What I Did This Summer

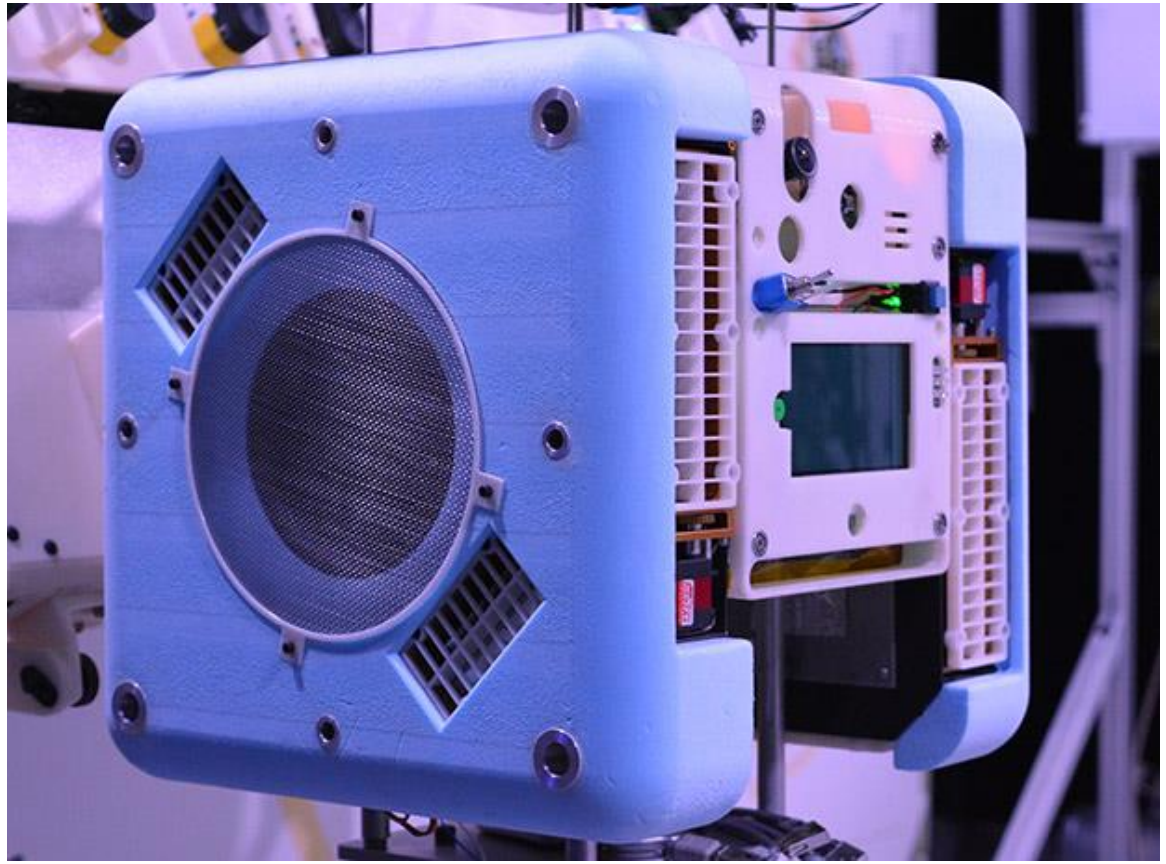
JEFFERSON RIDGEWAY

07 AUGUST 2017

RECENT GRAD FROM ELIZABETH CITY STATE UNIVERSITY (ECSU)

