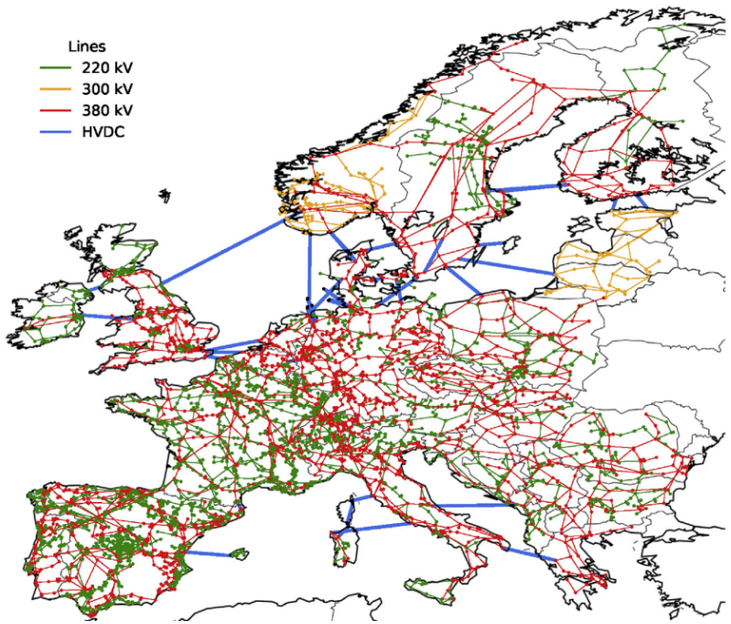
Models and Data

PyPSA meets Earth

Europe



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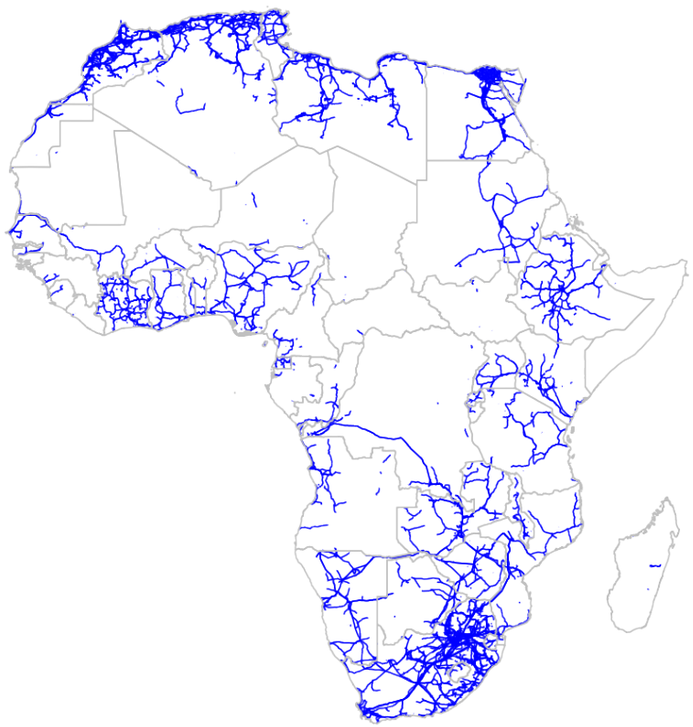
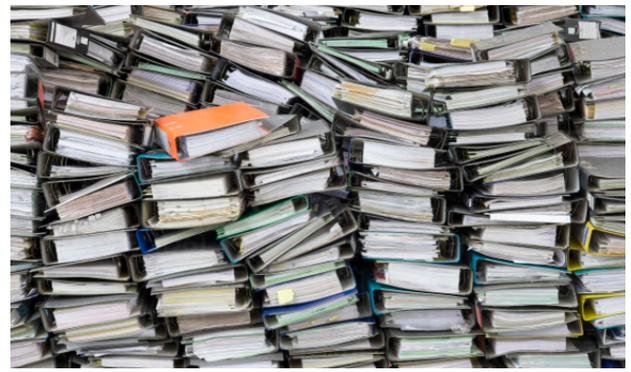
Models and Data

