



Daniel Saromo Mori

MECHATRONIC ENGINEER · INVENTOR OF THE AUTO-ROTATING PERCEPTRONS (ARP) · AI RESEARCHER AND TEACHER

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About me

Hi! I'm Daniel, a mechatronics engineer passionate about AI-powered robot control. My main research interest is *robotics × machine learning: robot learning*. As a result of my research in AI, I have invented the ARP and the ARNN —algorithms that I have presented in five countries. Besides that, I have 3+ years of experience in research and teaching AI, ML, and Data Science. Also, I have project experience in Robot Learning with physical robots, like my [spider robot guided by AI](#), work recognized with the [Innovation Award](#) at [IMECE 2019](#).

Education

M.Sc. in Automation and Control Engineering · Currently enrolled

POLITECNICO DI MILANO (13TH IN THE WORLD: [QS ENGINEERING RANKING 2022](#))

Milan, Italy

Since Sep. 2022

Mechatronics Engineering Professional Degree & B.Sc., Mechatronics Engineering

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ (1ST IN PERU: [QS RANKING 2022](#))

Lima, Peru

08/2019 - 11/2020, 03/2014 - 07/2019

- **Bachelor's average course grade:** 15.70 (Scale: minimum: 0, required to pass: 11, maximum: 20).
- **Academic ranking:** Top fifth of class (6th of 32 mechatronics graduates) · Top 6.66% of the students of the Faculty of Science and Engineering.
- **Theses title:** [Intelligent spider robot for detecting anti-personnel metallic landmines in uneven terrain](#).
- **Professional Degree Thesis Awards:** - [Extraordinary Support Funding for Undergraduate Research Thesis](#).
- **Ranking:** Degree thesis unanimously awarded by the tribunal with the qualification of *outstanding*.
- **B.Sc. Thesis Awards:** - [Best bachelor's thesis](#) and poster presentation at the PUCP Mechatronics Workshop of the semester 2019-1.
- [Innovation Recognition Award](#) at the [International Mechanical Engineering Congress & Exposition \(IMECE\) 2019](#).
- **Theses advisors:** [Elizabeth Villota, Ph.D.](#) and [Edwin Villanueva, Ph.D.](#)

Scientific Publications

- [C4] Bravo, L., **Saromo, D.**, and Villota, E. "[Smart Insole Sensor for vGRF Measurement](#)", *9th International Symposium on Sensor Science*. Warsaw, Poland. 2022.
- [C3] Valdenegro-Toro, M. and **Saromo, D.** "[A Deeper Look into Aleatoric and Epistemic Uncertainty Disentanglement](#)", *LXCV Research Workshop at CVPR 2022*. Louisiana, U.S.A. 2022 · Paper presented in the poster session and was one of the few selected for an oral presentation.
- [C2] **Saromo, D.**, Bravo, L., and Villota, E. "[Smart Sensor Calibration with Auto-Rotating Perceptrons](#)", *LXAI Research Workshop at ICML 2020*. Vienna, Austria. 2020 · Paper was presented in the poster session and was one of the few selected for an [oral presentation](#).
- [C1] **Saromo, D.**, Villota, E., and Villanueva, E. "[Auto-Rotating Perceptrons](#)", *LXAI Research Workshop at NeurIPS 2019*. Vancouver, Canada. 2019 · Paper presented in the poster session and was one of the few selected for an [oral presentation](#).
- [T1] **Saromo, D.** "[Intelligent spider robot for detecting anti-personnel metallic landmines in uneven terrain](#)", *Pontificia Universidad Católica del Perú*. Lima, Peru. 2020 · Thesis published in Spanish. English abstract available: [link](#).

Teaching Experience

- PUCP's Center for Advanced Manufacturing Technologies (CETAM)

TEACHER Courses: Machine Learning for Industry, Python for Data Science.

Lima, Peru

Since Sep. 2020

- PUCP Grad. School · Continuing Education Department · Teacher at Specialization Diplomas

TEACHER - Diploma in Development of AI Applications (Course: AI for Games).
- Diploma in Data Analytics (Course: Data Analysis Methods for Time Series).

Lima, Peru

Since Sep. 2019

Jun. 2022 - Oct. 2022

- National Meteorological and Hydrological Services (SENAMHI) · Peruvian Government Entity

TEACHER Course: Introduc. to AI and ML for National Meteorological and Hydrological Services.

