Giorgio L. Morales Luna

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EDUCATION

Montana State University — **Bozeman, MT, USA**
Ph.D., Computer Science — *January 2022 – May 2025*

- Dissertation: "Decomposable Neuro Symbolic Regression with Uncertainty Awareness"
- Advisor: John W. Sheppard.
- GPA: 3.97/4.0.
- Member of the Numerical Intelligent Systems Laboratory (NISL).
- Completed a Graduate Certificate in Artificial Intelligence (GPA: 4.0 / 4.0).

Montana State University — **Bozeman, MT, USA**
M.Sc., Computer Science — *August 2019 – December 2021*

- Thesis: "Towards Reduced-Cost Hyperspectral and Multispectral Image Classification".
- Designed low-cost prediction models for hyperspectral image classification and developed novel feature selection methods to identify key wavelengths, supporting the prototyping of compact multispectral imagers for applications such as produce monitoring and herbicide-resistance detection, in collaboration with MSU's Optical Technology Center.
- Advisor: John W. Sheppard.
- GPA: 3.97/4.0.

National University of Engineering — **Lima, Peru**
B.S., Mechatronics Engineering — *August 2010 – December 2015*

- GPA: 3.5/4.0.

EXPERIENCE

Université de Caen Normandie — **Caen, NRM, France**
Postdoctoral Researcher — *January 2025 – Present*

- Developing ML-based neutrino oscillation parameter estimation techniques to aid in large neutrino physics simulations.
- Member of the GREYC Laboratory.

Montana State University — **Bozeman, MT, USA**
Graduate Research Assistant. — *January 2021 – December 2024*

- Part of the Data-Intensive Farm Management (DIFM) project (USDA-funded).
- Published 12 first-author journal and conference papers related to symbolic regression, prediction/optimization in Precision Agriculture, uncertainty quantification, and XAI.
- Proposed and developed novel AI/ML methods to efficiently process field-collected data and predict future values of key agricultural variables, such as yield and protein content, optimizing resource usage (e.g., fertilizers), minimizing environmental impact, and maximizing profit.
- Built a web application in Flask, incorporating the prediction and optimization tools developed.

Graduate Teaching Assistant. — *August 2019 – December 2020*

Led lab sessions and managed grading for the following courses:

- CSCI 447 - Machine Learning (Fall 2020).
- CSCI 432 - Advanced Algorithm Topics (Fall 2020).
- CSCI 232 - Data Structures and Algorithms (Spring 2020).
- CSCI 132 - Basic Data Structures and Algorithms (Fall 2019 and Summer 2020).

National Institute of Research and Training for Telecommunications (INICTEL-UNI) — **Lima, Peru**
Computer Vision Researcher. — *November 2014 – July 2019*

- Published 11 conference and journal papers, and 1 B.Sc. thesis related to computer vision and remote sensing.
- Developed software to detect Mauritia Flexuosa palms in the Amazon using aerial images and drones. The project allowed the expansion of the monitored area by 200% and reduced the expedition costs by 500%.
- Developed software to segment clouds and shadows for the Space Agency of Peru (CONIDA) in high-resolution multispectral satellite images. The solution reduced the processing times by 1000%.
- Led small teams and worked in multidisciplinary environments.

TEACHING

Universitat Politècnica de València

Visiting Lecturer. "*Trustworthy AI: Equation Discovery and Uncertainty Quantification from Data*" within the course "*Artificial Intelligence and Emerging Technologies*." November 2025.

Université de Caen Normandie

Curriculum Contributor. Assisting in the design of the course "Data Analysis and Machine Learning" as part of the Erasmus Mundus Joint Master Degree in Nuclear Physics. Fall 2025.

Montana State University

Filled in for my PhD advisor to deliver lectures, engage with students, and ensure the smooth continuation of the course.

- CSCI 446 - Artificial Intelligence (Fall 2023, Fall 2024). One week/semester.
- CSCI 447 - Machine Learning (Fall 2022). Two weeks.

INICTEL–UNI

- Workshop: Deep Learning for Computer Vision. July 2019 (24 hours).
- 3rd Program for Technological Entrepreneurs: Machine Learning. July 2018 (24 hours).

