Financial Services Data and Analytics Newsletter

April 2022

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Introduction

PwC's Financial Services Data and Analytics team is excited to present the first edition of its monthly newsletter at the onset of this new financial year. The newsletter aims to introduce a non-conventional way of implementing artificial intelligence (AI) called 'federated learning', an innovative technology that supports training of machine learning (ML) models using 'intelligence' and not physical data. Given the changing business models and emerging ecosystems and partnerships, rising industrial 5.0 trends like 5G and edge computing, and growing risks of data sharing and cybersecurity, federated learning will play a pivotal role in the secured recalibration and personalisation of models.

The newsletter also presents industry and alliance updates on interesting use cases involving the application of the metaverse, multi-cloud strategy, regulatory changes, and lots more.

Happy reading!
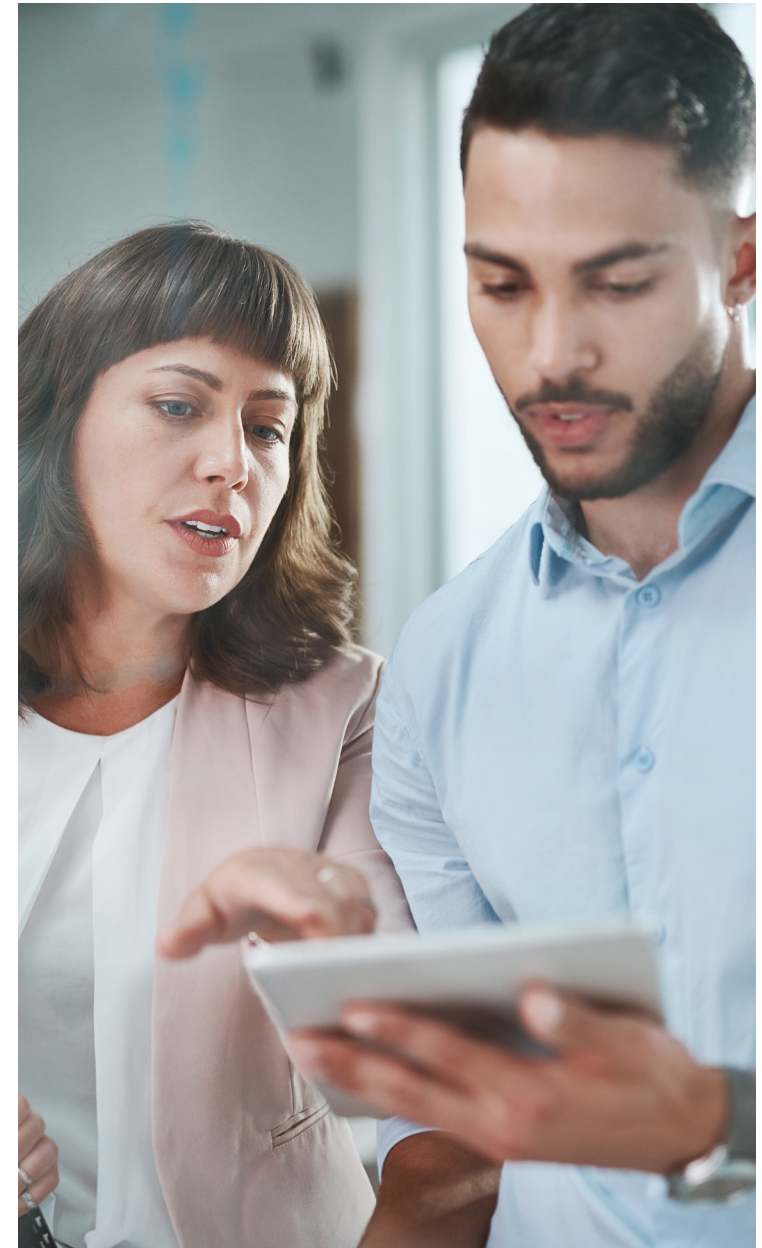
Topic of the month: Federated learning

Introduction

Federated learning is one of the leading AI trends today. In essence, it is a decentralised form of ML that aims to avoid user and data privacy conflicts. ML algorithms involve the use of data sets consolidated from several sources that are input into a centralised server. Using this training data, the algorithms build a model that generates final decisions or predictions. In the current climate where users are increasingly aware of data privacy and violation of this right across different platforms, this approach poses certain challenges. This is because the utilisation of data sets that incorporate personal data entails risks to data security and confidentiality. As an ethical means of managing user data violations and infringement of privacy, federated learning can help in addressing these issues.