ELIZABETH CITY STATE UNIVERSITY

Background



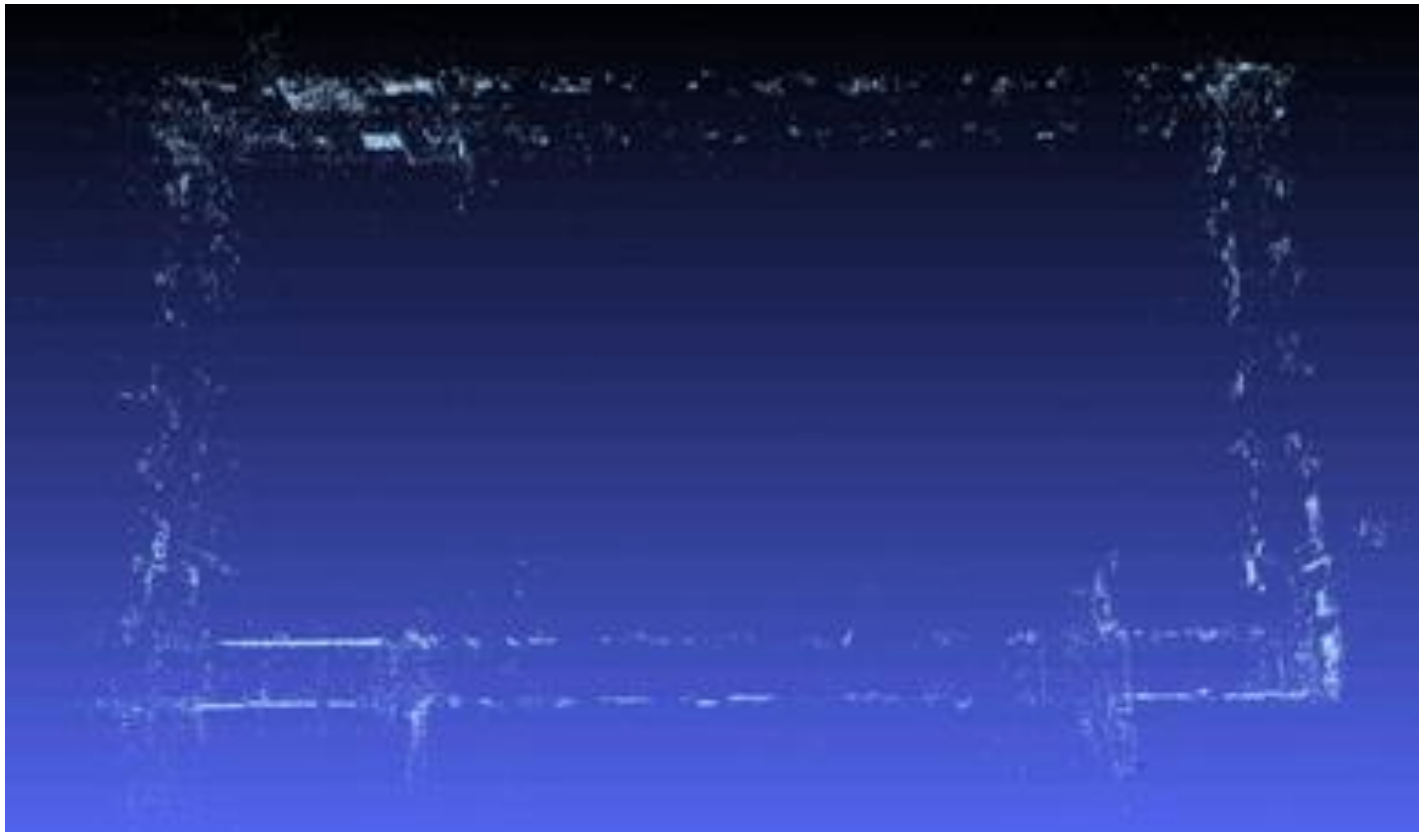
Astrobee is able to localize itself based on:

- Visual Features from Mapping
- AR Tags
- Handrail Measurements from a depth sensor
- Optical flow features

Objective:

