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Blockchain and Federated Learning - Protecting Privacy and Securing Information

The last few decades have witnessed a rapid advancement of digital technology in all aspects of society – governance, finance, agriculture, critical infrastructure among others. This is mainly due to data explosion and the use of machine learning tools. To address some privacy related concerns and the control of information, many organizations have introduced blockchain as a tool to mitigate the weaknesses of traditional data sharing and storage. The collaborative learning approach is also emerging as a tool for shared develop models in decision making. For example, in health care and other critical infrastructure data cannot be easily shared, thus gathering it in one location for machine learning is prohibitive. Federated learning is an example of a collaborative learning algorithm that can be applicable in these situations. In the Federated learning framework, a central server creates initial models and sends it to selected clients for training. After some training the client goes back to the server with model estimates which are aggregated and used for updating the model. In this presentation, blockchain technology will be used in a central approach so that individual client models' parameters can be consensual on the blockchain. This has the ability to improve the quality of the model and also create an audit trail for the federated learning parameters. An example using hypothetical healthcare data will be presented.

Biography

Dr. Attoh-Okine is a Senior IEEE Member; Founding Associate Editor for ASCE/ASME Journal of Risk and Uncertainty Analysis; Professor of Civil and Environmental Engineering; Professor of Electrical and Computer Engineering; and the Interim Academic Director of the University of Delaware Cybersecurity Initiative. Over the last couple of years, Dr. Attoh-Okine authored two books which are defining the direction of research across disciplines: a) Resilience Engineering: Models and Analysis [Cambridge Press 2016] and b) Big Data and Differential Privacy in Railway Track Engineering [John Wiley 2017]. He served as an Associate Editor on the following ASCE Journals: a) ASCE Journal of Infrastructure Systems; b) ASCE Journal of Computing; c) ASCE Journal of Bridge Engineering; d) ASCE Journal of Pipeline Systems Engineering and Practice. He is currently working with researchers from the United States and Japan on Blockchain applications to Society 5.0. Dr. Attoh-Okine's areas of research include: cyber resilience of critical infrastructure, data science application in railway engineering and graphical probability models.