In federated learning, instead of aggregating user data on a central server, a local copy of the data is created on the end device itself. The prebuilt 'global' model is downloaded on this device on the federated learning network and using the local data copy, the model is updated. The revised models are then transferred back to the central server, which then aggregates these model parameters to build an improved global model. It is important to note that in this approach, it is only the final resultant models and not the user data that is consecutively available on the central server. Thus, this method helps in bypassing key obstacles around data security/model personalisation.

> " Data minimization is an important privacy principle for us, and we're encouraged by advances developed by Google A.I. researchers called "federated learning".
>
> **Sundar Pichai**

Federated learning, coupled with differential privacy as a concept, aims to eliminate the transfer of data to a central repository for training and implementing an ML model. It allows for a collaborative framework between users/clients, enabling them to utilise each other's data to create a high-quality model while ensuring data security of each individual user/client data by training the model locally on the user systems.

Topic of the month: Federated learning

Process:

1. A prebuilt 'global' model is sent synchronously or asynchronously to user devices on the federated learning network.

2. Various facets of the user data are anonymised using differential privacy algorithms.

3. Each user computes an updated model using the anonymised local data on their local device/system.

4. Only the updated model parameters are sent from the users to the central server in an encrypted format. There is no transfer of user data to the central server.

5. The server aggregates these model parameters to construct an improved global model without taking in user data.

Federated learning framework
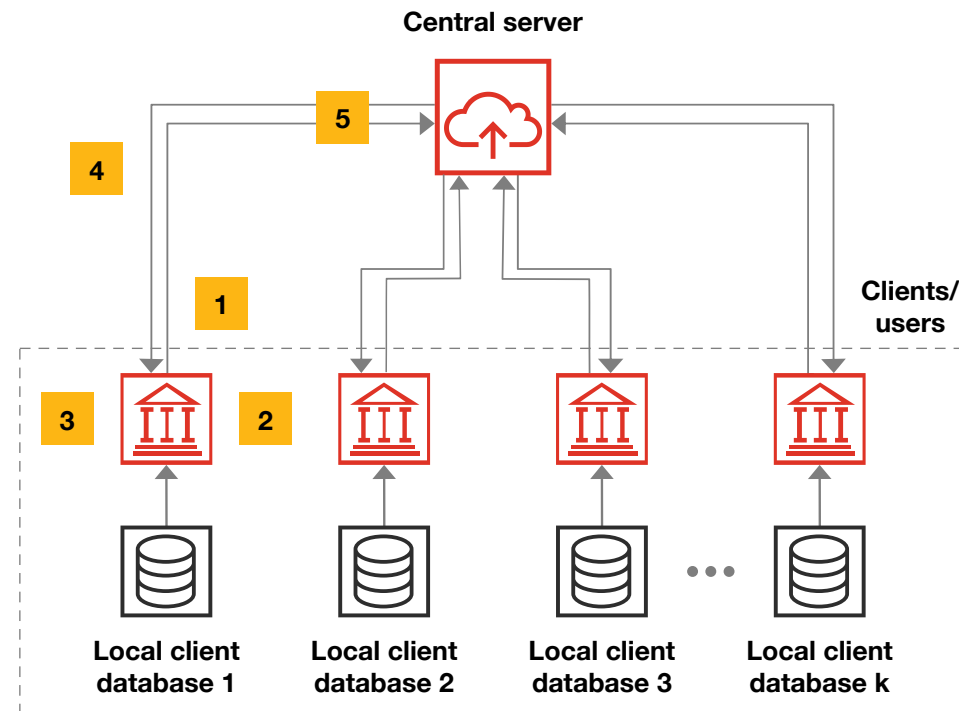
Topic of the month: Federated learning

