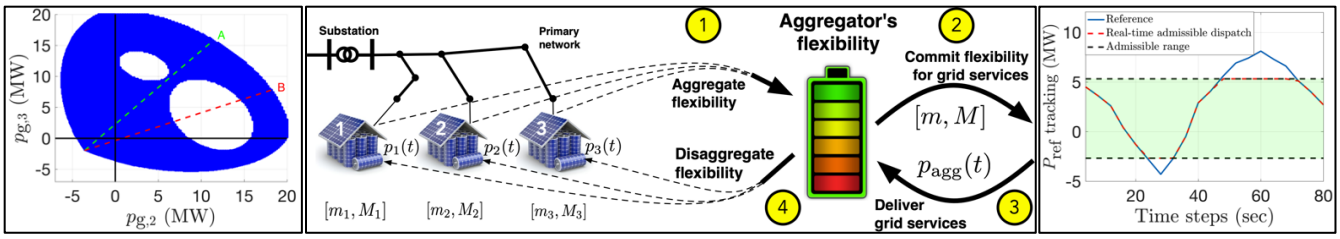

Funded Graduate Research Assistant (GRA) position

in distribution grid optimization and grid-aware distributed energy resource coordination

Prof. Mads R. Almassalkhi's CORE Systems Lab @ University of Vermont

With the support of a National Science Foundation CAREER award, the CORE Systems Lab (Control & Optimization of Renewable Energy Systems Lab) is seeking Ph.D. applications from creative, motivated, and bright students in the area of *grid-aware optimization and control of DERs and flexible demand*. The GRA position is a fully funded 12-month position for up to 4 years and includes future internship opportunities with collaborators at national laboratories and/or utility. The position's start date is Spring 2023 or Fall 2023. Underrepresented groups are strongly encouraged to apply.

Research project summary:

The project will bring transformative change to distribution system operations by creating a novel paradigm for grid and DER coordination. The intellectual merits of the project include advancing fundamental understanding of and theory for optimizing and controlling networked energy-constrained resources, including novel algorithms that formally certify a range of admissible DER controllers (aggregation and disaggregation). Preliminary results can be found here and there. The broader impacts of the project include casting power systems as a climate-change mitigation technology and developing an online DER simulation platform that enhances the power engineering curriculum and enables an inclusive STEM college education.

Today's power distribution system operations are top-down and rely on conservative margins that limit deployments and coordination of DERs and precludes independent third-party aggregators. To overcome these barriers the project proposes two research objectives: 1) Study scalable optimization algorithms that enable the DSO to dynamically maximize the hosting capacity of distribution feeders to maximize the penetration of flexible demand and DERs, while accounting for the nonlinear AC physics, practical network topologies and assets, and uncertain power injections; and 2) Develop (predictive) control algorithms that enable DER aggregators to participate in valuable grid services while certifying that control actions are network-admissible. The algorithms are based on convex optimization and machine learning, which promote scalability for larger power systems. All proposed work will be validated using data from utilities and aggregators within a real-time DER simulation platform, which provides a gateway for undergraduates to actively contribute to interdisciplinary research.

Helpful background for a Ph.D. applicant: a competitive application should clearly demonstrate effective communication skills (written and/or visual), ability to work independently, and *some experience with at least three (3)* of the following:

- Mathematical optimization (e.g., convex, nonlinear or distributed optimization)
- Mathematical analysis (e.g., series, sequences, convergence, continuity, proof techniques)
- Control theory (e.g., optimal control, predictive control, or state space methods)

- Machine learning/data-driven methods (e.g., using Matlab or PyTorch or TensorFlow)
- Power and energy systems modeling (e.g., voltage & frequency regulation, energy markets, OPF)
- Coding large or realistic grid simulations (e.g., MatPower, GridLab-D, Julia, C++/Java, Python, or Matlab)
- Industry experience implementing any of the above in the field (e.g., engineering company)

Preference will be given to applicants from underrepresented groups who can demonstrate ability to work creatively and those with an MS degree.

For international students, your **IELTS/TOEFL/DuoLingo score must exceed 7.0/100/120 to qualify for funding.**

To apply:

- Please follow instruction here: https://www.uvm.edu/graduate/application_instructions
- Please feel free to follow up with me via email and share your research interests and communicate why you believe they align with the position here an include CV and unofficial transcripts, too.

Contact info

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