Deep Learning for Genomic Data 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

The rapid expansion of genomic data, fueled by next-generation sequencing technologies, has revolutionized the life sciences and precision medicine. Leveraging deep learning techniques to interpret this vast and complex genomic information enables predictive insights into gene expression, disease susceptibility, and personalized therapeutics. Deep Learning for Genomic Data Training Course provides a cutting-edge curriculum designed to equip participants with practical expertise in applying advanced neural networks, convolutional models, and recurrent architectures to solve real-world genomic challenges. Participants will gain hands-on experience with state-of-the-art tools, frameworks, and real genomic datasets, empowering them to drive innovations in genomics, bioinformatics, and healthcare AI.

The course emphasizes actionable learning through interactive coding sessions, case studies, and project-based exercises, ensuring participants can bridge the gap between theory and application. Attendees will explore deep learning strategies for variant calling, functional genomics, epigenomics, and gene regulatory network prediction. By integrating high-impact, trending tools such as TensorFlow, PyTorch, and transformer models for genomic sequences, this program positions learners at the forefront of AI-driven genomics research. Participants will leave with both the analytical skills and strategic knowledge to design, implement, and optimize deep learning models for complex genomic data challenges.

Programme Curriculum

Deep Learning for Genomic Data Training Course

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Course Duration

5 days

Course Objectives

1. Understand the fundamentals of genomics, bioinformatics, and deep learning integration.
2. Apply convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to genomic sequences.
3. Develop predictive models for gene expression, mutation analysis, and disease risk.
4. Implement variant calling and functional genomics pipelines using deep learning.
5. Explore transformer-based models and attention mechanisms for sequence data.
6. Analyze epigenomics, methylation patterns, and regulatory networks using AI.
7. Gain hands-on experience with Python, TensorFlow, PyTorch, and Keras.
8. Optimize deep learning models for accuracy, interpretability, and scalability.
9. Integrate multi-omics data to improve predictive modeling and insights.
10. Evaluate model performance with precision, recall, AUC-ROC, and cross-validation techniques.
11. Explore AI-driven biomarker discovery and therapeutic target identification.
12. Conduct case studies and real-world projects in genomics using deep learning.
13. Stay ahead with trending AI genomics applications in precision medicine and drug discovery.

Target Audience

1. Bioinformaticians and computational biologists
2. Data scientists specializing in healthcare and genomics
3. Machine learning engineers focusing on biological data
4. Genomic researchers and lab scientists
5. PhD and postgraduate students in genomics or AI
6. Healthcare professionals exploring AI applications in precision medicine
7. Biotechnology and pharmaceutical industry professionals
8. AI enthusiasts interested in life sciences and biomedical applications

Course Modules

Module 1: Introduction to Genomics and Deep Learning

- Overview of genomics, transcriptomics, and proteomics

- Basics of deep learning
- Genomic data types
- Tools for genomic data preprocessing and visualization
- **Case Study:** Predicting gene expression patterns in cancer datasets

Module 2: Neural Networks for Genomic Sequences

- Sequence encoding
- Designing CNNs for motif discovery
- RNNs for sequence prediction and temporal genomics data
- Hyperparameter tuning and optimization strategies
- **Case Study:** Detecting pathogenic mutations using CNNs

Module 3: Variant Calling and Functional Genomics

- Understanding single nucleotide variants (SNVs) and indels
- Deep learning pipelines for variant detection
- Functional annotation of genetic variants
- Model evaluation metrics for variant calling
- **Case Study:** AI-driven variant identification in rare diseases

Module 4: Epigenomics and Regulatory Networks

- DNA methylation, histone modification, and chromatin accessibility
- Predicting gene regulatory networks with deep learning
- Integration of epigenomic datasets into models
- Visualization of regulatory interactions
- **Case Study:** Epigenomic biomarkers for early cancer detection

Module 5: Transformer Models for Genomics

- Introduction to transformer architecture and attention mechanism
- Sequence-to-sequence modeling for genomic data
- Fine-tuning pre-trained models like DNABERT
- Applications in mutation prediction and enhancer identification
- **Case Study:** Using transformers for predicting non-coding variants

Module 6: Multi-Omics Data Integration

- Combining genomics, transcriptomics, proteomics, and metabolomics
- Feature engineering for multi-omics datasets
- Deep learning models for integrative analysis
- Case-based interpretation of multi-omics outputs
- **Case Study:** Multi-omics modeling for personalized medicine

Module 7: Model Evaluation, Interpretability, and Optimization

- Performance metrics
- Model interpretability
- Overfitting prevention and regularization techniques
- Deployment strategies for deep learning models
- **Case Study:** Explainable AI in predicting drug responses

Module 8: Real-World Applications and Projects

- AI in precision medicine and drug discovery
- Clinical genomics and biomarker identification
- Deep learning for population genomics studies
- building a predictive model from raw genomic data
- **Case Study:** End-to-end workflow from sequencing to actionable insights

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

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
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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