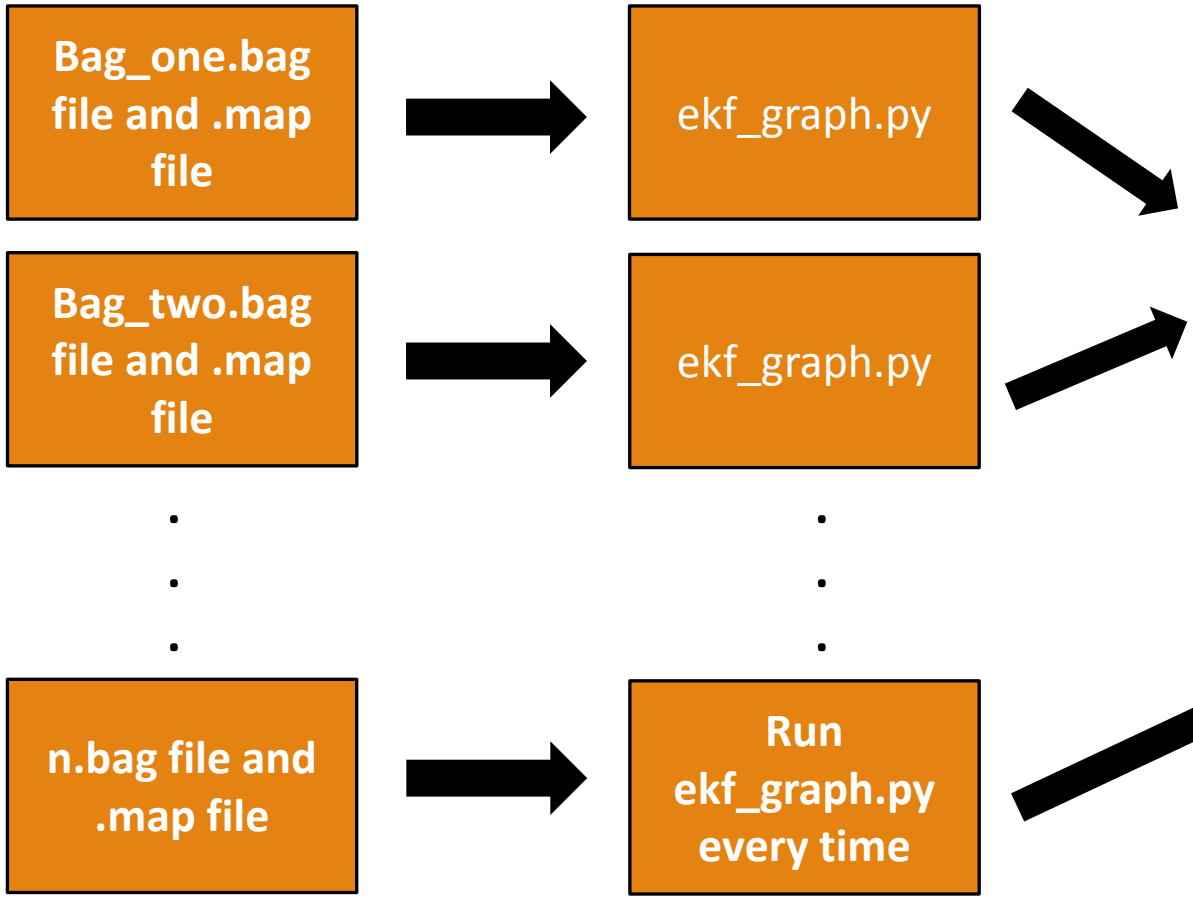
- Create a regression testing script to help understand data based on different features from Astrobee
- Visualize the summary of combined features into a human-readable output (i.e. pdf)

