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2/20/2023

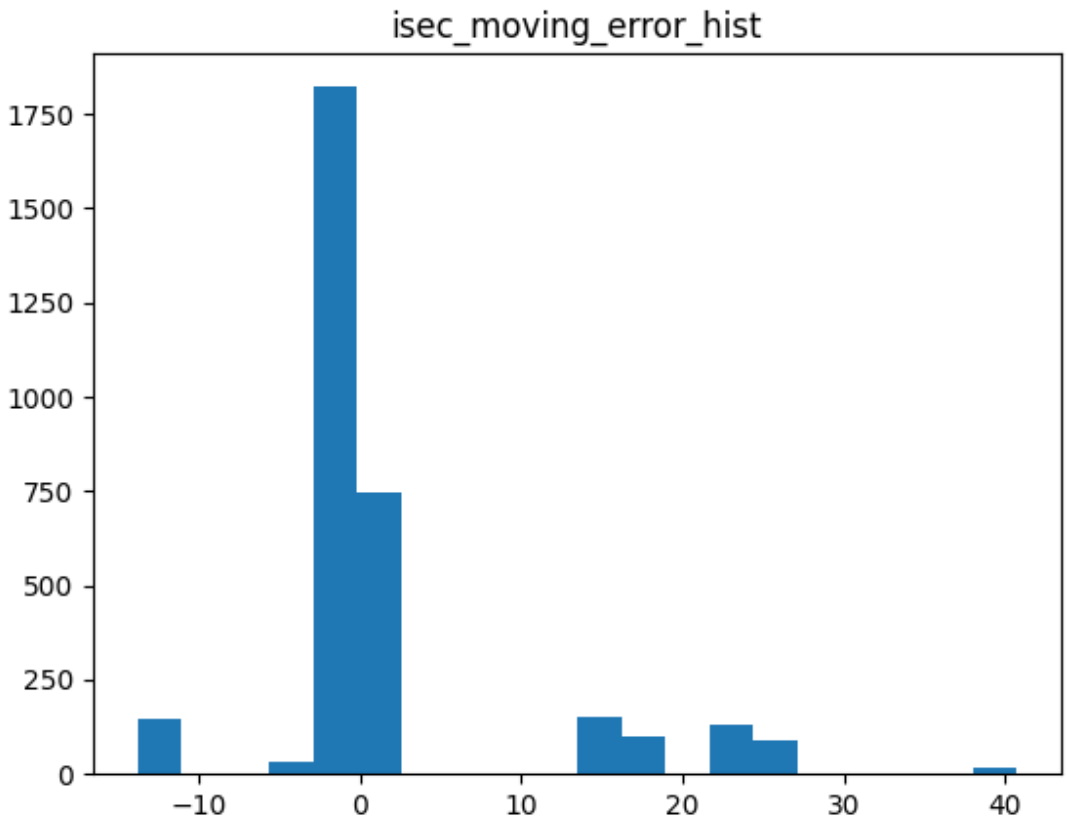
Lab2

RTK represents real-time kinematics, it is real-time kinematics. GNSS is global navigation satellite system, it can give us centimeter-level positioning accuracy. RTK GNSS is a portioning technology that relies on the base station and rovers to give us high precision positioning. The base receives signals from the GPS and GNSS satellites and it will calculate there own precise position. The rover also receives the signal from the same satellite and works with the base to correct the position and calculate the precise position in real-time.

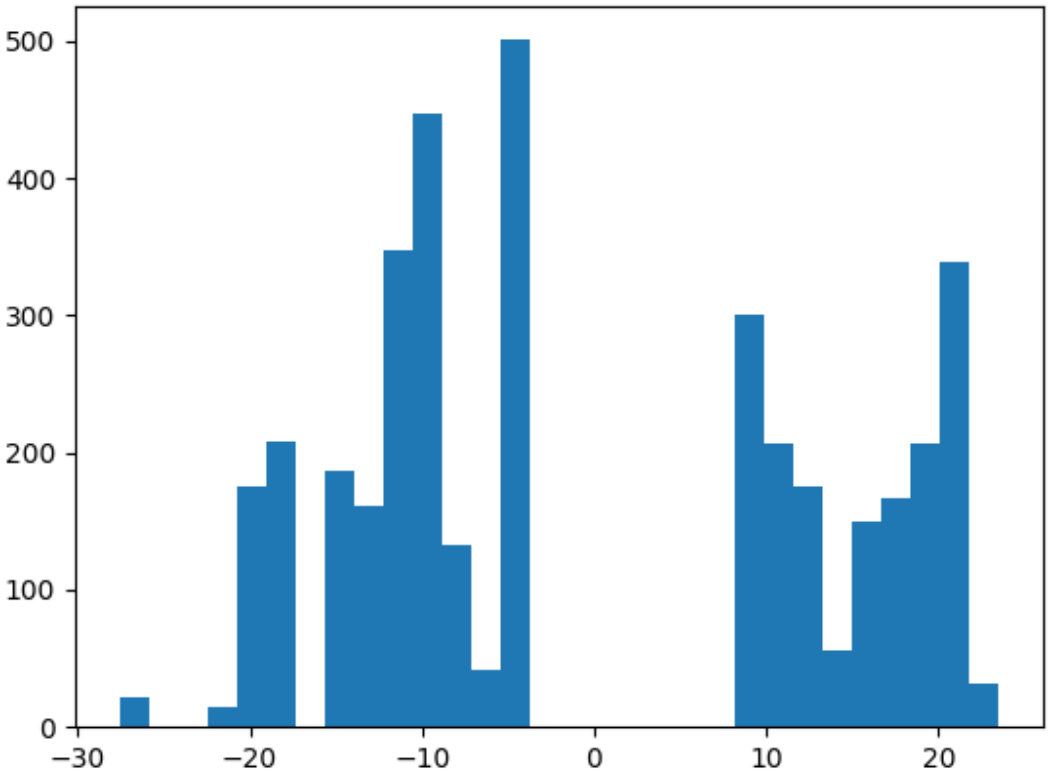
RTN GNSS uses continuous networks to give us real-time and high-precision positioning information. The rover can receive correction through the internet. RTN GNSS provides high-precision positioning that is very similar to RTK but it does not need a local base station. In general, GNSS is a system that provides global positioning and navigation information to all people.

There are several sources that can cause errors in RTK GNSS. I think the most important error is the delay, since the satellite is so far away from us, the signal has to travel for a long time. And this will cause a non-accurate position. While the signal travels to the base in multi directions, it can also create error positioning. Also, when buildings nearby, it can cause reflections and block the signal, which the signal will give us an accurate position as well.

