OpenStreetMap and deep learning for road information completion and extraction

In many middle and low-income countries, air pollution monitor networks are deficient or non-existing, but in these countries, people are the most vulnerable to air pollution, with young children suffer the most. The idea is to borrow information from countries where relatively dense ground monitors are available, and integrate information from satellite measurements and geospatial predictors, to give an estimation of global air quality. Global air quality has a strong and complex relationship with transport networks, capturing this relationship is a key in spatial prediction of traffic-related pollutants (e.g. NO2).

So far, OpenStreetMaps (OSM) provides the most open-source transport network, as in different types of tracks (e.g. roads, rails). A key challenge is that the transport network provided by OSM is incomplete in many countries, such as in China and African countries. High-Resolution satellite imagery (e.g. worldview2) and machine learning (particularly deep learning neural networks) are promising techniques to complement the OSM, and evaluate the consequences of directly using the OSM with missing roads to predict air pollution. On the other hand, OSM provides rich labels to perform supervised machine learning algorithms (e.g. to train a neural network).

This project expects to develop or apply advanced deep learning algorithms to extract transport networks from satellite imagery, using OSM. A software is developed to interactively complete OSM using satellite imagery. As the research matures, you will collaborate with environmental modelers to evaluate the consequences of using OSM for global air pollution mapping.

Keywords: OpenStreetMaps, deep learning, remote sensing, road extraction, software development