

# Ignacio Alzugaray

## Curriculum Vitae

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Residence: London, United Kingdom

Nationality: Spanish, born 1992

## Research Interests

- **Efficient Neural SLAM & Novel Scene Representations:** To explore hybrid approaches integrating traditional geometry with AI-driven modules, focusing on real-time performance and enhanced scene understanding.
- **Information-guided, Data-Efficient & Decentralized Spatial AI:** To design distributed systems and agents that reason about space, motion, and action while minimizing communication and computational overhead.
- **Self-supervised and Explainable AI from Large Foundation Models:** To extract and repurpose the knowledge from large pre-trained models for interpretable and generalizable AI solutions.

## Experience

- Since Jul'22 **Postdoctoral Research Fellow**, *Dyson Robotics Lab, Imperial College London*.
- Research on parallel and distributed on-pixel processing for visual SLAM.
  - Research on 3D implicit representations for self-supervised scene understanding.
  - Supervisor: Prof. Dr. Andrew Davison.
- Mar'22 - Jun'22 **Postdoctoral Researcher**, *Vision for Robotics Lab (V4RL), ETH Zürich*.
- Research on asynchronous, event-driven algorithms for visual SLAM using event cameras.
  - Designing of decentralized multi-agent visual SLAM architecture using distributed processing.
  - Supervisor: Prof. Dr. Margarita Chli.
- Sep'21 - Jun'22 **Research Scientist**, *Facebook/Meta Reality Labs*.
- Designing of a NeRF-based pipeline for image-based visual relocalization.
  - PyTorch implementation trained with real egocentric footage for AR applications.
  - Intern position during Sept'21-Dec'21. External contractor position during Mar'22-Jun'22.
  - Supervisors: Dr. Vasileios Balntas and Dr. Armen Avetisyan.
- Sep'19 - Jun'19 **Software Engineer Intern**, *Disney Research Zurich*.
- Development of VR animation tools with hand tracking and gesture recognition within Unity.
  - Close collaboration with Disney Animation Studio on [PoseVR project](#).
  - Supervisors: Dr. Jakob Buhmann and Dr. Martin Guay.
- Sep'16 - Feb'17 **Research Assistant**, *Vision for Robotics Lab (V4RL), ETH Zürich*.
- Implementation of probabilistic event-based scene mapping.
  - Design of active monocular-inertial SLAM pipeline for UAVs.
  - Supervisor: Prof. Dr. Margarita Chli.
- Jun'15 - Feb'16 **Research Assistant Intern**, *Institute of Robotics and Industrial Informatics (IRI-CSIC)*.
- Design of path planning algorithms for UAVs embedding the experience of expert pilots.
  - Supervisor: Prof. Dr. Alberto Sanfeliu.

## Education

- 2022 **Ph.D. in Computer Vision**, *Vision for Robotics Lab (V4RL), ETH Zürich*.
- Thesis: *Event-driven Feature Detection and Tracking for Visual SLAM*.
- Advisor: Prof. Dr. Margarita Chli.
  - Examiners: Prof. Dr. Andrew Davison, Prof. Dr. Davide Scaramuzza, Prof. Dr. Laurent Kneip.

- 2016 **M.Sc. Automatic Control and Robotics**, *Polytechnic University of Catalonia (UPC)*.  
 Top student in Master's program (2014-2016), GPA – 8.70/10.  
 Thesis: *Path planning for MAVs with vision in the loop*.  
 ◦ Advisor: Prof. Dr. Margarita Chli. Grade: 5.75/6. ETH Zürich – International student exchange.
- 2014 **B.Sc. Industrial Engineering**, *University of Malaga (UMA)*.  
 Top student in Bachelor's program (2010-2014). GPA – 8.49/10.  
 Thesis: *Teleoperation of Robotic Manipulators applied to Laparoscopic Surgery*.  
 ◦ Advisor: Dr. Carlos Perez del Pulgar. Grade: 9.5/10.

