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Towards an Automatic Framework for Urban Settlement Mapping from Satellite Images: Applications of Geo-referenced Social Media and One Class Classification

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Currently, urban dwellers comprise more than half of the world's population and this percentage is still dramatically increasing. The explosive urban growth over the next two decades poses long-term profound impact on people as well as the environment. Accurate and up-to-date delineation of urban settlements plays a fundamental role in defining planning strategies and in supporting sustainable development of urban settlements. In order to provide adequate data about urban extents and land covers, classifying satellite data has become a common practice, usually with accurate enough results. Indeed, a number of supervised learning methods have proven effective in urban area classification, but they usually depend on a large amount of training samples, whose collection is a time and labor expensive task. This issue becomes particularly serious when classifying large areas at the regional/global level. As an alternative to manual ground truth collection, in this work we use geo-referenced social media data. Cities and densely populated areas are an extremely fertile land for the production of individual geo-referenced data (such as GPS and social network data). Training samples derived from geo-referenced social media have several advantages: they are easy to collect, usually they are freely exploitable; and, finally, data from social media are spatially available in many locations, and with no doubt in most urban areas around the world.

Despite these advantages, the selection of training samples from social media meets two challenges: 1) there are many duplicated points; 2) method is required to automatically label them as "urban/non-urban". The objective of this research is to validate automatic sample selection from geo-referenced social media and its applicability in one class classification for urban extent mapping from satellite images. The findings in this study shed new light on social media applications in the field of remote sensing.