PUBLICATIONS

Journal Articles

- **Giorgio Morales** and John W. Sheppard, "Decomposable Neuro Symbolic Regression," arXiv:2511.04124. June 2025.
- **Giorgio Morales** and John W. Sheppard, "Dual Accuracy-Quality-Driven Neural Network for Prediction Interval Generation," *IEEE Transactions on Neural Networks and Learning Systems*, 36(2), 2843-2853, Feb. 2025.
- Paul Hegedus, Bruce Maxwell, John W. Sheppard, Sasha Loewen, Hannah Duff, **Giorgio Morales**, Amy Peerlinck, "Towards a Low-Cost Comprehensive Process for On-Farm Precision Experimentation and Analysis," *Agriculture*, 13(3), 524, Feb. 2023.
- **Giorgio Morales**, John W. Sheppard, Paul Hegedus, and Bruce Maxwell, "Improved Yield Prediction of Winter Wheat Using a Novel Two-Dimensional Deep Regression Neural Network Trained via Remote Sensing," *Sensors*, 23(1), 489, Jan. 2023.
- **Giorgio Morales**, John W. Sheppard, Riley Logan, and Joseph Shaw, "Hyperspectral Dimensionality Reduction Based on Inter-Band Redundancy Analysis and Greedy Spectral Selection," *Remote Sensing*, 13(18), 3649, Sept. 2021.
- **Giorgio Morales**, John W. Sheppard, Bryan Scherrer, and Joseph Shaw, "Reduced-Cost Hyperspectral Convolutional Neural Networks," *Journal of Applied Remote Sensing*, 14(3), 036519 (2020), Sept. 2020.
- Samuel Huamán, Antero Castro, **Giorgio Morales**, and Joel Telles, "Regression Models between Active Sensor-Measured NDVI and UAV-Acquired Multispectral Images with Positioning Uncertainty," *IEEE Latin America Transactions*, 17(06), pp. 1055-1067, June 2019.
- **Giorgio Morales**, Guillermo Kemper, Grace Sevillano, Daniel Arteaga, Ivan Ortega, Joel Telles, "Automatic Segmentation of Mauritia flexuosa in Unmanned Aerial Vehicle (UAV) Imagery Using Deep Learning," *Forests*, 2018(9), 736, Nov. 2018.

Refereed Conference Papers

- **Giorgio Morales**, Gregory Lehaut, Antonin Vacheret, Frédéric Jurie, and Jalal Fadili, "Neutrino Oscillation Parameter Estimation Using Structured Hierarchical Transformers," *IEEE Int. Joint Conference on Neural Networks (IJCNN)* (ready for submission), June 2026.
- **Giorgio Morales** and John Sheppard, "Adaptive Sampling for Epistemic Uncertainty Reduction Using Prediction-Interval Generation Neural Networks," *AAAI Conference on Artificial Intelligence*, Feb. 2025.

- **Giorgio Morales** and John Sheppard, "Univariate Skeleton Prediction in Multivariate Systems Using Transformers," *European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD)*, Sept. 2024.
- **Giorgio Morales** and John Sheppard, "Counterfactual Analysis of Neural Networks Used to Create Fertilizer Management Zones," *IEEE Int. Joint Conference on Neural Networks (IJCNN)*, June 2024.
- **Giorgio Morales** and John Sheppard, "Counterfactual Explanations of Neural Network-Generated Response Curves," *IEEE Int. Joint Conference on Neural Networks (IJCNN)*, June 2023.
- **Giorgio Morales**, John Sheppard, Riley Logan, and Joseph Shaw, "Hyperspectral Band Selection for Multispectral Image Classification with Convolutional Networks," *IEEE Int. Joint Conference on Neural Networks (IJCNN)*, 2021.
- Marco Apolinario, Samuel Huamán Bustamante, **Giorgio Morales**, and Daniel Díaz, "Estimation of 2D Velocity Model using Acoustic Signals and Convolutional Neural Networks," *IEEE Int. Conference on Electronics, Electrical Engineering and Computing (INTERCON)*, Lima, Peru, Aug. 2019.
- **Giorgio Morales**, Alejandro Ramírez, and Joel Telles, "End-to-end Cloud Segmentation in High-Resolution Multispectral Satellite Imagery Using Deep Learning," *IEEE Int. Conference on Electronics, Electrical Engineering and Computing (INTERCON)*, Lima, Peru, Aug. 2019.
- **Giorgio Morales**, Samuel Huamán, and Joel Telles, "Shadow Removal in High-Resolution Satellite Images Using Conditional Generative Adversarial Networks," *Int. Conference on Information Management and Big Data (SIMBig)*, Lima, Peru, Feb. 2019.
- **Giorgio Morales**, Itamar Salazar, Joel Telles, and Daniel Díaz, "Detecting Violent Robberies in CCTV Videos Using Deep Learning," *Artificial Intelligence Applications and Innovations (AIAI)*, Crete, Greece, May 2019.
- **Giorgio Morales**, Daniel Arteaga, Samuel Huamán, Joel Telles, and Walther Palomino, "Shadow Detection in High-Resolution Multispectral Satellite Imagery Using Generative Adversarial Networks," *IEEE Int. Conference on Electronics, Electrical Engineering and Computing (INTERCON)*, Lima, Peru, Aug. 2018.
- Walther Palomino, **Giorgio Morales**, Samuel Huamán, and Joel Telles, "PETEFA: Geographic Information System for Precision Agriculture," *IEEE Int. Conference on Electronics, Electrical Engineering and Computing (INTERCON)*, Lima, Peru, 2018.
- **Giorgio Morales**, Samuel Huamán, and Joel Telles, "Cloud Detection in High-Resolution Multispectral Satellite Imagery Using Deep Learning," *Int. Artificial Neural Networks and Machine Learning (ICANN)*, Rhodes, Greece, 2018.
- **Giorgio Morales**, Samuel Huamán, and Joel Telles, "Cloud Detection for PERUSAT-1 Imagery Using Spectral and Texture Descriptors, ANN, and Panchromatic Fusion," *Brazilian Technology Symposium (BTSym)*, Brazil 2017.
- **Giorgio Morales**, Daniel Arteaga, Marta Orduna, Guillermo Kemper, and Joel Telles, "An Algorithm for the Improvement of Aerial Images Acquired Via UAV for the Improvement of the Detection of Young Mauritia Flexuosa Palms in the Peruvian Amazon," *Brazilian Technology Symposium (BTSym)*, Campinas, Brazil 2015.

