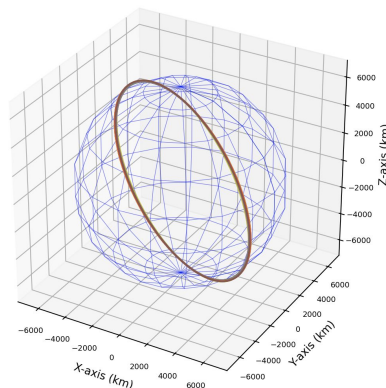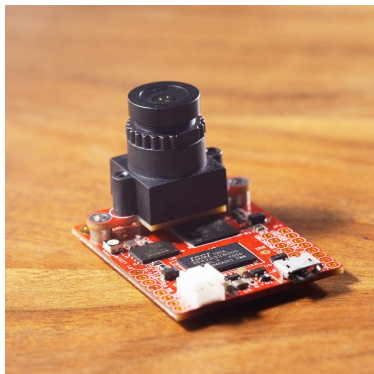Orbits plotted in the ECE frame as of 09 2024

Blockers
- Lack of concrete power and compute usage numbers: Due to the model/pipeline not being finalized (Lower the better.)
- Access to GPU workstation and start training/testing
- For sim: best tool to use? Build from scratch or use Orekit/Skyfield/GMAT to simulate observations?

Week's Results
- Updated level two requirements.
- Started researching different models and pipelines, including YOLO v8, YOLO v10, and contrastive learning models.
- Initiated research into camera modules, overall architecture, and preprocessing.
- Started working on orbit/imaging sim

By Sunday:
Dataset loading, Earth sim, choose cameras, camera model

Interfaces
- **Compute requirements**: Obtain the required frame rate and other data (gnc), then provide the compute requirements to the avionics team.
- **Cameras**: Collaborate with both the mechanical and avionics teams to finalize the number of cameras and camera architecture
- Both of these tasks will be completed by this weekend.

	Camera Module v1	Camera Module v2	Camera Module 3	Camera Module 3 Wide	OpenMV Cam RT1062
Pixel Width (µm)	1.4	1.12	1.4	1.4	1.4
Pixel Size (µm^2)	1.9600	1.2544	1.9600	1.9600	1.4
Pixel Size (n^2)					
Focal length (mm)	3.6	3.04	4.74	2.75	2.8
Focal length (m)	0.0036	0.00304	0.00474	0.00275	0.0028
Price ($)	25	25	25	35	120
Sensor resolution	2592 × 1944 pixels	3280 x 2464 pixels	4608 x 2592 pixels	4608 x 2592 pixels	2952x1944 pixels
GSD at altitude (km)					
400	0.0002177777778	0.0001650626316	0.0001654008439	0.0002850909091	0.0002
450	0.000245	0.0001856842105	0.0001860759494	0.0003207272727	0.000225
500	0.0002722222222	0.0002063157895	0.0002067616949	0.0003563636364	0.00025
550	0.0002994444444	0.0002269473684	0.0002274261603	0.000392	0.000275
600	0.0003266666667	0.0002475789474	0.0002481012658	0.0004276363636	0.0003
650	0.0003538888889	0.0002682105263	0.0002687763713	0.0004632727273	0.000325
700	0.0003811111111	0.0002888421053	0.0002894514768	0.0004989090909	0.00035
750	0.0004083333333	0.0003094736842	0.0003101265823	0.0005345454545	0.000375

```
(eed1) stoneyey@StonedeMBP eed1--main % python eed1.py -h
usage: eed1.py [-h] [-b BOUNDS [BOUNDS ...]] [-g GRID_KEY] [-i IDATE
               [-m MAXIMS] [-se {18,19,s2}] [-o OUTPATH] [-r REGION]
               [-c CRS] [-cc CLOUD_COVER_MAX] [-ccgt CLOUD_COVER_MIN
               [-cm CUSTOM_MOSAICS] [-vb VERTICAL_BUFFER] [-hb HORIZO
               [-np NPROCS] [-rm REGION_MOSAIC] [-rc REGION_COMPOSIT

options:
  -h, --help            show this help message and exit
  -b BOUNDS [BOUNDS ...], --bounds BOUNDS [BOUNDS ...]
  -g GRID_KEY, --grid_key GRID_KEY
  -i IDATE, --idate IDATE
  -f FDATE, --fdate FDATE
  -s SCALE, --scale SCALE
  -m MAXIMS, --maxims MAXIMS
  -se {18,19,s2}, --sensor {18,19,s2}
  -o OUTPATH, --outpath OUTPATH
  -r REGION, --region REGION
  -e {GEOTiff}, --format {GEOTiff}
  -sd SEED, --seed SEED
  -c CRS, --crs CRS
  -cc CLOUD_COVER_MAX, --cloud_cover_max CLOUD_COVER_MAX
  -ccgt CLOUD_COVER_MIN, --cloud_cover_min CLOUD_COVER_MIN
  -ba BANDS [BANDS ...], --bands BANDS [BANDS ...]
  -cm CUSTOM_MOSAICS, --custom_mosaics CUSTOM_MOSAICS
  -vb VERTICAL_BUFFER, --vertical_buffer VERTICAL_BUFFER
  -hb HORIZONTAL_BUFFER, --horizontal_buffer HORIZONTAL_BUFFER
  -gd GDRIVE, --gdrive GDRIVE
  -np NPROCS, --nprocs NPROCS
  -rm REGION_MOSAIC, --region_mosaic REGION_MOSAIC
  -rc REGION_COMPOSITE, --region_composite REGION_COMPOSITE
```
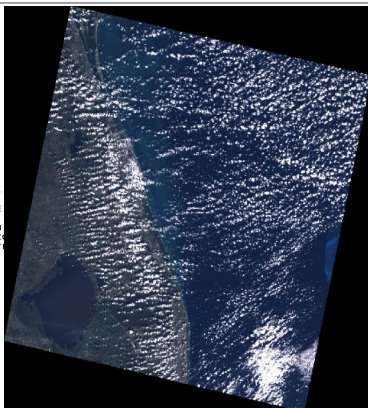
Blockers

- The estimation of power usages for ML + image processing + feature matching + relative pose of cameras rpt the world frame
- Access to GPU workstation to start training/testing

Week's Results

- Comparison of each camera model + GSD and price
- Dataset: github.com/CMUAbstract/eedl
- 700KB per image in average
- Hardware survey:
    - Jetson Orin NX: 16G VRAM, max 25W
    - Jetson Orin Nano: 8G VRAM, max 15W or 4G VRAM, max 10W
- Preprocessing: Variance of Laplacian（Blur）, Specular Highlight Detection (glare), OpenCV Out-of-focus/motion Deblur Filter (recovery), ML classifier (filter)

Interfaces

- GNC: discussed interface for the simulation. Working on determining the camera calibration models for the sim.