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Mapping population density in China using multi-source remote sensing within a random forests model

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Understanding the spatial distribution of populations at a finer spatial scale has important value and foundation for many applications such as ecological environment protection, disaster risk assessment and rescue, business decision-making, regional planning. Remote sensing image products such as nighttime lighting and land cover/land use type, have been widely used to disaggregate a large number of population (such as China) with significant differences in distribution to generate a gridded population map of large scales. However, the natural factors such as the topography, the river network and road network were considered less in previous studies. At the same time, geographic big data (such as POIs) can also be high accurately distinguish population distribution. In addition, the remarkable progress in machine learning provides toolkits for demographers. Therefore, Using existing land use products, nighttime lighting, DEM, POIs and census data, we used Random Forest(RF) models to simulate complex nonlinear correlation between population dependent variable and other independent variables. Finally, we disaggregated China's county-level census data into a 1KM $\times$ 1KM grid. The gridded population density datasets obtained by this method can be used to analysis spatial-temporal patterns of population density and provide the potential of geospatial big data for mapping other socioeconomic parameters in the future.