1. **Research Title:** Machine-learning Driven Inverse Design of Optical Metasurfaces
2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**
   Optics, Physics, Materials Science & Engineering, Chemical Engineering, or related field (BA/BS, MS or PhD level)

4. **Objectives:**
   a. Develop new computational electromagnetics methods to better understand and design optical metasurfaces
   b. Develop new machine learning methods to better understand and design optical metasurfaces
   c. Using the tools from a) and b), design optical metasurfaces with novel properties
5. **Description:** The next generation of optical materials will achieve novel performance by utilizing wavelength-scale geometric features to manipulate light in ways beyond the capability of traditional bulk optical materials. However, advanced optimization strategies coupled with computational electromagnetic simulation must be employed to accelerate the design process due to the near-infinite design space for such optical metamaterials. Machine learning approaches have demonstrated the potential to overcome the limitations of ansatz and/or iterative approaches by inverting the design process, delivering optical metamaterial designs with desired properties. This opportunity will allow for the investigation and creation of machine learning models capable of designing optical metasurfaces to achieve the desired performance.
6. **Research Classification/Restrictions:** Unclassified/Unrestricted
7. **Eligible Research Institutions:** DAGSI (all Ohio Universities including but not limited to Wright State University, AFIT, University of Dayton, Miami University, University of Cincinnati, Ohio University, and Ohio State University)
8. **PA Approval #: e.g.** AFRL-2024-3502