

# Ignacio Alzugaray

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📁 [ialzugaray.github.io](https://github.com/ialzugaray)

## Curriculum Vitae

London, United Kingdom

Spanish, born 1992

### Experience

Since Jul'22

#### Postdoctoral Research Fellow

*Dyson Robotics Lab, Imperial College London*

London, UK

- Developed implicit 3D scene representations to be applied in real-time multi-agent SLAM.
- Implemented 6-DoF object tracking and reconstruction from 2D/3D foundational models.
- Leveraged diffusion models for hierarchical segmentation and semantic keypoint matching.
- Designed parallel and distributed 3D motion estimators for emerging sensor–processor hardware.

Ref: Prof. Dr. Andrew Davison

Mar'22 – Jun'22

#### Postdoctoral Researcher

*Vision for Robotics Lab (V4RL), ETH Zürich*

Zurich, Switzerland

- Created novel asynchronous, event-driven algorithms for visual SLAM using event cameras.
- Explored the use of continuous-time spline-based representation in visual SLAM.
- Designed decentralized multi-agent visual SLAM systems using distributed optimization.

Ref: Prof. Dr. Margarita Chli

Sep'21 – Jun'22

#### Research Scientist

*Facebook / Meta Reality Labs*

London, UK (Remote)

- Designed a NeRF-based pipeline for image-based visual relocalization.
- Trained the network distributively using large-scale data from real egocentric footage.
- Intern during Sept'21–Dec'21. External contractor during Mar'22–Jun'22.

Ref: Dr. Vasileios Balntas / Dr. Armen Avetisyan

Sep'19 – Dec'19

#### Software Engineering Intern

*Disney Research Zurich*

Zurich, Switzerland

- Developed VR tools for 3D animation using hand tracking and gesture recognition within Unity.
- Close collaboration with Disney Animation Studio on [PoseVR project](#).

Ref: Dr. Jakob Buhmann / Dr. Martin Guay

Sep'16 – Feb'17

#### Research Assistant

*Vision for Robotics Lab (V4RL), ETH Zürich*

Zurich, Switzerland

- Implemented a probabilistic event-based scene mapping and reconstruction algorithm.
- Designed a path-planning system for active monocular-inertial SLAM applied to UAVs.

Ref: Prof. Dr. Margarita Chli

### 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.

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## 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.

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## Research and Dissemination Activities

### Chairing & Editorial Board

- Sep'25 **ICRA 2026 Associate Editor** in *Visual Perception and Learning*
- 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

- May'25 **Invited Talk** at the IRI - Institut de Robòtica i Informàtica Industrial, CSIC-UPC Barcelona. Presentation title: "Sparse Asynchronous and Distributed Spatial AI."
- 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 **Doctoral 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**.  
CVPR, ECCV, ICCV, 3DV, BMVC, IJCV, T-PAMI, RSS, RA-L, T-RO, ICRA, IROS, MVA.

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## Awards and Scholarships

- 2025 **CVPR 2025 Outstanding Reviewer**.
- 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**  
German **Intermediate**

*B1.1 University of Zürich (2017)*

## Skills

Programming Python, C++, CUDA, MATLAB  
Frameworks PyTorch, OpenCV, ROS, Unity, Unreal Engine, Blender, Gazebo  
Optimization GBP, Ceres, ADMM  
ML Coordinate Regression, Deep Point Trackers, 3D Foundational Models, Diffusion Models  
Graphics Gaussian Splatting, Triangle Splatting, NeRF, Instant-NGP

## 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

- [C17] I. Alzugaray, M. Taher, A.J. Davison.  
**ACE-SLAM: Scene Coordinate Regression for Real-Time SLAM.**  
*Under Review, 2025.*
- [C16] M. Taher, I. Alzugaray, K. Mazur, X. Kong, A.J. Davison.  
**KV-Tracker: Real-Time Pose Tracking with Transformers.**  
*Under Review, 2025.*
- [C15] S. Kim, I. Alzugaray, C. Rhodes, P.H.J. Kelly, A.J. Davison.  
**PixVOD: Pixel-Distributed Direct Visual Odometry and Depth Estimation.**  
*Under Review, 2025.*
- [C14] T. Yates, I. Alzugaray, Y. Cheng, D. Akarca, P.A.M. Mediano, A.J. Davison.  
**Belief Propagation Converges to Gaussian Distributions in Complex Factor Graphs.**  
*Under Review, 2025.*
- [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. Tschoopp, 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.