**Recommended AI/ML Courses for Understanding Fundamentals**

Courses that focus on the **internals, data collection, and model workings** rather than just application.

**1. Mathematics and Theory (Strong Foundation)**

* **Mathematics for Machine Learning (Coursera - Imperial College London)**  
  *Why?* Covers **linear algebra, calculus, probability, and statistics**, which are critical for understanding ML models.
* **MIT OpenCourseWare - Introduction to Deep Learning** *(Free)*  
  *Why?* Explains how models work under the hood, including gradient descent and backpropagation.

**2. Data Understanding and Preparation**

* **Data Science and Machine Learning Bootcamp with R & Python (Udemy - Jose Portilla)**  
  *Why?* Focuses on **data collection, cleaning, preprocessing, and feature engineering** before applying ML models.
* **Feature Engineering for Machine Learning (Coursera - Google)**  
  *Why?* Teaches **how to structure datasets, label them, and optimize feature selection**.

**3. Machine Learning Fundamentals (Internals + Real Understanding)**

* **Machine Learning Specialization (Coursera - Andrew Ng, Stanford)**  
  *Why?* Covers **model training, loss functions, optimization, and tuning models manually** rather than auto-plugging frameworks.
* **Deep Learning Specialization (Coursera - Andrew Ng, Stanford)**  
  *Why?* Focuses on neural networks from the inside out (how they learn, weights, activations, etc.).
* **Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (Book)**  
  *Why?* Provides deep explanations **before jumping into implementation**.

**4. Advanced Understanding and Research-Level AI**

* **CS231n: Convolutional Neural Networks for Visual Recognition (Stanford - Free)**  
  *Why?* Covers deep learning internals for image processing from scratch.
* **FastAI’s Practical Deep Learning (Free)**  
  *Why?* It teaches from intuition first before diving into code.

**Capstone Project: Setting an Ultimate Goal**

Rather than just "building a model," your capstone should have **a real-world problem to solve**. Based on your interests, here are a few **strong AI/ML capstone ideas**:

1. **AI-Based Cybersecurity Threat Detection** *(If you want to merge AI and security)*
   * Train a model to **identify suspicious activity in system logs**.
   * Collect real-world **anomaly detection datasets** from Kaggle.
   * Build a system that learns from **malware signatures and evolving threats**.
2. **Intelligent Resume Screener with Explainability**
   * AI that ranks job applicants and explains **why** it makes its decisions.
   * Uses **NLP (Natural Language Processing)** to analyze resumes.
   * Avoids bias by interpreting data transparently.
3. **Autonomous AI Stock Trading System (Ethical AI in Finance)**
   * A model that analyzes news sentiment + stock trends.
   * Includes risk prediction rather than just buying/selling blindly.
   * Fully explains **why it makes decisions** (not a black box).
4. **AI for Automated Game Level Design (Blending with Game Dev)**
   * AI that **generates procedurally balanced game levels** using RL (reinforcement learning).
   * Ensures **playability and challenge curves** are dynamically adjusted.
5. **AI for Healthcare: Early Disease Detection from X-rays or MRIs**
   * Uses deep learning **to analyze medical images** for early cancer detection.
   * Incorporates **explainable AI (XAI)** so doctors can **trust** the model’s results.