Francesco Mazzone

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Research Interests

Intelligent Systems · Computer Vision · Machine Learning

Education

- **Mechanical Engineering MSc** | **ETH Zürich** 2020 - 2023
  Zürich, Switzerland
  - **GPA**: 5.23/6.0
  - **Selected Coursework**: Control Systems 1 & 2, Flow Visualization & Computer Vision
  - **Master's Thesis**: Extracting Aerodynamic Insights from 3D Wind Tunnel Models: A Novel Computer Vision-Based Approach to Surface Flow Characterization, carried out at *ETH Zürich* and *Audi F1 Project*.
  - **Notes**: converted to part-time student as of 2021.

- **Mechanical Engineering BSc** | **Polytechnic University of Milan** 2016 - 2019
  Milan, Italy
  - **GPA**: 107/110 (91.5% faculty average)
  - **Selected Coursework**: Calculus 1 & 2, Statistics, Numerical Methods, Informatics, Mechanics

Awards & Honors

- **2 x Full Tuition Exemption** for students with particularly high merits, awarded by Polytechnic University of Milan (A.Y. 2017-2018, A.Y. 2018-2019)
  - Conferred in recognition of an outstanding grade point average from previous academic year.
- **ARIS team awards**: 1^{st} place European Rocketry Challenge, 3^{rd} place Spaceport America Cup
  - Europe- and world-wide student rocket launching competitions involving the design, construction, and launch of a sounding rocket, where I took part through ARIS (Academic Space Initiative Switzerland), the student-led rocket project at ETH Zürich.

Research Experience

- **Graduate Researcher** | **Multimedia Lab, CUHK** 09.2024 - Current
  Hong Kong, HKSAR, China
  - Currently working in the domains of perception, scene reconstruction and rendering for autonomous driving in Prof. Hongsheng Li's group at *The Chinese University of Hong Kong*, in the Multimedia Lab (MMLab) and Centre for Perceptual and Interactive Intelligence (CPII).
  - Selected Coursework: Introduction to Deep Learning, Image Processing and Computer Vision

- **Research Assistant** | **EMPA, ETH Zürich** 04.2021 - 04.2022
  Zürich, Switzerland
  - Took care of camera calibration for a measurement setup used to monitor crack propagation on plane fuselages (Airbus A350 project in Prof. Giovanni Terrasi's group)
  - Implemented a Digital Image Correlation algorithm with template-matching to assess real-time fuselage structural health

Publications

- **Offboard Occupancy Prediction with Diffusion Models**
  - **Authors**: Tao Ma, Xuesong Chen, Shaoshuai Shi, **Francesco Mazzone**, Hongbin Zhou, Botian Shi, Hongsheng Li
  - *In Preparation*

Work Experience

- **Computer Vision Engineer** | **Audi Formula 1 Racing Team** 03.2023 - 08.2024
  Zürich, Switzerland
  - **3D aerodynamic data processing**:
    - Performed point cloud registration (FPFH/RANSAC and ICP), segmentation, and rasterization on 3D wind tunnel model scans
    - Developed CV algorithms for flow features detection and classification
    - Reconstructed the features' 3D location with an error of less than 1% relative to measurement accuracy
    - Developed application software with an intuitive frontend integrated with the team's software infrastructure and cloud-based data warehouse
  - **Aeroelastic deflections tracking**:
    - Implemented monocular 3D vehicle pose estimation and object detection for front/rear-wing deflection tracking using markers on the Formula 1 car

- **Software Engineering Intern** | **Beyond Gravity AG** 08.2022 - 02.2023
  Zürich, Switzerland
  - Developed and implemented a micro-vibration model for solar array wings control (SADM Solar Array Drive Mechanism for ESA/NASA projects)
  - Developed a computer vision algorithm to inspect the quality of aluminum honeycomb in composite structures for space by automatically detecting manufacturing defects

- **Robotics Intern** | **Pick8ship Technology AG** 05.2022 - 08.2022
  Zürich, Switzerland
  - Implemented a simulator for a smart warehouse robotic system
  - Achieved 30% system performance improvement by using the simulator to establish new hardware requirements.

- **Software Engineer** | **Jenzer Motorsport - Formula 3 Team** 09.2021 - 02.2022
  Bern, Switzerland
  - Integrated an off-the-shelf F3 car physical model into the F3 car simulator
  - Improved the model with the car knowledge available in the team to achieve deviations below 10% in lap-time between hardware on track and simulation setup.

Leadership & Social Activities

- **Controls Team Lead** | **ARIS (rocket project at ETH Zürich)** 10.2020 - 10.2021
  Zürich, Switzerland
  - Led a team of 5 students in designing a pneumatic stage separation system and implementing control algorithms (Kalman filter for state estimation under supersonic flight conditions) for the ARIS rocket.
  - Successfully deployed the system during launch events and won international competitions (1st place European Rocketry Challenge, 3rd place Spaceport America Cup)

- **Software Engineer (Charity)** | **Fondazione Banco Alimentare Onlus** 09.2011 - 09.2016
  Como, Italy
  - Developed and maintained a simple software tool for *Fondazione Banco Alimentare Onlus*, a non-profit organisation in Italy, to manage food storage and weekly distribution to those in need

Skills

- **Programming**: C/C++, Python, SQL
- **Frameworks and Tools**: PyTorch, Git, Vim, Docker, CSS, Matlab, Jira, 3D CAD software, Blender
- **Languages**: Italian (C2), English (C1), German (C1), Spanish (C1), French (C1), Portuguese (B2), Mandarin Chinese (A1)
- **Interests**: sailing, analog film photography, languages, reading