Machine Learning Research Helps Marine Corps Ph.D. Graduate Make History

MONTEREY, CALIFORNIA, USA, June 28, 2023 /EINPresswire.com/ -- As battlespace sensors proliferate and data increases, commanders can easily find themselves in an information paradox: drowning in data, but starving for knowledge.

U.S. Marine Corps Lt. Col. Pedro Ortiz, who graduated from the Naval Postgraduate School (NPS) on June 16 with a Ph.D. in Computer Science, focused his dissertation on this challenge to help enable rapid, effective decision-making for commanders in an era of ever-increasing sensor data and uncertainty.

U.S. Marine Corps Lt. Col. Pedro Ortiz focused his Ph.D. dissertation at the Naval Postgraduate School on helping to enable rapid, effective decision-making for commanders in an era of ever-increasing sensor data and uncertainty.

“I am very interested in applying artificial intelligence and machine learning to solve warfighter problems,” said Ortiz. “Ideally, I would like to be able to investigate a warfighting problem, posit some solutions, and lead the efforts to apply those solutions at operational units.”

Not only did Ortiz join an elite group of graduates from the Marine Corps’ Ph.D. Program (PHDP), he also made history as the first Hispanic Marine to earn his Ph.D. through the Corps’ PHDP-Technical (PHDP-T) program.

As a very competitive program – only two candidates are selected each year – PHDP provides the service with a cohort of strategic and highly technical thinkers to support senior leader decision-making, assist in developing defense and service strategies, and help inform long-range concept and capability development areas.

Ortiz’ dissertation was entitled “Uncertainty Quantification and Decomposition through Bayesian Deep Learning for Big Data Satellite Remote Sensing Problems.” Through the application of

probabilistic models to massive satellite remote sensing data sets, Ortiz examined uncertainty quantification (UQ) methods that are pivotal in reducing the impact of uncertainty during optimization and decision-making processes.

In his next assignment, Ortiz will report to the DOD Chief Digital and Artificial Intelligence Office (CDAO) to apply his newfound knowledge and expertise. According to Ortiz – who previously earned his master's degree in computer science from NPS in 2010 – his research has the potential to positively affect the joint all-domain command and control (JADC2) in both present-day and future operations.

"My research involved using data sets from two different satellites, and two different sensors on each of those satellites," he explained. "We used probabilistic deep learning to fill in the gaps in a microwave dataset using infrared from a different satellite. We were also able to quantify the uncertainty, and tell you how reliable the data we generated from that model was."

UQ methods have been applied to solve a variety of real-world problems in science and engineering.

"With more data to fill in the gaps between different sensors, and an ability to understand the uncertainty in the data, the warfighter now has more information to make better decisions," Ortiz said. "High uncertainty means the model output may not be trustworthy. Understanding the uncertainty makes the output of a model more interpretable. This applies to many military decisions," such as target identification and other complex automated military systems.

Ultimately, Ortiz says modeling predictions will help with decision-making, as they address a critical component of trustworthiness in artificial intelligence and machine learning.

"It is my hope that my research will encourage other people to use the same models I did so that they can reap the benefits of being able to measure uncertainty," he continued. "One of the main contributions I made was demystifying how to use this additional information for many scientific fields, essentially anywhere deep learning is being used today or might be used in the future."

Learn more about Ortiz's research here: https://youtu.be/b-s_i3cGxjY

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