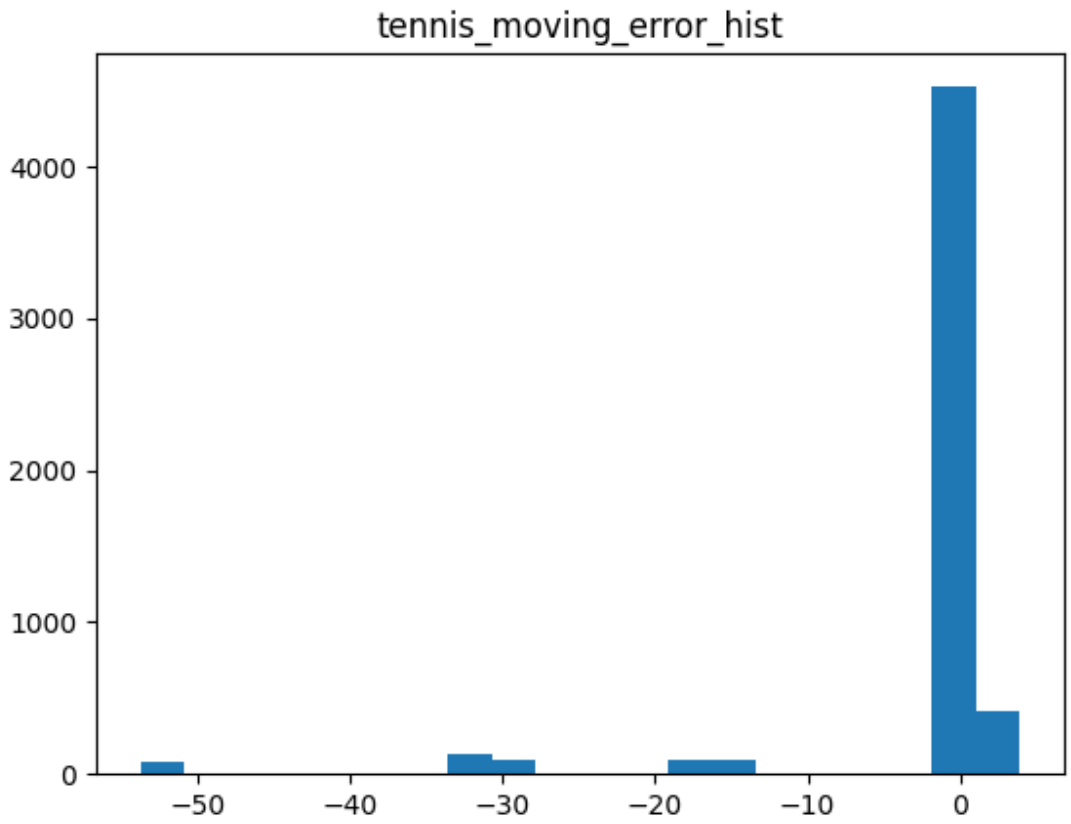
Q1.



