Python AI Developer Roadmap

1. Core Python (Must Know)

- Data types, lists, dictionaries, sets, tuples
- Loops, conditionals, functions
- File I/O
- OOP (Classes, inheritance, etc.)
- Exception handling
- Comprehensions (list, dict)
- Lambda, map(), filter(), reduce()

2. Mathematics for AI

- Linear Algebra: vectors, matrices, dot product
- Calculus: derivatives, gradients (basics)
- Probability & Statistics: distributions, Bayes theorem
- Optimization: gradient descent

3. Data Handling & Analysis

- NumPy - numerical arrays, vectorized operations
- Pandas - dataframes, filtering, aggregation
- Matplotlib / Seaborn - data visualization

4. Machine Learning (ML)

- Scikit-learn:
- Linear/Logistic Regression, Decision Trees
- K-means, PCA
- Model selection, metrics

- Data preprocessing & feature engineering

5. Deep Learning (DL)

- TensorFlow or PyTorch
- Neural networks, backpropagation
- CNNs, RNNs, LSTMs
- Transformers (basic understanding)
- Optimizers, activation, loss functions

6. Natural Language Processing (NLP)

- Tokenization, stemming, lemmatization
- Word embeddings: Word2Vec, GloVe
- Hugging Face Transformers: BERT, GPT
- Build simple chatbots

7. Computer Vision (CV)

- Image processing with OpenCV
- Deep learning with CNNs
- Object detection (YOLO, SSD)
- Image classification, segmentation

8. Model Deployment

- Save/load models: pickle, joblib
- APIs with Flask or FastAPI
- Streamlit or Gradio for UI

- Docker, cloud deployment (AWS, GCP, Hugging Face)

9. AI Ethics & Best Practices

- Bias and fairness
- Explainability: SHAP, LIME
- Responsible AI practices

10. Tools & Libraries

- NumPy, Pandas, Matplotlib, Seaborn
- Scikit-learn, TensorFlow, PyTorch
- NLTK, SpaCy, OpenCV
- Flask, FastAPI, Streamlit

11. Project Ideas

- Chatbot (NLP)
- Sentiment analysis on tweets
- Resume parser using NLP
- Image classifier (dogs vs cats)
- AI assistant (voice/text)
- Face mask detection (CV)
- Handwritten digit recognition (MNIST)

Suggested Learning Path:

1. Core Python -> 2. Math -> 3. NumPy/Pandas -> 4. Scikit-learn ->

5. TensorFlow/PyTorch -> 6. NLP or CV -> 7. Deployment -> 8. Projects