

# Adrian Mungroo

Mechanical Engineering PhD @ Georgia Tech  
Spatial Analytics & Geostatistics

Atlanta, GA

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## About

PhD researcher exploring how space, data, and energy shape each other using geostatistics and large-scale spatial modeling to understand urban growth, infrastructure challenges, and energy system resilience. Research experience spans building performance modeling, urban analytics, power outage equity analysis, and transportation systems.

## Education

<b>PhD Candidate in Mechanical Engineering</b> Georgia Institute of Technology Advisor: Dr. Bert Bras	2025–Present Atlanta, GA
<b>M.S., Mechanical Engineering</b> Georgia Institute of Technology	2022–2025 Atlanta, GA
<b>B.S., Aerospace Engineering</b> Georgia Institute of Technology	2016–2020 Atlanta, GA

## Experience

### Graduate Researcher – Spatial & Statistical Data Analytics

<i>Georgia Institute of Technology – Smart Campus Atlanta, GA</i>	2022–Present
<ul style="list-style-type: none"><li>Created movement model of Georgia Tech's campus using WiFi access point log data</li><li>Created canopy height map of Georgia Tech's campus using LiDAR and NDVI data</li><li>Developed campus work order mapping and visualization system using work order data</li><li>Built campus performance dashboard using building performance and sensor health data</li><li>Provided geospatial support for Python GIS-Modelica translator enabling non-technical users to interact with complex simulation models through ArcGIS Pro</li><li>Addressed construction feasibility and HVAC capacity inquiries using scenario simulations</li><li><i>Tools: Python, GeoPandas, H3, xarray, Streamlit, PostGIS, NumPy, Vue.js, Modelica, ArcGIS Pro</i></li></ul>	

### Graduate Summer Intern – Building Performance Modeling

<i>National Renewable Energy Laboratory (NREL) Denver, CO (remote)</i>	May 2025–Aug 2025
<ul style="list-style-type: none"><li>Experimented with predictive models for Atlanta building EUI using per-building surrounding spatial features</li><li>Developed custom analyses for NREL's SEED tool including surrounding building density/heights using Microsoft Building Footprint Data and heating/cooling degree days using GridMET data</li><li><i>Tools: Python, GeoPandas, H3, xarray</i></li></ul>	

### Graduate Researcher – Urban Energy Systems

<i>DoE FOA Georgia EnergyShed (DE-FOA-0002565, #2565-1535) Atlanta, GA</i>	2022–2025
<ul style="list-style-type: none"><li>Created CAKE (Consolidated Area Knowledge Extractor) as data processing and visualization backbone for spatial analytics</li><li>Developed Energyshed Developer and Communication Tool websites using Streamlit</li></ul>	

- Mapped solar rooftop energy potential for Fulton County using parcel and building footprint data
- Provided geospatial data supporting agent-based framework with 2+ million building energy profiles
- Collaborated with NREL, PNNL, EPRI, Argonne National Labs, and community organizations
- *Tools: GIS, Python, GeoPandas, Pandas, H3, Vue.js, Streamlit, ArcGIS Pro*

### **Undergraduate Researcher**

*Georgia Institute of Technology – Hyperloop GT HERMES*  
Atlanta, GA

2018–2020

- Published reliability-based design optimizations on hyperloop tube for cost-optimal design
- Sponsored by POSCO (South Korean steel industry)
- Used Java to augment multimodal transport demand architecture for optimal fares and market share
- Utilized DoE and surrogate models to predict demand and profitability of Stockholm-Helsinki Hyperloop
- *Tools: Java, Python, MATLAB, Design of Experiments, Surrogate Models*

### **Undergraduate Researcher**

*Georgia Tech Martian Advanced Renewable Systems (M.A.R.S.)*  
Atlanta, GA

2017–2018

- Won 2nd place and \$1000 prize in Spring 2018 VIP Research Competition
- Used Monte-Carlo simulations in FLUKA and MATLAB to investigate radiation shielding properties of Martian construction material (Ferrock)
- Found Ferrock promising for space radiation shielding when enriched with polypropylene
- *Tools: FLUKA, MATLAB, Monte-Carlo Simulations*

## **Independent Research & Development**

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**Ranking Site Suitability for Data Centers in Fulton County** Jan 2025–Feb 2025  
Used parcel data, building footprints, electrical grid data, socioeconomic data, climate and earthquake data to rank data center site suitability in Fulton County, Atlanta.

