Synchrotron X-ray microdiffraction image screening method based on federated learning

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Synchrotron X-ray microdiffraction (μXRD) can be applied to identify crystal impurities in industrial minerals.

However, two major problems are hindering the development of accurate µXRD image [screening](#). One is the lack of labeled industrial samples and the other is the privacy concerns of industrial users of µXRD services.

Recently, a research group led by Prof. Zhu Yongxin from the Shanghai Advanced Research Institute (SARI) of the Chinese Academy of Sciences has proposed a novel µXRD image screening method based on federated learning (FL) to improve the screening while protecting [data privacy](#).

Related results were published in *IEEE Transactions on Industrial Informatics*.

The researchers utilized the domain specific physical information to improve the federated learning accuracy. Then, with the consideration of the unbalanced data distributions in realistic world, they adopted a sampling scheme with novel client sampling algorithms. Finally, a hybrid training framework was proposed to deal with the unstable communication environment between FL clients and servers.

Extensive experiments showed that the accuracy of machine learning models got improved by around 14% to 25% and data features could be shared among different users or applications while keeping commercially confidential information.

This novel system with federated learning features will be helpful in lifting non-technical barriers on data sharing.

More information: Bo Chen et al, Federated Learning-Based Synchrotron X-ray Microdiffraction Image Screening for Industry Materials, *IEEE Transactions on Industrial Informatics* (2022). [DOI: 10.1109/TII.2022.3205372](#)

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