Alexander **Millane**

Senior Robotics Engineer

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Summary

Hey, I'm Alex. I work at NVIDIA on real-time 3D reconstruction and deep-learning-based robotic manipulation systems. I finished my Ph.D. in the Autonomous Systems Lab at ETH Zürich, where I worked on 3D mapping for rotary-wing UAVs. I love working with passionate people on hard problems that lie in the intersection of mathematics, software, and physical systems.

Education

ETH Zürich - Ph.D

Zurich, Switzerland

Dissertation: Scalable Dense Mapping Using Signed Distance Function Submaps. *2016 - 2021*

- My Ph.D. focused on 3D map-building and localization for rotary-wing UAVs.
- Research on representations for mapping large-scale environments on computationally constrained platforms.
- I spent the final part of my Ph.D. as a visiting scientist in the Microsoft Mixed Reality & AI Zurich Lab.

ETH Zürich - Master in Robotics, Systems and Control

Zurich, Switzerland

Dissertation: State Estimation for a Tethered Aircraft. GPA: 5.55/6.0. *2012 - 2015*

- Sensor fusion for estimating the pose of a tethered, power-generating aircraft.

University of Canterbury

Christchurch, New Zealand

B.S in Mechatronics (with Honors), GPA: 8.5/9.0. *2007–2010*

Work Experience

NVIDIA

Zürich, Switzerland

Senior Robotics Engineer *2021-present*

- **Deep learned** end-to-end learned manipulation policies for humanoid robots.
- Developed a **GPU-accelerated 3D reconstruction framework** from scratch in a small team.
- **High performance GPU programming** for a mixed CPU/GPU algorithms.
- Integrated the core reconstruction library into three robotics projects, a **vision-based navigation** system for ground robots, a **robot manipulation** framework, and into **PyTorch for machine learning**. Check out our video
- Released part of our code open source (nvblox and nvblox_ros) (docs)

Sauber Motorsport AG.

Hinwil, Switzerland

Research and Development Intern *2013*

- An eight-month internship as a member of the estimation team for Sauber's 2014 Formula 1 race car.
- Creation of a **simulation model** of an electro-hydraulic brake-by-wire system. Model-based **controller design**.
- Implementation of real-time, safety and performance-critical **control code** which was **deployed to a Formula 1 car** during the 2014 season.

Infact Limited, Engineering Design Consultancy

Christchurch, New Zealand

Research and Development Engineer *2010-2012*

- Development of an acoustic wood testing tool and integration into a hydraulic, heavy vehicle.
- **Digital electronics** design, **embedded software** development, **signal processing** and extensive prototyping and testing.
- Running **operational trials** at forestry sites located in New Zealand, Australia and the United States.

Research Projects

Mixed Reality & AI Lab Zurich

Zürich, Switzerland

Visiting Researcher *2020*

- 6 month visiting researcher position.
- Research on **geometry-based global localization** in distance-function-based maps.
- Led to a Robotics and Automation Letters submission. Check out our video.

Autonomous Fire-Fighting at MBZIRC *Zürich, Switzerland, Abu Dhabi, UAE*

Sub-Team Lead *2019 - 2020*

- Designed a system for autonomously finding fires in multi-story buildings as part of the MBZIRC 2020 international robotics competition.
- The mission is completed by a **collaborating robotic team**, consisting of a hexacopter and a tricopter. The approach exploits the **mapping** and **precise control** capabilities of each of the vehicles respectively.
- **Led a team** of masters students to design the hardware-software system.
- Check out our video.

Thermal Mapping at ARCHE (Advanced Robotic Capabilities for Hazardous Environment) *Wangen an der Aare, Switzerland*

Team Member *2018*

- In this work we showed a UAV building **3D thermal maps**, localizing within these maps, and autonomously navigating through narrow spaces to find potential injured people using a thermal camera.
- We demonstrated the system to military search and rescue personnel at a search and rescue training site in Switzerland.
- Check out our video.

Selected Publications

A full list of publications may be found my google scholar page or is available upon request.

Localization

2020 **Alexander Millane**, Helen Oleynikova, Christian Lanegger, Jeff Delmerico, Juan Nieto, Roland Siegwart, Marc Pollefeys, and César Cadena. **Freetures: Localization in Signed Distance Function Maps**. IEEE Robotics and Automation Letters, 2020. paper. video.

2019 **Alexander Millane**, Helen Oleynikova, Juan Nieto, Roland Siegwart, and César Cadena. **Free-Space Features: Global Localization in 2D Laser SLAM Using Distance Function Maps**. International Conference on Intelligent Robots and Systems (IROS), 2019. paper.

Dense Mapping

2023 **Alexander Millane***, Helen Oleynikova*, Emilie Wirbel, Remo Steiner, Vikram Ramasamy, David Tingdahl, Roland Siegwart, **nvblox: GPU-Accelerated Incremental Signed Distance Field Mapping**. arxiv preprint, 2023. paper. video. code (ros). code (lib).

2019 **Alexander Millane***, Victor Reijgwart*, Helen Oleynikova, Roland Siegwart, Cesar Cadena, and Juan Nieto, **Voxgraph: Globally Consistent, Volumetric Mapping using Signed Distance Function Submaps**. IEEE Robotics and Automation Letters, 2019. paper. video. code.

Honors & Awards

2014 **European semi-finalists**, OneStart Startup Competition. *London, UK*

2014 **Impact Hub Prize**, Hack Zurich. *Zürich, Switzerland*

2010 **First in class placing**, Bachelor of Engineering in Mechatronics. *Christchurch, NZ*

2008 **CS McCully Scholarship**, Performance in first year Bachelor of Engineering. *Christchurch, NZ*

2008 **Madam Tiong Guok Hua Prize**, Highest GPA first year of Bachelor of Engineering. *Christchurch, NZ*

2006 **NCEA Physics Scholarship**, Final high-school exams. *Christchurch, NZ*

Skills

Programming C++, CUDA, Python, Matlab/Simulink

Tooling Git, Linux, Jenkins CI, Robot Operating System (ROS), ARM, CMake, Bazel.

Electronics Electronic Prototyping. PCB design and manufacture. Altium Designer.

Mechanical Mechanical Prototyping. 3D Printing. CAD.

Languages English (native). German (Intermediate/B1).

Leadership & Teaching

Supervisor **18** Masters projects/theses, **6** Bachelor theses.

Teaching Assistant **2 ETH Master's courses:** Perception and Learning for Robotics, and Autonomous Mobile robotics.

Reviewer Various **journals/conferences**, including IROS, ICRA and RAL. **Finalist for Best Review Award** of MFI 2020. **Outstanding Reviewer Award** IROS 2021.