

Attachment 1 – DAGSI Research Topic Template

NOTE: Under the Cooperative Agreement, Technical Directorates have three options for topics. First, a topic can strictly be considered in the pool for the state allocation of funding. DAGSI will work across the TDs for this allocation. Second, the TD can be prepared to be a funding partner with the State of Ohio. This would include: providing additional funds to support additional recipients of a topic, or expand the proposers team to include additional members on a topic. Third, the TD may elect to fully fund a topic not selected for State of Ohio funding or to pursue University teams outside the State of Ohio. Contact lindsay.kotouch.2@us.af.mil for questions.

1. **Research Title:** 6DOF Motion Vessel Classification & Characterization for Synthetic Aperture Radar (SAR)
2. **Individual Sponsor:**
3. Mr. Edgard Zea. 6DOF Motion Vessel Classification & Characterization for Synthetic Aperture Radar (SAR)

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4. **Academic Area/Field and Education Level**
Electrical Engineering or Computer Science
Preferred: Machine/Deep Learning and/or Signal Processing (MS or PhD level)
5. **Objectives:** The objective is to develop techniques to classify and characterize types of maritime vessels based on motion data for monostatic SAR sensing.
6. **Description:** The primary objective is to leverage dynamic motion data of different maritime vessels (ships) and use machine learning/artificial intelligence (ML/AI) or other theoretical algorithms to identify, categorize, and define vessels in operation and varying sea-states. By analyzing how a vessel moves across all six translational and rotation dimensions, this method aims to identify unique signature patterns across the 6 degrees of freedom (6DOF) motion and determine the type of vessel based on the vessel's physical attributes (length, beam, draft). The work will lead to identifying the additional motion characteristics (i.e. speed, heading, bowtie smear) of individual/multiple ships in the SAR imagery domain. The project includes developing the necessary training/testing datasets, designing experiments, developing an automatic target recognition (ATR) approach leveraging AI/ML or other types of ATR algorithms, and conducting analyses of the target identification performance as a result of different target motions and sea-states.
7. **Research Classification/Restrictions:** Requesting U.S. citizen applicants. We remind the student/university that work completed under this DAGSI effort may not be released publicly until it has gone through an AFRL public release process, and has been formally approved for public release.

8. **Eligible Research Institutions:** Any university teams in Ohio state, (i.e. University of Dayton, Wright State University, The Ohio State University, etc.)

NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval #