# Reflection Report on GPS Data Collection

## 1. Usage of GPS Data

GPS data has become one of the most important sources for understanding mobility and human behavior. For example, transport planners can analyze commuting routes to design better bus or train schedules. Delivery companies use GPS traces to optimize logistics and reduce costs. Researchers in environmental science use trip distances from GPS logs to estimate carbon emissions from cars. GPS is also central to mobile applications, such as navigation tools (Google Maps, Waze) or ride-hailing services (Uber, Bolt). In academic settings, GPS logs collected from students or volunteers allow us to simulate traffic flows, identify hotspots of congestion, or measure accessibility to essential services. In short, GPS data is versatile: it connects individual movement patterns with wider social and urban challenges.

## 2. Reliability of GPS Data

Despite its usefulness, GPS data is not reliable at all times. The accuracy depends on the environment and the device. For instance, in dense cities with tall buildings, signals can bounce (multipath effect), giving false positions. Underground spaces such as tunnels or metro systems cause complete loss of GPS reception. Even in open areas, poor weather conditions (heavy rain or snow) can slightly reduce accuracy. Moreover, data loggers sometimes record at irregular intervals, which can distort speed or distance calculations. Battery saving modes on smartphones may also reduce the frequency of GPS recording. These issues mean that although GPS is a powerful tool, the data always needs to be validated and cleaned before analysis, otherwise the insights may be misleading.

## 3. Checking the Quality of GPS Data

Researchers use several strategies to make sure the collected GPS data is trustworthy. First, they look for outliers such as sudden jumps in position or unrealistic speeds (e.g., 200 km/h when the participant is walking). These are flagged and removed. Second, temporal consistency checks are done to ensure there are no major gaps in time stamps. Third, the data can be cross-checked against known road networks (map matching) to verify if the recorded path is plausible. Statistical methods, such as calculating the average speed, acceleration, and trip length, are also used to detect anomalies. Another approach is to combine GPS with other sensors (Wi-Fi, accelerometer, or cell tower signals) to confirm the movement. This kind of validation improves data reliability and makes the final analysis more meaningful.

## Conclusion

GPS data is extremely powerful in showing how people and vehicles move, and it has applications in research, urban planning, and business. However, the reliability of GPS signals cannot be taken for granted due to environmental, technical, and human factors. Therefore, data quality checks and careful preprocessing are necessary steps before using the data for analysis. By applying outlier removal, validation against maps, and statistical tests, researchers can transform raw GPS logs into valuable insights that support better decision-making.