Federated learning frameworks allow for flexibility and has multiple use cases that eliminate data visibility and data transfer issues. Some of these applications include:

Across touchpoints: Distributed ML approaches can train models using decentralised data residing on end-user devices such as mobile phones and tablets. This would help in transforming the organisation's customer servicing strategy to a hyper-personalised relationship.

Across geographies: Federated learning can be leveraged to utilise data silos across the geographical locations of a multinational firm or multiple entities located across countries. Given that India's data privacy bill and similar frameworks such as the General Data Protection Regulation (GDPR) impose significant restrictions on cross-border data transfer, federated learning could seamlessly resolve issues related to movement of data.

Across subsidiaries: Companies struggle to utilise data mines available with sister entities to provide targeted products to their user base (e.g. a brokerage house providing stock recommendations based on investment data present with a sister asset management company (AMC) due to user data transfer issues. Heterogeneous federated modelling can enable companies to use their sister entity's data to improve their products/services without any physical sharing of user data.

Across companies: Regulatory bodies such as the Insurance Regulatory and Development Authority of India (IRDA) and institutions that typically require access to data of multiple companies for regulatory purposes can use the federated learning approach to generate assets which can be very helpful for the entire industry. Federated learning can make it possible for regulatory bodies and consortiums to utilise data across firms to generate industry-level assets.
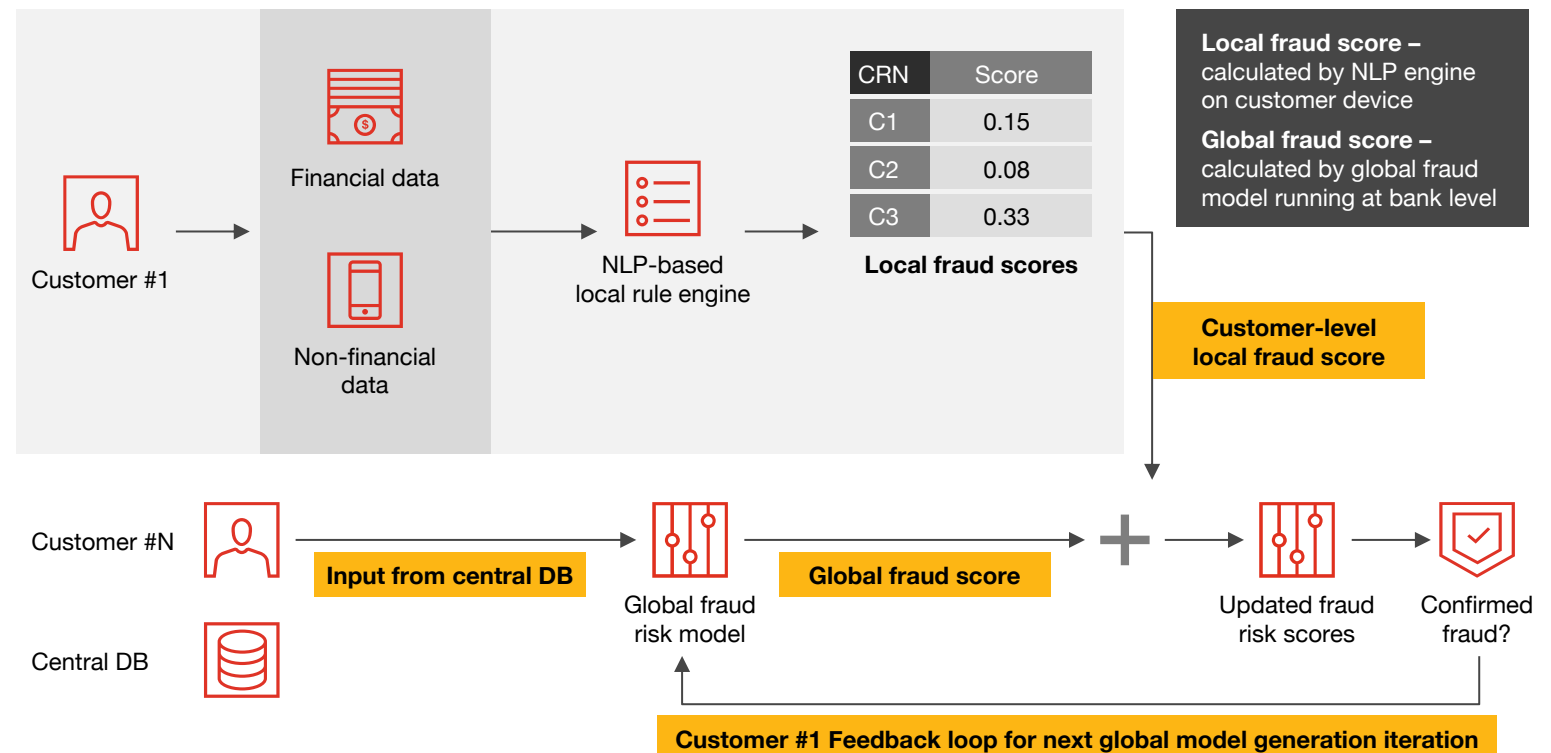
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Applications and benefits of federated learning

