1. Research Title: Automation and autonomy for materials/alloy discovery and development

2. Individual Sponsor:

Dr. Megna Shah, AFRL/RXNM
AFRL/RX Bldg 655
2230 Tenth Street
WPAFB, OH 45433
megna.shah.1@us.af.mil

3. Academic Area/Field and Education Level

Materials Science, Mechanical Engineering, Electrical Engineering, Computer Science, Statistics, Math, Machine Learning (MS or PhD level)

4. Objectives: Develop either hardware or software tools/algorithms to improve materials discovery and development

5. Description: In order for materials to be a design variable, they need to be discovered and developed much more rapidly. Automated, high throughput data collection is currently one bottleneck to assessing materials. Here, topics concerned with automating microstructure and defect characterization will be considered, including speeding up current collection capabilities, developing software to help decide how much data is sufficient, and aiding in closed loop control of data collection. Additionally, the algorithms to make decisions on the data are another area of opportunity. Using machine learning tools, including active learning, deep learning, and more conventional statistical tools to assess the data and make processing-structure-property linkages more robust is of interest. Latent space characterizations of materials, and linkages to other co-domains (processing, and properties) are active areas of interest, with physics as a regularizer when possible.

6. Research Classification/Restrictions: This research topic is unclassified basic research eligible for publication in the open literature. U.S. Citizens Students Only

7. Eligible Research Institutions: All DAGSI Institutions

8. PA Approval #: AFRL-2025-3256