# Dr. HEUNA KIM

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## WORKING EXPERIENCE

2020–06 – present **Researcher**
Project Vibranium (Power Trading Optimization)

Trading Behavior and Portfolio Optimization for Electricity Markets, in progress
- adapting model-free reinforcement learning algorithms to optimize power trading
- conducted the market analysis for different electricity markets and applied time-series analysis for price forecasting

2018–01 – 2020–05 **Deep Learning Researcher**
Haezoom Europe GmbH (IT-based Service Platform for Solar Power Forecasting)

Short-term Solar Power Forecasting based on Satellite "Chollian 2" Data
- as a **team lead**, supervised the algorithm research team and collaborated to develop (1) clear sky image compositions, (2) cloud motion tracking using optical flow, (3) microdust and snow detection algorithms
- designed the architecture and implemented the satellite image processing module for the newly launched environmental satellite "Chollian 2"

Wind Power Forecasting
- **Award**: won 4th place for the wind power forecasting competition 2019 by Korea Power Exchange (KPX)
- implemented a high-precision wind power forecasting model using wind farm data and numerical weather prediction (NWP) data
- applied the hybrid model combining statistical models and physical models
- improved the accuracy using bias corrections, ensemble over forecast horizon, power curve fitting with perturbation and variational methods

3D Building Reconstruction Prototype using Satellite Images for Shadow Simulation
- extracted the height information from 2D Satellite images by applying super resolution, stereo vision, deblurring, and depth estimation
- used SNAP (Sentinel Application Platform API) for Satellite "Sentinel 2" and Botos for Satellite "Landsat 8", QGIS, ImageMagick, Raster images

Cloud Detection and Cloud Motion Estimation
- researched and developed the cloud detection and cloud motion estimation algorithms by using CNN (Convolutional Neural Network), optical flow, transmittance simulators (RTTOV, 6S) based on satellite "Himawari 8" data

2016–12 – 2017–11 **Deep Learning Researcher**
Twenty Billion Neurons GmbH (Deep Learning based Video Analysis Software)

Realtime Common Sense Recognition for Video
- **published** at ICCV 2017
- improved the online RNN (Recurrent Neural Network) model from 5% to 85% and implemented with Tensorflow
- developed the model capable of understanding temporal common sense that 2D image object detection models failed to recognize

Neural Network for Video Captioning and Temporal Action Localization as a Cross-Team Collaboration using Tensorflow and PyTorch

Realtime Video Analysis Demo Infrastructure in Python
- designed and implemented a demo program that supports camera streaming, network communication and multiprocessing
- used OpenCV, PiCamera, PyGame, ImageIO with Raspberry Pi and Jetson board
- used multiprocessing, ZMQ, TCP streaming via socket, PyBuilder, Travis CI

## EDUCATION

2013–06 – 2016–06 **Ph.D. Mathematics and Computer Science** (Magna Cum Laude)
Freie Universität Berlin (FU Berlin), Germany

**Awards**
- Scholarship from German Research Foundation: Methods for Discrete Structures
- See the webpage for **publications** including **7 reviewed** and **3 weakly reviewed** papers.

2011–02 – 2013–02 **M.S. Computer Science** (GPA: 4.25/4.30, 99.44%)
Korea Advanced Institute of Science and Technology (KAIST), South Korea

**Awards**
- Best Poster Award for Master Thesis
- National Research Scholarship from Korea Scholarship Fund

2004–03 – 2008–02 **B.S. Mathematics, Minor in Physics** (GPA: 3.57/4.30, 92.7%)
Pohang University of Science and Technology (POSTECH), South Korea

**Awards**
- Honorable Scholarship from the President of Korea
- Honorable Scholarship from Korea Foundation for Advanced Studies
- Silver Medal from National Collegiate Programming Competition
- Winner of Software Security Team Competition between POSTECH & KAIST

## SKILLS

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| Programming | Proficient: Python, LaTeX, SQL (PostgreSQL, MySQL, SQLite, and DB theory)<br>Intermediate: Java, Haskell, R, Bash/Zsh<br>Small Projects: C++03, Standard ML, Coq, Sage, Maple, MATLAB, Octave |
| Frameworks | Tensorflow, PyTorch, OpenCV, Hadoop |
| Data/Numerical | pandas, seaborn, scikit-learn, NumPy, SciPy, Matplotlib |
| Methodologies | TDD, CI/CD (Travis CI, Jenkins, Docker), Agile (Scrum, Kanban, also as a moderator) |
| Environments | Proficient: Linux, Git |
| Language | English (IBT 105/120, Nov. 2012), German (C1), Korean (Native) |

## VOLUNTEERING AND TECHNICAL ACTIVITIES

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| 2020–08 – present | WiFi installation technician for refugee housing in Berlin (Freifunk Berlin) |
| 2020–06 – present | External advisor for a master student |
| Topic: | Optimizing loss model in power forecasting for Building Integrated Photovoltaics (BIPV) |
| 2020–07 – present | Collaborator of a sustainable food supply project |
| Topic: | Rice patch area prediction in Sri Lanka based on satellite “Sentinel 1” SAR data |
| 2019–07 – 2020–07 | Teacher at ReDi School (non-profit organization for refugees and more) |
| Course: | Python for Data Analysis |
| 2018–08 – 2019–11 | Master thesis supervisor (external commitee member, non-volunteering) |
| Topic: | Irradiance forecasting using satellite “Himawari 8” under snow conditions |
| 2018–08 – 2019–11 | Organizer of a research visiting program for master students |
| Example Topic: | Enumerating combinatorially different convex hulls of points in lines |
| 2014–08 – 2014–08 | Teacher at FU Berlin |
| Course: | Sommeruniversität: Experiencing Theoretical Computer Science with Origami |

## OPEN SOURCE PROJECTS

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| since 2020–11 | ConfigAutomationMikrotik: automatic batch configuration scripts for routers |
| since 2019–06 | django-migration-vis: Django management command for visualizing migration graphs |
| since 2017–07 | GulpIO: binary storage format for deep learning on videos |