

Computer Vision & Deep Learning

An advanced specialization course in Computer Vision and Deep Learning using Python, OpenCV, PyTorch, Convolutional Neural Networks (CNNs), object detection (YOLO), and image segmentation.

Duration 6 to 8 Months	Training Mode Offline Classroom Training	Certification Industry Certificate	Practical Labs 100% Hands-on
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Tools & Tech: Python • NumPy • Pandas • OpenCV • Pillow • Scikit-Image • TensorFlow • Keras • PyTorch • CUDA • Google Colab • Jupyter Notebook • YOLOv8 • Faster R-CNN • SSD • ResNet • MobileNet • EfficientNet • U-Net • Mask R-CNN • Vision Transformers (ViT) • Segment • Anything Model (SAM) • CLIP • ONNX • Flask • FastAPI • Docker • ChatGPT • Gemini Vision • Claude Vision

Detailed Course Curriculum & Modules

MODULE 01 | Introduction to Computer Vision & Deep Learning

- Computer Vision Fundamentals
- What is Computer Vision?
- Introduction to Deep Learning
- Artificial Intelligence vs Machine Learning vs Deep Learning
- Evolution of Computer Vision
- Human Vision vs Computer Vision
- Image Processing vs Computer Vision
- Real-World Applications
- AI in Healthcare, Security & Manufacturing
- Computer Vision Workflow
- Career Opportunities in Computer Vision

MODULE 02 | Python for Computer Vision

- Python Foundations
- Python Refresher
- NumPy for Image Processing
- Array Operations
- Matrix Operations
- Mathematical Functions
- File Handling
- Object-Oriented Programming Basics
- Virtual Environments
- Jupyter Notebook
- Google Colab
- Scientific Computing Libraries

MODULE 03 | Digital Image Processing

- Image Fundamentals
- Understanding Digital Images
- Pixels & Resolution
- RGB, Grayscale & HSV Color Spaces
- Image Formats
- Color Channels
- Histograms
- Image Transformations
- Brightness & Contrast Adjustment
- Gamma Correction
- Image Resizing
- Cropping & Rotation

MODULE 04 | OpenCV for Computer Vision

- OpenCV Fundamentals
- Introduction to OpenCV
- Reading & Writing Images
- Image Display
- Video Processing
- Webcam Integration
- Drawing Shapes
- Image Manipulation
- Video Frame Processing
- Real-Time Video Analysis
- Performance Optimization
- OpenCV Applications

MODULE 05 | Mathematics for Deep Learning

- Mathematical Foundations
- Linear Algebra
- Matrices & Vectors
- Matrix Multiplication
- Eigenvalues & Eigenvectors
- Probability Basics
- Statistics
- Calculus Fundamentals
- Derivatives
- Partial Derivatives
- Chain Rule
- Gradient Descent

MODULE 06 | Neural Networks & Deep Learning

- Deep Learning Fundamentals
- Introduction to Neural Networks
- Artificial Neurons
- Network Architecture
- Forward Propagation
- Backpropagation
- Activation Functions
- Loss Functions
- Optimizers
- Learning Rate
- Epochs & Batch Size
- Regularization

MODULE 07 | Convolutional Neural Networks (CNN)

- CNN Fundamentals
- Introduction to CNNs
- Convolution Layers
- Filters & Kernels
- Feature Maps
- Pooling Layers
- Flatten Layer
- Fully Connected Layers
- CNN Architecture
- Image Classification
- Model Evaluation
- Popular CNN Architectures

MODULE 08 | Object Detection & Image Segmentation

- Object Detection
- Introduction to Object Detection
- Bounding Boxes
- Anchor Boxes
- Non-Maximum Suppression (NMS)
- YOLO Fundamentals
- YOLOv8
- SSD
- Faster R-CNN
- Real-Time Object Detection
- Object Tracking
- Image Segmentation

MODULE 09 | Advanced Computer Vision Applications

- Face & Image Recognition
- Face Detection
- Face Recognition
- Facial Landmark Detection
- Emotion Recognition
- Age & Gender Prediction
- Image Similarity
- Image Retrieval
- Visual Search
- OCR Systems
- Document Analysis
- Video Analytics

MODULE 10 | AI for Computer Vision

- Modern Vision AI
- Vision Transformers (ViT)
- Segment Anything Model (SAM)
- CLIP Models
- Multimodal AI
- Image Captioning
- Visual Question Answering
- Image Generation Concepts
- Image-to-Image AI
- AI Image Enhancement
- Foundation Vision Models
- Generative AI Integration

MODULE 11 | Model Optimization & Deployment

- Production Deployment
- Dataset Preparation
- Data Annotation
- Model Evaluation
- Accuracy Metrics
- Precision & Recall
- F1 Score
- IoU (Intersection over Union)
- Confusion Matrix
- Model Optimization
- ONNX Export
- TensorRT (Introduction)

Practical Projects & Industry Capstones

- Face Recognition Attendance System
- AI-Based Object Detection System
- Real-Time Vehicle Detection
- Number Plate Recognition System
- Human Pose Detection
- Medical Image Classification
- AI Defect Detection for Manufacturing
- OCR-Based Document Scanner
- AI-Powered Security Surveillance System
- Smart Traffic Monitoring System
- Retail Customer Analytics
- Image Classification Platform
- Visual Search Engine
- End-to-End Computer Vision Application

■ Industry Certification

Authorized certificate verified globally via online portal.

■ 100% Placement Support

Resume review, mock interviews, and recruiter connections.

■ Lab Access & Mentorship

Dedicated workstation lab hours with expert guidance.