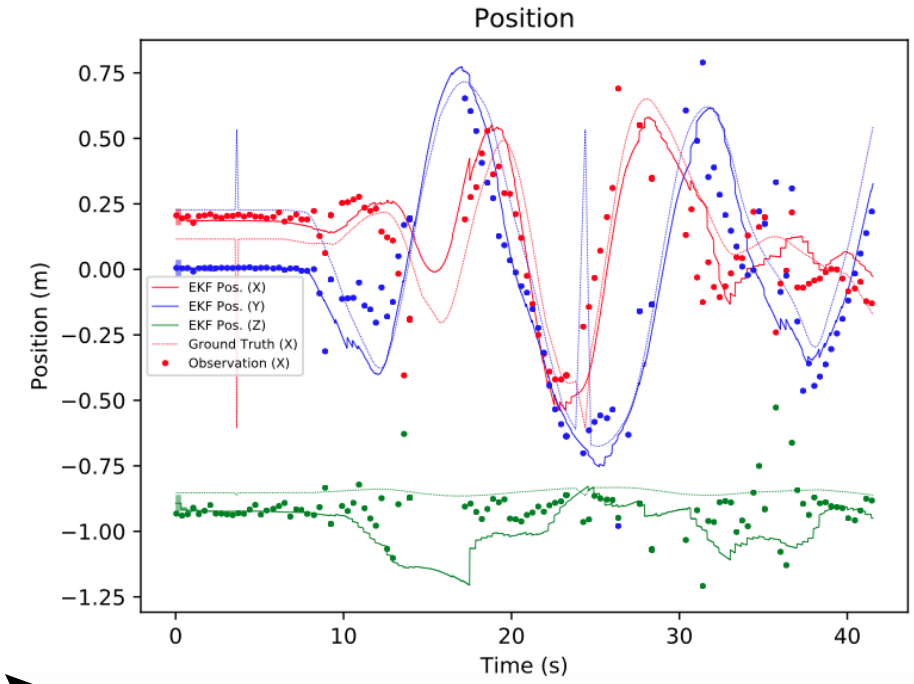
Background: Localization for Astrobee



- Map Building
- Visual Observations
- Position Tracking

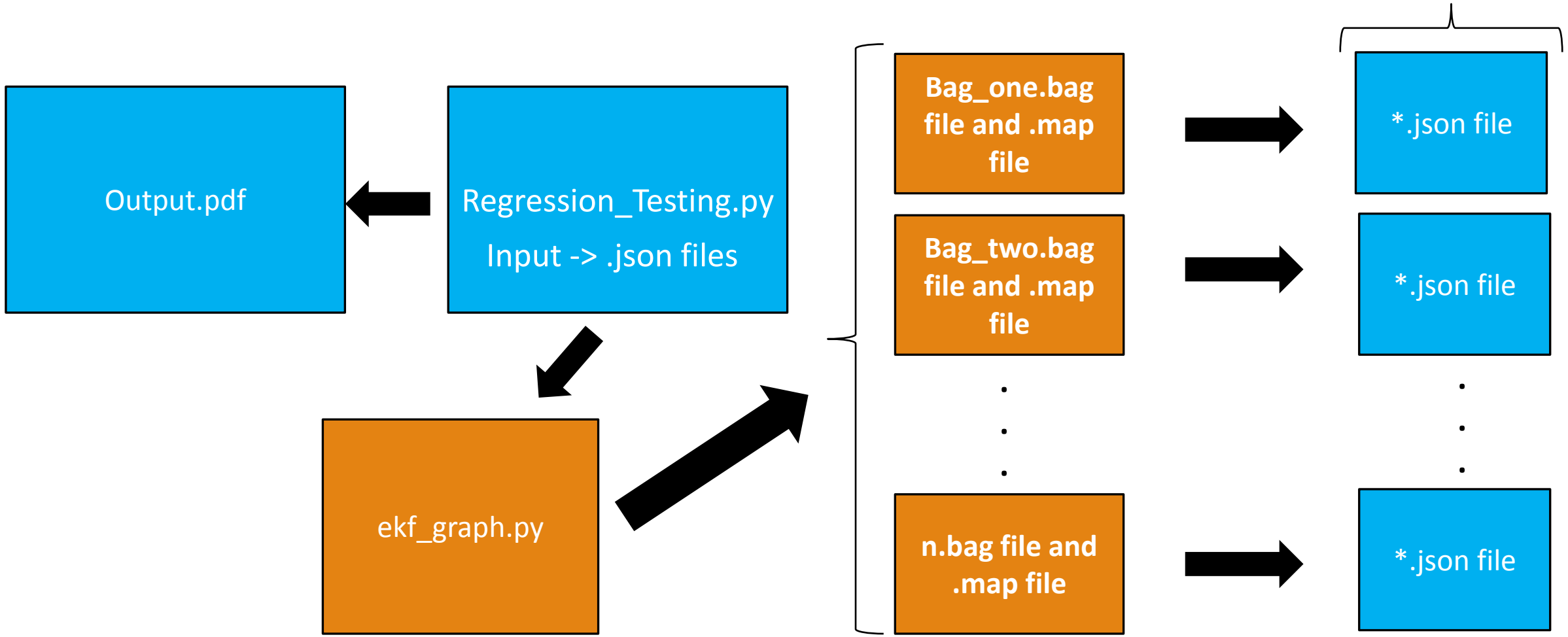
Current Control Flow Structure





What happens when you have *n* number of .bag files and their .map files?

Control Flow Structure with Regression Testing Script



Role of Regression Testing System

- Automate the manual running of ekf_graph on every .bag file
  - Check the hash number of the config file and if modified, run ekf_graph.py on subdirectory of .bag files
- Generate/Visualize summary of statistics in human-readable format (i.e. .pdf)

