# Gayathri Krishnamoorthy Energy Researcher | Software Developer

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Power Systems Engineer with 6+ years of experience as a researcher and software developer at National Laboratories and Washington State University. Worked on several projects developing theories, models, and software tools to efficiently integrate renewable energy resources while making them a significant player in energy markets. I am outgoing, creative, and detail-oriented with strong engineering basics and communication skills. I am effective both solo or on a team. In my spare time I practice yoga, dance, and painting. I am also passionate about journalism and the brain science behind mindfulness practice.



## PROFESSIONAL EXPERIENCE

## Present Jan 2022

### Researcher, NATIONAL RENEWABLE ENERGY LABORATORY (NREL), Golden, CO

- > Developing synthetic distribution grid infrastructure layer for the continental U.S. using licensed and open source geospatial data hosted by multiple utilities and cloud platforms.
- > Developing an upgrade cost database framework to evaluate the power system level operational violations with the increasing integration of fast charging electric vehicle (EV) stations and proposing least cost optimal grid upgrades.
- > Leading the writing on a lab wide effort to present to the U.S. congress on current state and evolution of cybersecurity needs for the power distribution grid.

QGIS Julia Python SQLite HPC

## Dec 2021 Aug 2016

### Graduate Research Assistant, Washington State University, Pullman, WA

- > Developed imitation learning based improvements to incorporate the physics of power distribution grid models in data driven solution approaches (deep reinforcement learning models).
- > Developed efficient regulation market techniques to enable transmission level frequency regulation service provision using distribution connected battery energy storage systems.
- > Developed analytical models to demonstrate the convergence of transmission and distribution grid co-simulation platforms.
- > Developed an optimal retail market model and performed impact assessment of demand-side renewable resource participation and its integration into the wholesale market.

Python MATLAB OpenDSS Tensorflow Keras

## May - Aug 2020 May - Dec 2018

### Graduate Research Intern, Pacific Northwest National Laboratory, Seattle, WA

- > Developed deep reinforcement learning models to perform AC optimal power flow for the power transmission system optimization.
- > Assisted in development of a transactive energy software agent, TESP, that optimizes the dynamics of distributed energy resources in a household to provide monetary benefits to the costumers with EVs, batteries, and PVs.
- > Performed scalability testing for the open source co-simulation platform (HELICS) in multiple envi-
- > Developed docker environment for a microgrid restoration application with HELICS.

C++ MATLAB OpenDSS Docker Python

## May 2022 May 2021

## Columnist, THE DAILY EVERGREEN, Pullman, WA

- > Worked on many research articles to encourage and support women pursuing graduate studies in the
- > Helping international students acclimate to the cultural and workplace differences in and around the university.



## May 2022 Jan 2019

## Ph.D. in Electrical Engineering, WASHINGTON STATE UNIVERSITY, Pullman, WA

- > Research: Learning Method based Enhancements to enable Frequency Regulation Service Provision from Distribution Connected Energy Storage Systems
- > Major : Power Systems
- > Minor: Computer Science

## May 2018 Aug 2016

### M.S. in Electrical Engineering, WASHINGTON STATE UNIVERSITY, Pullman, WA

- > Research: An Iterative Co-simulation Framework for the Integrated Transmission and Distribution System Analysis
- > Major: Power Systems
- > Minor: Computer Engineering

## May 2016 Aug 2012

### B.E. in Electronics and Communications Engineering, ANNA UNIVERSITY, Chennai, India

- > Title: Smart Home Design with Voice Recognition in a Single Controller (Arduino Uno) Environment
- > Major: Embedded Systems
- > Minor: Communications



## **PROJECTS**

#### DISTRIBUTION GRID COST UPGRADE TOOL

2022

### github.com/NREL/disco

I am developing multiple features (optimal cost functions, grid scaling, etc) within this distribution grid upgrade cost tool to perform integration and upgrade studies with increasing solar, electric vehicle, and extreme fast charging stations for the bay area grid.

