DEEP LEARNING FOUNDATION WITH APPLICATIONS IN COMPUTER VISION

BY ELITE INDIGO

Deep Learning Foundation with Applications in Computer Vision

• Program Overview

Welcome to the Deep Learning Foundation with Applications in Computer Vision course. In today's rapidly evolving digital landscape, deep learning has become a transformative force, driving innovations in areas such as autonomous vehicles, facial recognition, defect detection, and more. This comprehensive 3-day course is designed to equip participants with both the theoretical foundations and hands-on experience needed to apply deep learning techniques effectively in real-world computer vision tasks.
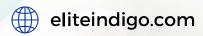
Throughout the course, you'll explore key concepts in artificial intelligence, machine learning models, neural networks, and convolutional neural networks (CNNs). You'll gain practical skills in areas like image classification, object detection, segmentation, and performance optimization using tools like Keras. Additionally, real-world case studies will help solidify your understanding of how these techniques are applied in industries such as autonomous driving and manufacturing.

By the end of this course, you'll have the knowledge and confidence to develop, optimize, and deploy deep learning models for computer vision applications.

• Learning Objectives

By the end of the course, participants will be able to:
- Understand the fundamentals of AI, machine learning, and computer vision techniques.
- Develop and optimize machine learning models for classification and regression tasks.
- Build and implement neural networks and CNN architectures for image analysis.
- Apply deep learning methods for object detection, localization, and segmentation.
- Analyze real-world case studies to understand practical applications of computer vision in industries.

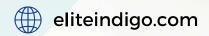## • Duration   Three (3) Full-Day Workshop;

Deep Learning Foundation with Applications in Computer Vision

- ## Course Schedule

DAY 1

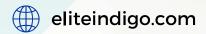| Time	Details
1 Hour 30 Minutes	**Module 1: Overview of Artificial Intelligence (AI) and Computer Vision** **Learning + Debrief:** • Introduction to AI and machine learning • Overview of computer vision techniques
2 Hours	**Module 2: Machine Learning Basics** **Learning + Debrief:** • Machine Learning • Pipeline • Data preparation • Learning, Validation and • Evaluation • Bias/variance • Hyperparameter tuning
1 Hour	**Lunch**
3 Hours	**Module 3: Machine Learning Models** **Learning + Debrief:** • Overview of supervised vs unsupervised models • Overview of classification vs regression tasks • Supervised methods • Unsupervised methods • Hands-on: House price prediction, Defect detection
30 Minutes	**Recap & Q&A**

Deep Learning Foundation with Applications in Computer Vision

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DAY 2

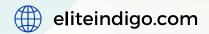| Time	Details
1 Hour 30 Minutes	**Module 4: Overview of Neural Networks** **Learning + Debrief:** • Basics of neural networks • Activation layers • Hyperparameters • Loss function and optimizers • Back-propagation • Hands-on: MNIST (handwritten digit recognition), Face recognition in the wild
2 Hours	**Module 5: Convolution Neural Networks (CNN)** **Learning + Debrief:** • Overview of Deep Learning • Convolutional layers • CNN Architectures • Step-by-step construction of a simple CNN in Keras • State of the art networks • Transfer learning / pre-trained networks • Classification using CNN • Hands-on: Fruits classification, Defect detection
1 Hour	**Lunch**
3 Hours	**Module 6: Improving Deep Learning Performance** **Learning + Debrief:** • Revisiting bias and variance • Data Optimization 1. Balancing a dataset 2. Augmentation • Hyperparameter tuning in the context of CNN 1. Learning Rate Decay 2. Batch size, number of epochs and batch normalization 3. Early Stopping 4. Dropout and Regularization • Ensembles • **Hands-on:** Improving performance of defect detection
30 Minutes	**Recap & Q&A**

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DAY 3

Time	Details
3 Hours 30 Minutes	**Module 7: Object Localization and Segmentation** **Learning + Debrief:** • Overview of localization, segmentation and applications • Converting a CNN to FCN • Sliding windows • Non-maxima suppression • Single-shot vs region proposal • Loss function for segmentation • Unpooling/upsampling/deconvolutions • State of the art localization frameworks • State of the art segmentation frameworks
1 Hour	Lunch
3 Hours	**Module 8: Application and Use Case** **Learning + Debrief:** • Case #1: Autonomous driving • Case #2: Defect localization and segmentation • Other case studies
30 Minutes	Recap & Q&A

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