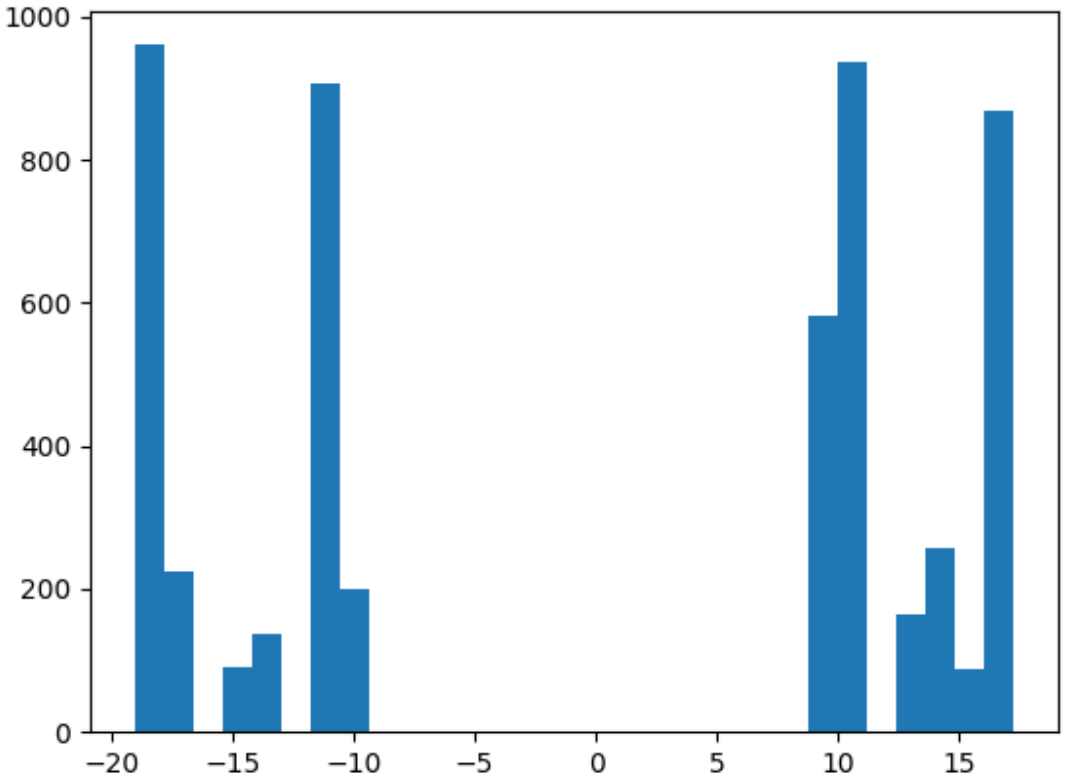
Isec moving error hist



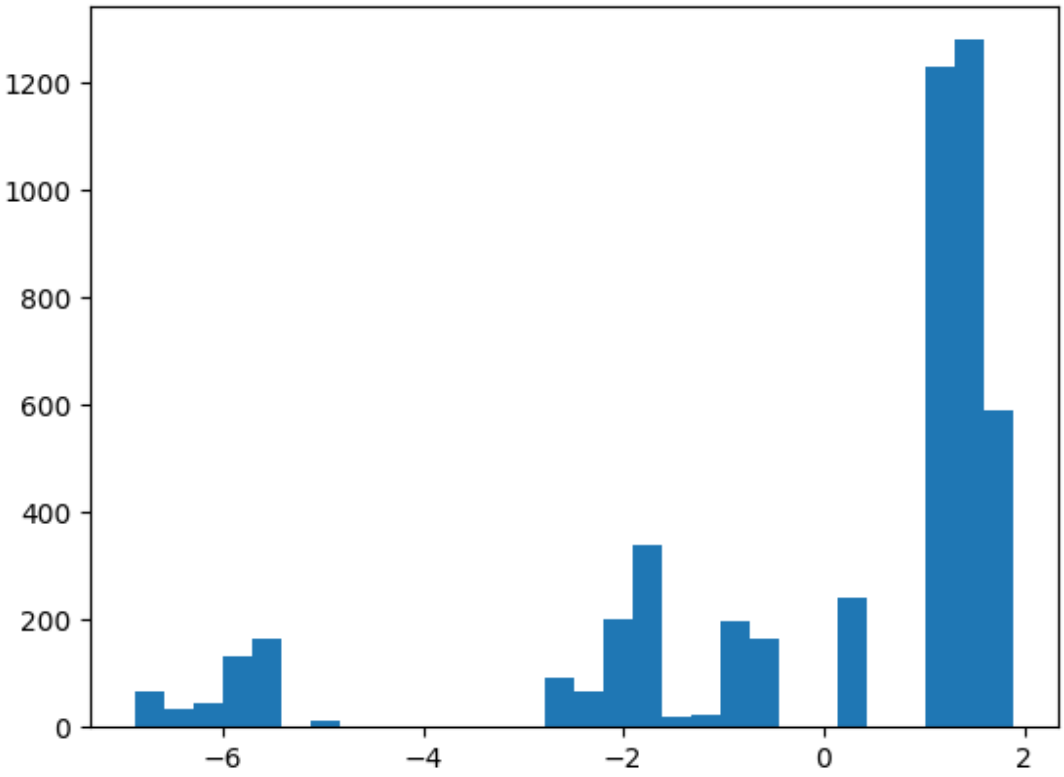
Isec moving position error hist



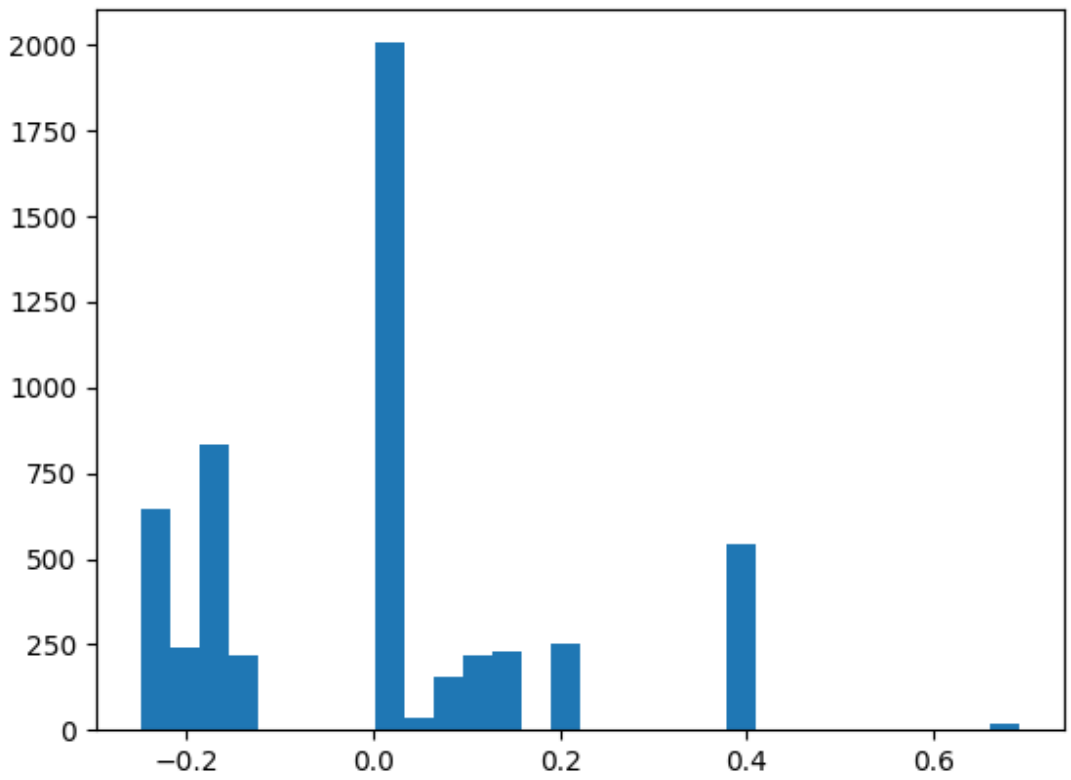
Tennis moving error hist



Tennis moving position error hist



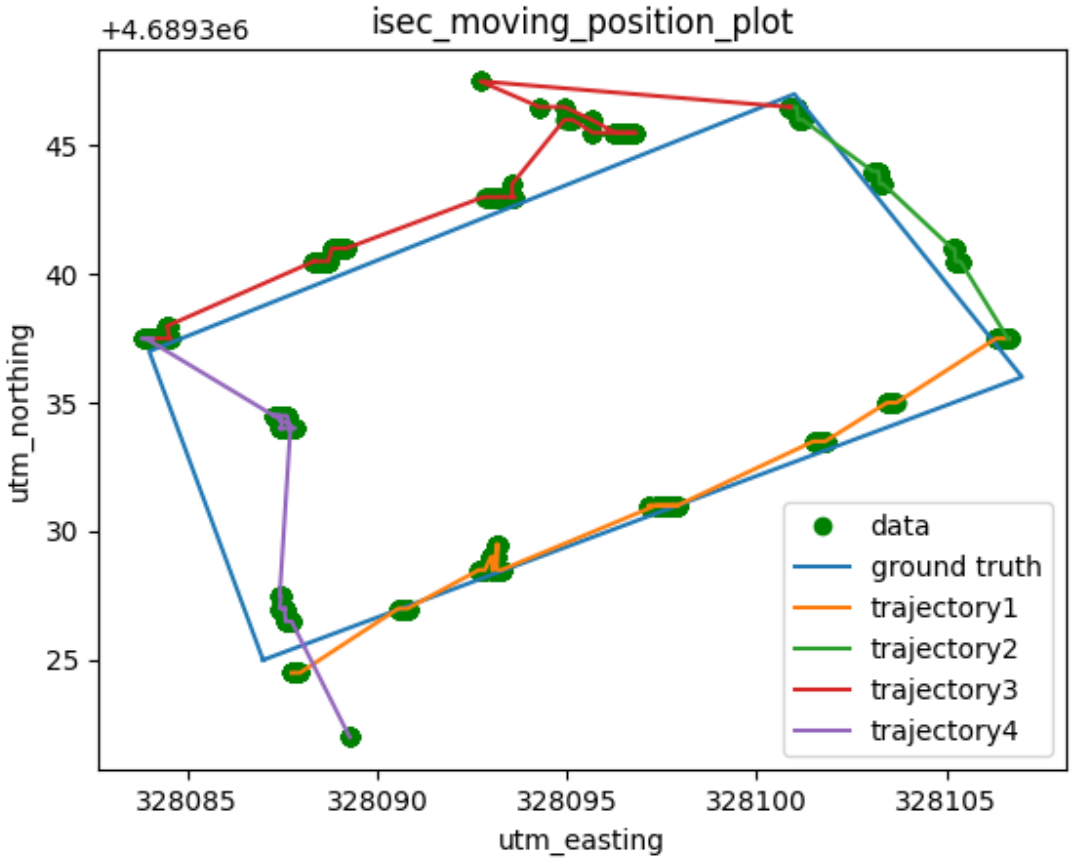
Isec static position error hist



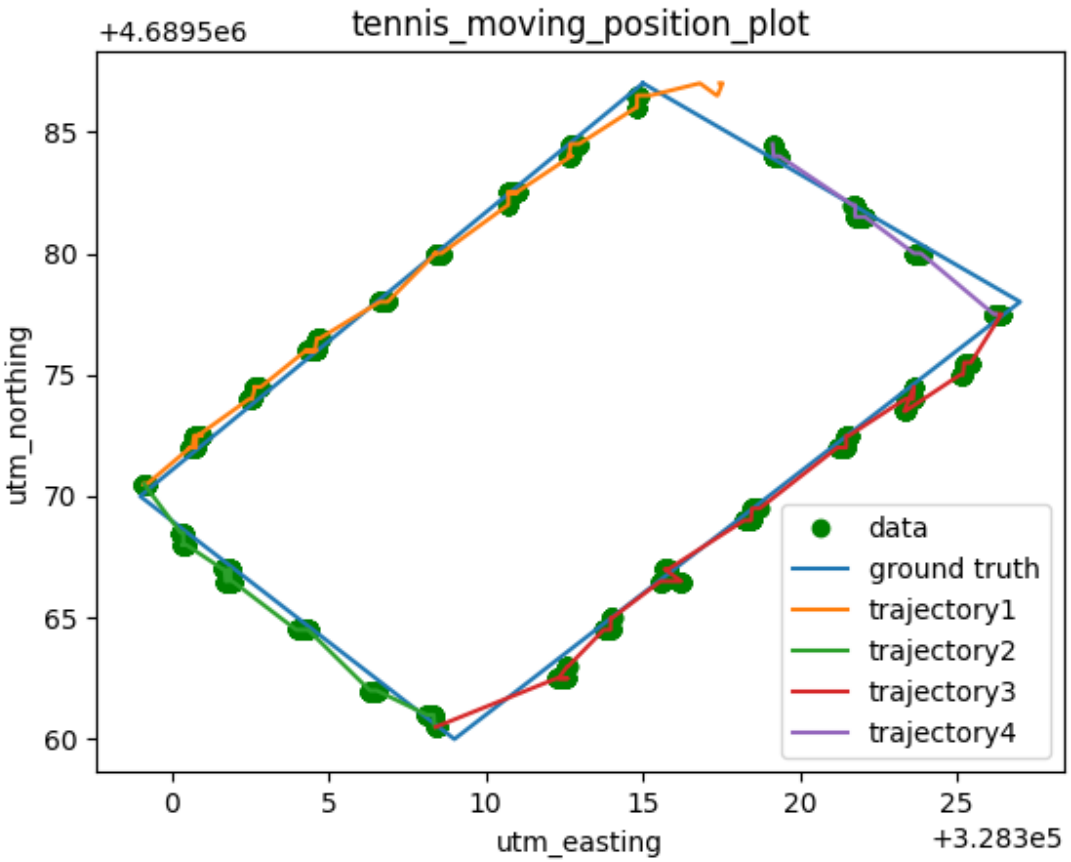
Tennis static position error hist

RTK GNSS is a high-precision satellite positioning technique that improves the accuracy of GNSS. In RTK GNSS, a fixed reference station with a known location and a rover or mobile unit simultaneously