# Flexible and Faithful Federated Learning Methods

ABSTRACT - Federated learning enables machine learning algorithms to be trained over decentralized edge devices without requiring the exchange of local datasets. We consider two scenarios in this talk. In the first scenario, we have cooperative agents running distributed optimization methods. Current literature fail to capture the heterogeneity in agents' local computation capacities. We propose FedHybrid as a hybrid primal-dual method that allows heterogeneous agents to perform a mixture of first and second order updates. We prove that FedHybrid converges linearly to the exact optimal point for strongly convex functions. In the second scenario, we consider strategic agents with different data distributions. We analyze how the distribution of data affects agents' incentives to voluntarily participate and obediently follow traditional federated learning algorithms. We design a Faithful Federated Learning (FFL) mechanism based on FedAvg method and VCG mechanism which achieves (probably approximate) optimality, faithful implementation, voluntary participation, and balanced budget.
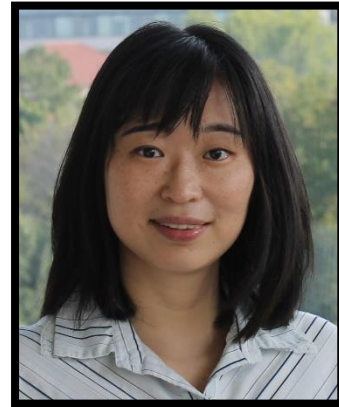
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SPEAKER BIO – Ermin Wei is currently an Assistant Professor at the Electrical and Computer Engineering Department and Industrial Engineering and Management Sciences Department of Northwestern University. She completed her PhD studies in Electrical Engineering and Computer Science at MIT in 2014, advised by Professor Asu Ozdaglar, where she also obtained her M.S. She received her undergraduate triple degree in Computer Engineering, Finance and Mathematics with a minor in German, from University of Maryland, College Park. Her team won 2nd place in the GO-competition Challenge 1, an electricity grid optimization competition organized by Department of Energy. Wei's research interests include distributed optimization methods, convex optimization and analysis, smart grid, communication systems and energy networks and market economic analysis.

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