

Javiera Castillo Navarro

PH.D. ARTIFICIAL INTELLIGENCE · EARTH OBSERVATION

Paris, France

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Experience

CEDRIC lab, Vertigo team, Conservatoire National des Arts et Métiers.

Paris, France

ASSISTANT PROFESSOR - MAÎTRE DE CONFÉRENCES

September 2024 - Current

- Member of the computer science department (EPN5).
- Teaching: *Statistical learning and deep learning (RCP 209)*; *Advanced artificial intelligence (RCP211)*; *Python for data science*; *Introduction to artificial intelligence*.
- Research on AI for multimodal data, applications to remote sensing and environment.
- Publications in top-tier international conferences in machine learning and computer vision, including ICLR 2025.

ECEO lab, École Polytechnique Fédérale de Lausanne.

Sion, Switzerland

POSTDOCTORAL RESEARCHER.

August 2022 - July 2024

- In the team of Prof. Devis Tuia.
- Project "*Knowledge-guided explanation for satellite image explanations of Earth phenomena*".
- I worked on different projects with involving multimodal data and vision-language models.
- Developing representation learning methods for multimodal data with contrastive learning.
- Integrating natural language into segmentation networks for richer and interactive cartography.
- Using knowledge-graphs and NLP tools for automatic visual question generation and image retrieval.
- Publications in top-tier international conferences in machine learning and computer vision, including AAAI, ECCV.
- Supervision of 5 master projects, 2 master thesis and collaboration/supervision of PhD students.
- Teaching: Master's level courses in machine learning, deep learning, and image processing.

IRISA, Université de Bretagne Sud

Vannes, France

POSTDOCTORAL RESEARCHER. SIXP PROJECT.

April 2022 - July 2022

- In the team of Prof. Sébastien Lefèvre and Dr. Thomas Corpetti
- Deep learning at the service of the ecology of plant communities growing in metal-rich soils in former mining areas.
- Development of semi-supervised and transfer learning methods for semantic segmentation of ultra-high-resolution drone-captured images.
- Supervision of a research student internship.

ONERA

Palaiseau, France

PH.D. THESIS "*Semi-supervised learning for large scale Earth observation data understanding*".

January 2019 - March 2022

- Supervised by Dr. B. Le Saux, Dr. A. Boulch and Prof. S. Lefèvre.
- I developed semi-supervised neural networks for semantic segmentation.
- I developed generative methods for semi-supervised classification.
- I created a new benchmark dataset for semi-supervised methods: MiniFrance.
- Co-organization of the international annual contest "*IEEE GRSS Data Fusion Contest 2022*" on semi-supervised learning for land cover classification.
- Teaching: Master's level courses in machine learning, optimization, and image processing (ENSTA, Institut d'optique GS, ESIEE), bachelor's level courses in mathematics (UVSQ).

ONERA

Palaiseau, France

RESEARCH INTERNSHIP

May 2018 - September 2018

- Project "*The ImageNet of remote sensing*".
- Application of deep learning methods to Earth observation data.
- Study of semantic segmentation networks on large scale data.

Société Générale

Paris, France

INTERNSHIP

September 2014 - February 2015

- 6 months internship in the marketing and trading department.
- Index management and numerical implementations.

CODELCO

Santiago, Chile

INTERNSHIP

July - August, 2013

- 6 weeks in the most important mining company in Chile.
- Project in the supply chain and inventory management department.

Education

Ph.D. Computer Science - Artificial Intelligence

France

UNIVERSITÉ BRETAGNE SUD - ONERA

January 2019 - March 2022

- Thesis “*Semi-supervised learning for large scale Earth observation data understanding*”.
- Adapting deep learning methods for Earth observation applications.
- Developing semi-supervised techniques for semantic segmentation.
- Working with large scale data.

M. Sc. Applied Mathematics - Data Science

France

UNIVERSITÉ PARIS-SACLAY - ÉCOLE POLYTECHNIQUE

September 2017 - September 2018

- Courses in statistical learning theory, optimization, graphical models, machine learning, bayesian learning, computer vision, deep learning.

M. Sc. Applied Mathematics

Chile

UNIVERSIDAD DE CHILE

March 2016 - May 2017

- Master thesis “*Study of the applicability of item response theory (IRT) models to the national mathematics university selection test (PSU)*”.