Applications:

The banking and insurance industries have matured in terms of research and adoption of new analytics techniques such as federated learning.

In the global context, LUXHUB – an open banking API platform founded by BGL BNP Paribas along with three banks – has partnered with the University of Luxembourg to create powerful AI/ML federated models focused on fraud detection, anti-money laundering (AML) and loan risk prediction, etc.

Federated learning fraud detection use case

Customer #1

Financial data

Non-financial data

NLP-based local rule engine

CRN	Score
C1	0.15
C2	0.08
C3	0.33

Local fraud scores

Local fraud score – calculated by NLP engine on customer device

Global fraud score – calculated by global fraud model running at bank level

Customer-level local fraud score

Customer #N

Input from central DB

Global fraud risk model

Global fraud score

Updated fraud risk scores

Confirmed fraud?

Central DB

Customer #1 Feedback loop for next global model generation iteration

Topic of the month: Federated learning

In India, with the rise of digital payments and greater financial inclusion, the number of retail fraud transactions has increased. In FY21, 55% of the fraud transactions reported to the Reserve Bank of India (RBI) were related to card/internet banking and worth more than INR 1 lakh.[1] In the banking sector, federated learning can be used to identify these fraudulent transactions. Whenever a new transaction is initiated, financial data such as the transaction time, transaction channel, amount, frequency and non-financial data such as SMS, behavioural biometrics, device password and pin and security questions are captured. Similarly, in the insurance industry, federated learning can be used to identify fraudulent claims. Calculation of fraud risk using a traditional rule-based approach (If 'x', then 'y') is reactive and requires manual intervention to identify a trend using exploratory data analysis. Instead, using a federated learning approach, automated rules can be created for specific customers using the local natural language processing (NLP) model and global fraud risk model. Whenever a new claim is initiated, financial data such as claim time, amount, frequency, premium details, exclusions and bills and non-financial data like SMS, behavioural biometrics and medical history are captured.

Captured across the banking and insurance industries, this customer information can be collated to identify hidden trends and deviation from normal patterns using NLP-based rule engines.

The identified patterns can be further validated using local and global fraud scores to create an updated fraud risk score that can confirm whether or not a transaction or an insurance claim is fraudulent. This insight, when aggregated from multiple customers, can be factored using the feedback loop to improve the global risk fraud model and develop an accurate customer profile for fraud identification.

