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MORS/Tisdale Competition Highlights Relevance, Impact of NPS Research

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Matthew Schehl | December 13, 2022

The four finalists for the Fall Quarter's MORS Tisdale Award are pictured with NPS Distinguished Professor of Operations Research Patricia Jacobs, far left, during the award competition held in NPS' Glasgow Hall. Each graduating student briefed their research, selected for near-term impact on DOD operations, with U.S Navy Ensign Ethan Boone, second from right, selected as the winner.

U.S. Navy Ensign Ethan Boone is the recipient of the Fall 2022 Military Operations Research Society (MORS) Stephen A. Tisdale Graduate Research Award for his thesis work exploring the use of machine learning algorithms to predict terrorist activities.

Boone was one of four graduating Operations Research (OR) students nominated to vie for the prestigious award, whose collective work underscores the breadth, quality and relevance of research conducted at the Naval Postgraduate School (NPS). Following presentations of their research and a tough deliberation by a panel of judges in Glasgow Hall, November 17, Boone was declared the winner.

"The winners of the MORS Tisdale Award competition exemplify NPS: supporting real military decisions, improving real-world operations and influencing policy," noted U.S. Navy Cmdr. Scott Cohick, OR Research Program Officer.

Navy Ensign Richard Fetter, Marine Corps Capt. Lane Johnson and Ecuadorian Navy Cmdr. Milton Mendieta also presented their excellent research, respectively, in naval aviation training impacts, network sustainment optimization for the Marines' Expeditionary Advanced Base Operations (EABO), and predicting collective violence from coordinated hostile social media campaigns.

Sponsored by MORS, the Tisdale award is presented on a quarterly basis to a student for an outstanding thesis of high-quality research which will have "immediate or near-term value to the defense of the United States and its allies."

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To be considered for the award, a graduate student must first be nominated by an OR department faculty member, according to Cohick. Finalists are then chosen by the OR department chair and military faculty and invited to present their research at the competition.

"Of the four award finalists, Ensign Boone's thesis research was chosen because it has the greatest potential for positively impacting U.S. military operations," Cohick said. "Ensign Boone utilized cutting-edge machine learning methods to identify which factors are most significant in influencing the likelihood of future terrorist activities."

Boone says he is extremely humbled to receive the award. His thesis, "Using Supervised Machine Learning Methods to Identify Factors That Influence the Probability of Future Terrorist Activities," applied machine learning to complex data sets and geospatial data to provide predictions of violent events on a monthly basis to the Defense Counter Terrorism Center (DCTC) at the Defense Intelligence Agency (DIA).

Two models are run side-by-side for comparison and their results are integrated into an interactive dashboard that displays a host of useful information, including increases or decreases in violence and associated terrorist organizations.

"Overall, we were interested in identifying what features are important when predicting when an area is going to have an increase in violent events with fatalities," Boone explained. "I wouldn't say that this thesis was a unique approach to the problem, but the stakeholders were particularly excited about the insights that were provided that would not have been accessible when the data was in its raw format."

Boone's interest in the topic was piqued after attending a briefing by Army Operations Research and Systems Analysis (ORSA) officers from the Research and Analysis Center (TRAC) office on campus.

"I was immediately drawn to the project because it seemed like there was a lot of room to run with it and let your imagination go," he recalled. "It addressed an immediate need within the DOD and it is something that needed to be built and delivered to stakeholders.

"I particularly liked the challenge of utilizing the machine learning algorithms, analyzing the results, and then presenting the results in a manner that could be understood by individuals with differing familiarity with machine learning."

Boone is ahead of the curve in many ways. The 23-year-old is attending NPS as a Shoemaker Scholar, meaning he's on a fast track to earning his master's degree in between getting his undergraduate degree in engineering (June 2021) and attending flight school in Pensacola, Florida (January 2023).

"The exposure to the diverse backgrounds of my peers [at NPS] was very insightful as an Ensign," Boone stated. "I was exposed to and learned about communities across all branches that I would not otherwise have gotten. The opportunity to come into school every day with peers that have a large spread in experience [O-1 to O-5] was incredibly valuable and unique."

Ecuadorian Navy Cmdr. Milton Mendieta's horizons have also expanded throughout his time at NPS.

"Before I started my OR journey here at NPS, if someone would have asked me what I like to do in the Navy, I would have answered 'solving problems,'" he said. "Now, after finishing my OR education, if someone would ask me the same question, I would answer 'solve bigger and more complex problems!'"