Python SQLite HPC

## LONG DURATION ENERGY STORAGE ANALYSIS

2022

#### github.com/NREL-SIIP

I am developing large scale test systems using SIIP to analyze and test different capacity expansion models for long duration energy storage devices in the light of increasing solar and wind renewable resources for the transmission grid planning tools.

Julia SIIP

### MODEL-BASED AND MODEL-FREE DISTRIBUTION SYSTEM OPTIMIZATION USING DEEP REINFORCEMENT LEARNING

2020

## github.com/gayukrishna/DRL-for-Secondary-Control-Services

I developed an optimization strategy (model-based) and DRL techniques (model-free) to distribute the frequency regulation dispatch with battery energy storage systems. Imitation learning models are used to enhance the reinforcement learning performance for larger test systems.

Python Tensorflow Keras

#### TRANSMISSION -DISTRIBUTION CO-SIMULATION

2017 - 2019

#### github.com/WSU-DS/Cosimulation

This is my master's thesis work. I developed a framework for the integrated T&D system analysis to understand the impacts of distribution-connected renewable resources on power grid operations

MATLAB OpenDSS

# GMLC-TDC/ HELICS 2018-2019

# github.com/GMLC-TDC github.com/GMLC-TDC/MATPOWER-wrapper

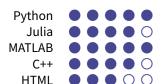
HELICS is a coordinated effort by multiple National Labs to develop a large scale real-time simulation platform that aids advanced power system operations. I worked on several aspects of the development such as scalability testing and wrapper development for power system tools like Matpower and PSAT.

C++ MATLAB Matpower

# </> PROGRAMMING SKILLS

# + SIMULATION TOOLS

# OFFICE SKILLS



- > SQLite
- > Tensorflow
- > Docker
- > HPC
- > AWS

- > LaTeX
- > MS Presentation
- > MS Excel
- > MS Visio
- > VSCode

# Research Articles

- G. Krishnamoorthy, A. Dubey and A. Gebremedhin, "An Open-source Environment for Reinforcement Learning in Power Distribution Systems," in 2022 IEEE Power & Energy Society General Meeting (PESGM).
- G. Krishnamoorthy, A. Dubey and A. Gebremedhin "Reinforcement Learning for Battery Energy Storage Dispatch augmented with Model-based Optimizer," in IEEE SmartGridComm 2021.
- 2019 G. Krishnamoorthy and A. Dubey, "Transmission–Distribution Cosimulation: Analytical Methods for Iterative Coupling," in IEEE Systems Journal 2019.
- J. C. Bedoya, C. Liu, G. Krishnamoorthy and A. Dubey, "Bilateral Electricity Market in a Distribution System Environment," in IEEE Transactions on Smart Grid 2019.
- Sen, P.K., Velaga, Y.N., Chen, A., Krishnamoorthy, G. and Dubey, A., 2019, "Advancements in Co-Simulation Techniques in Combined Transmission & Distribution Systems Analysis," in The Journal of Engineering 2019.

# PROFESSIONAL ACTIVITIES

- Present Serving as a Global Graduate Students Team Lead at the Society of Women Engineers
- Present Serving as a reviewer for IEEE Power and Energy Society Conferences, Institution of Engineering and Technology Journals, and IEEE Systems Journal
  - 2020 Participated in WCCI and NeurIPS 2020 learning to run power network challenges
- 2016-Present Paper and Poster Presentations- IEEE PES General Meeting, Power Systems Engineering Research Center

# Honors and Awards

- 2022 Awardee Best Conference Paper at IEEE Power and Energy Society General Meeting
- 2020 1st Place 3-Minute Thesis Competition at WSU Electrical Engineering and Computer Science Department
- 2019, 2020 Awardee Graduate & Professional Student Association Scholarship for the Research Exposition
  - 2018 2nd Place Best Student Paper Award at North American Power Symposium

# 66 REFERENCES

#### Anamika Dubey

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#### Nadia Panossian

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