M. Eng. specialization on Mathematics and Applied Mathematics

Chile & France

UNIVERSIDAD DE CHILE & ÉCOLE CENTRALE PARIS

March 2010, May 2017

- Double degree program between the two establishments.
- Courses in algebra, optimization, topology, measure theory, functional analysis, probability, stochastic calculus, machine learning.

Skills

Programming	Python, Java, C++, C#, SQL
Scientific computing	Matlab, Scilab, AMPL, R
Machine learning	Scikit learn, PyTorch, TensorFlow, Keras
Other tools	LaTeX, Git, SLURM
Languages	Spanish (native), English, French

Honors & Awards

2017	Laureate , Sophie Germain Master’s scholarship. Mathematics Foundation Jacques Hadamard (FMJH). Excellence scholarship to enroll master programs.	France
2017	Graduated with honors , Master’s degree in Engineering Sciences and Applied Mathematics, Universidad de Chile.	Chile
2012	Laureate , Chilfitec Scholarship, from the Mecsup project. Excellence scholarship awarded by the governments of France and Chile for exchanges in the field of engineering.	France & Chile
2010-2011	Exceptional student , Universidad de Chile. Distinction given to the best students each year.	Chile
2009	NYSC delegate , Selected as a representative of Chile for the National Youth Science Camp, out of 4 available positions.	West Virginia, U.S.A
2007, 2008, 2009	Finalist , National Olympiads on Mathematics, Physics and Chemistry. Silver (2007) and Bronze (2009) medallist on the mathematical olympiad.	Chile

Extracurricular activities

PEER-REVIEWER FOR DIFFERENT VENUES	2019-2023
<ul style="list-style-type: none">• Journals: Computer vision and image understanding, IEEE Transactions on Image Processing, IEEE Transactions on Geoscience and Remote Sensing, IEEE Geoscience and Remote Sensing Letters, IEEE Access, Landscape and urban planning, ISPRS Journal of Photogrammetry and Remote Sensing• Top-tier computer vision conferences (CVPR, ECCV), Earth observation conferences and workshops.	
COMUNIDAD INTERNACIONAL BEAUCHEF, UNIVERSIDAD DE CHILE	2015-2016
<ul style="list-style-type: none">• Bureau of the association of international students at the faculty of Engineering• Organize activities for the integration of exchange students: welcome, guided tours, hiking around Santiago, etc.	
LIBRARY OF THE ÉCOLE CENTRALE PARIS	2013
<ul style="list-style-type: none">• Permanence at the library to ensure its opening during the evening.	

- Member of the choir of the faculty, participation in rehearsals, presentations and other activities.

Miscellaneous

- **Reading.** Literature in spanish, french and english. I especially enjoy latin american authors.
- **Sports.** Passionate about climbing. I enjoy the mountain and the nature, I like to hike.
- **Music.** I play the flute and I am learning the ukelele. I also love singing.
- **Creative hobbies.** I enjoy knitting and pottery.

Publications

JOURNALS

- V. Zermatten, **J. Castillo-Navarro**, D. Marcos, D. Tuia, “Learning transferable land cover semantics for open vocabulary interactions with remote sensing images”, *ISPRS Journal of Photogrammetry and Remote Sensing* (accepted), 2025.
- L. Mi, X. Dai, **J. Castillo-Navarro**, D. Tuia, “Knowledge-aware text-image retrieval for remote sensing images”, in *IEEE Transactions on Geoscience and Remote Sensing* (accepted), 2025.
- V. Zermatten, X. Lu, **J. Castillo-Navarro**, T. Kellenberger, D. Tuia, “Land cover mapping from multiple complementary experts under heavy class imbalance”, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2024.
- **J. Castillo-Navarro**, B. Le Saux, A. Boulch, S. Lefèvre, “Energy-based models in Earth observation: from generation to semi-supervised learning”, *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60, 2022.
- **J. Castillo-Navarro**, B. Le Saux, A. Boulch, N. Audebert, S. Lefèvre, “Semi-supervised semantic segmentation in Earth observation: the MiniFrance suite, dataset analysis and multi-task network study”, *Machine Learning*, 2021.
- R. Hänsch, C. Persello, G. Vivone, **J. Castillo-Navarro**, A. Boulch, S. Lefèvre, and B. Le Saux, “2022 IEEE GRSS Data fusion contest: semi-supervised learning [technical committees]”, in *IEEE Geoscience and Remote Sensing Magazine*, 2022.
- R. Hänsch, C. Persello, G. Vivone, **J. Castillo-Navarro**, A. Boulch, S. Lefèvre, and B. Le Saux, “Report on the 2022 IEEE Geoscience and Remote Sensing Society Data Fusion Contest: Semisupervised Learning [Technical Committees]”, in *IEEE Geoscience and Remote Sensing Magazine*, 2022.