receive signals from multiple satellites, and the difference between the measured phase or code of the signals is used to determine the precise location of the rover relative to the reference station. The level of accuracy of the RTK can be shown when using RTK GNSS navigation compared with the true position. The small error can show that RTK GNSS has a better accuracy. Without the RTK, the accuracy can be affected by the delay and reflection, which cause a larger error in the positioning. So RTK GNSS is more accurate than GNSS without RTK.

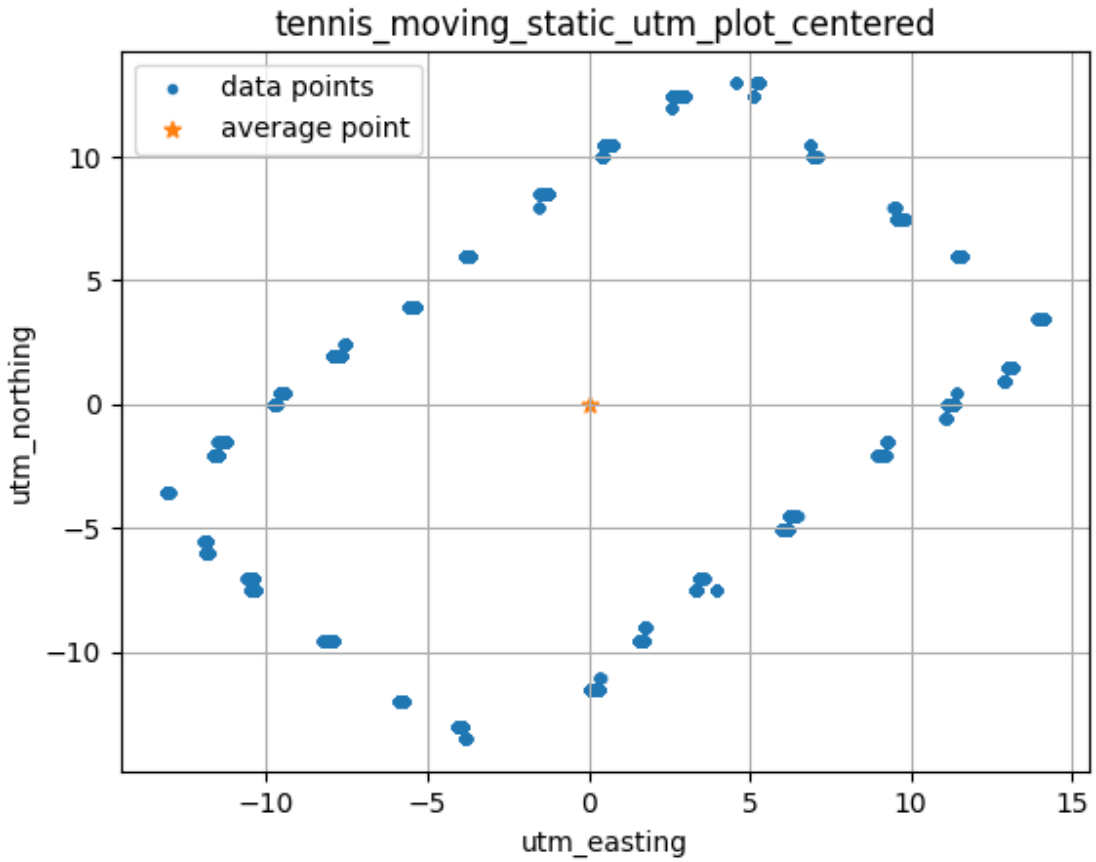
Q2.