Modifications to ekf_graph.py

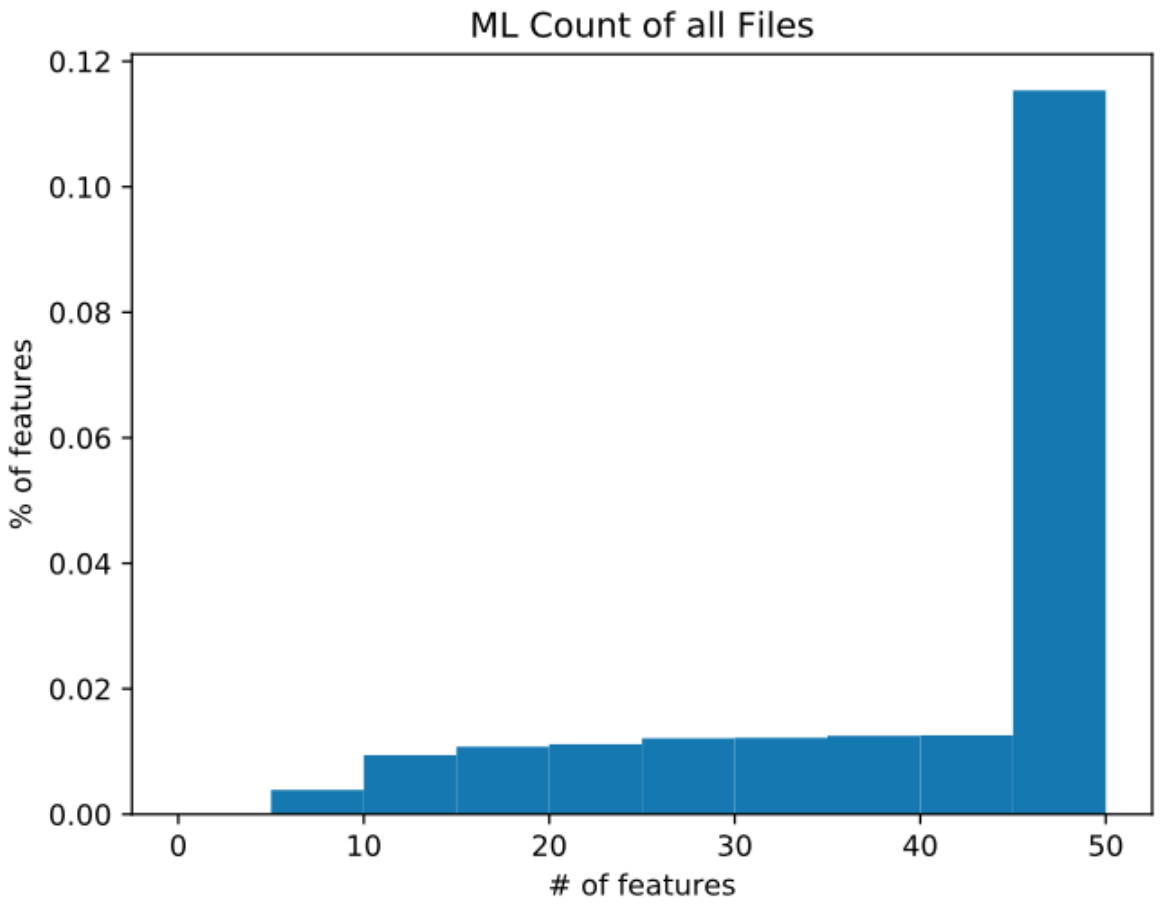
- Added two functions to handled processing the covariance and writing information to the .json file:
  - ***Process_covariance()*** – takes the Euclidean distance per each time step from the covariance array and finds the mean and standard deviation of all the numbers
  - ***Save_json()*** – gets all the data from the statistics and saves it to .json file to be read by the regression testing sytem