Refereed Workshop Papers

- **Giorgio Morales**, Frederic Jurie, and Jalal Fadili, "Towards Uncertainty Quantification in Generative Model Learning," *EurIPS Workshop: Epistemic Intelligence in Machine Learning* (in review), December 2025.

Invited Papers

- **Giorgio Morales** and John W. Sheppard, "Two-dimensional Deep Regression for Early Yield Prediction of Winter Wheat," *Proceedings of SPIE Future Sensing Technologies*, Nov. 2021.

Non-Refereed Conference Papers

- **Giorgio Morales**, John Sheppard, Amy Peerlinck, Paul Hegedus, and Bruce Maxwell, "Generation of Site-specific Nitrogen Response Curves for Winter Wheat using Deep Learning," *15th Int. Conference on Precision Agriculture*, Minneapolis, Minnesota, United States, June 2022.
- Amy Peerlinck, **Giorgio Morales**, John Sheppard, Paul Hegedus, and Bruce Maxwell, "Optimizing Nitrogen Application to Maximize Yield and Reduce Environmental Impact in Winter Wheat Production," *15th Int. Conference on Precision Agriculture*, Minneapolis, Minnesota, United States, June 2022.
- Bruce Maxwell, Paul Hegedus, Sasha Loewen, Hannah Duff, John Sheppard, Amy Peerlinck, **Giorgio Morales**, Anton Bekkerman, "Decision support from on-field precision experiments," to appear in the *15th Int. Conference on Precision Agriculture*, Minneapolis, Minnesota, United States, June 2022.

Theses

- **Giorgio Morales**, "Decomposable Neuro-Evolutionary Symbolic Regression with Uncertainty Awareness," Ph.D. Dissertation, Gianforte School of Computing, Montana State University, 2025.

- **Giorgio Morales**, "Towards Reduced-Cost Hyperspectral and Multispectral Image Classification," MS thesis, Gianforte School of Computing, Montana State University, 2021.
- **Giorgio Morales**, "Development of a Remote Sensing Software Oriented for Identification and Automatic Measurement of Mauritia Flexuosa plantations in the Peruvian Amazon using Aerial Images Acquired Via UAV and Digital Image Processing Algorithms," BS thesis, Department of Mechatronic Engineering, Universidad Nacional de Ingeniería, 2017.

