



DIGITAL TRIDENT AI CHALLENGE

AT A GLANCE

WHAT IS IT?

The Digital Trident AI Challenge is part of NPS' effort to explore, experiment with, and operationalize emerging AI technologies and advanced AI techniques that will have an immediate and advantageous impact on national security challenges.

HOW IT WORKS:

The Digital Trident AI Challenge is a collaborative program between NPS, the Naval Postgraduate School Foundation, and NVIDIA. Projects received funding and in-kind support for labor and hardware from the NPS Foundation to enable rapid research and development throughout a one-year research sprint.

WHY IT MATTERS:

- Increase mission impact through applied AI
- Enable interdisciplinary collaboration
- Accelerate the adoption of AI across the DOD
- Leverage NVIDIA's cutting-edge technologies available at NPS

POINTS OF CONTACT:

Kaitie Penry, Director, NPS Emerging Technology and Innovation Office
research@nps.edu

Randy Pugh, Vice Provost for Warfare Studies; AI Task Force lead ai@nps.edu

MISSION: Empower NPS students and faculty to push the boundaries of AI through collaboration with industry and academic partners and the exploration and adoption of new technologies, thereby strengthening the DoD's ability to rapidly deliver decision advantage and operational effectiveness to our warfighters.

Seven projects submitted by faculty-student teams were selected out of the 38 proposals. Each proposal was evaluated for its technical merit, use of applied AI, interdisciplinary collaboration, operational relevance, and potential to deliver impact to the Department of Defense.

The selected projects address five key operational areas: command and control (C2), low-cost attritable platforms, robotic autonomous systems, space operations, and contested logistics.

- **BOMA NIX: AI-Enhanced Passive Sensing and Interoperable C2 for Maritime Operations** (PI: Prof. Kevin Smith) – The project aims to inform development of interoperable sensing and C2 architectures that could be deployed in support of multinational maritime missions. The work is expected to advance physical AI experimentation and contribute to NATO and DOD maritime integration efforts.
- **AI-Driven Seeker Autonomy and Omniverse-Integrated Digital Twin for Low-Cost Missile Development** (PI: Maj. Dillon Pierce) – The project aims to accelerate development of autonomous weapons systems and contribute to the design of affordable, scalable missile architectures that align with emerging operational requirements.
- **Towards Ultra Long Endurance Flight Around the World** (PI: Prof. Mark Karpenko) – The project to improve endurance, adaptability and autonomy of UAVs operating in remote or denied environments. Validated through flight testing, this approach supports mission planning and platform development for future long-range operations.
- **Terahertz imaging camera for upper atmosphere surveillance** (PI: Prof. Fabio Durante Pereira Alves) – The project will validate core system functionality and establish a concept of operations for deploying compact THz imaging sensors on orbit. Phase I results will inform feasibility of future onboard AI processing and help define pathways for integrating edge-enabled sensing into space-based ISR (Intelligence, Surveillance and Reconnaissance) missions.
- **Operational Application of AI for Automatic High Energy Laser (HEL) Beam Control** (PI: Prof. Brij Agrawal) – The project supports the development of AI-enhanced targeting systems that increase responsiveness and accuracy of laser weapon platforms. With potential application to drone swarm defense and other fast-emerging threats, the project contributes to future integration of autonomous targeting into Navy HEL platforms.
- **Small Scale AI for Aviation Maintenance** (PI: Harrison Schramm) – The project supports the development of AI-powered maintenance tools that function independently of cloud or network infrastructure. By enabling fault detection and repair recommendations in real time, it aims to increase mission readiness and resilience in forward deployed and austere aviation environments.
- **Operationalizing AI with Microgrid Digital Twins for Energy Security** (PI: Prof. Doug Van Bossuyt) – The project increases operational resilience and mission assurance across naval infrastructure. With scalable applications at global installations, the project supports DOD energy security goals across INDOPACOM and other contested regions.