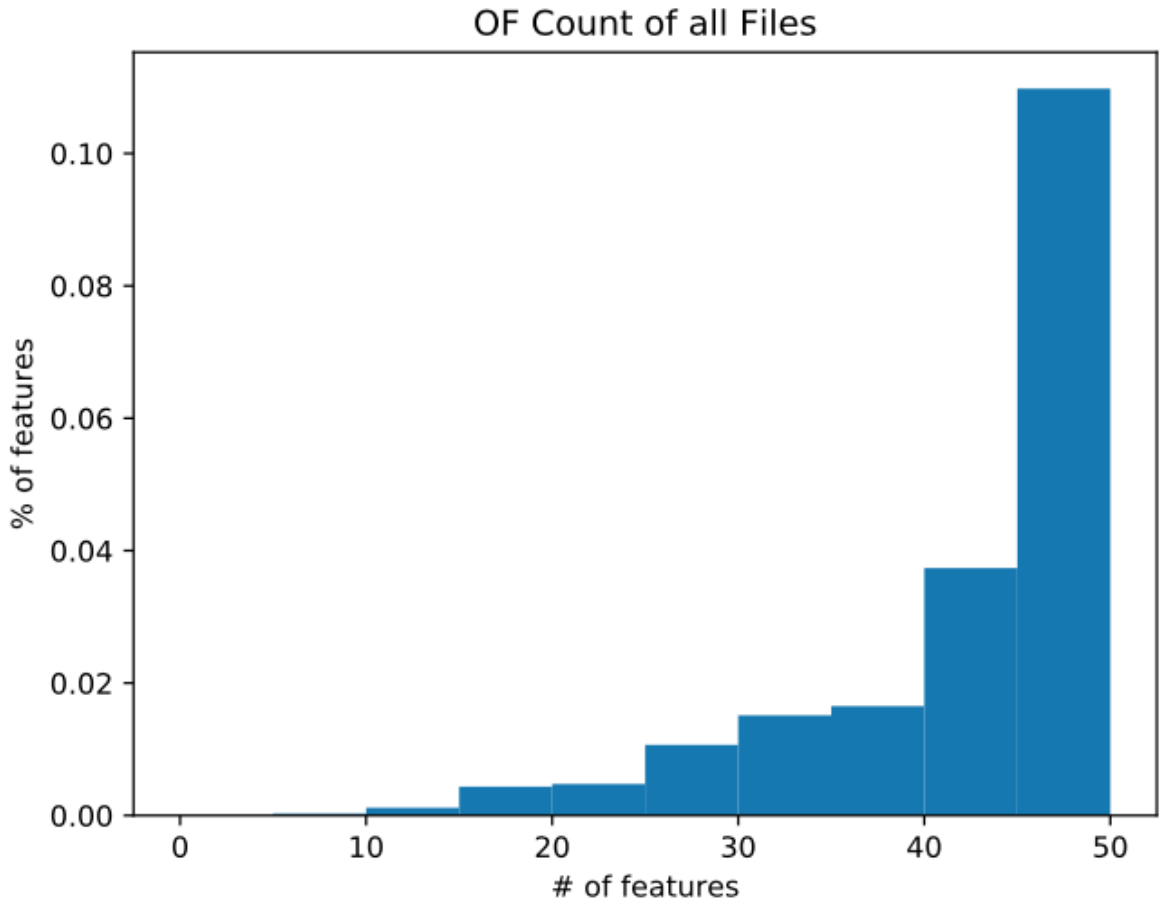
Example of Output.pdf

	Pos.Error(m)	Ang.Error(deg)	Runtime(sec)
crazy_max_medium	0.15	1.642	175.358
dark	0.152	2.126	148.089
forward_back	0.196	1.263	107.964
map	0.137	13.494	130.536
figure_8	0.14	1.292	170.587