Benefits: The benefits of federated learning include, but are not limited to, data privacy, hyperpersonalisation of models based on behavioural traits, lower latency through elimination of data transfer aspects and reduced infrastructure needs due to minimal storage requirements.

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1. https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/0RTP2020CF9C9E7D1DE44B1686906D7E3EF36F13.PDF , Table IV.13

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Industry news

1. AI Driven chatbot by Bajaj Allianz for personalised customer experience

Bajaj Allianz has set up an AI-driven WhatsApp bot to better understand customer intent. Also, they plan to launch a humanoid based on AI to provide a high level of personalisation to customers.

2. Luxembourg banks partner with researchers for federated learning models

LUXHUB, an open banking API platform founded by four major Luxembourg banks (BCEE, BGL BNP Paribas, Banque Raiffeisen and POST Luxembourg), has partnered with the University of Luxembourg to create powerful AI/ML federated models. In phase 1, the team will focus primarily on financial crime use cases like fraud detection, AML and loan risk prediction, which will help in reducing false positives and operational cost.

3. NBFCs team up with FinTech and tech companies to tap synergies

NBFCs are exploring collaborations with tech companies to realise their full potential. Nitstone Finserv recently partnered with TCS. This will enable the NBFC to get real-time access to data and derive quick insights which in turn will help in optimisation of revenue, costs and operations. New-age NBFCs are not only collaborating with leading tech companies but also with FinTechs to draw out synergies. One such NBFC is Arka Fincap which has collaborated with a FinTech called LoanTap. This will help the FinTech reach a larger audience and in return the FinTech will help the NBFC source, share risk (co-lend), underwrite, plug in capital, and manage loans.

4. RBI cancelling Certificates of Registration (CoRs) of digital lenders

Regulators are keeping a hawk's eye on some digital lenders pursuant to the violation of RBI directions on outsourcing and KYC norms. The Working Group on Digital Lending including Lending through Online Platforms and Mobile Apps, in its report, has stated that there are more than 600 illegal moneylending apps operating in India.[2]

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2. https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=1189

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5. BNY Mellon uses Microsoft Azure for data and analytics solutions

US investment bank BNY Mellon is collaborating with Azure to scale up its data and analytics capabilities. It has built a data vault platform on Azure that enables easy integration with its clients and third-party vendors. This approach is part of BNY Mellon's vision to be more customer centric and provide a comprehensive solution to clients.

