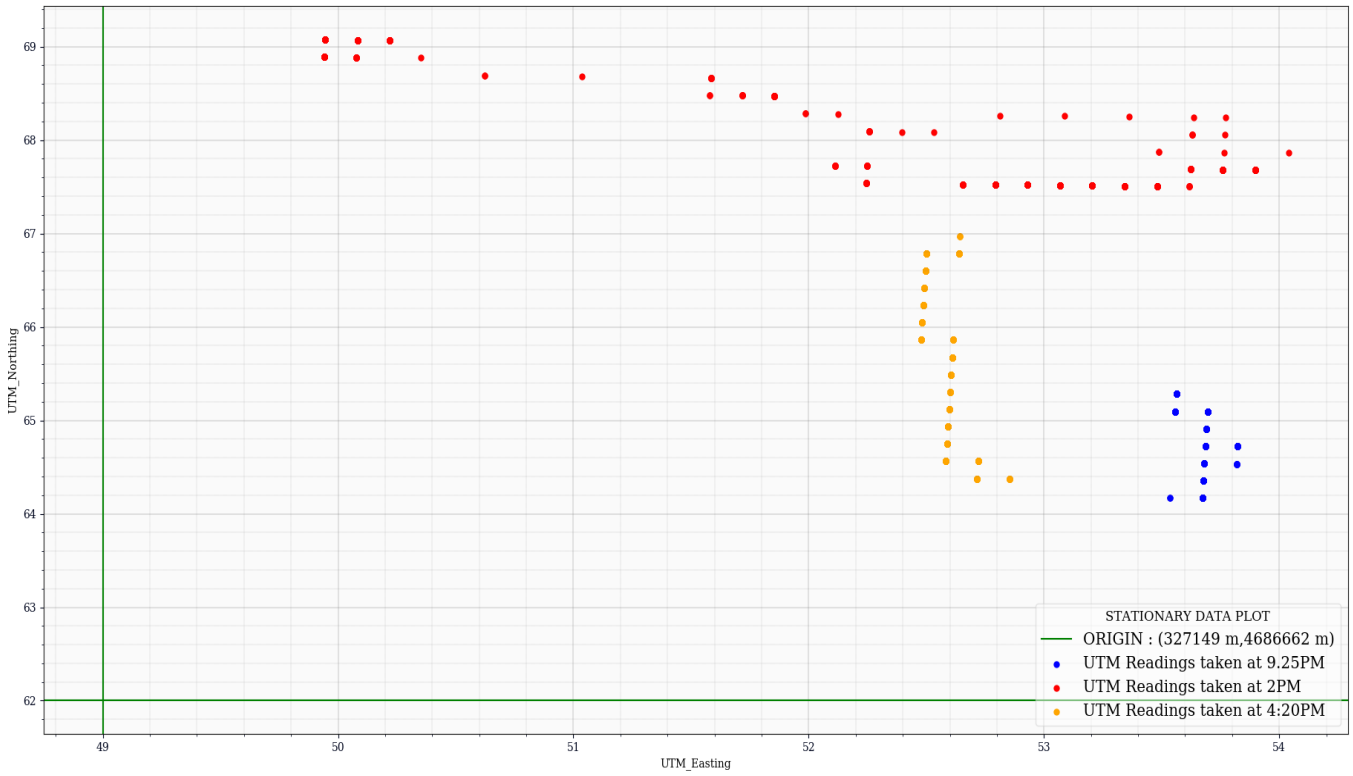
LAB1 Analysis Report

Figure 1: Plot of Stationary Data (UTM_Easting vs UTM_Northing)



- Three distinct data sets were gathered at various times of the day to study a GPS receiver's precision and repeatability.
- The table below shows the no of satellites, HDOP values, and the time at which the dataset was captured. All the datasets were taken at the exact same position.