crazy_max_fast	0.129	26.888	190.072
rotation	0.138	11.486	169.942
sideways	0.137	1.187	85.2
square	0.132	24.65	204.314

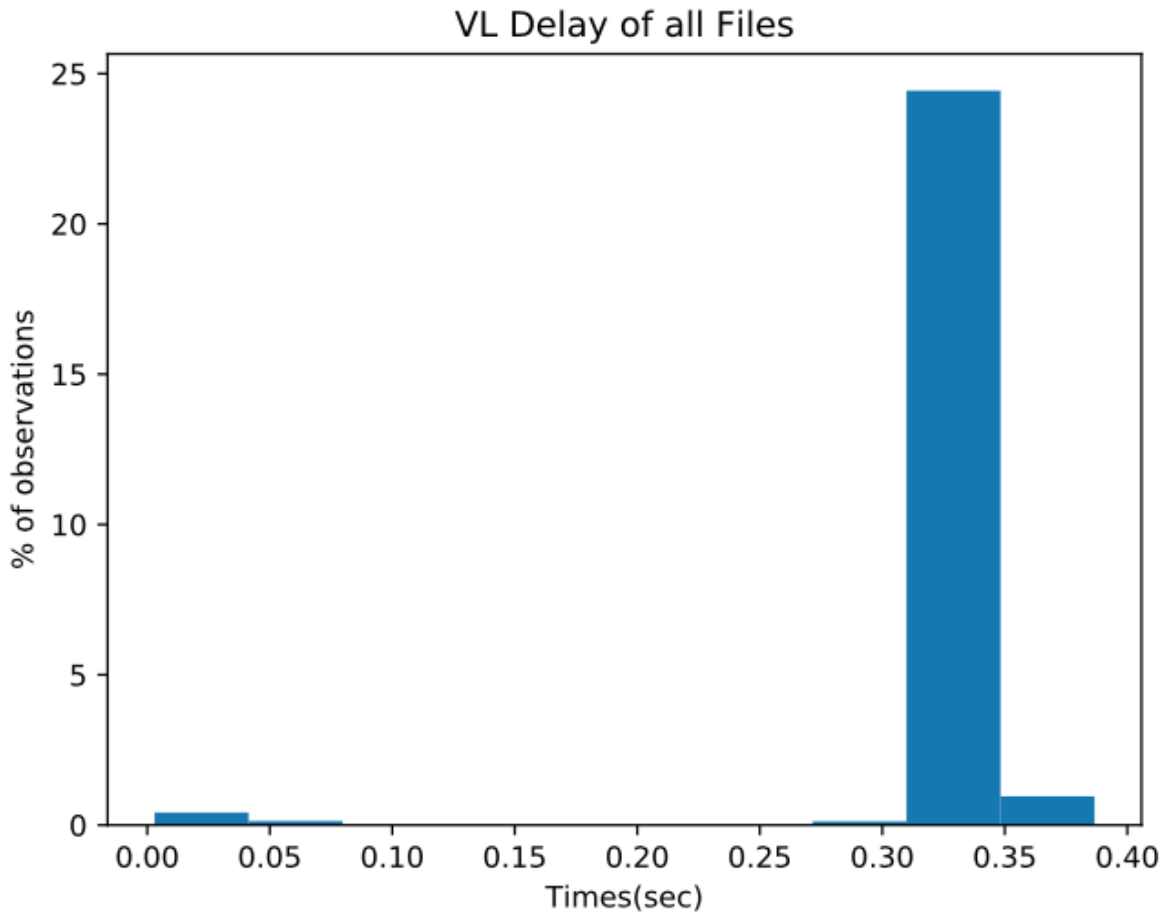
The Mean of the Position Error is: 0.146000
The Mean of the Angular Error is 9.336000
The Mean of the Runtime is: 153.562000