AWARDS AND RECOGNITIONS

- **Outstanding PhD Researcher** (28/04/2025): Annual award given by MSU's Gianforte School of Computing, which recognizes one PhD student for outstanding research contributions.
- **Everyday Hero of Research** (21/04/2025): This award, given by MSU's Office of Research and Economic Development, recognizes students, staff, faculty, or administrators who go above and beyond to support the success of MSU's research, creativity, and innovation.
- **1st Place - Seismic Monitoring and Analysis Challenge** (16/07/2024): Awarded first prize in a discovery challenge hosted at the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases ECML PKDD 2024.
- **Cobleigh Scholarship Endowment** (19/04/2023 and 11/04/2024): Scholarship for students of the Norm Asbjornson College of Engineering. Received during the 2023 and 2024 academic years.
- **Graduate Professional Advancement Grant** (08/05/2023 and 03/04/2024): Travel grants for MSU graduate students to conduct oral presentations at professional conferences.
- **IEEE CIS Travel Grant** (13/05/2023): Travel grant for a student presenting at IJCNN 2023.
- **Chunzi "Chris" Zhang Award** (04/05/2023): Award for International Graduate Excellence in Research offered by MSU's Office of International Programs.
- **William V. Benjamin Scholarship** (19/04/2021 and 16/05/2022): Scholarship for students of the Norm Asbjornson College of Engineering. Received during the 2021 and 2022 academic years.
- **Southern Peru – ProUNI Graduate Scholarship** (05/07/2019): $20K award program that supports graduates from the National University of Engineering to pursue MSc/PhD studies abroad.

SOFTWARE

- Jhordan Castillo, Walther Palomino, **Giorgio Morales**, Marco Apolinario (2020), "Software de Identificación de Nubes sobre Imágenes Multiespectrales SINIM-1". Registered at the National Institute for the Defense of Competition and Protection of Intellectual Property (INDECOPI), Lima, Peru. Reg. Number: 00740-2021. Registration date: 17/06/2021.
- **Giorgio Morales** (2019), "Software de Segmentación de Aguajes MAUFLEX". Registered at the National Institute for the Defense of Competition and Protection of Intellectual Property (INDECOPI), Lima, Peru. Reg. Number: 00572-2019. File number: 000735-2019. Registration date: 12/04/2019.
- **Giorgio Morales**, Luis Bendayán, Jorge Sanjurjo, Antero Castro, Guillermo Kemper, David Ponce, and Joel Telles (2017), "Software de Teledetección de Palmeras de Aguajales". Registered at the National Institute for the Defense of Competition and Protection of Intellectual Property (INDECOPI), Lima, Peru. Reg. Number: 00989-2017. File number: 001120-2017. Registration date: 11/07/2017.
- Joel Telles, Walther Palomino, Urpi Brioso, Christian Vargas, **Giorgio Morales**, Ivan Ortega, Adison Pacheco, Samuel Huamán (2017), "Software de Identificación de Tres Patrones de Deforestación SI3PD". Registered at the National Institute for the Defense of Competition and Protection of Intellectual Property (INDECOPI), Lima, Peru. Reg. Number: 01758-2017. File number: 003031-2017. Registration date: 13/11/2017.

INVITED TALKS

- "Counterfactual Analysis of Neural Networks Used to Create Fertilizer Management Zones," International Conference on Digital Technologies for Sustainable Crop Production (DIGICROP). Online event. July, 2025.
- "Managing Uncertainty in Regression Neural Networks - From Prediction Intervals to Adaptive Sampling," *Causality and Quantification of Uncertainties Day*, NormasTIC federation, Caen, France, June 2025.
- "Decomposable Symbolic Regression Using Transformers and Neural Network-Assisted Genetic Algorithms," *Séminaire IMAGE*, Laboratoire de recherche en sciences du numérique (GREYC), UNICAEN, April 2025.
- "Unraveling the Complexity of Multivariate Systems with Symbolic Regression," *Technology and Artificial Intelligence Learning Seminar (TAILS)*, Dept. Mathematical Sciences, Montana State University, Nov. 2024.
- "AI for Precision Agriculture," *AI in Research and Education Symposium*, Montana INBRE Data Science Core and Montana Technological University, October 2024.

- "Counterfactual Explanations of Nitrogen Response Curves", *International Conference for On-Farm Experimentation (ICOFPE)*, Research Reports: ML and AI, Texas, Jan. 2024.
- "Prediction Software using OFPE and Machine Learning," *International Conference for On-Farm Experimentation (ICOFPE)*, Data Intensive Farm Management Cyber-Infrastructure, Texas, Jan. 2024.
- "First Paper Essentials: How to Write Your First Paper," *Invited Seminar*, Student Chapter IEEE Signal Processing Society, National University of Engineering, Lima, Peru, July 2022.
- "Participation in Research Projects and General Admission Process to US Universities," Invited Seminar, *Student Chapter IEEE Signal Processing Society*, National University of Engineering, Lima, Peru, July 2021.
- "Hyperspectral Image Classification with Low Cost 3D-2D Convolutional Neural Networks", *Gianforte School of Computing Seminar*, Montana State University, Feb. 2020.
- "Cloud Detection in PERUSAT-1 Satellite Images Using Deep Learning", *I International Workshop - "PERUSAT-1" Lessons Learned*, Space Agency of Peru CONIDA, Lima, Peru, Dec. 2018.
- "Use of Drones for Research", *"Eduardo Hábich" Conference Cycle*, National University of Engineering, Lima, Peru, June 2018.
- "Smart Cities: Tourist Challenge", *World Day of Telecommunications and Information Society*, INICTEL-UNI, Lima, Peru, May 2016.
- "Drones and their Application in Agriculture", *First Meeting of Innovation and Technological Entrepreneurship in Engineering and Architecture*, Peruvian University "Unión", Lima, Peru, October 2015.