## Research and Dissemination Activities

### Chairing

- Oct'24 **Session Chair** for *Multi-Robot Systems III*, Oral Session, IROS'24
- May'24 **Session Chair** for *Perception for Grasping and Manipulation III*, Oral Session, ICRA'24

### Invited Talks & Workshops

- Oct'21 **Invited Talk** at the Robotic and Perception Group, ETH Zurich / University of Zurich.  
 Presentation title: "Event-Driven Feature Detection and Tracking for Robotic Applications."
- Jun'21 **Invited Speaker** at the *Event-based Vision* workshop, CVPR 2021. Presentation title:  
 "Towards Asynchronous SLAM with Event Cameras."
- Oct'18 **Invited Speaker** at the *Unconventional Sensing and Processing for Robotic Visual Perception* workshop, IROS 2018. Presentation title: "Asynchronous Vision."

### Others

- May'25 **External PhD. Thesis Examiner**, Institute of Robotics and Industrial Informatics (IRI-CSIC).  
 Thesis: "Bio-inspired Event-driven Intelligence for Motion Estimation" by Yi Tian.
- Since 2016 **Supervision of Students and Researchers**, *ETH Zürich / Imperial College London*.  
 ◦ Supervised over 35 graduate student projects.  
 ◦ Shared supervision of doctoral students on SLAM, scene understanding and 3D geometry.
- Since 2016 **Reviewer of Scientific Publications**.  
 ICRA, IROS, 3DV, BMVC, ECCV, ICCV, CVPR, MVA, RSS, T-RO, T-PAMI, RA-L, IJCV.

## Awards and Scholarships

- 2016 **Award for Academic Performance in Master's**, *Polytechnic University of Catalonia (UPC)*.  
 Granted to the top performing student in postgraduate programme (2014–2016). The recipient is granted with an internship sponsored by KUKA AG.
- 2016 **International Student Scholarship**, *ETH Zürich, Swiss-European Mobility Programme*.  
 Competitive scholarship granted to students in an international exchange programme.
- 2014 **Excellence Scholarship in Master's Programme**, *Catalunya-La Pedrera Foundation*.  
 Two-years scholarship granted to the Master's program applicant with the best academic record.
- 2014 **Award for Academic Performance in Bachelor's**, *University of Malaga (UMA)*.  
 Granted to the top performing student in undergraduate programme (2010–2014).
- 2013 **Undergraduate Research Scholarship**, *University of Malaga, Spanish Ministry of Education*.  
 Nationally competitive scholarship to conduct six-months research projects.

## Languages

Spanish **Native**

English **Professional Proficiency**

B2.2 University of Cambridge (2013)

German **Intermediate**

B1.1 University of Zürich (2017)

## Skills

Programming Python, C++, CUDA, MATLAB, C#, SIMULINK,  $\LaTeX$

Frameworks PyTorch, OpenCV, ROS, Unity, Unreal Engine, Gazebo, Blender, Git

Technologies NeRFs, Gaussian Splatting, Diffusion Models, Gaussian Belief Propagation, ADMM

## Software Releases

2021 **HASTE: Event-driven Feature Tracking and Optimization**, in C++.  
[github.com/ialzugaray/haste](https://github.com/ialzugaray/haste)

2019 **Arc\*: Event-driven Corner-Event detector**, in C++/ROS.  
[github.com/ialzugaray/arc\\_star\\_ros](https://github.com/ialzugaray/arc_star_ros)