Lima, Peru

May. 2022 - Jun. 2022

- PUCP Undergraduate School · Faculty of Science and Engineering

TEACHING ASSISTANT Undergraduate courses: AI, ML, Computer Science Applications.

Lima, Peru

Mar. 2019 - Dec. 2019

Honors & Awards

DOMESTIC 🏠

- 2020 [Extraordinary Support Funding for Undergraduate Research Thesis](#), PUCP · 2500 PEN Lima, Peru
- 2019 [Best bachelor thesis and poster presentation](#), PUCP Mechatronics Engineering End of Career Workshop Lima, Peru
- 2018 [Automatic system for pre-fried potatoes production: Best team project](#), PUCP Mechatronics Project Fair Lima, Peru
- 2017 [11th place \(national level\)](#), FESTO's X Academic Mechatronics Olympics 2017 · Teamed with Leonardo Bravo Lima, Peru

INTERNATIONAL

- 2022 **CVPR Registration and Travel Grant**, for attending [CVPR 2022](#) to be an oral and poster presenter · 900 USD *New Orleans, U.S.A.*
- 2022 **LXCV Travel Grant**, for attending [CVPR 2022](#) to be an oral and poster presenter · 2567 USD *New Orleans, U.S.A.*
- 2019 **LXAI Travel Grant**, for attending [NeurIPS 2019](#) to be an oral and poster presenter · 1860 USD *Vancouver, Canada*
- 2019 **Innovation Recognition Award**, Old Guard 63rd Annual Oral Competition (World Finals at [IMECE](#)) · 250 USD *Utah, U.S.A.*
- 2019 **ASME Travel Award**, to represent PUCP and South America at ASME IMECE Finals Competition · 1500 USD *Utah, U.S.A.*
- 2019 **1st place + Technical Award**, Old Guard Oral Presentation Competition (ASME E-FEST South America) · 850 USD *Lima, Peru*

Professional and Research Experience

German Research Center for Artificial Intelligence (DFKI)

Bremen, Germany

GUEST RESEARCHER · REMOTE MODE

Aug. 2020 - Jul. 2022

- **Auto-Rotating Neural Networks (ARNN)**: I [extended the ARP concept](#) and created a new neural model family named Auto-Rotating Neural Networks. I've implemented dense, recurrent, LSTM, GRU, and convolutional layers with the Auto-Rotating operation; and obtained promising results. We are [finishing the journal paper](#) for this project. *Research advisors: Edwin Villanueva, Ph.D. and Matias Valdenegro-Toro, Ph.D.*
- We are testing the implementation of the ARNN, to validate and compare their performance against equivalent models without the Auto-Rotation. Experiments ran in the research center's GPU clusters. Results presented at the [Online Asian Machine Learning School \(OAMLS\)](#).

PUCP Applied Robotics and Biomechanics Research Group (GIRAB)

Lima, Peru

RESEARCH ASSISTANT

Mar. 2020 - Dec. 2020

- **Smart Sensor Calibration with Auto-Rotating Perceptrons**: In this paper, we applied the ARP to calibrate a wearable force sensor. By changing classic neurons to ARP, we obtained [15x better](#) neural network performance. *Research advisor: Elizabeth Villota, Ph.D.*

PUCP Artificial Intelligence Research Group (IA-PUCP)

Lima, Peru

RESEARCH ASSISTANT

Since Mar. 2019

- **Auto-Rotating Perceptrons**: I invented this neural unit to mitigate the vanishing gradient problem at deep neural networks. The results show that if we change classic perceptrons to ARP, we can improve the learning performance of neural networks. *Research advisors: Elizabeth Villota, Ph.D. and Edwin Villanueva, Ph.D.*

PUCP Polymers and Composites Research Group (POLYCOM)

Lima, Peru

PROJECT ASSISTANT · PRE-PROFESSIONAL RESEARCH INTERNSHIP

Jul. 2018 - Oct. 2018

- I supported the execution and documentation of these research projects: [analysis of the mechanical properties of Peruvian spiders' silk](#), and [extraction of starch nanoparticles from Peruvian potatoes](#). *Research advisor: Omar Troncoso, Ph.D.*