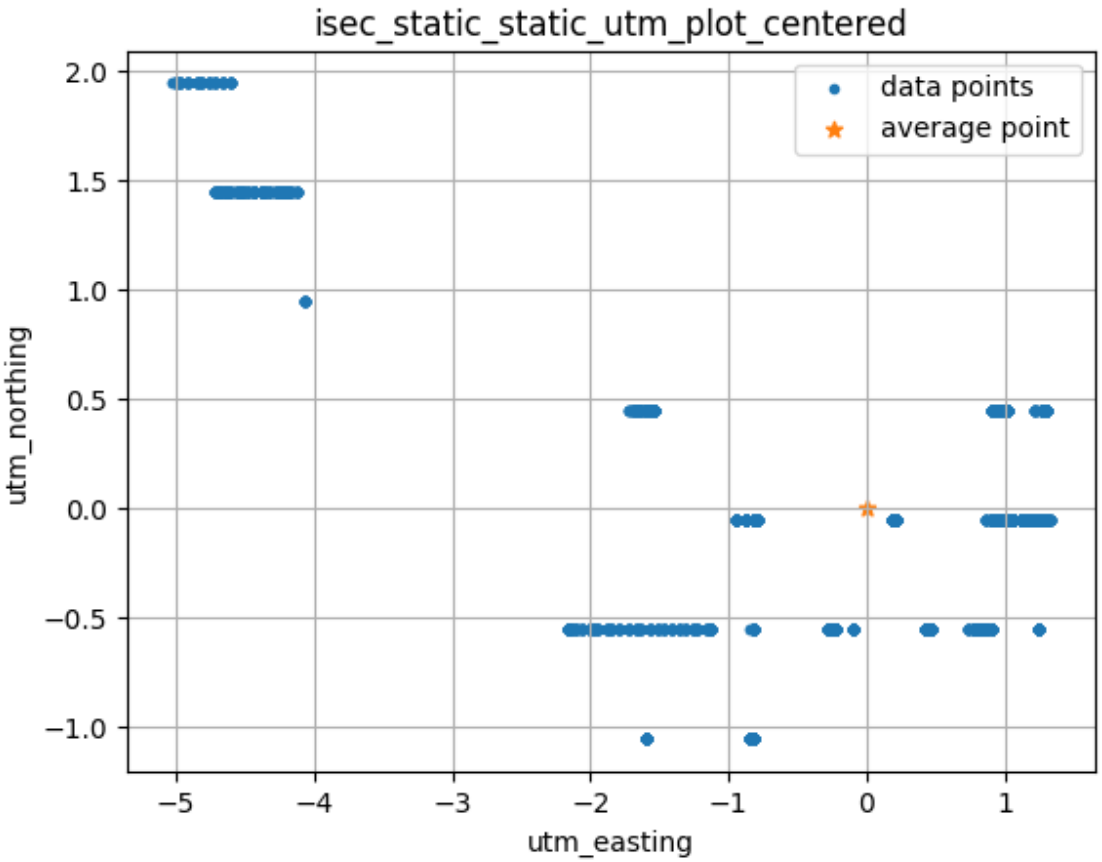
Isec moving position plot



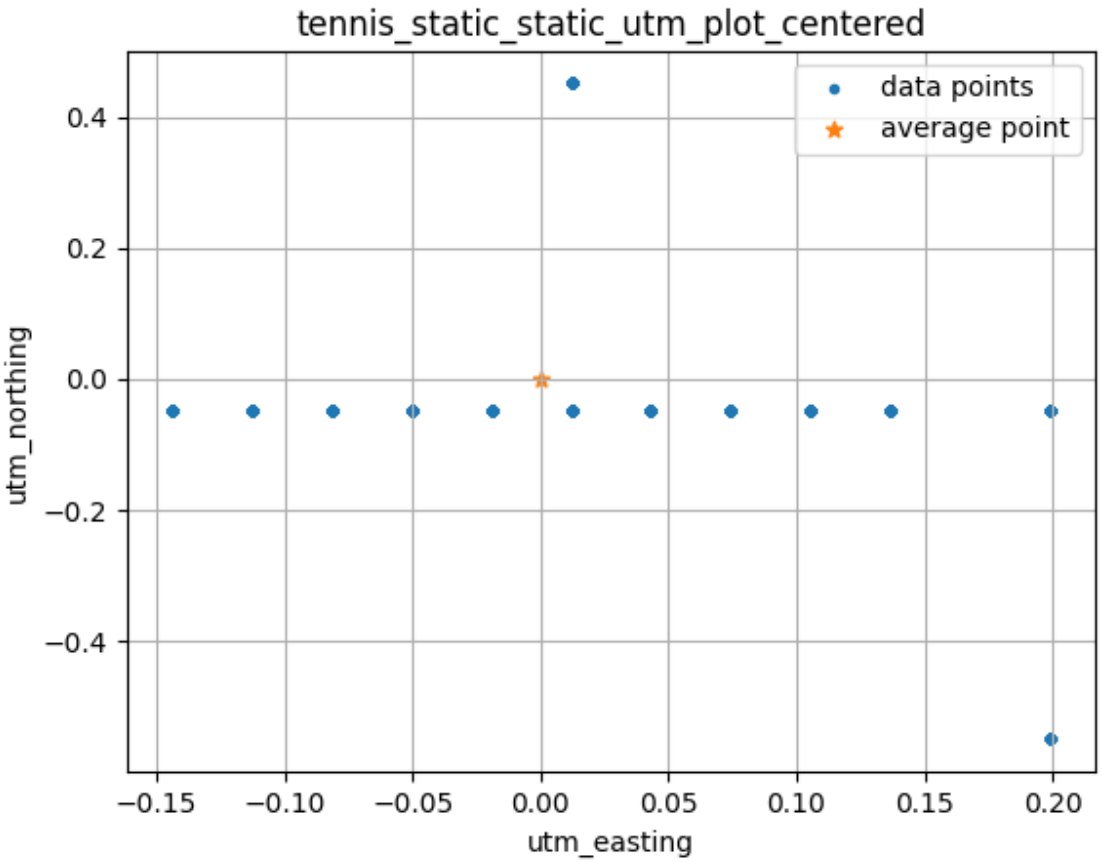
Tennis moving position plot



Tennis moving static utm plot centered



Isec static utm plot centered

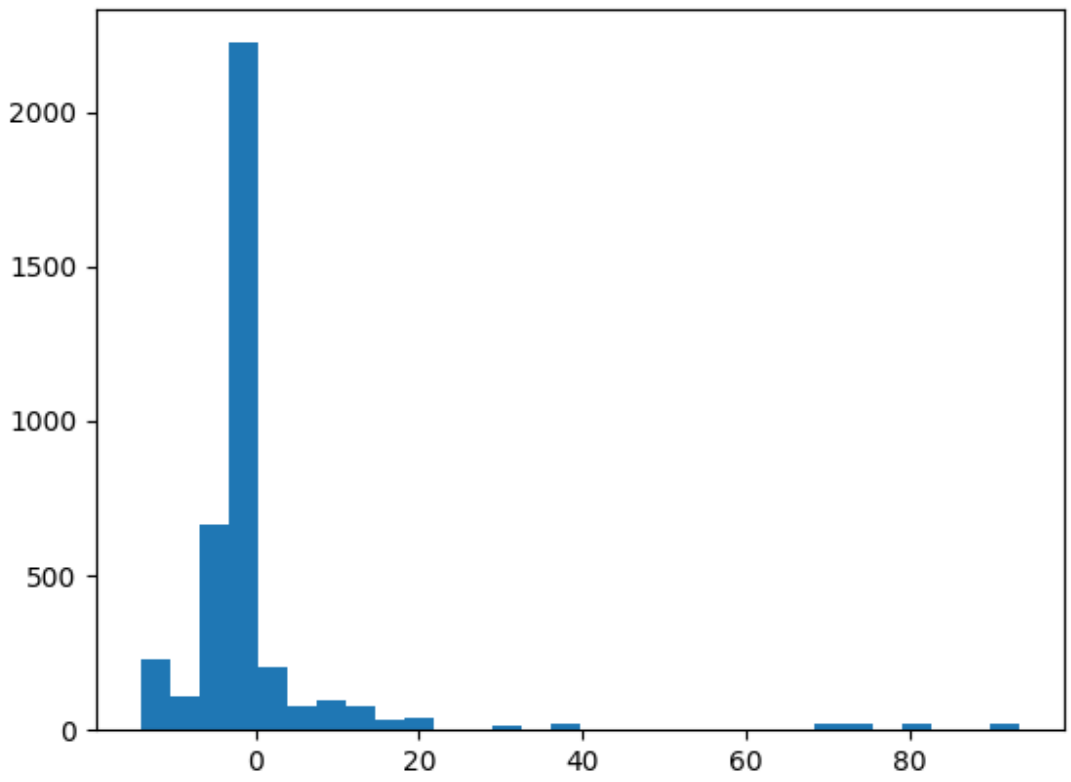


Tennis static utm plot centered

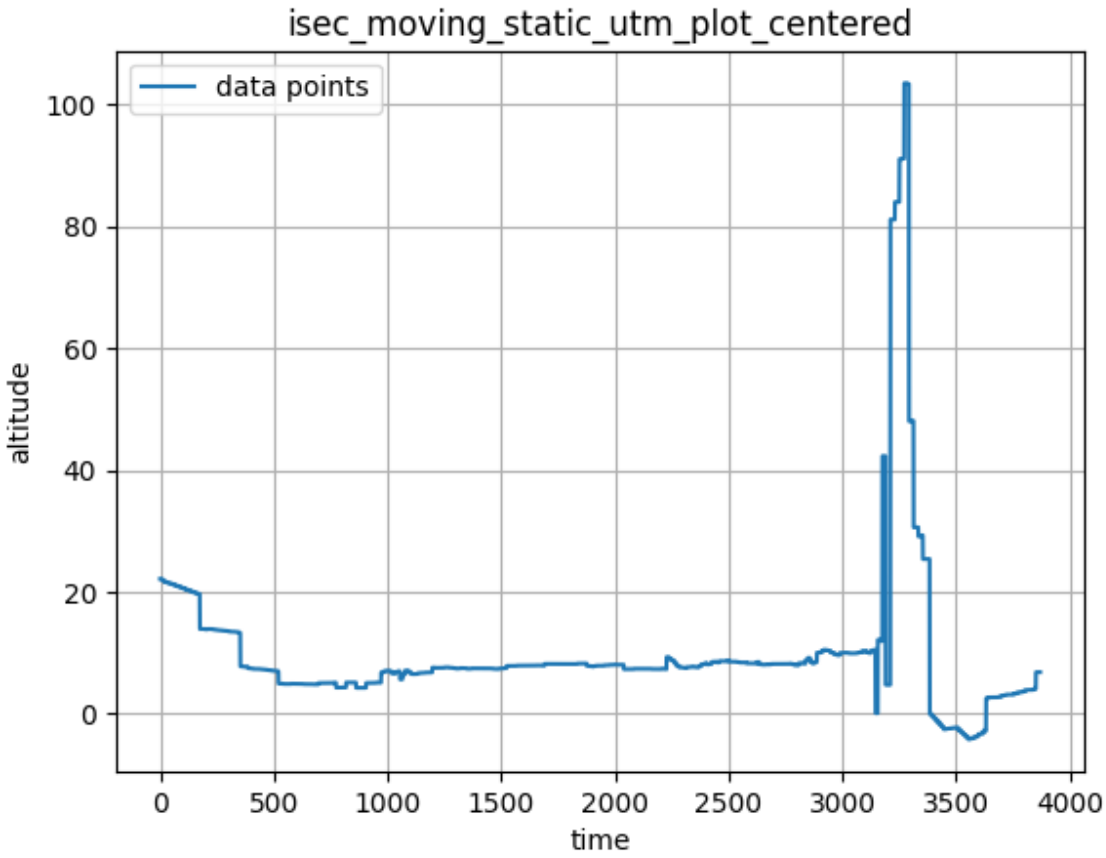
From the graph I got, I found that the graph with occluded data was not good as open area ones. The plot dot in the graph was more dispersed and