *Costante, G.; Mancini, M.; Valigi, P; Ciarfuglia, T.A.*, IEEE Robotics and Automation Letters, 2016.
2015	**Transferring knowledge across robots: A risk sensitive approach**, *Costante, G.; Ciarfuglia, T.A.; Valigi, P; Ricci, E.*, Robotics and Autonomous Systems, Elsevier, 2015.
2014	**Evaluation of Non-Geometric Methods for Visual Odometry**, *Ciarfuglia, T.A.; Costante, G.; Valigi, P; Ricci, E.*, Robotics and Autonomous Systems, Elsevier, 2014.

Summer School

14-20 July 2013	**International Computer Vision Summer School - ICVSS**, *Calabria, Italy*.
	The seventh edition of the International Computer Vision Summer School aims to provide both an objective and clear overview and an in-depth analysis of the state-of-the-art research in Computer Vision. The courses will be delivered by world renowned experts in the field, from both academia and industry, and will cover both theoretical and practical aspects of real Computer Vision problems as well as examples of their successful commercialization. The school aims to provide a stimulating opportunity for young researchers and Ph.D. students. The participants will benefit from direct interaction and discussions with world leaders in Computer Vision. Participants will also have the possibility to present the results of their research, and to interact with their scientific peers, in a friendly and constructive environment.
23-27 June 2014	**IFI Summer school, University of Zurich**, *Zurich, Switzerland*.
	The 2014 IFI Summer School is a week-long event for graduate students and research assistants in informatics and related fields, where invited experts teach a number of different topics in day-long courses (8 hours) on a variety of topics in Computer Science.

Computer skills

Intermediate	Computer Hardware, Adobe Photoshop, Adobe Premiere
Advanced	Robot Operating System (ROS), C, C++, Matlab, java, Python, PHP, Yii2, Javascript, jQuery, AngularJS, NodeJs, HTML5, CSS, LESS, Hibernate, MySQL, LaTeX, Linux, Microsoft Windows, Joomla!

Deep Learning technologies	Caffe, Tensorflow, Keras, Pytorch

Languages

Italian	**Mothertongue**	
English	**Advanced**	*Conversationally fluent. Advanced writing, reading and listening*
German	**Basic**	*Basic words and phrases only*