PyPSA meets Earth

Africa





Models and Data

PyPSA meets Earth

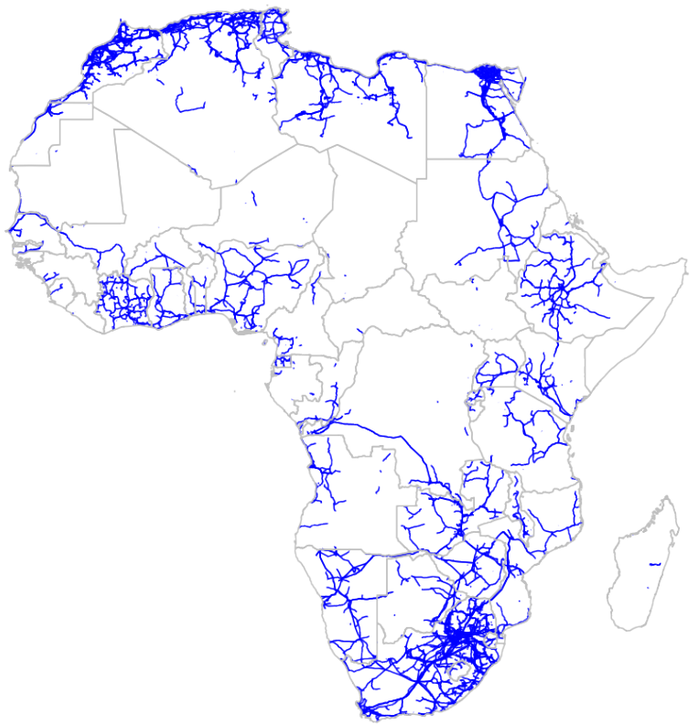
Our efforts

- Grid Topology
- Demand

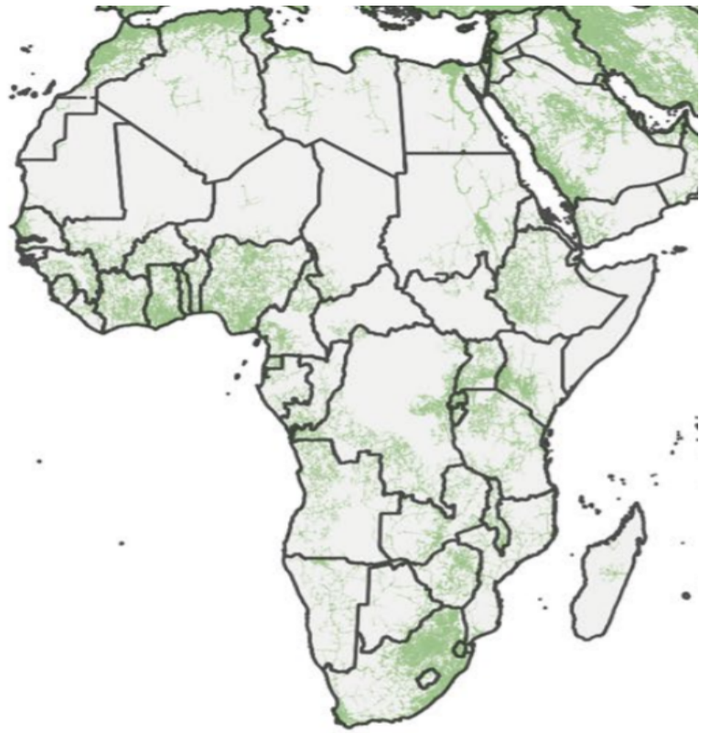
Our plans

- What exists
- What we need
- What we can build

Infrastructure Detection



Picture by Hazem Abdel-Khalek

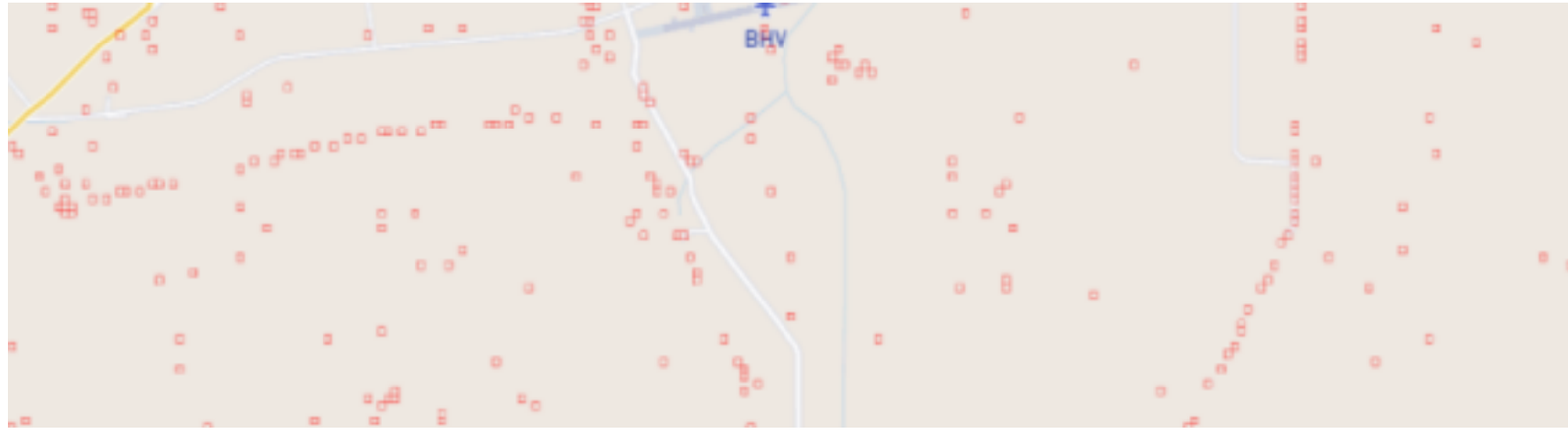


Arderne et al. 2020

Infrastructure Detection

PyPSA meets Earth

World Bank & Development Seed



World Bank & Facebook

http://devseed.com/ml-griddocs/introduction/strategy/
gridfinder.org

Infrastructure Detection

PyPSA meets Earth

Re-Tackle Detection of Individual Towers

- Grid Infrastructure Dataset by Duke University
- Satellite Imagery released by maxar for humanitarian purposes
- Research advances in machine learning

train

transfer

infer

maxar.com/open-data
https://figshare.com/articles/dataset/Electric_Transmission_and_Distribution_Infrastructure_Imagery_Dataset
https://pxhere.com/en/photo/560374

Infrastructure Detection

PyPSA meets Earth

MAXAR

Name
texas
south_africa
sierra_leone
malawi
ghana
drc
chad
california
brazil
bangladesh
australia

