Lockheed Martin Computer Vision Proposal
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- **Company background**: Lockheed Martin Space provides cutting edge aerospace solutions for commercial and government customers. From Lockheed's involvement in every single one of NASA's Mars missions, to providing GPS to billions of people world wide, the diversity of missions and ongoing work is vast and constantly changing and adapting. An ongoing area of research in the aerospace community is in the application of computer vision technologies onboard space based assets. Now, more than ever, the community is looking towards autonomy and computer vision to solve the increasingly concerning problem of space debris. The idea is this: if we can repair something that's broken rather than launching a new one, we can begin to reduce the amount of waste that's in space and conserve the assets that are already up there

- **A description of the work to be done:** On-Board Spacecraft Object Detection – As Product Owner, I would like to have an on-board capability to perform feature detection from several distances in order to identify the various components of a spacecraft during a satellite servicing mission. The software service will accept raw, resolved imagery as an input and use machine learning techniques such as a neural network to return components, their classification and their location in the imagery. Because of the resource constraints of satellites as embedded systems, the capability must be able to run on a Linux based CPU using less than 500Mb of RAM, and the processing of a single image must complete in less than 5 seconds. Demonstrating the product on an embedded system such as a raspberry pi is a plus. I will provide a large set of synthetic and real images as the training and validation data. Object detection is a well established area of Computer Vision with a rich abundance of off-the-shelf tools, but the constraints of operation on a spacecraft's limited processing power along with limited image sensor inputs provide a unique challenge. Work will be performed in an agile environment.

- **Any desired skill set for the students:** This project will rely heavily on computer vision, machine learning, and optimization.

- **Preferred team size:** Any. Scope can be adjusted for team size.

- **(optional) Whether there is a potential to offer student(s) an internship at the end of the course:** Yes. Subject to funding availability, but our team typically supports 1-5 interns per summer.

- **Location where work should be performed:** On campus, or from home. I will plan on attending sprint planning/demo meetings on the Mines campus.