

Machine Learning Predictions of GDP at higher spatial and sectoral resolution

Topic: Input-Output Modelling: Disaster analyses (1)

Author: Daniel Moran

Co-Authors: Mohamed-Bachir Belaid

High-resolution data on the spatial distribution of value added and employment by industry can be valuable in a range of use cases in input-output analysis and modelling. Yet robust datasets on employment or value added with desirable sectoral and spatial resolution are rare. Satellite nighttime light imagery is a popular tool for improving spatial resolution, but this approach is unsatisfying as lighting weakly correlates with activity intensity and cannot differentiate activities. Here we present a machine learning framework to predict the presence and distribution of industry-specific employment at a fine spatial scale using a wider range of predictor variables. The model predicts employment by industry sector at high spatial resolution occurrence using widely available predictor datasets (gridded population, OpenStreetMap (OSM)), and is trained using public business registry and employment data from Norway. This machine-learning approach can provide spatially explicit estimates of employment by sector even in countries with no such data available. We present the modelling approach (a graph neural network with self-attention mechanism); results; and discuss the potentials and limitations of this approach.