Infrastructure Detection

Infrastructure Detection

PyPSA meets Earth

Cycle-GAN to bridge gap between dataset

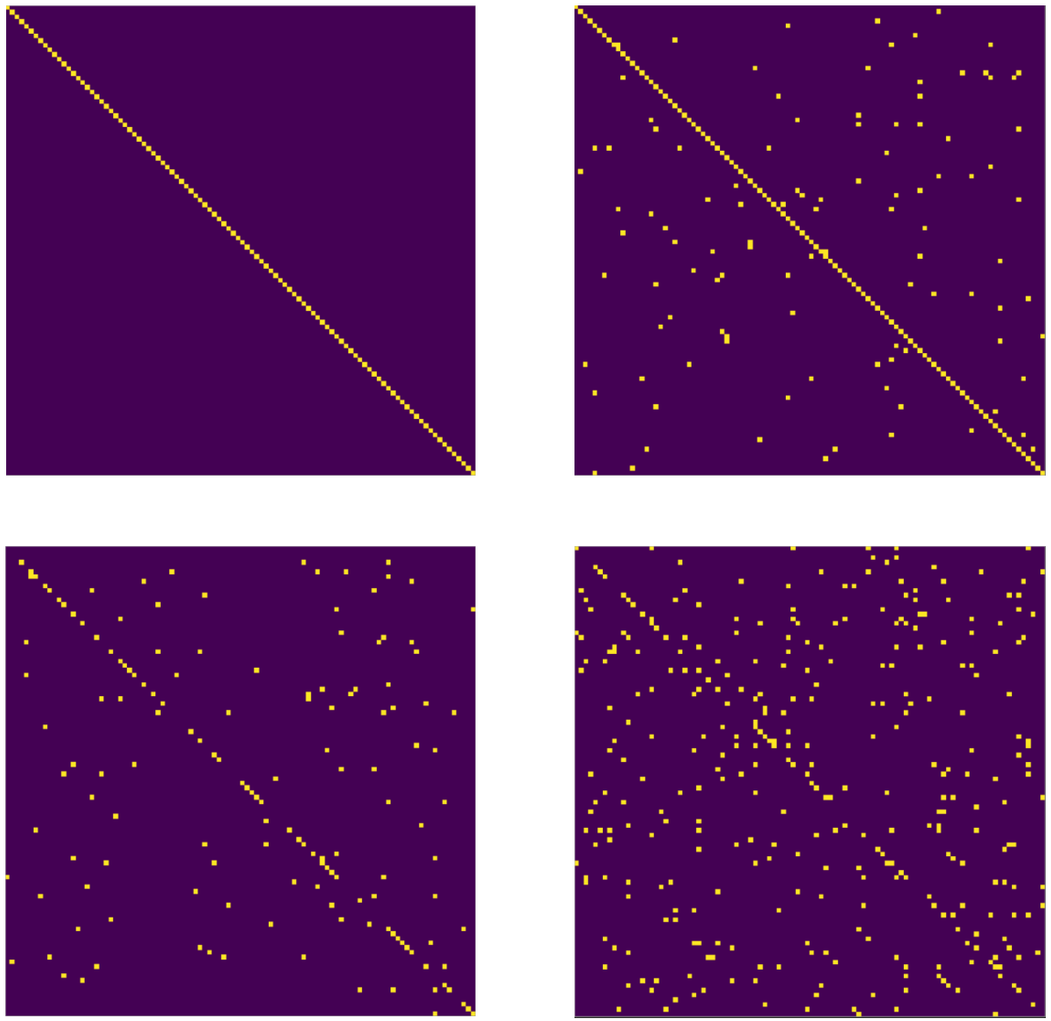
Infrastructure Detection

PyPSA meets Earth

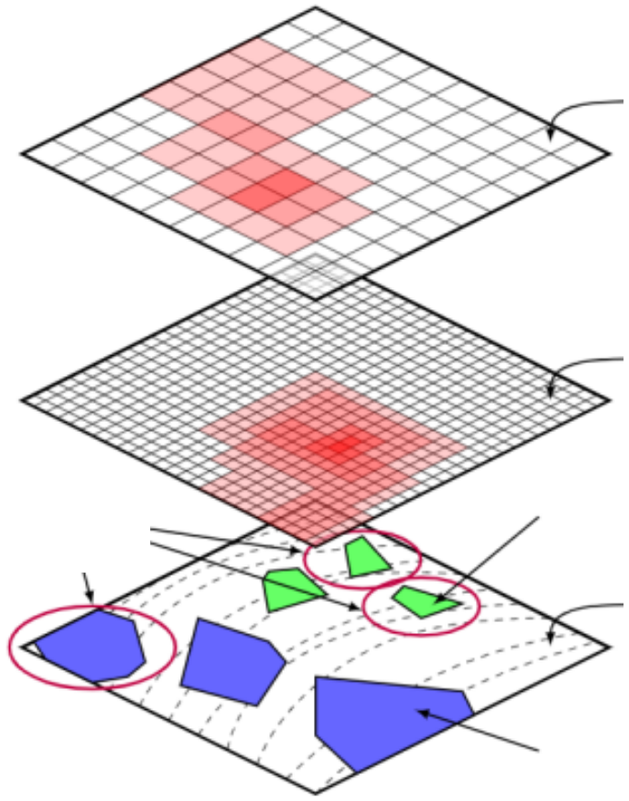
Cycle-GAN to bridge gap between dataset

Infrastructure Detection

PyPSA meets Earth



Demand Forecasting



1. Country-Level Demand Forecasting

2. Data-driven Downscaling

3. Building-Level Demand Forecasting

Aggregation (optional)

