1. Research Title: Enhancing Strip R-CNN for Robust Object Detection in Remote Sensing Imagery via Transformer Networks and Keypoint Analysis

2. Individual Sponsor:
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3. Academic Area/Field and Education Level:
Computer Vision, Artificial Intelligence, Remote Sensing / Object Detection (MS level)

4. Objectives:

- Improve the object detection performance of Strip R-CNN in remote sensing imagery by integrating transformer-based attention mechanisms.
- Develop a keypoint detection algorithm for detailed object analysis beyond bounding box detection in aerial imagery.
- Extend the framework's applicability to additional sensing modalities, such as SAR and IR data.
- Contribute novel methodologies and results to the research community through publications.

5. Description:
Recent advances in object detection from aerial imagery, as highlighted by benchmark datasets like DOTA, have emphasized the challenges and opportunities in this domain. Accurate object detection from overhead views is critical for applications like surveillance, environmental monitoring, disaster response, and target recognition. However, remote sensing imagery presents challenges such as extreme variations in object scale, orientation, and aspect ratio that conventional detection frameworks struggle to overcome.
Strip R-CNN has demonstrated progress by incorporating strip convolutions to better capture elongated object features. It addresses the detection of high aspect ratio objects by introducing orthogonal strip convolutions, a StripNet backbone, and a decoupled detection head.
Building on the success of Strip R-CNN, this project aims to enhance its performance by incorporating attention mechanisms in a transformer-like manner to improve feature representation and detection accuracy. Furthermore, this project will develop a keypoint detection algorithm, enabling more detailed object analysis and opening new possibilities for object characterization. This is a relatively unexplored area with significant potential for advancing the field. A secondary goal is to extend the framework's applicability to additional sensing modalities such as SAR and IR.

6. Research Classification/Restrictions:
Unclassified

7. Eligible Research Institutions:
OSU, WSU or any other universities with graduate programs in Computer Vision, Artificial Intelligence, or Remote Sensing.