KOENIG SOLUTIONS · COURSE OUTLINE

Computer Vision: CNNs, YOLO & 3D Reconstruction

Learn to build and apply CNNs, object detection, 3D reconstruction and video analysis for real-world vision challenges.

8 MODULES

24 TOPICS

COURSE OVERVIEW

In the rapidly evolving field of computer vision, advanced techniques and applications are transforming industries ranging from healthcare to automotive. This course, “Advanced Applied Computer Vision,” delves into sophisticated topics and cutting-edge methodologies that enable computers to interpret and understand the visual world. Participants will explore a range of advanced concepts, algorithms, and practical applications, equipping them with the skills needed to tackle real-world vision challenges.

WHO THIS COURSE IS FOR

- Computer Vision Engineers
- Machine Learning Engineers
- AI Researchers
- Data Scientists
- Robotics Engineers
- Software Developers

LEARNING OBJECTIVES

By the end of this course, participants will:

- Have a deep understanding of advanced computer vision techniques and be well-prepared to apply these skills to complex challenges in various industries

COURSE SYLLABUS

8 Modules, 24 Topics

01

Fundamentals of Computer Vision

TOPICS

- **Introduction to Computer Vision:** Review the basic concepts and evolution of computer vision, setting the stage for advanced study
- **Image Processing Techniques:** Explore advanced techniques in image manipulation and enhancement critical for computer vision applications
- **Feature Detection and Matching:** Understand complex algorithms for identifying and matching features across images, a key step in many vision tasks

02

Deep Learning for Vision

TOPICS

- **Convolutional Neural Networks (CNNs):** Dive deep into the architecture, training, and optimization of CNNs for image recognition and classification
- **Advanced Neural Network Architectures:** Investigate cutting-edge models such as ResNet, DenseNet, and EfficientNet, and their applications in vision
- **Transfer Learning and Fine-Tuning:** Learn how to leverage pre-trained models to improve performance on specific vision tasks effectively

03

Object Detection and Segmentation

TOPICS

- **State-of-the-Art Object Detection:** Examine modern frameworks such as YOLO, SSD, and Faster R-CNN for detecting objects in images
- **Semantic and Instance Segmentation:** Differentiate between these two types of segmentation and explore algorithms like Mask R-CNN
- **Applications of Detection and Segmentation:** Apply detection and segmentation techniques to real-world problems such as autonomous driving and medical imaging

04

3D Vision and Reconstruction

TOPICS

- **Stereo Vision and Depth Estimation:** Discover techniques for deriving depth from stereo image pairs and their applications
- **Structure from Motion (SfM):** Learn about reconstructing 3D structures from 2D image sequences
- **3D Object Reconstruction:** Explore methods for building 3D models from multiple viewpoints and their practical uses

05

Video Analysis and Action Recognition

TOPICS

- **Motion Analysis in Video:** Understand techniques for detecting and analyzing motion in video sequences
- **Action and Activity Recognition:** Delve into recognizing and classifying actions in videos using advanced models
- **Real-Time Video Processing:** Learn about the challenges and solutions for processing video data in real-time applications

06

Vision in Adverse Conditions

TOPICS

- **Low-Light and Night-Time Vision:** Explore techniques for improving image quality and recognition in challenging lighting conditions
- **Adversarial Attacks and Defenses:** Understand how adversarial examples can fool vision systems and strategies to mitigate these attacks
- **Robustness and Generalization:** Study methods to increase the robustness of vision models against variations and unforeseen scenarios

07

Vision Beyond Visible Spectrum

TOPICS

- **Infrared and Thermal Imaging:** Investigate computer vision applications involving non-visible wavelengths
- **Hyperspectral and Multispectral Imaging:** Learn about processing techniques for images captured across numerous spectral bands
- **Applications in Security and Surveillance:** Apply non-visible spectrum imaging techniques to enhance security and surveillance systems

08

Ethical and Societal Implications of Vision Technologies

TOPICS

- **Privacy and Surveillance Concerns:** Discuss the implications of widespread vision systems on privacy and individual rights
- **Bias and Fairness in Vision Algorithms:** Examine the sources of bias in vision models and strategies to ensure fairness
- **Future Directions and Ethical Considerations:** Explore the potential future impact of vision technologies on society and ethical considerations

WHAT IS INCLUDED

Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

ABOUT KOENIG

Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

FLEXIBLE DELIVERY

Learn the Way That Suits You

Classroom Training | Live Online Classes (ILO) | Fly-Me-A-Trainer (FMAT) | Flexi (Self-Paced) | 1-on-1 Training

Ready to Get Started?

Talk to a learning advisor about schedules, group training and customised delivery.

Visit koenig-solutions.com | info@koenig-solutions.com