harder to see the shape we walked. With the stationary graph, the plots were dispersed as well, they are not in a line.

Q3. Because in Lab 1, we only used the GPS to locate where we are and there are so many things that can influence the data we get, but in lab 2, we used RTK GNSS which uses the internet, and a base station to help the rover to correct the position it reads, so we can have a better data and more accurate.

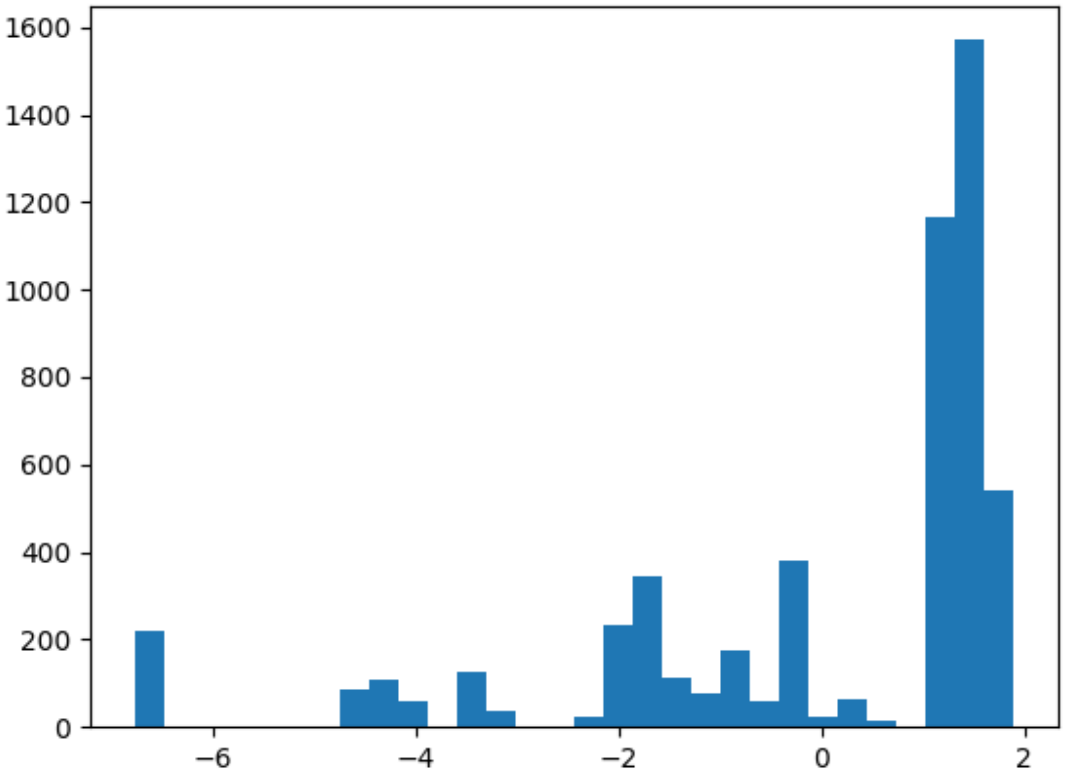
Q4.



