

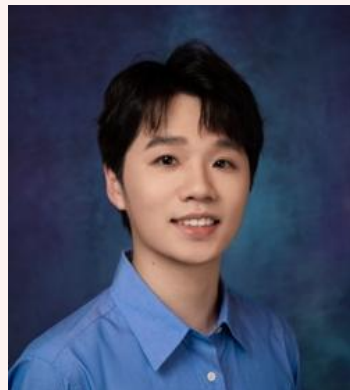
# 学术报告会

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## Stability Constrained Voltage Control in Distribution Grids

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### 摘要:

Motivated by the increasing deployment of distributed energy resources (DERs) in power distribution grids, this talk presents a data-driven framework to design efficient and reliable Volt/Var controllers for DERs to perform voltage regulation. Our approach employs machine learning techniques to learn surrogates that map voltages to ideal reactive power setpoints approximating solutions to the optimal reactive power flow problem. We propose control update schemes to steer the reactive power injection to a setpoint described by these surrogates and identify conditions on the surrogates and control parameters such that it guarantees to converge in a global asymptotic sense. For decentralized control, where controllers only have access to local measurements, we show the key role played by the monotonicity of the surrogates in ensuring asymptotically stability. We extend this idea to the case where the controllers can take advantage of an arbitrary communication infrastructure on top of the physical network. This allows the controllers to incorporate information beyond their local bus, covering the decentralized control case as a special case, and leading to less conservative constraints on the controller design. We train neural networks so that, by design, they meet the conditions on surrogates and illustrate the performance of the resulting control scheme. Our simulations show that the proposed framework guarantees the closed-loop stability while significantly reducing the operation cost, and highlight the role of communication in improving control performance.

### 简介:

Zhenyi Yuan is currently a Ph.D. Candidate at the Department of Mechanical and Aerospace Engineering, University of California, San Diego, working with Professor Jorge Cortés. He was a visiting scholar with the Department of Information Engineering of the Chinese University of Hong Kong, Hong Kong, hosted by Professor Changhong Zhao. Prior to that, he received both the B.S. and M.S. degrees in control science and engineering from the Honors School of Harbin Institute of Technology under the supervision of Professor Ligang Wu. His research interests lie at the intersection of control, optimization and learning, with applications to smart grids.