Jose E. Aguilar Escamilla

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Curriculum Vitae

RESEARCH INTERESTS

My experience and interest in machine learning spans the wide spectrum from theory to applied machine learning. On the theoretical end, I am interested in **adversarial attack** models and defenses that guarantee safe learning. On the Applied end, I am interested in applying **reinforcement learning** systems to safety-critical real world problems. In short, my work focuses on studying **robustness of reinforcement learning** algorithms **for real world safety-critical problems**. *My vision* in every research endeavor I pursue is to create the best collaboration possible with the experts I work with, and provide the best of my ability in solving problems critical to pushing the boundaries of knowledge, and maintaining an open mind.

EDUCATION

Jul, 2018 - May, 2022 **B.S. Computer Science**, *University of Oklahoma.*

May, 2022 - May, 2023 **M.S. Computer Science (Accelerated)**, *University of Oklahoma.* Thesis: *Graph Attention and Persistence for Traveling Salesman Problem.* Committee: Dr. Dean Hougen (Chair), Dr. Dimitrios Diochnos, Dr. Chao Lan.

Sep, 2023 **Ph.D. Artificial Intelligence**, *Oregon State University.* Mentors: Dr. Huazheng Wang and Dr. Sanghyun Hong. (co-advisors)

RESEARCH EXPERIENCE

June, 2023 – Aug, 2023 **Sub-Grid Scale Modeling Correction with Machine Learning | National Renewable Energy Laboratory (NREL)**, *Flatirons, CO. GEM Fellow Intern. (Mentors: Dr. Michael Kuhn)*

- Studied and ran 2-stage computational fluid dynamics with AMR-Wind for large eddy simulations.
- Implemented an U-Net model to learn the source term of wave crash simulations to more accurately account for sub-grid scale energy dissipation of sea waves.

Feb, 2022 – May, 2023 **Using Attention and Decision Hierarchies for Interpretable Auto-Routing of Aircraft | University of Oklahoma, School of Computer Science & Oklahoma City Air Logistics Complex (OCALC) & OADII,** *Norman, OK. Graduate Research Assistant. (Mentors: Dr. Dean F. Hougen, Alex Stringer, Lacey Schley)*

- Research focused on developing an explainable reinforcement

learning system for automatic routing amid dynamic threats.
- Formalized routing problem as an orienteering-based problem seeking to find best/safest waypoint-based trajectory.
- Proposed a *Graph Attention Reinforcement Learning* system to be used as part of the auto-routing system for aircraft within an explainable framework in collaboration with Oklahoma City Air Logistics Complex.
- Has a leading role collaborating with four PhD and Master's students to implement and further research the system.

May, 2021 – Sep, 2022 **Perceptrons Under Verifiable Random Data Corruption | University of Oklahoma, School of Computer Science,** *Norman, OK. Undergraduate Research Collaborator.* (Mentor: Dr. Dimitrios I. Diochnos)

- Studied the robustness/tolerance of the Perceptron to random data corruption on linear and non linearly-separable data. Used real world data as well as two self-made synthetic datasets.
- Demonstrated empirically that the Perceptron can take up to 80% data corruption before model accuracy deteriorates significantly. This robustness was characterized as stability amid data loss.
- Research presented at The 9th International Conference on Machine Learning, Optimization, and Data Science.

Mar, 2021 – May, 2022 **Quantification of the Robustness of Stochastic Synapse Reinforcement Learning | Robotics, Evolution, Adaptation, and Learning (REAL) Laboratory, The University of Oklahoma,** *Norman, OK.* Undergraduate Research collaborator. (Mentor: Dr. Dean F. Hougen.)

- Studied the robustness of Stochastic Synapse Reinforcement Learning (SSRL) and Deep Deterministic Policy Gradient (DDPG) using tools from machine learning (Local Lipschitz Continuity).
- Discovered SSRL is considerably more robust than Deep Deterministic Policy Gradient (DDPG) on OpenAI environments.

Sep, 2020 – Mar, 2021 **A Spiking Neural Network for Self-Organizing World Representation | Independent Project, The University of Oklahoma,** *Norman, OK.*

- The continuation of class project in Intelligent Robotics, developed a hybrid robot architecture for giving college tours with a Turtlebot 2.
- Used a spiking neural network (SNN) model to create a self-organizing map to represent and learn an unknown environment as the robot explores.
- Used ideas from decision tree pruning to reduce the complexity of model, permitting convergence on complex problems.

Oct, 2018 – May, 2022 **Developing Machine Learning Models for Hail Sizing and Classification With Size-Variable Data Sets | National Severe Storms Laboratory, CIMMS**, *Norman, OK.* Undergraduate Research Assistant. (Mentors: Kiel Ortega, Skylar Williams.)

- Performed data-quality processing of Multi-Year Reanalysis of

Remotely Sensed Storms (MYRORSS).