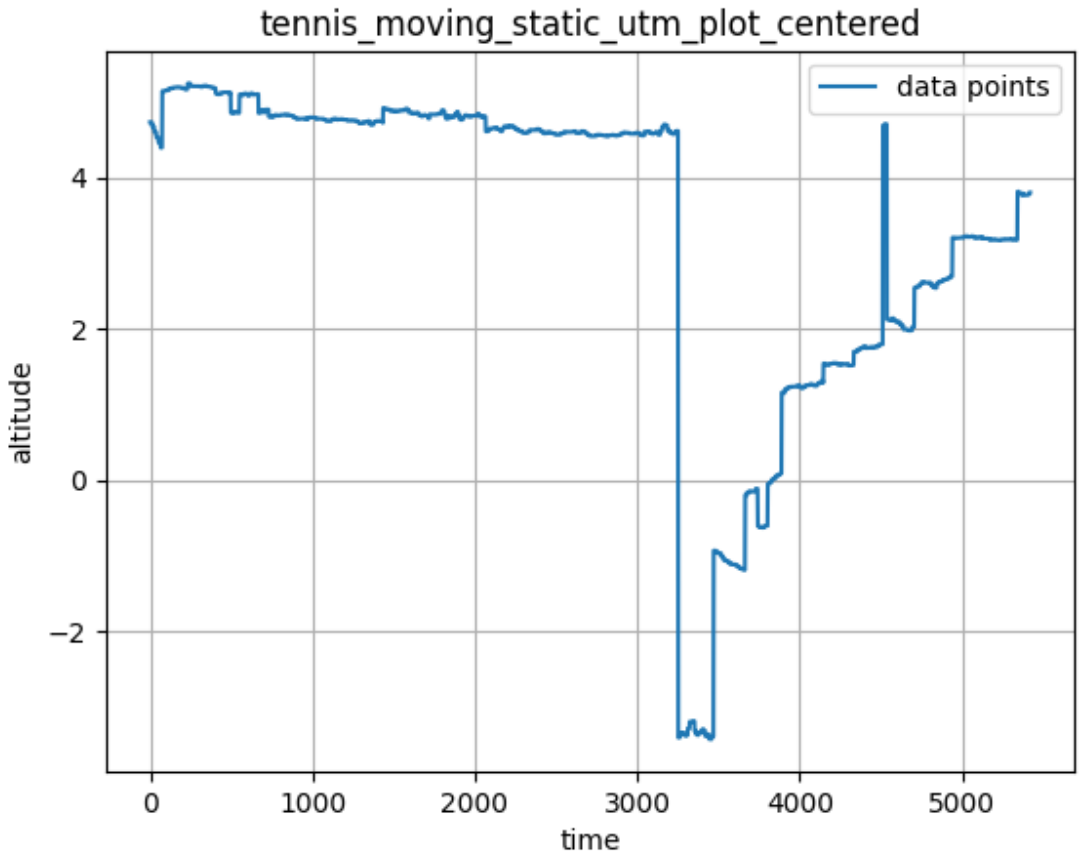
Isec moving alt hist



Isec moving alt plot



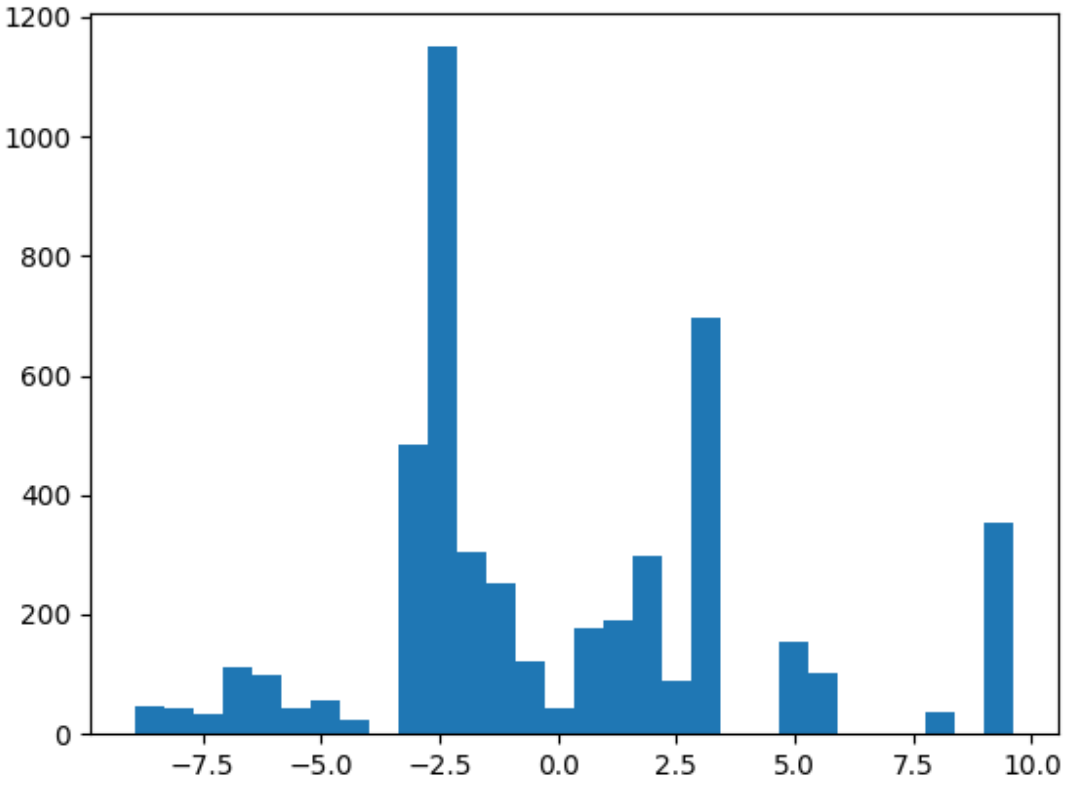
Tennis moving altitude hist



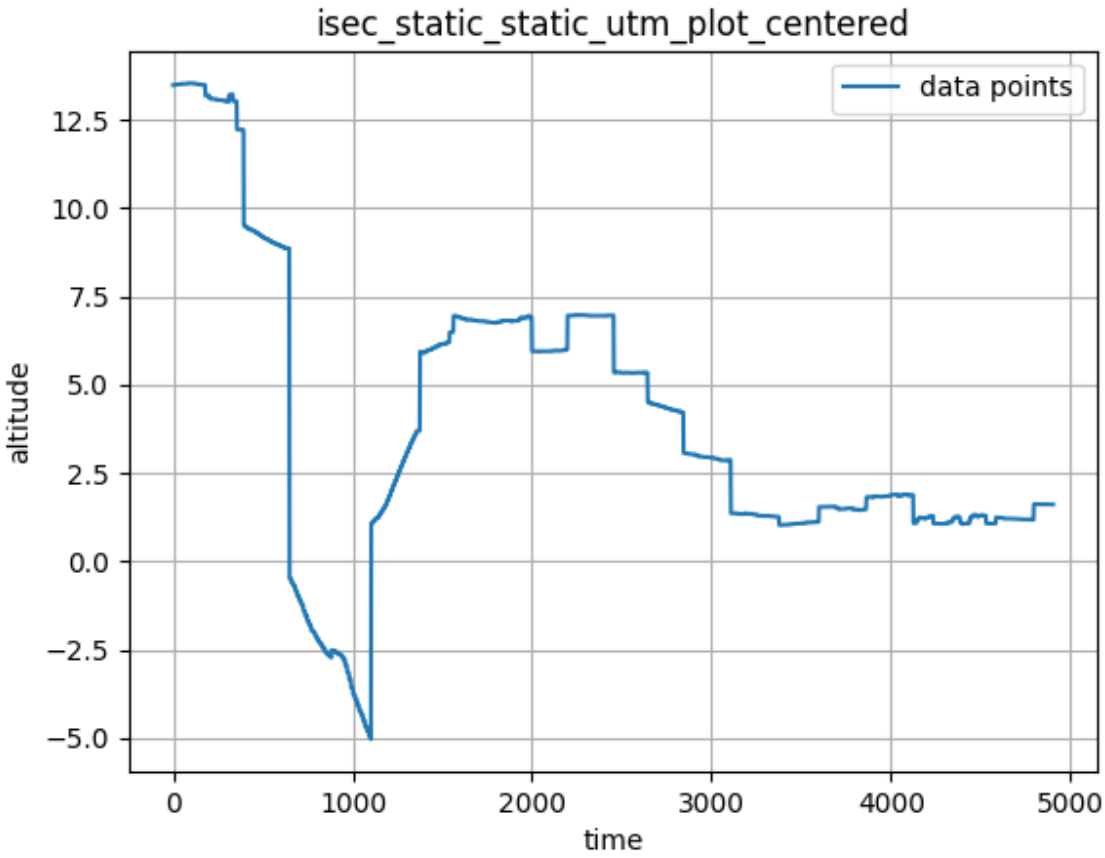
Tennis moving altitude plot

Compare the data we get from moving in an open area and the occluded area, the error in an open area is much smaller than occluded area, I think because, in an occluded area, there are some signals that have been blocked or reflected, so the base and rover could not be able to get an accurate position. The GNSS fix quality can show the accuracy of our data, for example, with a 3D 5m quality, we are having an accuracy of 5m in error. Basically, the showing fix of the quality of GNSS is telling the error of the positioning.

