WENQI CUI

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EDUCATION

University of Washington, Seattle, WA *Sept.2019 - Present*
Ph.D. Student in Electrical and Computer Engineering
Advisors: Prof. Baosen Zhang, Prof. Daniel Kirschen

Zhejiang University, Hangzhou, P.R. China *Sept. 2016 - Jun. 2019*
Master of Science in Electrical Engineering Ranking:1/58 Advisor: Prof. Yi Ding

Southeast University, Nanjing, P.R. China *Sept. 2012 - Jun. 2016*
Bachelor of Engineering in Electrical Engineering and Automation Ranking:1/163

INDUSTRY EXPERIENCE

Microsoft Research, Redmond, WA *Jun.2021 -Sept.2021*
Research Intern at Microsoft Research Special Projects at Remond Lab Mentor: Weiwei Yang
Working on AI for sustainable energy system

PUBLICATIONS

Preprints

[1]. **W. Cui**, J. Li and B. Zhang, "Decentralized Safe Reinforcement Learning for Voltage Control", submitted to *Power System Computation Conference (PSCC)*; *arXiv preprint*: 2110.01126.

[2]. **W. Cui** and B. Zhang, "Reinforcement Learning for Optimal Frequency Control: A Lyapunov Approach", submitted to *IEEE Transactions on Control of Networked Systems*; *arXiv preprint*: 2009.05654.

[3]. C. Doty*, S. Gallagher*, **W. Cui***, W. Chen*, S. Bhushan*, M. Oostrom, S. Akers, S. Spurgeon, "Design of a Graphical User Interface for Few-Shot Machine Learning-Based Classification of Electron Microscopy Data", submitted to *Nature Scientific Data*; *arXiv preprint*: 2107.10387. (* authors contributed equally)

Journal and Conference Papers

[4]. **W. Cui** and B. Zhang, "Lyapunov-Regularized Reinforcement Learning for Power System Transient Stability ", *IEEE Control Systems Letters (L-CSS)* 2021;6:974-979.

[5]. N. Shang, Y. Ding, **W. Cui**, "Review of Market Power Assessment and Mitigation In the Reshaping of Power Systems: State-of-Art Status and Potential Research Studies", accepted to *Journal of Modern Power System and Clean Energy* 2021.

[6]. Y. Ding, **W. Cui***, S. Zhang, H. Hui, Y. Qiu, Y. Song, "Multi-State Operating Reserve Model of Aggregate Thermostatically-Controlled-Loads for Power System Short-Term Reliability Evaluation",*Applied Energy* 2019;241:46-58. (*corresponding author)

[7]. **W. Cui**, Y. Ding, H. Hui, Z. Lin, P. Du, Y. Song, C. Shao, "Evaluation and Sequential-Dispatch of Operating Reserve Provided by Air Conditioners Considering Lead-Lag Rebound Effect", *IEEE Transactions on Power Systems* 2018; 33(6):6935-6950.

[8]. Z. Liu, **W. Cui***, R. Shen, Y. Hu, H. Wu, C. Ye, "Design of Capacity Incentive and Energy Compensation for Demand Response Programs", *IOP Conf. Ser. Earth Environ. Sci.* 2018; 121(5):52059.(*corresponding author)

[9]. **W. Cui**, Y. Ding, H. Hui, M. Li, "Two-Stage Payback Model for the Assessment of Curtailment Services Provided by Air Conditioners", *Energy Procedia* 2017;142:2050–2056.

[10]. Y. Ding, H. Hui, Z. Lin, M. Zheng, X. Qu, **W. Cui**, "Design of Business Model and Market Framework Oriented to Active Demand Response of Power Demand Side", Automation of Electric Power Systems 2017; 41(14):2-9.

[11]. J. Liu, **W. Cui**, C. Wang, M. Liu, Q. Xu, "Feasibility Analysis on Using Photovoltaic System with Battery as Black-Start Unit Under Uncertain Environment", Southern Power System Technology 2016; 10(8): 82–88.

TALKS AND PRESENTATIONS

[1]. "Safe Reinforcement Learning for Optimal Frequency Control", Department of Electrical and Computer Engineering, University of Texas at Austin, 2021/08. Hosted by Prof. Hao Zhu.

