Yibo Ma

86-17721295163 | mayb22@mails.tsinghua.edu.cn
10-202, Rohm Building, Tsinghua University, Beijing, China, 100084

EDUCATION

Tsinghua University - Department of Electronic Engineering 09/2022 - Present

Master of Science in Big Data Engineering

- GPA: 3.4/4.0

Tongji University - School of Mechanical and Energy Engineering 09/2018 - 06/2022

Bachelor of Engineering in Mechanical Design and Automation

- GPA: 3.27/4.0

***Research Interests*: Robotics and AI, Embodied AI, Vision-Language-Action Model, MLLM, 3D Vision Perception**

PUBLICATIONS

- ***Yibo Ma***, Yuwei Du, Tong Li, Yong Li, Practical insights into mobile network deployment by analyzing interaction between 4G and 5G traffic, TMC, Under Review
- ***Yibo Ma***, Tong Li, Yuwei Du, Schahram Dustdar, Zhaocheng Wang, Yong Li, Sustainable connections: exploring energy efficiency in 5G networks, ACM CoNEXT'2024, Accepted
- ***Yibo Ma***, Tong Li, Yan Zhou, Li Yu, Depeng Jin, *Mitigating Energy Consumption in Heterogeneous Mobile Networks Through Data-Driven Optimization*, IEEE Transactions on Network and Service Management, P:1-1 (2024) (DOI)
- Tong Li, Li Yu, ***Yibo Ma***, Tong Duan, Wenzhen Huang, Yan Zhou, Depeng Jin, Yong Li, Tao Jiang, *Carbon emissions of 5G mobile networks in China*, Nature Sustainability, 6, 1620 – 1631 (2023) (DOI)

RESEARCH EXPERIENCE

Mobile Network Configuration Parameter Recommendations 06/2024 - Present

Core Researcher, Advised by Prof. Yong Li and Prof. Tong Li

- ✧ Utilize the large language model such as GPT4, Llama2-70B for recommendations of network configuration parameters
- ✧ Reviewed post-2020 research on network parameter recommendation, including methods capturing attribute and configuration dependencies and evaluating performance metrics for configuration changes across various scenarios.
- ✧ Recommend configuration parameters for a multitude of parameters and detect misconfigurations, handling both network expansion and existing cell reconfiguration. Tested on real-world data, the model surpasses baselines, demonstrating accuracy, generalizability, and robustness against concept drift.

The Impact of Deep 5G Mobile Network Adoption on Residential Power Systems 06/2023 -Present

Core researcher, Advised by Prof. Yong Li and Prof. Tong Li

- ✧ Employed machine learning methods such as SVM, KNN, and K-Means to investigate the relationship between 5G base station deployment and spatial attributes such as map data, 4G base station distribution, and population distribution. Modeled the spatial distribution of densely deployed 5G networks with various base station types on a grid basis.
- ✧ Utilized a VAE-based model to generate daily user trajectories, which can effectively extract the feature of existing trajectories and then capture the correlation between adjacent points in a trajectory, capturing city-scale user activity patterns and simulating network traffic demand.
- ✧ Incorporated network usage preferences (4G or 5G) into traffic demand modeling, modeling the joint distribution of multi-dimensional traffic demand attributes and generating synthetic traces. Analyzed the impact of network energy consumption on residential power systems under varying deployment densities and user preferences.

Practical Insights into Mobile Network: Analyzing Usage Patterns, Energy and Misalignment 09/2023 - 06/2024

Core researcher, Advised by Prof. Yong Li and Prof. Tong Li

- ✧ Used the real-world datasets from a Portuguese mobile operator as well as public cellular traffic data and employed statistical analysis and regression models to clean and impute cell-level performance data and used cluster analysis to mine 5G network traffic usage patterns.
- ✧ Predicted 5G network deployment trends using a power law distribution, proposing regional recommendations to optimize base station deployment strategies for effective resource utilization.
- ✧ Analyzed city POI data to understand human activity characteristics and delineate functional regions, identifying misalignment between network deployment and usage within these regions and proposed customized recommendations.

Sustainable Connections: Exploring Energy Efficiency in 5G Networks 06/2023 - 06/2024

Core researcher, Advised by Prof. Yong Li and Prof. Tong Li

- ✧ Established a comprehensive energy consumption model based on the characteristics of base station subsystems and their relationship with traffic load involves decomposing the historical data into seasonal, trend, and residual components.
- ✧ Developed a large-scale data-driven framework to quantitatively assess the carbon emissions, since the launch of 5G networks and quantitatively assessed the decline in energy efficiency due to 5G deployment.
- ✧ Conducted quantitative analysis of the impact of three energy-saving methods—carrier shutdown, channel shutdown, and deep sleep—on base station energy consumption and provided specific recommendations for applying these methods tailored to different network usage patterns.

Mitigating Energy Consumption in Heterogeneous Mobile Networks 12/2022 - 04/2024

Core Researcher, Advised by Prof. Yong Li and Prof. Tong Li

- ✧ Proposed REDEEM, a data-driven energy-saving framework integrating active control and energy efficiency profiling, to address the limitations of traditional energy-saving methods in large-scale urban scenarios involving heterogeneous 5G and 4G networks.
- ✧ Conducted comprehensive experimental validation of REDEEM's effectiveness in mobile networks, achieving state-of-the-art performance in reducing network energy consumption and improving energy efficiency, also demonstrating REDEEM's robustness across various temporal, spatial, and traffic load scenarios.

Carbon Emissions of 5G Mobile Networks in China 04/2022 - 05/2023

Core Researcher, Advised by Prof. Yong Li and Prof. Tong Li

- ✧ Proposed a misalignment measurement metric between energy consumption and traffic usage, estimating the additional carbon emissions caused by 5G deployment in each province and identifying carbon efficiency traps.
- ✧ Analyze an energy-saving method, called DeepEnergy, leveraging collaborative deep reinforcement learning and graph neural networks, to make it possible to effectively coordinate the working state of 5G cells.
- ✧ Simulated the photovoltaic power generation using the PVWatts Calculator developed by the NREL, designing Python crawler scripts to automate the simulation of distributed photovoltaic systems in large-scale networks.

Lightweight Wearable Exoskeleton Lower Limb Assistive Device 06/2020 - 10/2021

Core Researcher, Advised by Prof. Wanghui Bu

- ✧ Utilized SolidWorks for product performance assessment and virtual prototyping, device modeling, and finite element analysis.
- ✧ Proposed a solution considering the characteristics of the compressor, especially the efficiency and stall margin, are analyzed in design and off-design operation conditions by adjusting stagger angles of IGV and stators as well as changing the rotational speed. to instability by adjusting the pulley angle to ensure ground contact.

ADDITIONAL INFORMATION

- ✧ Programming Languages: Python, C++, PyTorch, Tensorflow, Matlab, LaTeX
- ✧ Software: SolidWorks, AutoCAD, Adobe Illustrator, Microsoft Office
- ✧ Tools: Jupyter Notebook, Git, MySQL, Matplotlib, Seaborn
- ✧ Interests: Programming, Swimming, Playing Guitar, Reading