Federated Learning for Distributed Data Analysis Training Course

Professional Development Training Course Outline

Category	Research and Data Analysis	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

As the volume of data across edge devices and remote silos grows exponentially, traditional centralized machine learning approaches are becoming less viable due to privacy, latency, and data ownership concerns. Federated Learning (FL) has emerged as a cutting-edge decentralized AI paradigm that allows for collaborative model training without transferring raw data, thereby ensuring data privacy and compliance. Federated Learning for Distributed Data Analysis Training Course equips learners with the knowledge and skills to build, manage, and deploy federated systems across multiple domains including healthcare, finance, IoT, and mobile applications.

This course is tailored for professionals looking to harness distributed machine learning and privacy-preserving AI techniques using tools such as TensorFlow Federated (TFF), PySyft, and Flower. Learners will gain hands-on experience with real-world case studies and be able to apply FL to cross-silo and cross-device environments. From understanding the architecture of FL to implementing secure aggregation and differential privacy, this course provides a complete framework for scalable and compliant AI development.

Programme Curriculum

Federated Learning for Distributed Data Analysis Training Course

Introduction

As the volume of data across edge devices and remote silos grows exponentially, traditional centralized machine learning approaches are becoming less viable due to privacy, latency, and data ownership concerns. Federated Learning (FL) has emerged as a cutting-edge decentralized AI paradigm that allows for collaborative model training without transferring raw data, thereby ensuring data privacy and compliance. Federated Learning for Distributed Data Analysis Training Course equips learners with the knowledge and skills to build, manage, and deploy federated systems across multiple domains including healthcare, finance, IoT, and mobile applications.

This course is tailored for professionals looking to harness distributed machine learning and privacy-preserving AI techniques using tools such as TensorFlow Federated (TFF), PySyft, and Flower. Learners will gain hands-on experience with real-world case studies and be able to apply FL to cross-silo and cross-device environments. From understanding the architecture of FL to implementing secure aggregation and differential privacy, this course provides a complete framework for scalable and compliant AI development.

Course Objectives

1. Understand the fundamentals and architecture of Federated Learning.
2. Differentiate between cross-silo and cross-device FL settings.
3. Apply differential privacy and secure aggregation techniques.
4. Design and implement FL algorithms using TensorFlow Federated (TFF).
5. Analyze the communication efficiency and latency in FL systems.
6. Integrate FL into healthcare and financial use cases.
7. Implement personalized federated learning models.
8. Evaluate model convergence and bias in distributed environments.
9. Understand federated optimization algorithms like FedAvg and FedProx.
10. Use PySyft and Flower for federated machine learning experimentation.
11. Address challenges in non-IID data distribution.
12. Apply FL in IoT and edge computing environments.
13. Ensure regulatory compliance (GDPR, HIPAA) in federated systems.

Target Audiences

1. AI/ML Engineers
2. Data Scientists
3. Cybersecurity Professionals
4. IoT System Developers
5. Healthcare IT Analysts
6. Financial Tech Specialists
7. Academic Researchers
8. Mobile Application Developers

Course Duration: 5 days

Course Modules

Module 1: Introduction to Federated Learning

- Overview of Federated Learning
- Centralized vs. Federated ML comparison
- Key advantages and limitations
- Use cases across industries
- Types of FL (cross-device, cross-silo)
- **Case Study: Federated Learning in COVID-19 symptom tracking**

Module 2: FL Architecture and System Design

- Components of an FL system
- Server-client coordination
- Federated averaging (FedAvg)
- Personalization strategies
- Communication protocols
- **Case Study: Designing a scalable FL framework for hospitals**

Module 3: Tools and Frameworks

- TensorFlow Federated (TFF) fundamentals
- PySyft and Federated Torch
- Introduction to Flower framework
- FL experimentation best practices
- Deployment pipelines for FL
- **Case Study: Implementing FL with PySyft in mobile banking**

Module 4: Security and Privacy in FL

- Differential privacy techniques
- Secure multi-party computation
- Homomorphic encryption basics
- Threat models in FL
- Privacy-preserving aggregation
- **Case Study: Ensuring HIPAA compliance in federated medical imaging**

Module 5: Optimization in FL

- Federated SGD vs. centralized SGD
- FedAvg, FedProx, and other variants
- Personalization and model heterogeneity
- Addressing data imbalance
- Adaptive learning strategies
- **Case Study: Optimization strategies for FL in retail demand forecasting**

Module 6: Handling Non-IID and Unbalanced Data

- Understanding non-IID data challenges
- Statistical vs. system heterogeneity
- Client sampling strategies
- Personalized FL models
- Regularization techniques
- **Case Study: Overcoming non-IID issues in rural telemedicine**

Module 7: Federated Learning in Edge & IoT Environments

- FL for smart home devices
- Real-time inference at the edge
- Energy-efficient learning
- Data locality constraints
- Network reliability issues
- **Case Study: FL deployment in smart meters for energy analytics**

Module 8: Compliance and Real-World Applications

- Legal frameworks (GDPR, HIPAA)
- Ethical implications of decentralized AI
- Model auditability in FL
- Cross-border data processing
- Long-term deployment challenges
- **Case Study: GDPR-compliant FL solution for European banking sector**

Training Methodology

- Instructor-led interactive sessions

- Practical coding workshops using TFF, PySyft, Flower
- Collaborative group projects with real-world datasets
- Regular quizzes and assessment tasks
- Industry expert guest lectures
- Capstone project based on real case studies

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com