**Title:**

Disk on disk system

**Supervisors:**

Joel Ferguson

**Background:**

The disk on disk system is a classical underactuated mechanical system comprised on a single driven disk which is manipulated to stabilize a freely rotating disk. The scope of this project is to design, build and control a disk on disk experimental apparatus.

Complicating the implementation is the use of a camera for the freely rotating disk state measurements. Sensor models for the camera will be investigated and the hardware characterized. Once completed, the camera can be used in conjunction with an appropriate control law to achieve closed-loop stability.

**Aim:**

Build and control a disk on disk system

**Objectives:**

1. Construct a numerical simulation of the system and implement an MPC control.
2. Design and build a disk-on-disk experimental apparatus.
3. Develop a camera sensor model to identify the location of the free spinning disk.
4. Implement MPC control on the physical hardware.
5. Implement nonlinear observer for the velocities / momentum.
6. Implement energy-based control method with integral action in hardware.