

Special Issue on Federated, Distributed Learning and Analytics (FDLA)

IISE Transactions, Operations Engineering and Analytics Focused Issue

A critical change is happening in today's Internet of Things (IoT). The computational power at the edge devices is steadily increasing. AI chips are rapidly infiltrating the market. Mobile phones' processing power is becoming comparable to laptops available for everyday use. Powerful AI chips now drive autopilot systems for new electric vehicles, and small local computers such as Raspberry Pis have become commonplace in manufacturing systems. This change opens a new paradigm of data analytics within IoT that exploits edge compute resources to distribute model learning and to process more of the users' data where it is created. More specifically, with the availability of some computing resources at the edge, clients/devices can execute some computations locally, instead of sharing all raw data to a central cloud, and share only the information needed for collaboratively extracting knowledge and building smart analytics. This paradigm shift sets forth many intrinsic advantages, including reduced latency as decisions can be achieved locally, cost and communication efficiency as less data is communicated and stored centrally, and enhanced privacy as only updates need to be communicated for collaborative learning.

Indeed, in the past few years, there has been an interest in distributed and privacy-preserving predictive analytics tailored for mobile applications under the notion of federated learning (FL). Most work in FL has focused on predictive modeling using deep neural networks (DNN) learned via first-order methods. This is understandable, as FL has been predominantly explored within mobile applications. However, these efforts are still in their infancy. New challenges will arise as federated, distributed learning and analytics (FDLA) infiltrate new applications, including manufacturing, transportation, energy, healthcare, and supply chain. Here domain knowledge will play a critical role in formulating the right analytics and establishing effective methodologies to solve them. Further, the success of distributed and federated analytics will depend on the ability to go beyond predictive analytics to diagnostics and prescriptive analytics.

This special issue aims to advance research in FDLA beyond the current practice. Our overarching goal is to pave the way for distributed and federated analytics to permeate new applications. Topics of interest within distributed and federated analytics include, but are not limited to:

- Personalization and clustering
- Distributed constrained optimization
- Distributed min-max optimization
- Uncertainty quantification
- Network learning
- Federated systems at scale
- Self-supervised learning
- Robustness to system heterogeneity
- FDLA beyond empirical risk
- Distributed feature extraction
- Differential privacy for FDLA
- Predictive modeling with correlated samples
- Leveraging physical knowledge
- FDLA for optimal sequential design
- Diagnostic analytics for system monitoring and control
- Optimal resource allocation
- Incentive design for collaboration
- Trustworthy FDLA for fairness and protection against privacy or poisoning attacks
- Vertical FDLA
- Full decentralization
- Efficient communication
- Manufacturing, transportation, energy, healthcare, and supply chain applications of FDLA

We expect novel and innovative contributions for these research domains, ideally motivated by a practical context.

Papers must be submitted through <https://mc.manuscriptcentral.com/tandf/iietransactions> and prepared according to the journal's [Instructions for authors](#). Select "Special Issue" for the question "Please select the Focus Issue to which the paper is most related" in Step 1 in the submission process, and select the specific special issue in Step 6.

Important Dates

- Manuscript submission: 6/1/2023
- Completion of 1st round review: 8/31/2023
- Completion of 2nd round review: 12/31/2023
- Final manuscript submission: 02/31/2024
- Tentative publication date: later 2024

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