ZEAL SHAH

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RESEARCH INTERESTS

Technology for development, data science and AI for social good, energy analytics, remote sensing

EDUCATION

University of Massachusetts Amherst — Amherst, MA
Ph.D. in Electrical & Computer Engineering — Aug 2018 - Present
Advisor: Prof. Jay Taneja

Carnegie Mellon University — Pittsburgh, PA
M.S. in Energy Science, Technology & Policy (*concentration: ECE*) — Aug 2016 - Dec 2017

Pandit Deendayal Petroleum University — Gandhinagar, India
B.Tech. in Electrical Engineering (*concentration: ECE*) — Jun 2012 - Jun 2016

PUBLICATIONS

[1] **Zeal Shah**, Feng-Chi Hsu, Christopher D. Elvidge, and Jay Taneja. "Mapping Disasters & Tracking Recovery in Conflict Zones Using Nighttime Lights." In the IEEE Global Humanitarian Technology Conference (GHTC'20), **October 2020**.

[2] **Zeal Shah**, Alex Yen, Ajey Pandey, and Jay Taneja. "GridInSight: Monitoring Electricity Using Visible Lights." In the 6th ACM International Conference on Systems for Energy-Efficient Built Environments, Cities, and Transportation (BuildSys'19), **November 2019**. **Best Paper Nominee**.

POSTERS & PRESENTATIONS

[3] **Zeal Shah**, Jay Taneja. "Monitoring Electric Grid Reliability Using Satellite Data." In the 6th ACM International Conference on Systems for Energy-Efficient Built Environments, Cities, and Transportation, November 2019. **Best Poster Award**.

[4] **Zeal Shah**, Alex Yen, Ajey Pandey, Jay Taneja. "GridInSight: Monitoring Electricity Using Visible Lights." In the 2nd Annual ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS'19), July 2019.

[5] Jon Thacker, **Zeal Shah**. "Smart Metering Data For Tracking Access to Electricity." In the 7th Microgrid Global Innovation Forum, September 2018.

[6] **Zeal Shah**, Yoolhee Kim, Anand Prakash, Vasu Nambeesan. "Occupancy Prediction Based on the Power Consumption Patterns" In the Carnegie Mellon University Symposium on Machine Learning in Science and Engineering, May 2017.

[7] **Zeal Shah**, Siddhartha Joshi. "Operation and Analysis of a Bi-directional DC-DC Converter for Efficient Charge Control of Battery in a Microgrid." In the 50th IEEE Industry Applications Society Annual Meeting, October 2015.

EXPERIENCE

STIMA Lab, University of Massachusetts Amherst — Amherst, MA
Graduate Research Assistant — Aug 2018 - Present

- Develop, evaluate and optimize novel electric grid reliability measurement indices using nighttime-lights satellite data to enable grid reliability monitoring at a global scale. Outputs: [3]
- Estimate density of residential and commercial buildings in daytime satellite images using deep learning, to support energy demand prediction efforts in emerging economies.
- Devise a non-intrusive monitoring tool using machine vision cameras to measure the power quality of electricity systems in real-time, to support efficient electricity grid operations and maintenance.
- Developed methods for mapping disasters, characterizing electricity outages and tracing recovery both spatially and temporally, to aid humanitarian efforts in conflict zones. Outputs: [1]
- Demonstrated the use of unmodified smartphone cameras as a low-cost means to monitor power grids, for facilitating efforts towards improving grid quality and reliability. Outputs: [2, 4]

Atlas AI Palo Alto, CA
AI Engineering Intern (Remote) May 2020 - Aug 2020

- Applied machine learning to satellite data to develop a new data layer - monthly electrification maps with spatial resolution of 0.5km for the continent of Africa, from 2012 to present.
- Built prototype of energy consumption data layer that used electrification maps, publicly available satellite data and surveys to estimate tiers of energy consumption at a spatial resolution of 0.5km.
- Developed the aforementioned data layers to improve the market insights being delivered to company's clients and to supplement data used for training company's proprietary ML models.
- Gained experience in building end-to-end data pipelines using Google Cloud products - BigQuery, Bucket, Compute Engine, and a geospatial data analysis platform - Google Earth Engine.

SparkMeter Washington, DC
Data Science Intern Feb 2018 - Sep 2018

- Developed a monitoring tool using Grafana and SQL for real-time monitoring of deployed smart meters, base stations and cloud services to facilitate efficient troubleshooting.
- Analyzed smartmeter data to track the evolution of electricity quality and reliability across 68 sites spread over Sub-Saharan Africa and South-Asia with 10 to 500+ customers per site. Outputs: [5]

Nikola Power Washington, DC
Engineering Intern (Remote) Jun 2018 - Aug 2018

- Developed an optimal battery dispatching algorithm to minimize the operating cost of residential solar grid+storage system by controlling charging & discharging of the battery.
- Assisted in development of short-term load forecasting algorithm for company's residential energy management system.

Carnegie Mellon University Pittsburgh, PA
ECE Graduate Teaching Assistant Jan 2017 - Dec 2017

- Head TA for two senior level courses: *Fundamentals of Power Systems* and *Embedded Systems.*

SparkMeter Washington, DC
Data Science Intern May 2017 - Aug 2017

- Developed a suite of interactive analytical reports that provide actionable commercial, financial and technical insights into grid operations to company's utility customers.
- Created an outlier detection and removal program to filter noise recorded by smart meters.

SELECTED COURSE PROJECTS

- **Multi-tier Online Book Store:** Developed a multi-tier web application using Flask in Python and added features like caching, replication, load-balancing, fault tolerance and recovery.
- **Where, When and Watt?:** Created a program to predict occupancy of different rooms based on appliance power consumption data and achieved 93% model prediction accuracy. Outputs: [6]

SELECTED COURSEWORK

Neural Networks, Machine Learning, Algorithms, Distributed & Operating Systems, Applied Stochastic Processes, Economics of Electricity Networks, Optimization in Power Systems, Energy Policy

HONORS & AWARDS

- Dean's Fellowship, UMass Amherst College of Engineering 2018
- Travel Grant Award, IEEE Industrial Applications Society 2015
- Travel Grant Award, IEEE Energy Conversion Congress and Exposition 2015

COMPUTING SKILLS

Programming: Python, SQL, Matlab
Python Libraries: Flask, GeoPandas, Matplotlib, Numpy, OpenCV, Pandas, PyTorch, Rasterio, Scipy, Scikit-learn, Shapely, SQLAlchemy
Visualization Tools: Plotly, Grafana
Geo-spatial Tools: Google Earth Engine, QGIS