Poverty Prediction with Satellite Imagery and Deep Learning

Research Paper: [Link](#)

First of all, they tried to predict Poverty with Nighttime Luminosity

Table 1. Regression results for wealth index prediction from luminosity.

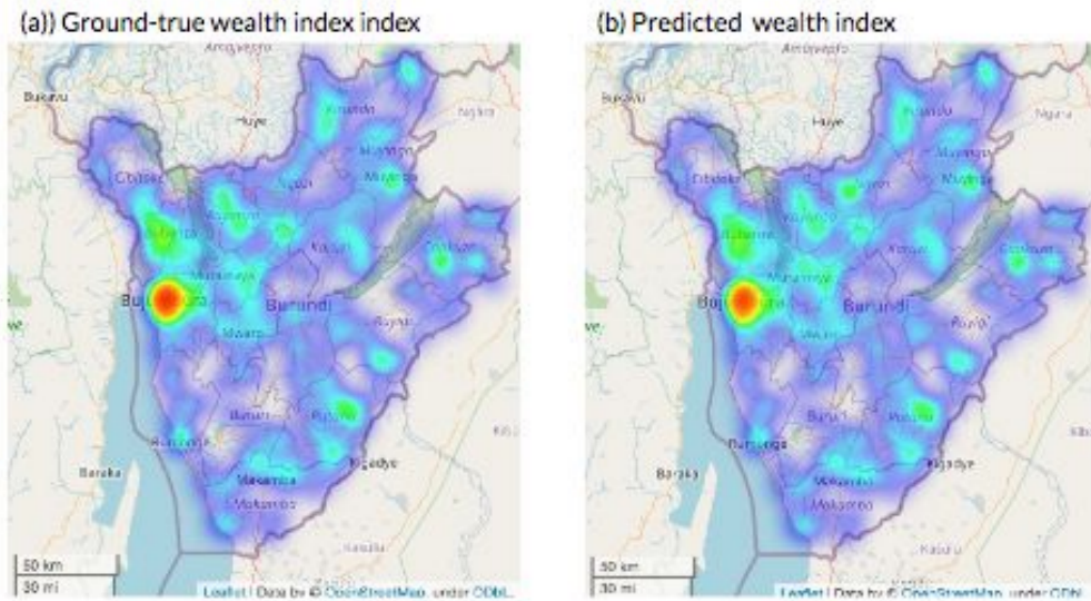| Regression model	R^2 (test)
Linear regression	0.50
Lasso	0.50
Rigid	0.50
Random forest	0.54

Figure 7. Ground-truth wealth indices and the predicted wealth indices from nighttime satellite imagery using machine learning aggregated to the cluster level.

Although the predicted wealth index has a good visual match with the group truth value on the map, the major problems of this method are
1) the cloud covered on the sky can cause model bias, and
2) 73% of the luminosity values are zero.

Deep Learning to Predict Poverty from Daytime Satellite Imagery

Then trained a basic CNN model (with architecture similar to LeNet-5 [ref], which has two Convolutional layers and one max_pooling layer) to predict the nighttime light intensity classes from daytime satellite images
Afterwards, they used different models to Predict Poverty and here are the accuracy of the various models.
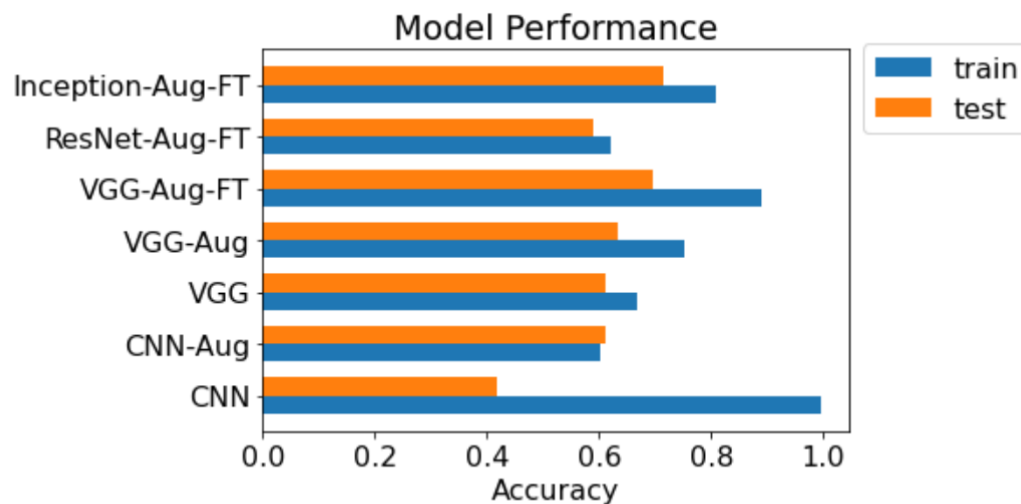

Figure 15. Model performance with various models.

Conclusion

Our results confirm the applicability of the methodology, with the best regression model achieving an r-squared of 0.54 for estimating wealth index from nighttime luminosity. We also demonstrate that a combination of transfer learning and neural networks can be implemented to capture the features from daytime satellite images to predict poverty, with the best model achieving 80% accuracy.