Kshitiz Khanal, PhD
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Education

Ph.D. City and Regional Planning	University of North Carolina at Chapel Hill	2024
Dissertation: Applications of Machine Learning in Energy and Water Utility Planning for Climate Resilience		
M.S. Energy Systems Planning	Kathmandu University	2017
B.E. Mechanical Engineering	Kathmandu University	2013

Technical Skills

Energy and Climate Analytics:	PyPSA, EnergyPlus, gridstatus, REopt, pvlib, HOMER, CMIP, ERA
Programming:	Python, R, Bash, JavaScript, LaTeX
Orchestration:	Git, Github Actions, Docker, AWS, GCP, HPC
AI/ML:	PyTorch, scikit-learn, LightningAI, HuggingFace, Transformers, WandB
NLP/LLM/CV:	Transformers, BERT, LangChain, YOLO, Voxel51, Roboflow
GIS:	ArcGIS, QGIS, Google Earth Engine, GeoPandas
Data Visualization/Storytelling:	D3.js, Observable, Shiny, LeafletJS, Quarto
Big Data/Database:	SQL, DuckDB, xarray, Supabase, PostgreSQL

Relevant Experiences

Data Science and Research **University of North Carolina at Chapel Hill** 2019–Present

- Machine Learning research for energy/utility/climate planning
  - Identified location and capacity of **more than 55,000** unique kilowatt scale solar interconnection filings in North Carolina by developing a **robust pipeline combining Regular Expressions and open weight large language model (Google FLAN-T5 Large) and Mapbox Geocoding API with unstructured web-scraped utility commission records as input** to characterize flood risk exposure of solar PV infrastructure in North Carolina. Ground-truthing based on high-resolution imagery validated **80.5%** built solar among sampled proposed solar systems.
  - Identified **250 out of 963 occupations in Occupational Information Network (O*NET)** database to re-train to 21 clean energy occupations without specialized education and extensive experience requirements **based on occupational text similarity metrics (SBERT/GLoVe embeddings) and labor market data**, and used **agglomerative hierarchical clustering to reorganize ONET occupations for bespoke workforce development program design** and occupational attributes extraction.
  - Identified **8,460 Manufactured Home Parks (MHPs) in North Carolina (compared to next best public records with 2,600 rows)** using high resolution (15 cm resolution, 30+ terabytes) aerial imagery and **computer vision based approach (YOLOv8 architecture, 93% recall, 93% box precision, 95% minimum average precision on held-out set)** and assessed their water utility service accessibility.
- Data Engineering
  - **Data processing and pipeline design** to support development of a **data dashboard to track pandemic economic recovery in North Carolina https://carolinatracker.unc.edu/**
    - Automated processing of a monthly dataset of job postings to track weekly job listings
    - Automated daily scraping and processing of Craigslist website to track weekly rental listings
  - **Processed structured and unstructured data from multiple sources** and **combined them using pattern matching and deduplication** to create a dataset of minority owned vendors
- Lead Instructor
  - PLAN 372: **Intro to Urban Data Analytics with R** (Summer 2023)
  - PLAN 590: **Master's Project Proposal Development** (Spring 2023)

Project Coordinator/Research Assistant **Kathmandu Living Labs** 2017–2019

- **Co-designed and led the implementation** of action research project on OpenStreetMap data contributions

Consultant **International Network for Bamboo and Rattan (INBAR)** 2016-2017

- Designed and fabricated biomass gasifier/low carbon charcoal maker

Peer-reviewed Articles (selected)

5. **Khanal, K.**, Kaza, N., & Lowe, N. (in review). "Retraining for Energy Transition: A Workforce Development Approach Using Occupational Similarity and Unsupervised Clustering." Economic Development Quarterly.

4. Donald, B., Brail, S., Lowe, N., DeLoyde, C., Heatwole, K., Hernandez, F., Hill-Tout, K., Kaza, N., **Khanal, K.**, Planey, D., & Wang, J. (in review). The Dashboard is not dead: Dashboards as effective tools in skills building, sense-making and community collaboration. In Journal of American Planning Association.