PyPSA

Country-Level Demand Forecasting via Bayesian Deep Learning and Others

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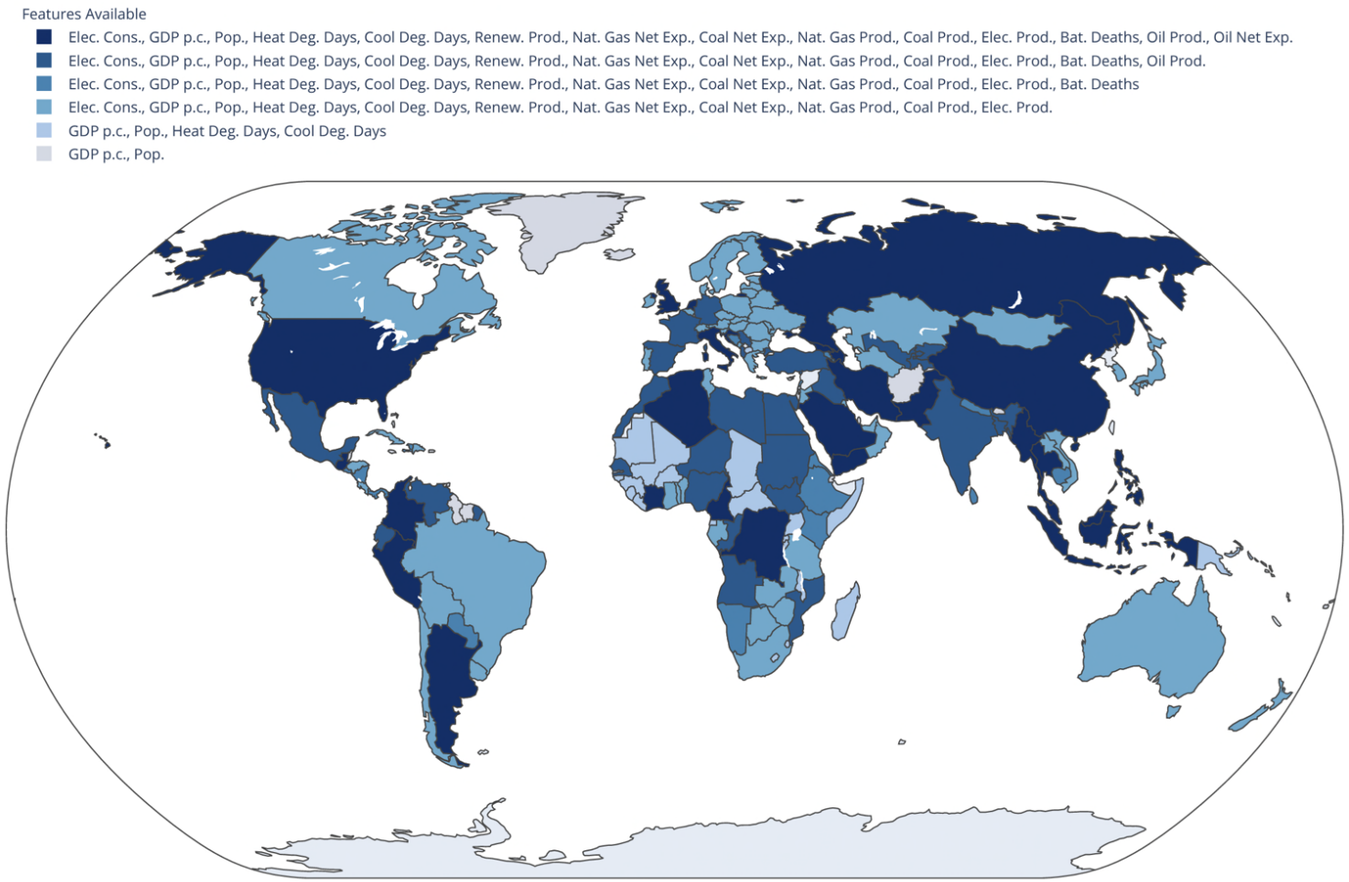