Talks & Presentations

INTERNATIONAL

- Nov. 2021 **Poster presentation: Auto-Rotating Neural Networks**, [Online Asian Machine Learning School](#) at [ACML](#) *Singapore, Singapore*
- Mar. 2021 **Tutorial: Auto-Rotating Perceptrons**, Invited speaker for the group [Papers We Love Guatemala](#) *Guatemala, Guatemala*
- Jul. 2020 **Paper exposition: Smart Sensor Calibration with Auto-Rotating Perceptrons**, Speaker at [LXAI ICML](#) *Vienna, Austria*
- Dec. 2019 **Paper exposition: Auto-Rotating Perceptrons**, Speaker at [LXAI NeurIPS](#) *Vancouver, Canada*

DOMESTIC

- Oct. 2021 **Workshop: Introduction to AI and Robotics**, Conference speaker at [IEEE Open Fest LATAM Week](#) *Lima, Peru*
- Oct. 2021 **Conference: VII Research Meeting of the PUCP Engineering Department**, Conference speaker *Lima, Peru*
- Jul. 2020 **Fair: Getting to know your carrer: Mechatronics Engineering · Timestamp: 2:27:42**, Speaker *Lima, Peru*
- Feb. 2020 **Fair: CEFACI PUCP's Fair of Engineer Carreers 2020**, Speaker *Lima, Peru*
- Jun. 2018 **Fair: PUCP's Mechatronics Project Fair 2018 · Timestamp: 9:45**, Oral presenter of the winning project *Lima, Peru*

Volunteer experience

Member of [AEA POLIMI](#) · Project being executed in collaboration with [POLIMI Sailing Team](#)

Milan, Italy

LEADER OF THE ML-BASED CONTROL TEAM

Since Dec. 2022

- The AEA is the Automation and Robotics Engineering Association of Politecnico di Milano.
- The AEA is supporting the development of an automatic control system for the sailboat that will be used by POLIMI students at the [Foiling SuMoth International Competition 2023](#).

International Women's Day Hackathon 2022 · Organized by the group [Teens in AI](#)

Lima, Peru

TECH MENTOR

Mar. 2022

- The Teens in AI initiative, launched at the AI for Good Global Summit at the UN (2018), aims to give young people early exposure to AI.
- I was invited to be a mentor of one of the Peruvian teams, in the areas of AI and ML. My group was awarded first place in the hackathon.

PUCP's Women In Engineering (WIE) affinity group

Lima, Peru

MENTOR

Nov. 2021 - Dec 2021

- I was assigned to a freshman mechatronics engineering student to guide her to transition to her university-level studies.
- I gave her academic advice, study tips, and orientation to help her reach her professional goals.

Continuing Education

Aug. 2022	Oxford Machine Learning Summer School , Oxford University & AI for Global Goals	Oxford University
Jun. 2022	AutoCAD - Level: Intermediate , National University of Engineering (UNI)	UNI
Mar. 2022	Solidworks - Level: Intermediate , National University of Engineering (UNI)	UNI
Jan. 2022	Solidworks - Level: Basic , National University of Engineering (UNI)	UNI
Nov. 2021	Online Asian Machine Learning School , Asian Conference on Machine Learning (ACML)	ACML 2021
Aug. 2021	RIIAA Summer School , International Meeting on AI and its Applications (RIIAA)	RIIAA 2021
Jul. 2021	Robot Operating System (ROS) , Center for Advanced Manufacturing Technologies (CETAM)	CETAM PUCP
Nov. 2020	Scrum Master Certification Training , IEEE Ricardo Palma University Student Branch	IEEE Peru Section
Jul. 2019	Getting started with AI on Jetson Nano , NVIDIA Deep Learning Institute	NVIDIA DLI
Nov. 2018	PyTorch Scholarship Challenge , Udacity / Facebook	Udacity / Facebook
Apr. 2018	Machine Learning for Data Science and Analytics , Columbia University	edX
Feb. 2017	PCB design with international standards oriented to manufacturing , AlDelta Technologies	AlDeltaTec.com
May 2016	Embedded Systems – Shape the World , University of Texas at Austin	edX
May 2015	Introduction to Robotics , Queensland University of Technology	QUT MOOC

Robot Learning Projects

Robot learning using DDQN and Neuroevolution for my 2 DOF laser pointer robot

Lima, Peru

GOAL: TO HAVE A PHYSICAL ROBOT TO BE CONTROLLED USING MACHINE LEARNING

Apr. 2020 - May 2020

- I built an arm-type robot that learns to control a laser pointer using Deep Reinforcement Learning, Neuroevolution, and Computer Vision.
- The 2 DOF robot learned to point a laser beam to reach a target located at the center of two marks. The algorithms used were DDQN and NEAT.
- These algorithms were executed on Linux. Then, the commands were sent to an Arduino board using the [PyDuino Bridge Library](#) I authored.

