

BEATHA UWIRAGIYE CURRICULUM VITAE

Suwon City, Republic of Korea

(+82)10-6266-1973

Betty24209041@gmail.com

Google scholar: <https://scholar.google.com/citations?user=QWRYEyIAAAAJ&hl=en>

EDUCATION

MEng in Architectural Engineering

2021 - 2023

Kyung Hee University, Republic of Korea

Thesis: Explainable AI for energy-efficient building heating systems: A case study of commercial building.

Supervisor: Prof. Geun Young Yun

Email: gyyun@khu.ac.kr

GPA: 3.9/4.0 (98.67 /100)

BS in Computer Science

2013 - 2017

Kigali City, University of Rwanda, College of Science and Technology (CST)

Project: Online Access and Payment Application for Health Insurance Subscribers.

Supervisor: Mr. NGABO Desire

Email: dngabo@gmail.com

GPA: 3.0/ 4.0 (74.95 /100)

RESEARCH INTERESTS

Research interests are:

- ✧ *Indoor environmental modeling.* Developing machine learning methods to predict indoor environments, including airflow patterns, indoor temperature, energy use, and daylighting in buildings.
- ✧ *Optimizing energy consumption.* Applying deep reinforcement learning to optimize building energy use while maintaining thermal comfort.
- ✧ *Enhancing autonomous driving models.* Improving perception, trajectory prediction, and real-time decision-making.
- ✧ *Emerging big data and advanced methods.* Reexamining disaster resilience before, during, and after extreme weather events.

RESEARCH EXPERIENCE

1. Research Assistant

Kyung Hee University

2021 - 2023

Project: Development and demonstration of energy efficiency diagnosis and remodeling technology for existing public buildings

Task/Responsibilities:

- Forecasting energy consumption and indoor air temperature.
- Developing a forecasting model for various synchronized time intervals to identify the perfect synced interval for final project.
- Selecting the training and testing period within a large data.
- Integrated ESS and PV optimal control algorithm for energy and cost saving. Build a web based application which estimates the electricity generation from solar photovoltaics (PV)

Project: Intelligence-based, demand-oriented climate change risk assessment and adaptation research

Task/Responsibilities:

- Developed hardware-based and expert knowledge-based models using eXtreme Gradient Boosting (XGB), TabNet, and Convolutional Neural Networks (CNN) to leverage an AI-based bottom-up approach for climate change risk assessment and adaptation.
- Employed incremental and transfer learning methods to adapt these solutions for various applications.
- Developed a probabilistic Bayesian CNN that outputs a distribution with learnable mean and variance parameters to capture uncertainty due to irreducible noise in the data and model fitness.

Project: Responding to future climate change through automatic measurement of urban heat island effect, big data analysis, and deep learning prediction, reducing heat islands and improving energy and environmental performance of buildings

Task/Responsibilities:

- Gathered and analyzed data related to air conditioner usage patterns, energy consumption, and environmental impact.

- Collected historical and real-time data from a commercial building to understand air conditioner utilization and identify inefficiencies.
- Forecasted indoor air temperature and energy consumption using Light Gradient Boosting Machine (LightGBM) models, which served as virtual sensors for the reinforcement learning agent.
- Applied reinforcement learning to control (i) high pressure, and (ii) the setting temperature and On/Off cycles.
- Created an SQLite database to store real-time data and reinforcement learning new policies.
- Developed a KMA open API to obtain real-time outdoor temperature.
- Implemented the control model on an edge device (Raspberry Pi) for real-time monitoring and control of air conditioner operations.
- Created a user-friendly dashboard to view system performance.

2. Research Assistant

ChungAng University

2023 - 2024

Project: Green Button Project.

Task/Responsibilities:

- Downloaded data from Korean Energy Agency website and organized it efficiently.
- Employed various data cleaning techniques to remove inaccuracies, inconsistencies, and fill in missing data using methods such as ARMA (AutoRegressive Moving Average), MA (Moving Average), and linear interpolation to ensure high data quality.
- Conducted comprehensive data analyses to uncover trends, patterns, and insights aligned with project goals, employing various approaches such as decomposition and detecting stationarity.
- Collaborated with data scientists and data analysts to refine analytical models and reports.
- Designed an efficient RESTful API to facilitate seamless data exchange between systems.