**Georgia Power Outage Spatio-temporal Analysis** 2024–2025  
Collected power outage data every 15 minutes from November 2024. Used CAKE to bin outages into neighborhood-scale hexagons. Performed statistical and time series analysis identifying correlations with socioeconomic factors, weather patterns, and building characteristics.

**Georgia Digital Surface Model (DSM) Generation** Jan 2025–Aug 2025  
Collected LIDAR and DEM data for Georgia. Performed spatial raster calculations to create DSM for Georgia.

**Ranking Reusability of Vacant Parcels in Fulton County** Jun 2024–Aug 2024  
Used parcel data, building footprints, and transportation infrastructure data to rank vacant parcel reusability for residential, commercial, and industrial scenarios.

## **Publications**

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**Leveraging Convexity on Performance Envelope to Detect and Reduce Energy Faults in HVAC Systems**  
Lewe, J., Aziz, I., **Mungroo, A.**, Solano, D.  
*2025 ASHRAE Annual Conference*, August 2025

**From Data Lake to Digital Twin: A Data Management Framework for BEM and BAS Interoperable Buildings**  
Kim, H. W., **Mungroo, A.**, Lewe, J.  
*ASHRAE*, January 2024

**Fatigue-sensitive Feature Extraction, Failure Prediction and Reliability-based Design Optimization of the Hyperloop Tube**

**Mungroo, A.**, Lewe, J.

*Journal of Infrastructure Intelligence and Resilience*, October 2023

## Future Publications (In Preparation)

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### Using Social Vulnerability Index and Power Outage Data to Demonstrate the MAUP Effect on Energy Equity

Mungroo, A., et al. – Target: *Energy Policy / Applied Energy* (Q4 2026)

### Hexagon-Scale Energy Equity Modeling Using Integrated Socioeconomic, Weather, and Outage Data

Mungroo, A., et al. – Target: *Energy Policy / Applied Energy* (Q3 2026)

### Modeling Urban Growth, Energy Inequality, and Infrastructure Stress Through a Unified Hex-Based Simulation Framework

Mungroo, A., et al. – Target: *Landscape and Urban Planning* (Q4 2026)

## Key Projects

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### Campus-scale Movement Model

2025

Created node and edge network model for Georgia Tech campus in ArcGIS Pro. Developed data structure for WiFi access point movement events. Generated congestion time series for all campus walkways.

### Georgia Tech Tree Canopy Height Model

Jun–Aug 2025

Used DSM data with NDVI to create canopy height map for Georgia Tech campus.

### CAKE – Consolidated Area Knowledge Extractor

2024–2025

Open-source geospatial toolkit for homogenizing, interpolating, and visualizing spatial data. Developed in-house at Georgia Tech. Backbone of all spatial analyses at Smart Campus team.

## Skills

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**Geospatial & GIS:** GeoPandas, H3, PostGIS, ArcGIS Pro, QGIS, and many Python libraries

**Data Science & Analysis:** Python, NumPy, Pandas, xarray, Scikit-learn, Matplotlib

**Web Development:** Streamlit, Vue.js, Git

**Energy Systems:** Modelica, Building Energy Modeling, HVAC Systems

**Engineering:** MATLAB, Java, Excel, Design of Experiments, Surrogate Models

**Domain Expertise:** Geostatistics, Spatial Analytics, Energy Equity Analysis, Building Performance, Urban Energy Systems

## Presentations & Talks

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### The Modern Arms Race: Energy and AI – Guest Lecture at KENTECH

Nov 2025

Presented overviews of concepts and trends related to energy & AI to KENTECH students in Naju, South Korea.