

AI & ML in Electronics & Telecommunication Engineering Roadmap (12 Weeks)

Week 1: Introduction to AI & ML

- What is Artificial Intelligence (AI) and Machine Learning (ML)?
 - AI vs ML vs Deep Learning.
 - Applications in E&TC: signal classification, anomaly detection, optimization.
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Week 2: Python for ML

- Basics of Python programming.
 - Libraries: NumPy, Pandas, Matplotlib.
 - Working with datasets and arrays.
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Week 3: Statistics & Linear Algebra Essentials

- Mean, median, variance, standard deviation.
 - Probability basics, conditional probability, Bayes theorem.
 - Vectors, matrices, dot product – all needed for ML math.
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Week 4: Supervised Learning Algorithms

- Linear Regression, Logistic Regression.
 - k-Nearest Neighbors (k-NN), Decision Trees, Random Forest.
 - Applications in sensor data prediction, fault detection.
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Week 5: Unsupervised Learning

- Clustering (k-Means, Hierarchical).
 - Dimensionality Reduction (PCA).
 - Use cases in signal separation and network traffic analysis.
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Week 6: Neural Networks & Deep Learning

- Perceptron model, backpropagation.
- Multilayer neural networks.

- Real-time signal/image classification.
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Week 7: Convolutional Neural Networks (CNNs)

- CNN architecture and layers.
 - Applications: image classification, PCB defect detection.
 - Frameworks: TensorFlow/Keras.
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Week 8: Time Series and Signal Data Processing

- Using ML for ECG, audio, RF signal classification.
 - Feature extraction from waveforms.
 - LSTM and RNN for sequence modeling.
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Week 9: ML for Communication Systems

- Modulation classification using ML.
 - Predictive channel estimation.
 - Cognitive radio and spectrum management.
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Week 10: Edge AI & Embedded ML

- Running ML models on microcontrollers (TinyML).
 - Tools: TensorFlow Lite, Edge Impulse.
 - IoT + ML: real-time predictive systems.
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Week 11: AI in Image & Video Processing

- Object detection and recognition.
 - Applications in surveillance, medical imaging.
 - Face and gesture recognition for E&TC interfaces.
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Week 12: Final Project / Case Study

- Choose one:
 - Signal anomaly detector
 - Real-time camera-based object classifier

- Smart sensor system using TinyML
- Use Python + ML framework + E&TC hardware integration (optional).