WORKING EXPERIENCE

IT Support Staff National Institute of Statistics of Rwanda (NISR), Rwanda 2018 - 2020

- Development and testing of electronic survey data collection applications.

- Played a key role in questionnaire design and data quality management.
- Contributed to knowledge transfer and capacity building by providing comprehensive support and training on Python programming and CsPRO software to staff and interns.

CONFERENCES AND WEBINARS

- Webinar: AI Business Revolution- make a person act with data, Generative AI Trends and Application of AI Exhibition Industry, Seoul, South Korea (2024).
- AWS OCSF Webinar (2024).
- Webinar: Integrating R and ArcGIS for Spatial Data Science Using R-ArcGIS Bridge from Esri (2024).
- The 4th International Climate Change Adaptation, Seoul, South Korea (2022).

PUBLICATIONS

Journal Articles

1. Ngarambe, J., Adilkhanova, I., Uwiragiye, B., & Yun, G. Y. (2022). A review on the current usage of machine learning tools for daylighting design and control. Building and Environment, 223, 109507. <https://doi.org/10.1016/j.buildenv.2022.109507>
2. Uwiragiye, B., Duhirwe, P. N., Seo, H., & Yun, G. Y. (2024). Sequential attention deep learning architecture with unsupervised pre-training for interpretable and accurate building energy prediction with limited data. Journal of Asian Architecture and Building Engineering, 23(6), 2012-2028. <https://doi.org/10.1080/13467581.2023.2278460>

PROJECT PARTICIPATION

| Research project name | Participati on period | Funding institution name | Participati ng position | Responsibl e Researcher | Research funds |
|---|-------------------------------|--|----------------------------|-------------------------------|--------------------|
| 1. Development of energy efficiency diagnosis and remodeling technology for existing public buildings | 2021-03-01 ~ 2022-02-28 | Ministry of Trade, Ministry of Industry (RCMS) | Team Researcher | Geun Young Yun | 257,000,000 KWR |

| | | | | | |
|---|-------------------------------|---|-----------------|----------------|-----------------|
| 2. Intelligence-based demand-oriented climate change risk assessment and adaptation research | 2022-03-01 ~ 2023-02-28 | Korea National Research Foundation (KNRF) | Team Researcher | Geun Young Yun | 93,847,000 KWR |
| 3. Response to change, heat island reduction, and improvement of energy and environmental performance of buildings | 2022-03-01 ~ 2022-12-31 | Ministry of Trade, Ministry of Industry (RCMS) of Korea | Team Researcher | Geun Young Yun | 192,000,000 KWR |
| 4. Automatic measurement of urban heat island effect, big data analysis, deep learning prediction to respond to future climate change, heat island reduction, and improvement of energy and environmental performance of buildings | 2022-03-01 ~ 2022-12-31 | Ministry of Trade, Ministry of Industry (RCMS) | Team Researcher | Geun Young Yun | 182,500,000 KWR |
| 5. [Mid-career research type 1-1] Automatic measurement of urban heat island effect, big data analysis, deep learning prediction to respond to future climate change, heat island reduction, and improvement of energy and environmental performance of buildings | 2023-03-01 ~ 2024-02-29 | Korea National Research Foundation (KNRF) | Team Researcher | Geun Young Yun | 93,847,000 KWR |

819,194,000 KWR

Total

TECHNICAL SKILLS

- Programming languages and mathematical packages: Python, R, and JavaScript.
- Machine learning frameworks: NumPy, Pandas, Scikit-learn, TensorFlow, and PyTorch.
- Deep learning techniques: DRL (Deep Reinforcement Learning), CNN (Convolutional Neural Networks), RNN (Recurrent Neural Networks), and GAN (Generative Adversarial Networks)
- Databases: SQL, MongoDB
- Other: SPSS, Linux (Ubuntu), Flask and Django

CERTIFICATES

- IBM AI Engineering Professional Certificate
- TensorFlow 2.0
- ML Data Science and Generative AI with Python
- Spatial Data Science: The New Frontier in Analytics
- Digital Earth Africa

LANGUAGES

- English: Fluent
- Kinyarwanda: Rwanda (native)
- French: Advanced