

# **Solving the latency problem in Real-time GNSS Precise Point Positioning using open source software**

## **ABSTRACT**

Real-time Precise Point Positioning (PPP) can provide the Global Navigation Satellites Systems (GNSS) users with the ability to determine their position accurately using only one GNSS receiver.

The PPP solution does not rely on a base receiver or local GNSS network. However, for establishing a real-time PPP solution, the GNSS users are required to receive the Real-Time Service (RTS) message over the Network Transport of RTCM via Internet Protocol (NTRIP). The RTS message includes orbital, code biases, and clock corrections.

The GNSS users receive those corrections produced by the analysis center with some latency, which degraded the quality of coordinates obtained through PPP. In this research, we investigate the Support Vector Machine (SVR) and RandomForest (RF) as machine learning tools to overcome the latency for clock corrections in the CLK11 and IGS03 products. A BREST International GNSS Services permanent station in France selected as a case study. BNC software implemented in real-time PPP for around three days. Our results showed that the RF method could solve the latency problem for both IGS03 and CLK11. While SVR performed better on the IGS03 than CLK11; thus, it did not solve the latency on CLK11. This research contributes to establishing a simulation of real-time GNSS user who can store and predict clock corrections accordingly to their current observed latency.

The self-assessment of the reproducibility level of this study has a rank one out of the range scale from zero to three according to the criteria and classifications are done by (Nüst et al., 2018).