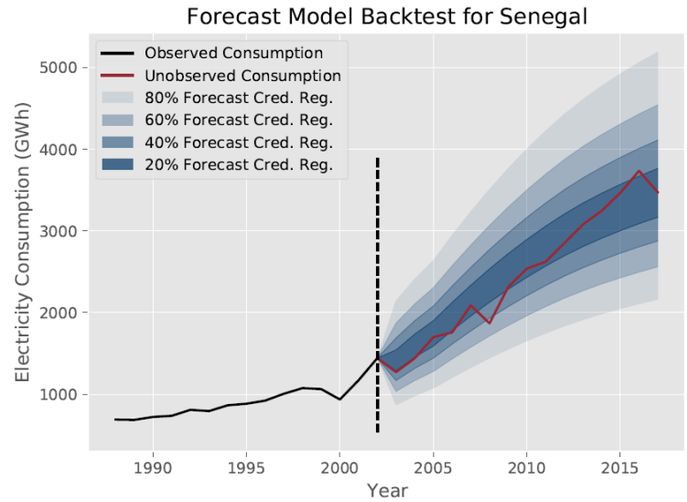
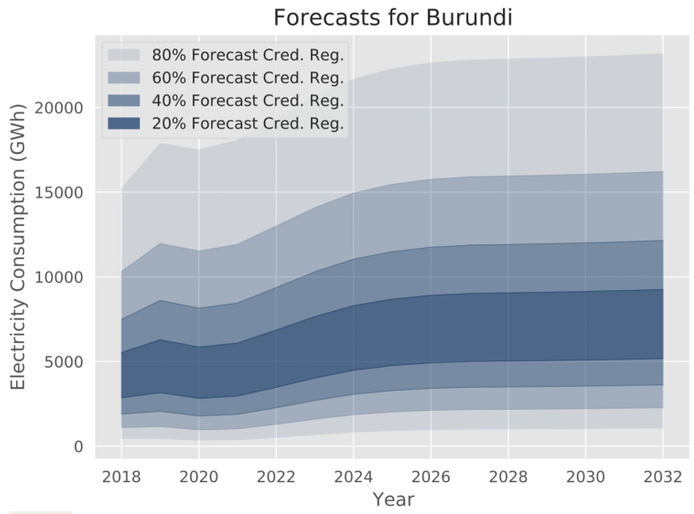
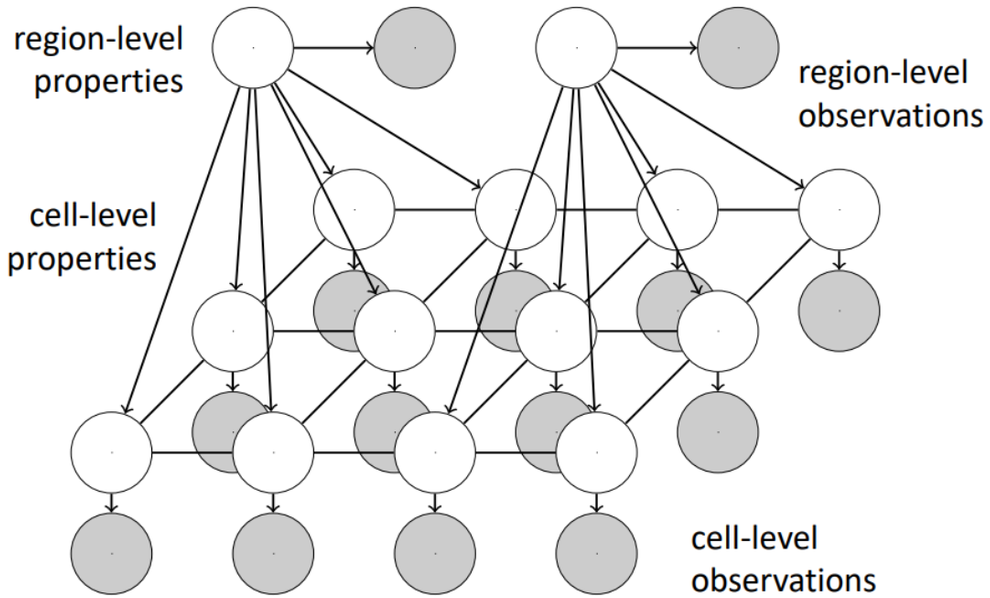






