PROJET GrAViTAS
Global Accessibility Visualisation and Transport Analytics for Urban Sustainability

Post-Doc Fellowship Activity Plan


Associated Work Packages: WP1, WP3, WP4
Grant: Post-Doc Fellowship, 24 months
Supervisors: Antonio Miguel V. Monteiro (PI) and Mariana A. Giannotti (Co-PI)

Summary

To develop the necessary improvements on recent methods dealing with the integration of remote sensing time series of images from different sensors with ancillary information to fill-up the gap for geocoded information on urban land use and land cover, urban infrastructure, employment and spaces of activities. These methods are to be used for providing the new datasets with the inputs needed for the establishment of innovative accessibility measures related to the public transport system and the walking and cycling modals in metro-regions in Brazil and Latin America.

Objectives

In order to assess the geographical distribution of the opportunities for the population living in different metro-regions around the globe, a set of a transport-based accessibility measures have been developed and they rely on datasets describing travel opportunities, in particular populations by residence and employment opportunities by workplaces. Beyond employment, health, education and leisure opportunities can also be explored in more in-depth analysis. However, although these datasets can be easily found in a ready-to-use state for many USA and Europeans metro-regions that is not the case for the Brazilian and Latin American ones and also for African and many Asian metro-regions as well. It is possible to find these data but usually the datasets are not open to use and are under restricted access laws. This is a significant shortcoming for a global approach on accessibility indicators.
The main objective of the Post-Doc Fellowship is to focus on using alternative datasets and new methods and methodologies to derive innovative ways to fill-up this data gap allowing for the development of adapted measures of accessibility to opportunities in Brazilian and Latin American metro-regions.

In particular, the Post-Doc Fellow will be dealing with innovative techniques to produce a proxy for geolocalized data at intra-urban scale based on an activity-space approach. It shall be done by using a heterogeneous data integration approach combining remote sensing images, census tract data, potentially trajectory data (social media/mobile) and spatial modeling to estimate employment and other opportunities. This approach will be tested first in cities/metro-regions where employment/other opportunities data is available to calibrate and to assess the methods, then used at large on the metro-regions chosen where these data is lacking.

**Activity Plan and Methodology**

A set of new remote sensing satellite programs running under open licenses, a set of new techniques to deal with big remote sensing images databases and new spatio-temporal methods have cropped-up in the literature. (Xiaojing et al, 2006; Kuang et al, 2014; Longwei et al, 2016; Soares Machado et al, 2014; Taubenböck et al, 2013; He et al, 2010; Varshney et al, 2013; Dória et al, 2016; Dal’Alasta et al, 2012; Alexander et al, 2011). Some of the studies due with techniques, others with its application and assessment. In GRAVITAS the challenge is, first, the need for identifying which of these methods can be applied for helping in deriving the information the project needs and, second, to verify the possibility of these techniques or improvements over them in being operational over large databases.

The Post-doc fellow in GRAVITAS will deal with these necessary methodological innovations and will have to act as an interface amongst the most technical transport system and accessibility analysis team and the urban geography of the opportunities group. In this role the Post-Doc will have to be active in some tasks related to:

1. The selection of metro-regions for Brazil and Latin America;
2. The assessment of the remote sensing derived information datasets;
3. The assessment of the activity-based accessibility indicators
4. The assessment of these indicators for inter metro-regions comparability
Work Plan

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<th>Task</th>
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<td>. Literature review on methods/methodologies on the subject</td>
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<td>. Methodology for deriving geocoded activity space data from</td>
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<td>heterogeneous data sources (proxy for employment by workplace for</td>
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<td>Exploration of other opportunity datasets.</td>
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<td>Methodology for defining the activity-based accessibility measures</td>
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<td>and its potential and limitation in comparative studies</td>
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Initial References


**Post-Doc Fellowship Profile**

The candidate should have a PhD in (Urban) Geography, Urban and Regional Planning, (Urban) Economy, Remote Sensing (of the Urban Environment), GeoInformatics, Spatial Information Engineering, Transport Engineering or any other area with a relation with accessibility in urban studies. It is strongly desirable training in remote sensing, spatial analysis, statistical computing with R and experience with GIS technology. It is strongly desirable also knowledge of the demographic databases, economic databases and the remote sensing catalogs of image collections. It would be very welcomed experience or knowledge of the urbanization in Latin America (one or more cities). It is necessary good communication skills of english and spanish.