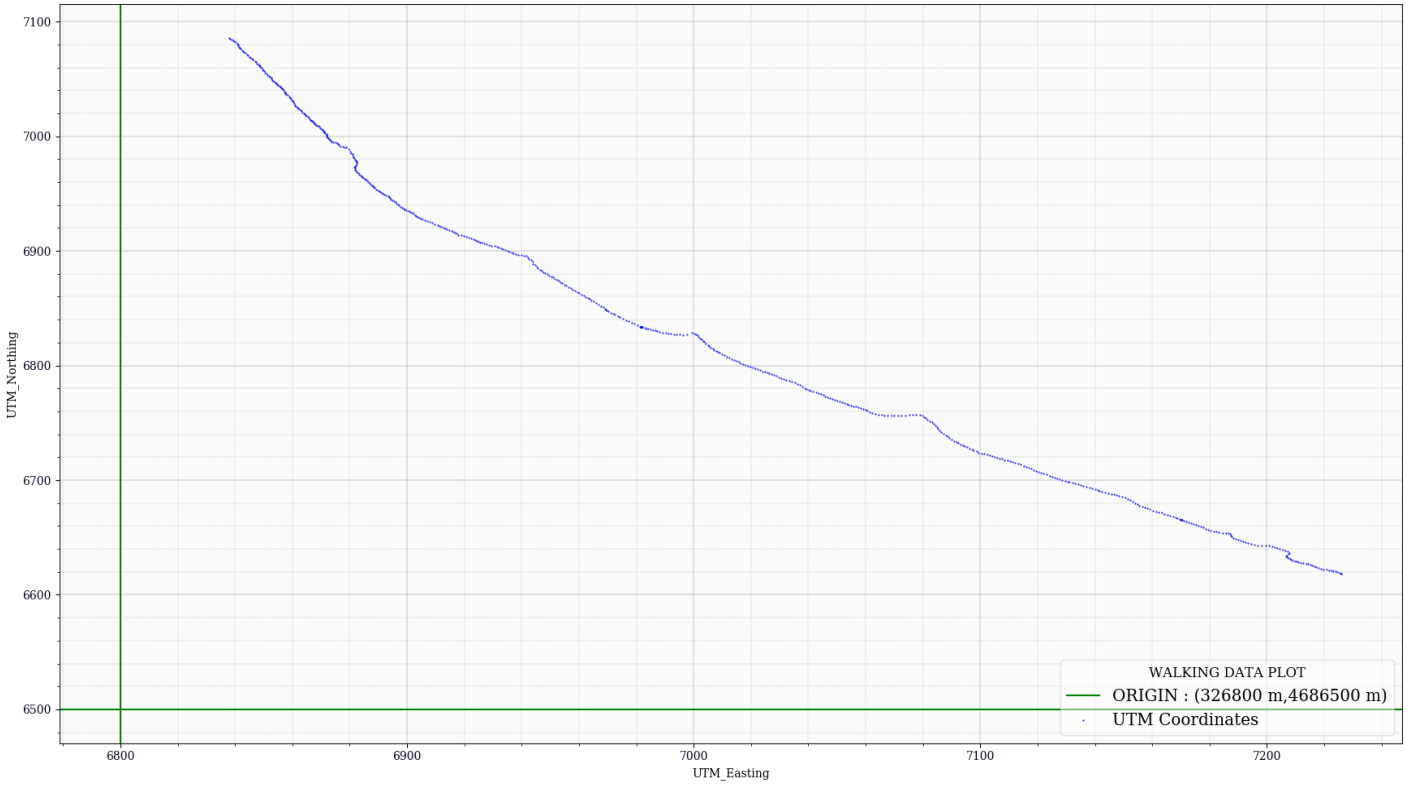
Dataset	Time	HDOP	No. Of Satellites
1	2 PM	1-1.1	7-8
2	4:30 PM	1.2-1.4	10-11
3	9.30 PM	0.8-1.0	10-11

- From the above table it can be clearly seen that the HDOP values vary a lot with time and the number of satellites observed.
- The readings taken at 4:30 pm show a widespread of the dataset with high noise in the readings. Thus the distribution of error is more compared to the dataset taken at 9:30 PM. HDOP plays an important role in the distribution of data/ error.
- With GPS receivers, when satellites are grouped together in the same general area of the sky, the satellite geometry will be weak (higher DOP value) as in case 2.
- When satellites are evenly spread throughout the sky, their geometry will be strong (lower DOP value). Thus, when more satellites are available and spread evenly throughout the sky, the

better our positional accuracy will be (and the lower the HDOP value) which is in the case of dataset 3.

- The major source of error which I understood from the analysis are as follows:
    - Atmospheric Interference which keeps changing throughout the day.
    - Multipath effects.
    - Ephemeris Error

Figure 2: Plot of Walking Data (UTM_Easting vs UTM_Northing)



- The dataset was collected in a clear space with few barriers. In contrast to the steady data, the noise distribution is not the same.
- The graph of the histogram deviates from the normal distribution.
- Additionally, it is clear from the plot that easting and northing are shifting in opposite directions, with easting increasing and northing decreasing from left to right along the plot. This is because I was moving straight in the Southeast direction.