Sources: S. J. Lee, D. Suri, P. Somani, C. L. Dean, J. Pacheco, R. Stoner, I. Perez-Arriaga, J. W. Fisher III, and J. Taneja, "How probabilistic electricity demand forecasts can expedite universal access to clean and reliable electricity," *Energy for Economic Growth*, 2021.; S. J. Lee, C. L. Dean, D. Suri, P. Somani, J. Pacheco, R. Stoner, I. Perez-Arriaga, J. W. Fisher III, and J. Taneja, "Probabilistic forecasts of country-level electricity demand in Africa," 2022 (not yet public). – Soon to be open-sourced, please contact authors

Downscaling via Economics-Informed Probabilistic Models and Others



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Building-Level Demand Forecasting via Bayesian Deep Learning and Others

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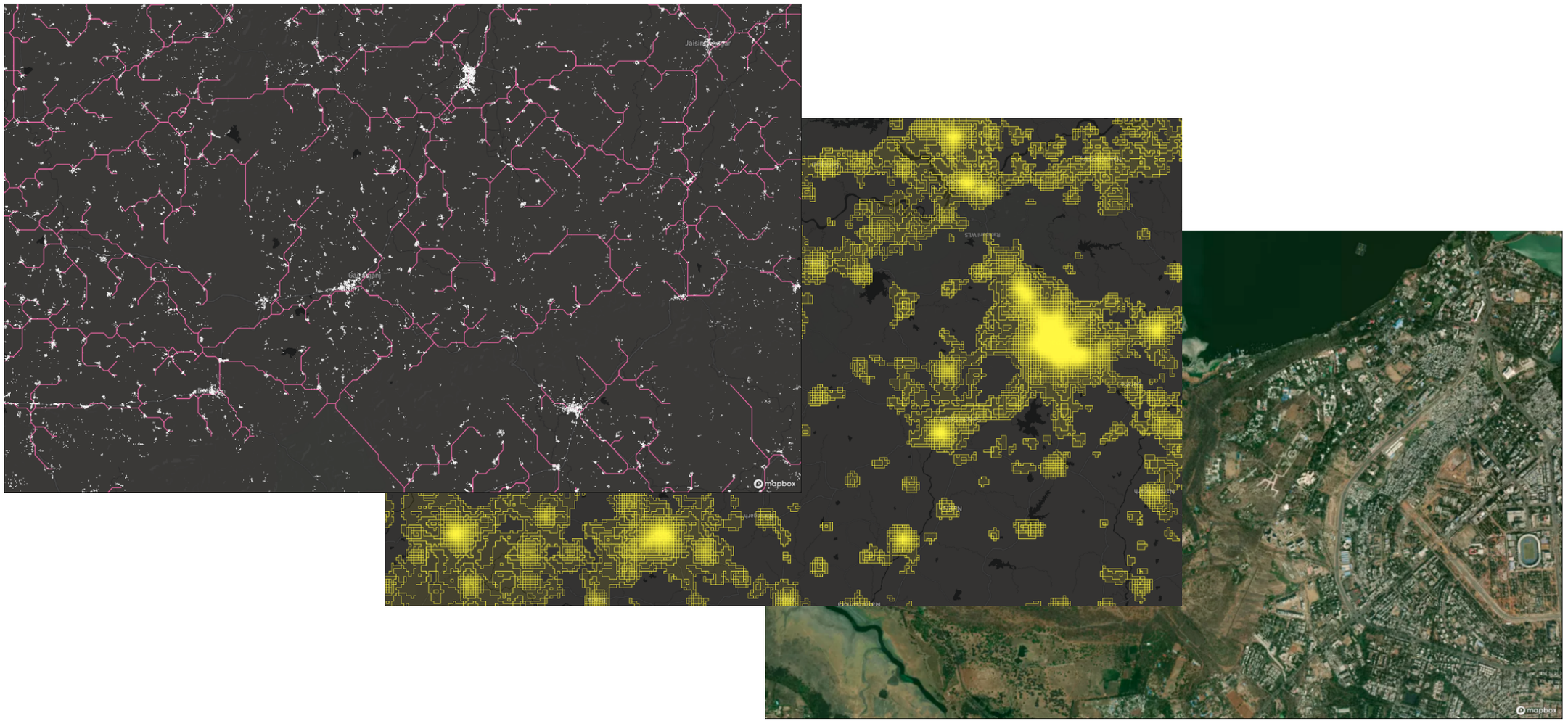