- Used machine learning for hail meteorology to study the effect of a quality-variable dataset (MYRORSS) against a high-quality dataset (SHAVE). Proposed and implemented an algorithm inspired by cross-validation (CV) to modify training data size and collect performance of different models while searching for optimal hyperparameters.
- Discovered training machine learning models is more efficient using high quality datasets than large, low quality datasets. Managed to obtain better accuracy than Maximum Expected Size of Hail (MESH).

PUBLICATIONS

Sep, 2023 **Aguilar Escamilla, J. E, Diochnos, Dimitrios.** Perceptrons Under Verifiable Random Data Corruption, *The 9th International Conference on Machine Learning, Optimization, and Data Science,* Grasmere, Lake District, England.

May, 2021 **Aguilar Escamilla, J. E.** A spiking neural network For Self-Organizing World Representation, *The Honors Undergraduate Research Journal*, 20: 86-99.

CONFERENCE PRESENTATIONS

Sep, 2023 **Aguilar Escamilla, J. E, Diochnos, Dimitrios.** Perceptrons Under Verifiable Random Data Corruption, *The 9th International Conference on Machine Learning, Optimization, and Data Science,* Online.

Oct, 2022 **Aguilar Escamilla, J. E et al.** Auto Routing using Graph Attention, Norman, Ok. Addressing Our Evolving Global Security Challenge Symposium by OADII.

Apr, 2022 **Aguilar Escamilla, J. E**. A Study On The Perceptron Learning Bounds Under Data Corruption. Industry and Government Day, Norman, OK.

Apr, 2022 **Aguilar Escamilla, J. E**. A Study On The Perceptron Learning Bounds Under Data Corruption. Undergraduate Research Day, Norman, OK.

Mar, 2022 **Aguilar Escamilla, J. E**. A Study On The Perceptron Learning Bounds Under Data Corruption. 2022 National Conference on Undergraduate Research (NCUR), Online.

Mar, 2022 **Aguilar Escamilla, J. E**. A Study On The Perceptron Learning Bounds Under Data Corruption. 2022 National McNair Conference. College Park, MD.

Oct, 2021 **Aguilar Escamilla, J. E**. Perceptron Learning Bounds Across Distributions Under Data Poisoning. 2021 MKN Heartland McNair Research Conference, Kansas City, MO.

Jan, 2021 **Aguilar Escamilla, J. E**. Developing Machine Learning Models for Hail Sizing and Classification With Size-Variable Data Sets. 101th AMS Annual Conference, Online.

Jan, 2020 **Aguilar Escamilla, J. E**. MRMS-Based Hail Sizing and Classification Using Different, Large Databases. 100th Anual Annual Conference, Boston, MA.

HONORS / AWARDS / FELLOWSHIPS

Sep, 2023 Mr. & Mrs. Edward N. Rickert, Jr. Fellowship at Oregon State University.

Sep, 2023 Oregon State University *Outstanding Scholar* (EECS Scholars)

Jun, 2023 2023 *GEM Fellowship*, PhD (Employer: National Renewal Energy Laboratory [NREL].)

Apr, 2022 *2nd Place* University of Oklahoma Undergraduate Research Day Presentation, Aerospace and Mechanical Engineering.

Apr, 2022 Cornell SoNIC Summer *Research Workshop on Robotics*.

Oct, 2021 Princeton Prospective PhD Preview Scholar, Cohort of 2021.

Oct, 2021 Qubit by Qubit/IBM 2021-2022 Introduction to Quantum Computing *Undergraduate Scholarship*.

Apr, 2021 Presidents International *Travel Fellowship* (Italy).

Jan, 2021 *Best Student Poster Presentation Award*, 20th conference on AI for Environmental Science, 101th American Meteorological Society Conference.

MEMBERSHIPS / AFFILIATIONS

Sep, 2023 Oregon State University EECS Scholar.

Jun, 2023 GEM Fellow at Oregon State University.

Jun, 2023 – Aug, 2023 National Renewable Energy Laboratory (NREL.)

May, 2022 New Horizons in Theoretical Computer Science Summer School, Cohort of 2022.

Apr, 2021 – May, 2023 Robotics, Evolution, Adaptation, and Learning (REAL) Laboratory.

Apr, 2021 – Sep, 2022 McNair Scholar.

Dec, 2020 – May, 2022 OU AI, Project Manager.

Oct, 2018 – May, 2022 National Weather Center, National Severe Storms Laboratory, CIMMS (Now CIWIRO.)

PROFESSIONAL SERVICE

Apr, 2022 Organizing Committee Member 1st Annual OU AI Symposium.

Mar, 2022 Reviewer IEEE WCCI, March 2022.

CERTIFICATIONS

Apr, 2022 Qubit by Qubit's Introduction to Quantum Computing