Title: Energy Consumption Prediction in Rio Grande do Sul with Night-Time Satellite Light Images

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Various studies have consistently demonstrated the relationship between night-time satellite light images and energy consumption [1][2], and some studies have made predictions based on this relationship [3]. In this context, and with the goal of promoting low-cost improvements in energy resource management, this study evaluates the potential of using night-time satellite light images to predict electricity consumption in Rio Grande do Sul, using open data.

To achieve this, night-time light image data was collected via the VIIRS-DNB satellite and pre-processed by the GPMC (Marketing and Consumption Research Group). Data on electricity consumption was provided by the EPE (Brazilian Energy Research Company) [4]. The analysis considered statistical and econometric aspects between the time series, such as correlation, causality, and cointegration [5]. Additionally, a comparison was made between univariate models (past energy consumption values) and models incorporating night-time light as an exogenous variable. These comparisons were performed using the classical ARIMA model (Auto-Regressive Integrated Moving Average) [6] and a more modern Machine Learning model, LSTM (Long Short-Term Memory) [7].

These analyses were conducted using Python, employing libraries such as statsmodels, Scikit-Learn, and Keras. Preliminary results demonstrate that the use of night-time light data can improve energy consumption forecasts in Rio Grande do Sul, presenting a potential low-cost alternative for optimizing the management of energy resources. To confirm this hypothesis, it is necessary to evaluate other predictive models and increase the dataset size in future work.

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