CONFERENCES ET WORKSHOPS

- **J. Castillo-Navarro***, B. Dufumier*, D. Tuia, J. P. Thiran, “What to align in multimodal contrastive learning?”, to appear in *International Conference on Learning Representations (ICLR)*, 2025. * equal contribution.
- L. Mi, **J. Castillo-Navarro**, S. Montariol, A. Bosselut, D. Tuia, “ConGeo: Contrastive Visual Question Generation with Multimodal Guidance”, in *Proceedings of the European Conference on Computer Vision (ECCV)*, 2024.
- V. Zermatten, **J. Castillo-Navarro**, D. Marcos, D. Tuia, “Ecosystem mapping with remote sensing images and ground observation”, in *EGU General Assembly*, 2024.
- J. Prado, S. Montariol, **J. Castillo-Navarro**, D. Tuia, A. Bosselut, “Training visual language models with object detection: grounded change descriptions in satellite images”, in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2024.
- S. Li, L. Mi, **J. Castillo-Navarro**, D. Tuia, “Knowledge-aware visual question generation for remote sensing images”, in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2024.
- L. Mi*, S. Montariol*, **J. Castillo-Navarro***, X. Dai, A. Bosselut, D. Tuia, “ConVQG: Contrastive Visual Question Generation with Multimodal Guidance”, in *Proceedings of the Conference on Artificial Intelligence (AAAI)*, 2024. * equal contribution.
- V. Zermatten, **J. Castillo-Navarro**, L. Hughes, D. Tuia, “Text as richer source of supervision in semantic segmentation tasks”, in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2023.
- C. Chappuis, C. Sertic, N. Santacroce, **J. Castillo-Navarro**, S. Lobry, B. Le Saux, D. Tuia, “Multi-task prompt-RSVQA to explicitly count objects on aerial images”, in *Proceedings of the British Machine Vision Conference - Machine Vision for Earth observation Workshop (BMVC-W)*, 2023.
- T. Dewez, A. Breton, M. De Boisvilliers, G. Bellenfant, M. Houllès, F. Guiotte, B. Roux, **J. Castillo-Navarro**, G. Fernandez Garcia, S. Lefèvre, F. Kröber, T. Corpetti, F. Delerue, “Mapping Pb/Zn-stressed plant communities: challenges of centimeter-to-millimeter-scale UAV sensing for training deep learning schemes”, in *Virtual Geoscience Conference*, 2023.
- **J. Castillo-Navarro**, B. Le Saux, A. Boulch, S. Lefèvre, “Classification and generation of Earth observation images using a joint energy-based model”, in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2021.
- **J. Castillo-Navarro**, B. Le Saux, A. Boulch, S. Lefèvre, “Energy-based models for Earth observation applications”, in *Proceedings of the International Conference on Learning Representations - Energy Based Models Workshop - (ICLR-W)*, 2021.
- **J. Castillo-Navarro**, B. Le Saux, A. Boulch, S. Lefèvre, “On auxiliary losses for semi-supervised semantic segmentation”, in *European Conference on Machine Learning and Principles and Practice of Knowledge Discovery Workshops (ECML- PKDD W) - MACLEAN*, 2020.
- **J. Castillo-Navarro**, B. Le Saux, A. Boulch, S. Lefèvre, “Réseaux de neurones semi-supervisés pour la segmentation sémantique en télédétection”, in *Colloque GRETSI*, 2019.
- **J. Castillo-Navarro**, N. Audebert, B. Le Saux, A. Boulch, S. Lefèvre, “What data are needed for semantic segmentation in Earth observation?”, in *Joint Urban Remote Sensing Event (JURSE) - IEEE*, 2019.

UNDER REVIEW

- S. Li, L. Mi, **J. Castillo-Navarro**, D. Tuia, “Questions beyond pixels: Integrating commonsense knowledge in Visual Question Generation for remote sensing”, under review, 2024.