3. Wang, J., Kaza, N., McDonald, N. C., & **Khanal, K.** (2022). "Socio-economic disparities in activity-travel behavior adaptation during the COVID-19 pandemic in North Carolina." Transport Policy.

2. **Khanal, K.**, Budhathoki, N. R., & Erbstein, N. (2019). "Filling OpenStreetMap data gaps in rural Nepal: a digital youth internship and leadership Programme." Open Geospatial Data, Software and Standards, 4(1).

1. **Khanal, K.**, & Baral, B. (2019). "Sub-national Energy Access Planning Model for Sustainable Development Goals: A Case Study of Barpak." Journal of the Institute of Engineering, 15(3).

Conference Papers/Talks/Panel Discussions (selected)

12. **Khanal, K.**, Chapagain, J. (2024). "Curating LLM Tuning Data from the FineWeb Dataset for High-Fidelity Domain Adaptation." American Geophysical Union (AGU) Fall Meeting.

11. **Khanal, K.**, Kaza, N., Hino, M., & Sebastian, A. (2024). "Identifying Manufactured Home Communities in North Carolina using Computer Vision and High-Resolution Aerial Imagery for Climate Resilience Planning." American Geophysical Union (AGU) Fall Meeting.

10. "Workforce 2.0: Using AI to Structure Energy Workforce Data and Support Critical Talent Needs." Clean Energy Workforce Development (CEWD) Summit. (panelist)

9. **Khanal, K.**, Kaza, N., Hino, M., & Sebastian, A. (2024). "Characterizing Water Access in Manufactured Home Parks in North Carolina." Association of Collegiate Schools of Planning (ACSP) Annual Conference.

8. **Khanal, K.**, & Kaza, N. (2024). "Comparing Flood Risk Exposure Characterization of Utility Scale Solar Based on Floodplain Maps and Hurricane Induced Flooding." ASNEngr Annual Conference.

7. **Khanal, K.**, Kaza, N., & Lowe, N. (2023). "Targeting occupations to retrain for clean energy workforce development and implications for labor market dynamics." Association of Collegiate Schools of Planning (ACSP) Annual Conference.

6. **Khanal, K.** (2022). "Communicating economic recovery with data stories." DAT/Artathon Speaker Series November 2022.

5. **Khanal, K.**, Kaza, N., & Kittner, N. (2022). "Improving Energy Infrastructure Information Extraction from Aerial Images Using Conditional Generative Adversarial Networks." Macro Energy Systems Workshop.

4. **Khanal, K.**, Kaza, N., & Kittner, N. (2022). "Evaluating generalization of deep learning computer vision models for satellite data and global development." SatSummit.

3. Sedai, A., Singh, G., Dhakal, R., Khatiwada, A., **Khanal, K.**, Kumal, B., Gautam, S., & Mishra, A. K. (2021). "Technical and Economic Feasibility of a Fully Solar-Powered Airport in Nepal." In IEEE International Conference on Intelligent Systems, Smart and Green Technologies (ICISSGT).

2. **Khanal, K.** (2018). "A New Approach to Garner Prolific Contributions in OpenStreetMap." State of the Map.

1. Dhakal, R., Bajracharya, T. R., Shakya, S. R., Kumal, B., **Khanal, K.**, Williamson, S. J., Gautam, S., & Ghale, D. P. (2017). "Computational and experimental investigation of runner for gravitational water vortex power plant." In IEEE 6th International Conference on Renewable Energy Research and Applications (ICRERA), vol. 373, p. 363.

Awards

Duke University Energy Analytics PhD Student Fellowship	$12,500	2022
Internal Professional Development Fellowships, Department of City and Regional Planning, UNC	$8,000	2020–24
Chi-Rong and Ying-Chong Chu Memorial Fellowship	$5,000	2022
Best Paper Award, IEEE ICRERA		2017

Relevant Github project

https://github.com/kshitizkhanal7/daily-updated-rag