PROFESSIONAL ACTIVITIES AND SERVICE

Professional Society Memberships

- Institute for Electrical and Electronics Engineers (IEEE), Member:
  - Computational Intelligence Society.
  - Young Professionals
- Int. Neural Network Society (INNS), Member

Journal Reviewer

- Transactions on Neural Networks and Learning Systems (IEEE): 2025.
- Journal of Applied Remote Sensing (SPIE): 2020 – 2023.
- Journal of Photogrammetry and Remote Sensing (ISPRS): 2022.
- Journal of Electronic Imaging (SPIE): 2018, 2021.
- Drones (MDPI): 2019.
- Machine Learning and Knowledge Extraction (MDPI): 2019.

Program Committees

- 40th Annual AAAI Conference on Artificial Intelligence: 2026.
- 15th Int. Conference on Artificial Intelligence Applications and Innovations (AIAI 2019).
- 27th Int. Conference on Artificial Neural Networks (ICANN 18).

Conference Reviewer

- EurIPS Workshop. "Epistemic Intelligence in Machine Learning": 2025.
- IEEE Int. Joint Conference on Neural Networks (IJCNN): 2022, 2023, 2024, 2025.
- European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD): 2024 (PhD Forum).
- IEEE Conference on Artificial Intelligence (ICAI): 2024.
- World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI): 2022.
- IEEE Int. Conference on Electronics, Electrical Engineering, and Computing (INTERCON): 2020.

Conference Session Chair

- IEEE Int. Joint Conference on Neural Networks (IJCNN): 2021, 2023.
- IEEE Int. Conference on Electronics, Electrical Engineering, and Computing (INTERCON): 2019.

Other Committees

- Faculty Search Committee (Student Representative), Gianforte School of Computing, Montana State University, 2021.

CERTIFICATIONS

Machine Learning Engineering for Production (MLOps) Specialization *January 2023*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/specialization/6ZRMRMYJALBB.

Deploying Machine Learning Models in Production *January 2023*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/S3PQ5G7K436L.

Machine Learning Modeling Pipelines in Production *January 2023*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/92HQPG98T9D5.

Machine Learning Data Lifecycle in Production *January 2023*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/8KWAFHQSD8SZ.

Machine Learning in Production *January 2023*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/7V34NWM239TG.

"RENACYT" Researcher - Group "María Rostworowski", Level III *Sept. 2020*
- Organization: Concytec Perú.
- Credential ID: P0048308.

IRB Data or Specimens Acquired from Human Subjects *July 2020*
- Organization: CITI: Collaborative Institutional Training Initiative.
- Credential ID: 37511482.

Deep Learning Specialization *December 2018*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/specialization/JGTWUVQVTBJM.

Sequence Models *December 2018*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/J3WDNYEKEUW7.

Convolutional Neural Networks *December 2017*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/JW66CK3KXBMQ.

Structuring Machine Learning Projects *October 2017*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/8QGT9ZNBRQY2.

Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization *Sept. 2017*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/2894FSX8SQAW.

Neural Networks and Deep Learning *Sept. 2017*
- Organization: DeepLearning.AI.
- Credential ID: coursera.org/verify/VHQ4RSZVLC4E.

Object Detection *November 2016*
- Organization: Universitat Autònoma de Barcelona.
- Credential ID: coursera.org/verify/BC2UP2WAFTAB.

Machine Learning *July 2016*
- Organization: Standford University.
- Credential ID: coursera.org/verify/DBS7CC7AWA7Z.

LANGUAGE AND SKILLS

- Spanish (native), English (full professional proficiency), Italian (C1), French (B1).
- Python, Java, C/C++, Pytorch, Tensorflow/Keras, Matlab, LaTeX.