



Elia Bonetto

Ph.D. Student

07 September 1994

Languages

Mother tongue: Italian
English: B2/C1 - Proficient, CEFR
German: A1/2

Coding

Programming: C and C++, Python, Java, *SQL
Simulation: Gazebo, Unreal Engine, Unity, NVIDIA Omniverse suite, IsaacSim, IsaacSDK, Blender
Libraries: Tensorflow, Keras, Numpy, Pandas, OpenCV, PyTorch, ROS, Blenderproc
Other: Git, LaTeX, OpenCV, Hadoop, Spark, Make, Arduino

About me

I am very into the audio-video arts, especially movies, music, and photography. I like reading books, even if I do not do that enough, and motor-sports. Traveling to new places to experience different cultures, be immersed in nature, and experience “exotic” food are some of my greatest passions. I am currently also studying finance and investing techniques.

Professional Summary

I use my knowledge in computer vision and robotics to let machines sensing the world and react to it. My research focuses on the synergy between those two fields, bridging the sensing and the action. In the end, I want to build systems capable to autonomously understand and interact with the world. My current research focus is on **Active SLAM**, especially in dynamic environments. I also worked on human body pose estimation, 3D semantic segmentation, autonomous vehicles and with robotic arms.

Education

2020 - now	Ph.D. Max Planck Institute, Perceiving Systems Dept, Tübingen Currently enrolled in the International Max Planck Research School for Intelligent Systems (IMPRS-IS) program, under the supervision of Dr.-Ing. Aamir Ahmad and Prof. Michael J. Black .
2017 - 2019	M.Sc. - 110/110 with Honors University of Padova ICT for Internet and Multimedia Engineering - Cybersystems GPA 29.5/30 . Thesis supervisor: Prof. Stefano Ghidoni
2013 - 2017	B.Sc. - 96/110 University of Padova Computer Science Engineering

Publications

2022	Published Elsevier Robotics and Autonomous Systems <i>“iRotate: Active Visual SLAM for Omnidirectional Robots”</i> . DOI: 10.1016/j.robot.2022.104102.
2022	Published IEEE Robotics and Automation Letters + ICRA2022 <i>“AirPose: Multi-View Fusion Network for Aerial 3D Human Pose and Shape Estimation”</i> . DOI: 10.1109/LRA.2022.3145494
2021	Published — Abstract 2021 Deutsche Gesellschaft für Robotik (DGR days) <i>“Towards Active Visual SLAM”</i>
2021	Published 2021 European Conference on Mobile Robots (ECMR) <i>“Active Visual SLAM with Independently Rotating Camera”</i> . DOI: 10.1109/ECMR50962.2021.9568791.
2020	Published IEEE Robotics and Automation Letters + IROS2020 <i>“AirCapRL: Autonomous Aerial Human Motion Capture Using Deep Reinforcement Learning”</i> . DOI: 10.1109/LRA.2020.3013906.

Experience

Current	Reviewer Reviewer for ICRA, IROS, RAL.
06/22-09/22	Research intern @ NISSAN North America Santa Clara, CA Designed and developed a novel ADAS mechanism without the use of lane-level localization . The system works with low quality sensory data and zero road-specific additional information. After estimating the lane structure and locally localizing the car, the system correctly suggests lane changes, turns, and U-turns when appropriate.
12/19 - 03/20	Research Intern @ MPI Tübingen - Robot Perception Group Tübingen, DE Developed a realistic dataset generation pipeline and worked in aerial human motion capture, among other projects (AirCapRL). The data was then used for the AirPose work.

Skills

- Strong problem-solving. Active and fast learning
- Team-work experience through various university projects and work experience in interdisciplinary groups
- Proficient use of various computer vision libraries, robotic simulation tools, and machine learning frameworks
- Organization, decision-making, and group management skills to match deadlines and objectives



Elia Bonetto

Ph.D. Student



07 September 1994



Tübingen, Germany



+39 3403306427



My webpage



eliabntt94@gmail.com



eliabntt



eliabntt



Google Scholar



Semantic Scholar



ResearchGate



DBLP



ORCID

Other Publications

- 2020 **Published** 2020 25th International Conference on Pattern Recognition
“[Enhancing Deep Semantic Segmentation of RGB-D Data with Entangled Forests](#)”. DOI: 10.1109/ICPR48806.2021.9412787.
- 2019 **Published** IEEE Communications Surveys and Tutorials
“[A Survey on Recent Advances in Transport Layer Protocols](#)”. DOI: 10.1109/COMST.2019.2932905

Previous Experience

- 07/21 **ETH Robotics Symposium and Summer School** ETH Zurich
Selected to participate in the ETH Robotics Summer School.
- 02/19 - 07/19 **Research Intern** University of Padova@IAS-Lab
Worked with 3D semantic segmentation by transferring features between *3D Entangled Forests* and *FuseNet*. Reduced by **eight** times the number of total parameters of *FuseNet* while obtaining a similar accuracy.

Main Projects

Active Visual Slam - iRotate

Initially, I focused on developing an **Active Visual SLAM** method that could efficiently and autonomously explore an environment. This resulted in a multi-layered approach that works by optimizing the robot's heading in **both the global and local** scales. The method, *iRotate*, was firstly developed for omnidirectional robots and resulted in exploration paths up to **39% shorter** than common SOA approaches. To expand *iRotate* to semi and non-holonomic platforms, we developed a custom camera's **independent rotational joint**. This also further lowered the energy consumption by reducing the rotation of the wheels thanks to a more flexible control. The proposed joint state estimation also proved its efficacy by **lowering** the trajectory error of up to **40/50%**. Currently, to expand this work, we are generating a dataset of indoor dynamic environments to move toward more realistic scenarios. [Code](#) and videos^{1,2} publicly available.

Human MoCap and 3D Shape Estimation with Drones

The goal of the [AirCap](#) project is **markerless, unconstrained, human motion capture outdoors**. To that end, we developed a flying MoCap system using a **team** of aerial vehicles (MAVs) with only on-board, monocular RGB cameras. In [AirCapRL](#) we apply [RL](#), control strategies, and novel CV architectures to achieve state-of-the-art results. Check the [video](#) and the [code](#).

In [AirPose](#) we obtained a bi-drone markerless 3D motion capture system for unstructured outdoor environments. This is the first method using **extrinsically uncalibrated** flying cameras. In this, I actively developed the data generation pipeline and the challenging **synchronization** mechanism between the two drones. Get a look at our [video](#) and the released [code and data](#).

3D Semantic Segmentation

The aim of this project is to transfer features between *3D Entangled Forests* and *FuseNet*. To do so I extract information from 3D data, either in the point cloud or RGB-D format, and export it to a different learning system to improve performances and lower the computational cost making use of **Pytorch**, **C++**, and the **PCL library**. I am able to **reduce** the parameters (i.e., computational load) of *FuseNet* **eight times** with respect to the original network without losing too much accuracy. This work was [published](#) in ICPR2020.

Human Activity Recognition

The project aims at developing and testing different machine learning models to perform human activity recognition, starting from IMU sensors. The deep use of **Keras** and **Tensorflow** allowed to implement numerous networks based on both **CNN** and **RNN**. One of them brought an **improvement** of the current state-of-the-art results over the considered dataset by making use of a **fast** combined model with both convolutional and LSTM layers. The project is available [here](#).