Foundations of Deep Learning with PyTorch: From Tensors to Real-World Models Training

BILGINC IT Academy
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Duration: **3 Day**

Exclusive - Learn to build, train, and deploy deep learning models with PyTorch—bridging foundational concepts to real-world AI applications.

Foundations of Deep Learning with PyTorch: From Tensors to Real-World Models is a hands-on, immersive course designed to help learners build a solid understanding of deep learning through the lens of PyTorch. Whether you're a software engineer, data scientist, or aspiring ML practitioner, this course guides you from the fundamentals of tensor operations and model construction to deploying real-world applications in computer vision and natural language processing. The emphasis is on practical skills—learners will not only grasp the theory behind neural networks but also gain the confidence to build, train, and evaluate models using PyTorch's intuitive and flexible framework.

Participants will explore essential deep learning workflows, including data preprocessing, model optimization, and performance evaluation, while working with popular libraries like torchvision and HuggingFace Transformers. The course also introduces responsible AI practices and deployment strategies using tools like FastAPI and Docker, preparing learners to take their models from experimentation to production. By the end, learners will have developed and deployed models for tasks such as image classification and sentiment analysis, equipping them with the skills to tackle real-world AI challenges with confidence.

Who Should Attend?

- Software engineers or developers with basic Python programming skills
- Aspiring or early-career Machine Learning engineers
- Data scientists looking to strengthen their deep learning foundation
- AI enthusiasts who understand ML concepts (like supervised learning, overfitting, optimization).
- Professionals aiming to transition into AI/ML roles
- Students or researchers who want practical hands-on experience with PyTorch.
- Teams or individuals tasked with building, training, or deploying ML models
- Anyone who has basic knowledge of vectors, matrices, and calculus (helpful but not mandatory)
- Cloud familiarity (e.g., using Colab or cloud notebooks) is beneficial.

Prerequisites

- Basic proficiency in Python (familiarity with functions, loops, classes, list comprehensions, etc.)
- Ability to work with libraries like NumPy or Pandas is helpful, but not mandatory.
- Basic knowledge of ML concepts such as: Features and labels, Training vs. testing, Loss functions and model evaluation,
- No prior experience with deep learning required, but familiarity is a plus.

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What You Will Learn

- Understand the core components of the PyTorch framework, including tensors, autograd, and neural network modules.
- Construct and train neural networks using PyTorch's modular API for various deep learning tasks.
- Load, preprocess, and augment datasets using PyTorch utilities for image and text data.
- Apply optimization techniques such as backpropagation, regularization, and learning rate tuning to improve model performance
- Build and evaluate models for real-world applications in computer vision (e.g., CNNs) and natural language processing (e.g., RNNs/LSTMs).
- Fine-tune pretrained NLP models (e.g., BERT) and evaluate on domain-specific datasets.
- Utilize transfer learning and pretrained models to accelerate development on custom datasets.
- "Deploy PyTorch models for inference using TorchScript or ONNX in production-ready formats.
- Deploy trained models as REST APIs using FastAPI, TorchScript, and containerization techniques.

Training Outline

Getting Started with PyTorch and Building Blocks of Deep Learning

- ● Welcome and Setup
- ● Tensors and Operations
- ● Autograd and Computational Graphs
- ● PyTorch Modules & Custom Models
- ● Training Loop Mechanics

Training Like a Pro – Dataloaders, Training Strategies, and Vision Models

- ● Data Loading and Preprocessing
- ● Training Best Practices
- ● Model Evaluation & Metrics
- ● Introduction to Computer Vision with CNNs
- ● Saving, Loading, and Deploying Models
- ● End if Day Challenge - Mini Project

Applied PyTorch – NLP Models and End-to-End Project

- ● Intro to NLP with PyTorch
- ● Transformers with HuggingFace
- ● Transfer Learning & Fine-Tuning
- ● Advanced Optimization Techniques
- ● Model Deployment and Production Readiness
- ● Responsible NLP