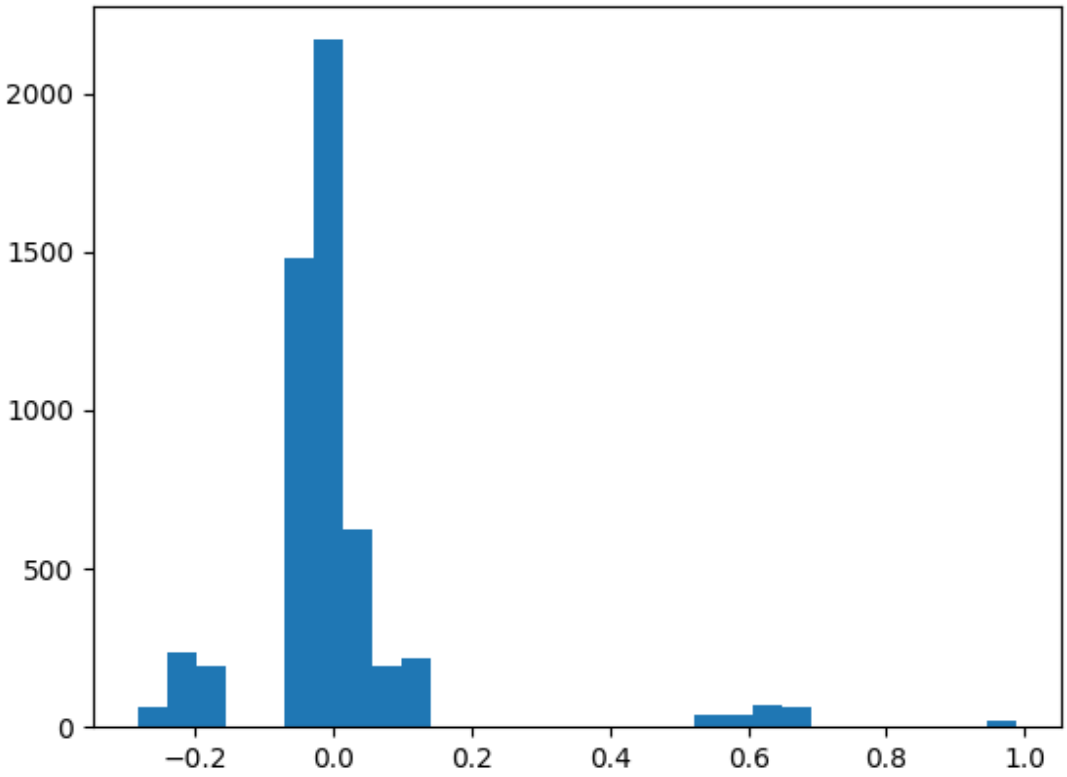
Q5.



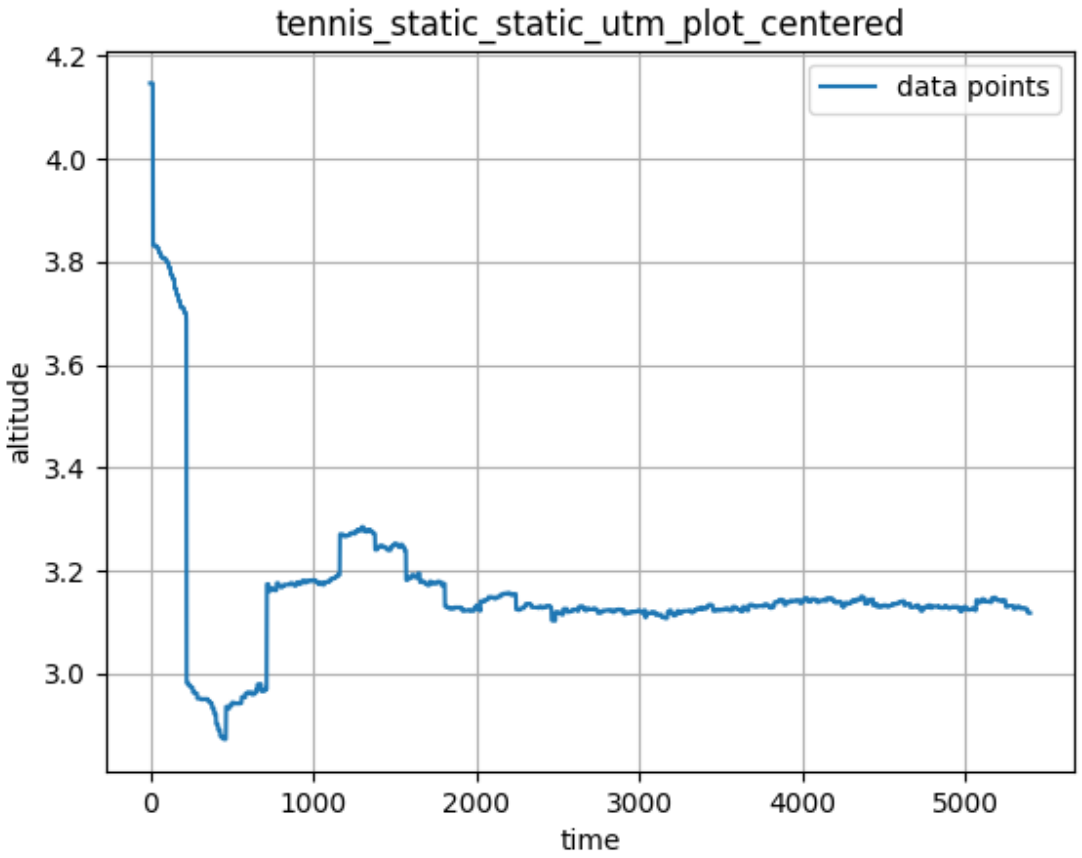
Ise static altitude hist



Isec static altitude plot



Tennis static altitude hist



Tennis static altitude plot

The error of stationary open area is much smaller than stationary in occluded area. I think it is because the signal has been blocked by the building and could cause some shift in data. The GNSS fix quality can show the accuracy of our data, for example, with a 3D 5m quality, we are having an accuracy of 5m in error. Basically, the showing fixes the quality of GNSS is telling the error of the positioning.

Conclusion:

With the graphs, we can see that the data we get at open area are better than the data we get at occluded area. There has to be something influence the data, such as the signal delay in the atmosphere, reflection and blocking of the signal from the building. So to have a better data, people need to get data at open area with a better internet.