"Officers in the OR curriculum learn how to learn, and we learn so much that we can challenge ourselves to tackle problems that we otherwise wouldn't even dream of," Mendieta continued. "We get a high-quality education that we wouldn't get anywhere else, and I am so proud that I was part of it."

Mendieta, who concurrently earned a dual master's degree in [Defense Analysis](#) and OR as well as a specialized certification from each department, maintained a 4.0 TQPR (GPA) throughout, and was selected as this quarter's recipient of both the Chief of Naval Operations Award for Excellence in Operations Research and as NPS Outstanding Academic Achievement Award for International Students.

For his graduate thesis, "Predicting Collective Violence from Coordinated Hostile Information Campaigns in Social Media," Mendieta developed a deep learning model using Natural Language processing techniques to automatically detect hostile social media campaigns that could lead to violence.

"The officer's corps in the military constantly have to manage violence worldwide, in a world where there are more than 7,000 languages spoken today," Mendieta explained. "With the model presented in my work, warfighters now have a tool to evaluate and learn the language of violence across all human languages."

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"I am so grateful that I was nominated for this special honor," he continued. "This recognition means that NPS did find value in my work, and that motivates me to further my education and my research journey. I hope I can maintain a long-lasting relationship with the faculty here in NPS to explore more challenging research opportunities."

Marine Corps Capt. Lane Johnson also expressed gratitude for having been nominated for the MORS/Tisdale Award.

"I was honored," he said. "To me, it signifies that my research is meaningful and has the potential to positively impact the operating forces."

As the Marine Corps shifts to its new EABO strategic paradigm , the need for a resilient and robust distribution network capable of providing sustainment to the Force in a contested environment becomes increasingly vital. It is unclear whether current platforms and infrastructure, however, can keep up with EABO's increased operational tempo.

To solve this problem, Johnson's thesis, "Optimizing the Sustainment Network for Expeditionary Advanced Base Operations," introduces stochastic programming - a mathematical framework for modeling optimization under uncertain parameters - as a means of minimizing the expected constraints of network sustainment across a range of potential scenarios.

"Stochastic programming is not something that is taught in the OR curriculum at NPS," Johnson said. "However, given the fact that my thesis involved optimizing a sustainment network under uncertainty, stochastic programming is something I was fortunate enough to learn through working with my advisors and additional self-study."

Johnson hopes his thesis presentation highlighted the utility of stochastic programming for other students, as another powerful tool to add to their toolkits.

U.S. Navy Ensign Richard Fetter is another MORS Tisdale Award finalist at NPS through the Shoemaker Scholar program.

"I'm very fortunate as a student Naval Aviator to have had the opportunity to contribute to the Naval Aviation community through my thesis efforts," he said. "I hope that my presentation helped people to see that the work we do here at NPS can have potentially far-reaching impacts that may even be observed in their own careers."

His thesis, "Analysis of Training Progression Impacts in Naval Aviation at the Unit Level," provides a deep dive into the factors that contribute to a naval air squadron's training progression and overall aviation readiness.

Drawing on an extensive data set provided by Commander, Naval Air Forces (CNAF) Force Readiness Analytics Group (FRAG), including reporting on 78 unique variables from across 313 different units, Fetter's thesis creates a model using advanced time series analysis methods that are able to accurately describe and predict the effect of each on unit training progression over future months .

"Starting in our very first quarter at NPS, our cohort has been attending MORS Tisdale competition presentations showcasing extremely inspiring work by some incredibly talented OR analysts, so it was very meaningful to be able to participate and be a part of this," he said.

The MORS/Tisdale award is named in honor of Lt. Cmdr. Stephen A. Tisdale, a dual-degree graduate of NPS in 1989 who perished in a military aircraft accident on March 21, 1991, while serving with Patrol Squadron 50 off the coast of California. Tisdale's outstanding and influential thesis, "Assessing Optimal Utilization of Potential Anti-Satellite Architectures," won the MORS prize for his graduating class, and he was also recognized as the top Space Systems Operations student.

Tisdale's legacy lives on through this award in recognition of his defense-focused intellectual acumen, relevant applied research, and a steadfast desire to both solve existing problems and formulate new, innovative ideas for the fleet and joint force.

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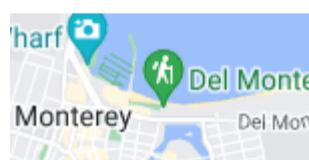M E E T S   T H E   A R T   O F
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