[2]. "Reinforcement Learning for Optimal Frequency Control: A Lyapunov Approach", *Tackling Climate Change with Machine Learning workshop at ICML 2021*, spotlight talk, 2021/07.

[3]. "Two-Stage Payback Model for the Assessment of Curtailment Services Provided by Air Conditioners", *the 9th International Conference on Applied Energy*, Cardiff, UK, 2017/08.

[4]. "Design of Capacity Incentive and Energy Compensation for Demand Response Programs",*the 2nd International Conference on Energy Engineering and Environmental Protection* , Sanya, China, 2017/12.

SELECTED RESEARCH EXPERIENCE

Lyapunov-Regularized RL for Power System Transient Stability Jan. 2021 - May. 2021

- Proposed a Lyapunov regularized RL approach for optimal frequency control for transient stability in lossy networks
- Learned a neural Lyapunov function where the losses are specially designed with respect to the physical power system. We enhance training performance by active learning
- The learned neural Lyapunov function is then utilized as a regularization to train the neural network controller by penalizing actions that violate the Lyapunov conditions

A Lyapunov Approach for Safe Reinforcement Learning Apr. 2020 - Dec. 2020

- Derived structure property of stablizing neural network controllers according to Lyapunov condition in power system frequency control problem
- Proposed a stacked-ReLU neural network controller to construct a monotonic increasing function through the origin, which implicitly guarantee exponential stability for all system parameter and topologies

RNN Framework for Efficient Training in Sequential Decision Making Oct. 2019 - May. 2020

- Integrated neural network controller and state transition dynamics in recurrent neural network (RNN) to implicitly satisfy inequality and equality constraints in optimization
- The proposed RNN based framework realize efficient update of neural network variables with time-coupled state dynamics and decision making in frequency control problem

Optimization and Control for Power System Operation Sept. 2016 - Dec. 2019

- Proposed an optimal sequential dispatch strategy of demand side resources to mitigate the harmful payback effect to the power system
- Improved the reliability of demand side resources for the provision of ancillary services, e.g., frequency regulation, spinning reserve, non-spinning reserve
- Implemented a coupon-based pilot demand response policy in residential areas with approximately 110,000 residential customers in Changzhou and Suzhou

PATENTS AND SOFTWARE COPYRIGHTS

[1]. Chinese Patent No.CN201810584434.9 " Sequential-Dispatch of Operating Reserve Provided by Air Conditioners Considering Lead-Lag Rebound Effect", July 6, 2021.

[2]. Chinese Software Copyrights No. 2018SR449433 "Software for Coupon Computing and Settlement in Friendly Interactive Smart Grid," , May 26, 2018.

HONORS & AWARDS

Sept. 2020	Clean Energy Institute (CEI) Fellowship, University of Washington
Sept. 2019	Rushmer Innovator Fellowship, University of Washington
Mar. 2019	Excellent Postgraduate Students' Award, Department of Education of Zhejiang Province
Oct. 2018	National Scholarship, Chinese Ministry of Education (top 3%)
Oct. 2018	Graduate of Merit, Zhejiang University (top 10%)
Jun. 2016	Outstanding Graduate Award, Southeast University (top 5%)
Oct. 2015	Chancellor Scholarship, Southeast University (top 1%)
Nov. 2014	Pacemaker to Merit Student, Southeast University (top 1%)
Oct. 2014	National Scholarship, Chinese Ministry of Education (top 3%)
Aug. 2014	Third Prize in 2014 National University Student Social Practice and Science Contest on Energy Saving & Emission Reduction, Chinese Ministry of Education

SERVICES & ACTIVITIES

Oct. 2020 - Present	Clean Energy Institute (CEI) Ambassador for K-12 Students
Nov. 2018 - Present	Reviewer for IEEE Transactions on Power Systems; IEEE Transactions on Smart Grid; Applied Energy
Oct. 2016 - Oct. 2017	Deputy Director of Academic Department in Graduate Union, Zhejiang University
Sept. 2013 - Sept. 2014	Deputy Director of Academic Department in Student Union, Southeast University