My 8 DOF spider robot: making it learn to walk · Honored with IMECE's Innovation Award

Lima, Peru

GOAL: TO HAVE A PHYSICAL ROBOT TO TEST THE AI-BASED ALGORITHM I PROPOSED FOR MY THESES

Aug. 2018 - Jul. 2019

- A spider robot was designed and implemented following Kamrani's rapid prototyping methodology.
- Development of a novel algorithm that uses supervised ML, genetic algorithms and Arduino/Python interaction let the robot learn to walk.

Skills

Technical tools **CAD/CAE:** *Mechanics:* Inventor, SolidWorks, AutoCAD. *Electronics:* EagleCAD, Altium Designer, Circuit Maker, Proteus, B2 Spice. | **Embedded Systems:** ATmega328P, ATmega2560 (Arduino IDE); Raspberry Pi (SBC and RP2040); Jetson Nano. | **Coding:** Python, MicroPython, C, C++, MATLAB, VBA (for Excel), UserRPL, \LaTeX . | **Frameworks:** Git, Tensorflow, Keras, Scikit-learn, PyTorch, NumPy, Pandas, Seaborn, Matplotlib, Plotly, OpenCV, OpenAI Gym, [PyDuino Bridge](#). | **Math Software:** Wolfram Mathematica, Simulink. | **Web:** HTML, CSS, Jekyll. | **Automation:** TIA Portal (PLC/HMI). LabView.

Technical skills **Mechanics:** Parametric 3D modeling and assembly. Technical drawing. **Electronics:** Schematic drawing. PCB design, assembly, and testing. Excellent soldering skills (THT and SMT). | **Automatic Control:** Classical and state-space. | **Artificial Intelligence:** Deep Learning (MLP, CNN, ARNN, ARP). Search algorithms and heuristics. Bio-inspired optimization (ABC, ACO, and PSO). Decision Trees. Random Forests. SVM. Image Style Transfer. Clustering. PCA. Ensemble Learning. Transfer Learning. Neuro-Evolution of Augmenting Topologies (NEAT). Deep Reinforcement Learning (DQN, DDQN). Computer Vision.

Soft skills Strong abilities in public speaking, teamwork, and leadership. Maker spirit. Curiosity and perseverance.

Languages **Spanish** (native), **English** (TOEFL iBT [2020]: 97/120), **Italian** (elementary level), and **French** (elementary level).

Other Extracurricular Projects

For more information about my projects, please visit my web portfolio: <https://www.danielsaromo.xyz/>.

My own website! · <https://www.danielsaromo.xyz/>

Lima, Peru

GOAL: TO HAVE AN ONLINE PORTFOLIO TO SHOW MY PROJECTS FOR AN M.SC. PROGRAM APPLICATION

Jul. 2021 - Aug. 2021

- I learned how to program in HTML, CSS, and Jekyll, to develop and maintain the front-end of a webpage.

SCARA 2D robot simulator

Lima, Peru

GOAL: TO CREATE A VIRTUAL ROBOT ENVIRONMENT FOR TEACHING STUDENTS TO CONTROL IT WITH ML

Jun. 2021 - Jul. 2021

- The code allows the user to create a generic SCARA robotic arm, with any number of links desired and a graphical interface.
- I created this simulator for my students of the course "Machine Learning for Industry," so they can learn ML in a more interactive and visual way.
- It was presented at the international conference IEEE Open Fest LATAM Week 2021, where I gave the workshop: "[Introduction to AI and Robotics](#)."

Auto-Rotating Perceptrons Library · Teamed with Dr. Matias Valdenegro-Toro

Lima, Peru

GOAL: TO MAKE AN OPEN-SOURCE LIBRARY FOR THE ARP NEURAL UNITS

Oct. 2020 - Mar. 2021

- We made a Keras implementation of the ARP units.
- The library is available on the Python Package Index (with the command: 'pip install arpkeras').
- On March 2021, I presented this library in a [tutorial](#) for the research group [Papers We Love Guatemala](#).