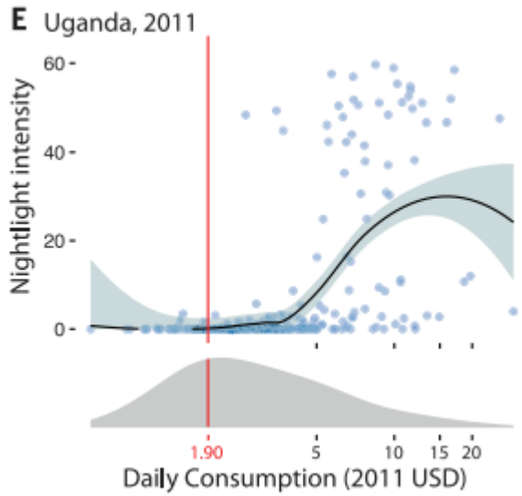
PyPSA meets Earth

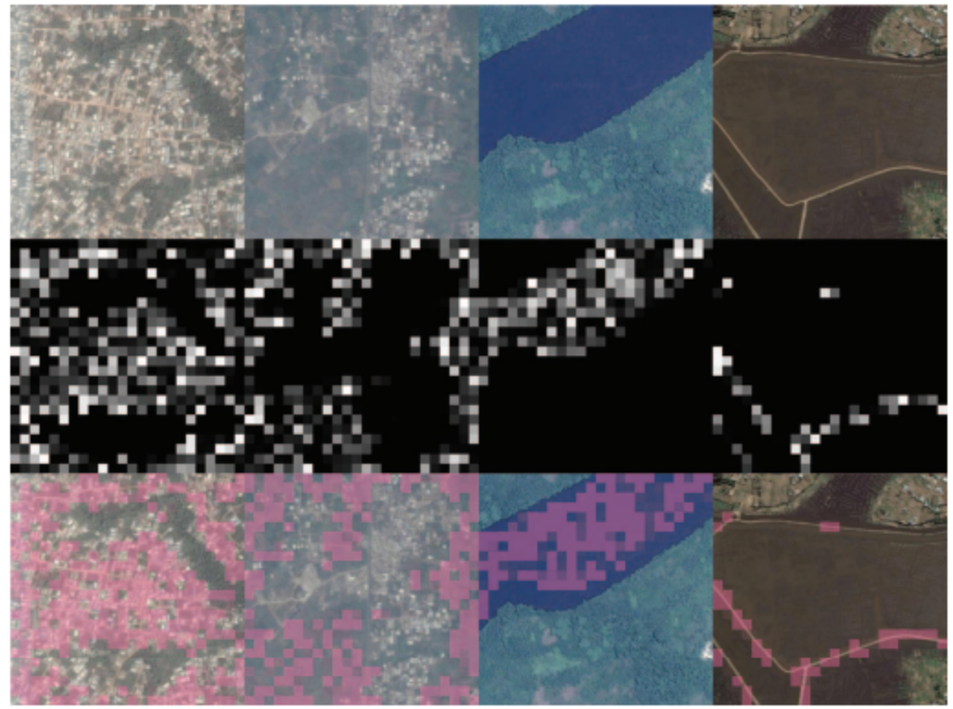
RESEARCH ARTICLES

ECONOMICS

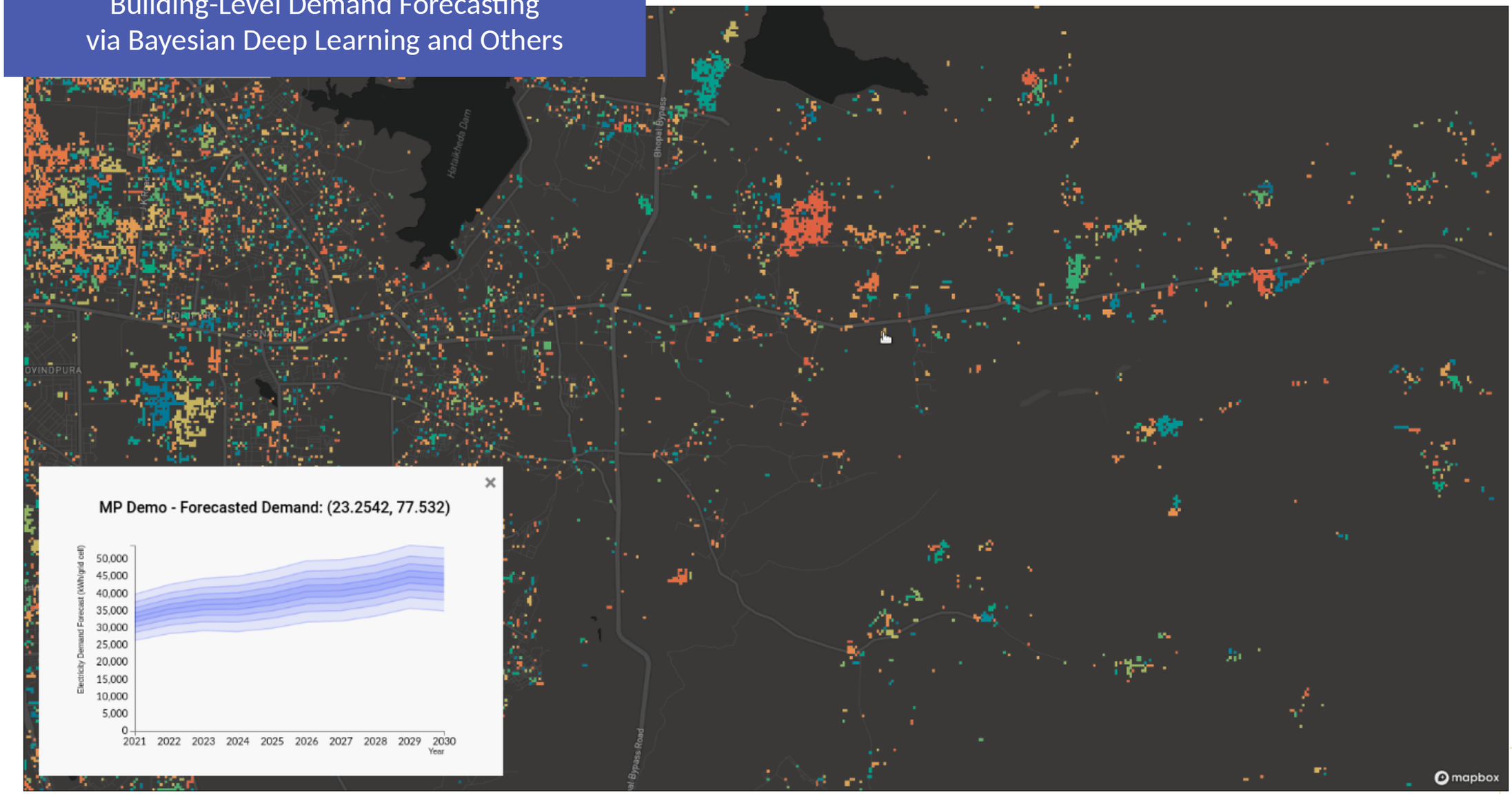
Combining satellite imagery and machine learning to predict poverty

Neal Jean,[1,2*] Marshall Burke,[3,4,5*†] Michael Xie,[1] W. Matthew Davis,[4] David B. Lobell,[3,4] Stefano Ermon[1]





Building-Level Demand Forecasting via Bayesian Deep Learning and Others



Where next!