Example of Output.pdf – Mapped Landmarks (ML) & Optical Flow (OF)

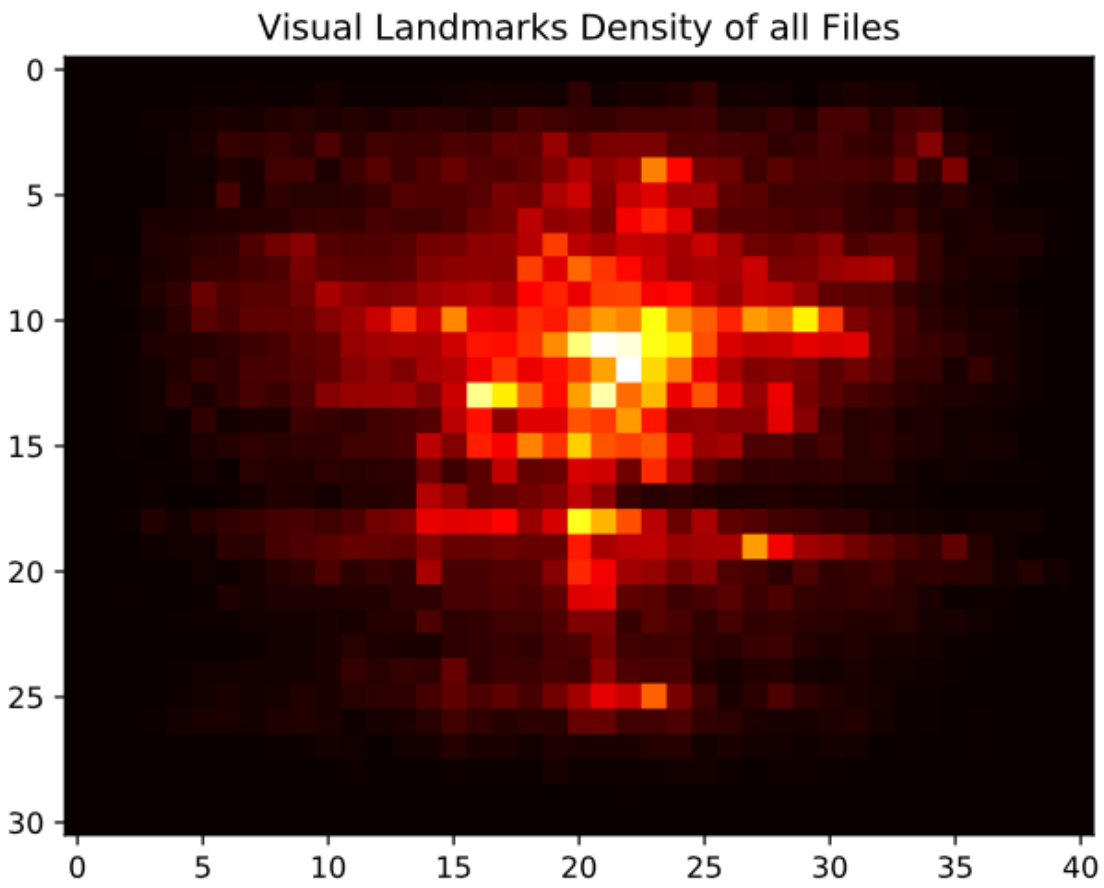


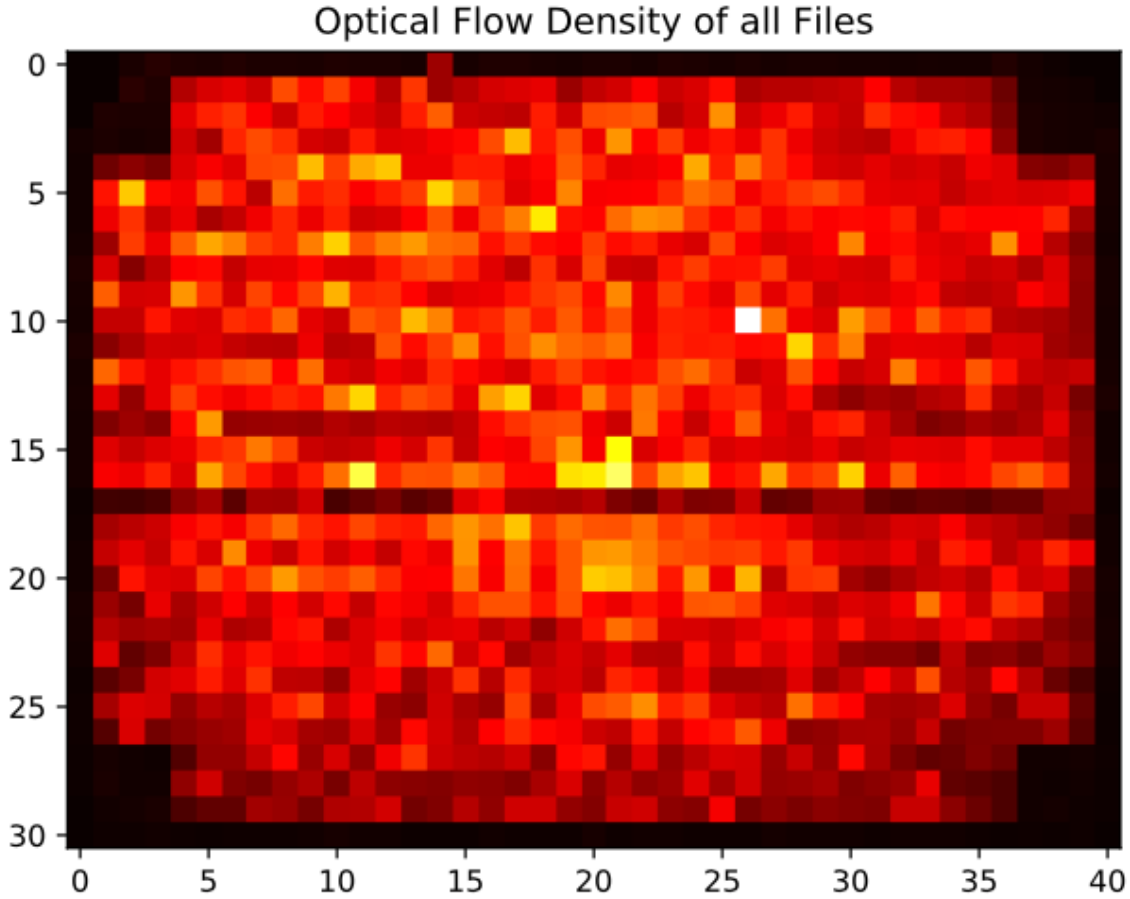


Example of Output.pdf – Visual Landmarks Delay



Example of Output.pdf - Heatmap





Example of Output.pdf - Covariance

	Orient.	Gyro. Bias	Velocity	Accel. Bias	Pos.
mean	0.002821	0.001704	0.003117	0.002013	0.00702
stddev	0.000952	0.00053	0.001053	0.000696	0.002627
max	0.172787	0.114207	0.127339	0.090043	0.40484
min	0.008897	0.004731	0.008925	0.005743	0.015819

My time in California

Questions?