6. JPMorgan Chase (JPMC) meets the metaverse with a USD 1 trillion yearly opportunity

JPMC launched its 'Onyx' lounge on the Decentral and metaverse platform. 'Onyx' is JPMC's blockchain arm. The lounge has a digital portrait of CEO Jamie Dimon, a live tiger and spiral staircase. Visitors can create digital avatars by choosing their gender, hairstyle, clothes, etc.
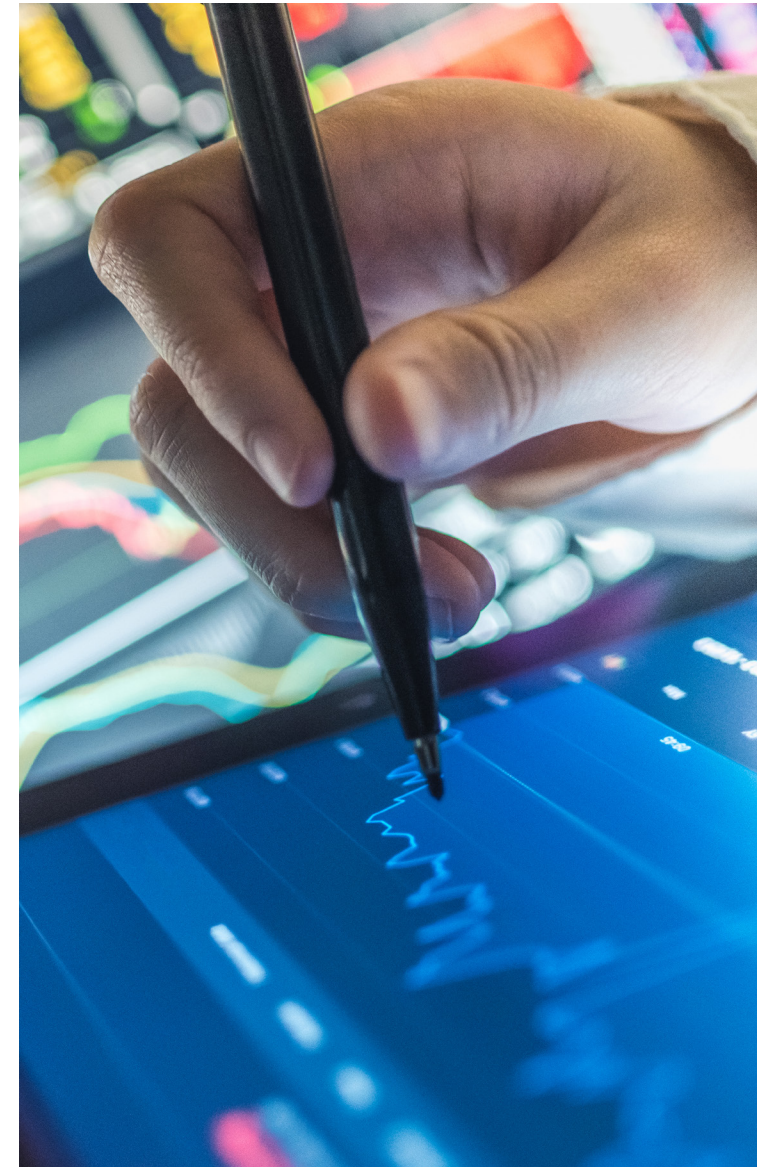
Alliance news

1. How Deutsche Bank is leveraging a multi-vendor cloud strategy

Deutsche Bank is leveraging cloud services from Google to develop applications and use services from niche providers like Salesforce and Workday for specific requirements. The bank plans to build applications directly on cloud to speed up technology transformation, drive innovation and business opportunities.

This will give the bank access to always up-to-date and fully managed infrastructure and will provide a stable, scalable and fully compliant environment, including replication, back-ups and disaster recovery. Apart from public cloud, the bank has several investments in hyperconverged infrastructure (HCI), which is a software-defined, unified system that combines all the elements of a traditional data centre: storage, compute, networking and management.

2. Flipkart enters into a strategic alliance with Google Cloud

Indian e-commerce market giant Flipkart has partnered with the Google Cloud Platform to achieve its digital transformation to cloud and expand in tier 2 and tier 3 cities. This step will help the company grow to the next phase in e-commerce and boost the onboarding of new shoppers and sellers. The company will be able to deliver sturdy app performance during the peak purchase season by leveraging Cloud's secure and extensive global infrastructure.

Google Cloud's advanced data analytics and ML technologies will help the company build a more vigorous platform which will help in analysing transaction data and traffic. This will unlock real-time insights into customer purchasing and shopping behaviour and will help create more personalised recommendations to enrich the customer experience.

Knowledge bytes

1. **Axis bank leveraged Secured Logistics Document Exchange blockchain to execute first domestic trade deal**

   Axis Bank adopted the Government of India backed blockchain technology to execute a domestic trade deal between ArcelorMittal Nippon Steel and Lalit Pipes & Pipes. Secured Logistics Document Exchange helps in increasing transparency, compliance, efficiency and user experience, and reduces the carbon footprint.

2. **How data science is easing payment collection for NBFCs**

   Data science is helping NBFCs to not only optimise collection through the correct channels by using predictive analysis but also reduce collection costs by enabling products such as UPI net banking and e-NACH.

Contact us

Mukesh Deshpande
Partner, Technology Consulting
mukesh.deshpande@pwc.com
+91 98450 95391

Hetal Shah
Partner, Technology Consulting
hetal.d.shah@pwc.com
+91 9820025902

Acknowledgements:

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Knowledge bytes

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