

## **(Graduation) internship in using 3D city models for GNSS skymasks – CGI**

Positioning in the urban environment will become increasingly important with the advent of autonomous vehicles, such as delivery drones and self-driving cars. Navigation satellites, such as GPS (USA) and Galileo (EU), form the basis for many outdoor positioning solutions. Satellite navigation is widely integrated in telephones, cars and smart devices, and many technologies are rapidly modernizing. The urban canyons in cities however, can often block view on satellites or cause multipath reflections. As 3D city models are becoming open-source available, new opportunities arise in urban navigation and route-planning techniques.

The core of the internship/graduation project is envisioned around the following tasks:

- Carry out a literature study related to GNSS, 3D city models and skymasks in the urban environment
- Development of a program to transform 3D city models into skymasks
- Development of a decision logic to filter out satellites without a line of sight to the receiver
- Verification and validation of the developed program using a to be supplied receiver
- (Optionally) development of object detection based on GNSS raw measurements

During the internship, there will be ample support related to the space and navigation domains, such as GNSS, GPS and Galileo. With respect to mapping 3D city models to a skymask, a level of autonomy is expected. If you are interested in this topic, send an e-mail with your cv to Tom van den Oever ([tom.vanden.oever@cgi.com](mailto:tom.vanden.oever@cgi.com)).