Ignacio Alzugaray

Curriculum Vitae

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Residence: London, United Kingdom
Nationality: Spanish, born 1992

Research Interest

- **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 Bacherlor'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`

2019 **Arc*: Event-driven Corner-Event detector**, in C++/ROS.
`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.