## Publications

### Conferences & Workshops

- [C13] I. Alzugaray, R. Murai, A. Davison.  
**PixRO: Pixel-Distributed Rotational Odometry with Gaussian Belief Propagation.**  
*IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR), International Workshop on Computational Cameras and Displays (CCD)*, Seattle, 2024.
- [C12] D. Hug, I. Alzugaray, M. Chli.  
**Hyperion – A fast, versatile symbolic Gaussian Belief Propagation framework for Continuous-Time SLAM.**  
*European Conference on Computer Vision (ECCV)*, Milan, 2024.
- [C11] I. Kapelyukh, Y. Ren, I. Alzugaray, E. Johns.  
**Dream2Real: Zero-Shot 3D Object Rearrangement with Vision-Language Models.**  
*IEEE International Conference on Robotics and Automation (ICRA)*, Yokohama, 2024.
- [C10] M. Taher I. Alzugaray, A. Davison.  
**Fit-NGP: Fitting Object Models to Neural Graphics Primitives.**  
*IEEE International Conference on Robotics and Automation (ICRA)*, Yokohama, 2024.
- [C9] P. Bänninger, I. Alzugaray, M. Karrer, M. Chli.  
**Cross-Agent Relocalization for Decentralized Collaborative SLAM.**  
*IEEE International Conference on Robotics and Automation (ICRA)*, London, 2023.
- [C8] C. Le Gentil, I. Alzugaray, T. Vidal-Calleja.  
**Continuous-Time Gaussian Process Motion-Compensation for Event-Vision Pattern Tracking with Distance Fields.**  
*IEEE International Conference on Robotics and Automation (ICRA)*, London, 2023.
- [C7] I. Alzugaray and M. Chli.  
**HASTE: multi-Hypothesis Asynchronous Speeded-up Tracking of Events.**  
*British Machine Vision Conference (BMVC)*, Virtual, 2020.
- [C6] C. Le Gentil, F. Tschopp, I. Alzugaray, T. Vidal-Calleja, R. Siegwart and J. Nieto.  
**IDOL: A framework for IMU-DVS odometry using lines.**  
*IEEE/RSJ Conference on Intelligent Robots and Systems (IROS)*, Las Vegas, NV, USA, 2020.

- [C5] I. Alzugaray and M. Chli.  
**Asynchronous Multi-hypothesis Tracking of features with Event Cameras.**  
*International Conference on 3D Vision (3DV)*, Quebec, Canada, 2019. Oral presentation.
- [C4] I. Alzugaray and M. Chli.  
**ACE: An Efficient Asynchronous Corner Tracker for Event Cameras.**  
*International Conference on 3D Vision (3DV)*, Verona, Italy, 2018.
- [C3] L. Texeira, I. Alzugaray and M. Chli.  
**Autonomous Aerial Inspection Using Visual-Inertial Robust Localization and Mapping.**  
*Conference on Field and Service Robotics (FSR)*, Zurich, Switzerland, 2017.
- [C2] I. Alzugaray, L. Texeira and M. Chli.  
**Short-term UAV Path-Planning with Monocular-Inertial SLAM in the Loop.**  
*IEEE International Conference on Robotics and Automation (ICRA)*, Singapore, 2017.
- [C1] I. Alzugaray and A. Sanfeliu.  
**Learning the Hidden Human Knowledge of UAV Pilots when navigating in a cluttered environment for improving Path Planning.**  
*IEEE/RSJ Conference on Intelligent Robots and Systems (IROS)*, Daejeon, Korea, 2016.

#### Journals

- [J5] L. Yang, R. Mascaro, I. Alzugaray, S.M. Prakhya, M. Karrer, Z. Liu, M. Chli.  
**LiDAR Loop Closure Detection using Semantic Graphs with Graph Attention Networks.**  
*Journal of Intelligent & Robotic Systems*, 2025.
- [J4] R. Murai, I. Alzugaray, P.H.J. Kelly, A. Davison.  
**Distributed Simultaneous Localisation and Auto-Calibration using Gaussian Belief Propagation.**  
*IEEE Robotics and Automation Letters (RA-L)*, 2024.
- [J3] D. Hug, P. Bänninger, I. Alzugaray and M. Chli.  
**Continuous-Time Stereo-Inertial Odometry.**  
*IEEE Robotics and Automation Letters (RA-L)*, 2022.
- [J2] Z. Lai, I. Alzugaray, M. Chli and E. Chatzi.  
**Full-field structural monitoring using event cameras and physics-informed sparse identification.**  
*Mechanical Systems and Signal Processing*, 2020.
- [J1] I. Alzugaray and M. Chli.  
**Asynchronous Corner Detection and Tracking for Event Cameras in Real Time.**  
*IEEE Robotics and Automation Letters (RA-L)*, 2018.

#### Doctoral Thesis

- [T] I. Alzugaray.  
**Event-driven Feature Detection and Tracking for Visual SLAM.**  
*ETH Zurich*, 2022.