Detailed Roadmap for Data Science, ML, NLP, DL, and Generative AI Engineers

1. Programming Basics

- **Languages:** Python (lists, sets, dictionaries, tuples, OOPs, functional programming)
- **Libraries:** NumPy, Pandas, Matplotlib, Seaborn

2. Mathematics for Data Science

- **Statistics:** Hypothesis testing, chi-square test, ANOVA, Central Limit Theorem, Regression, Correlation
- **Linear Algebra:** ND equations, maxima/minima, slope, distances (point-point, point-line), unit vectors, matrix multiplication

3. Machine Learning

Supervised Learning:

- **Classification Algorithms:** Logistic Regression, SVM, KNN, Decision Trees, Random Forest, Bagging, Boosting (XGBoost, AdaBoost, CatBoost, LightGBM)
- **Regression Algorithms:** Linear Regression, SVM, Decision Trees, Random Forest, Bagging, Boosting (XGBoost, AdaBoost, CatBoost, LightGBM)
- **Metrics:**
    - **Classification:** Confusion Matrix, Precision, Recall, F1 Score, ROC-AUC, Classification Report, Accuracy Score, Brier Score, Balanced Accuracy Score, Log Loss
    - **Regression:** MAE, MSE, R-Squared, Adjusted R-Squared, RMSE
- **Other Concepts:** Overfitting, Underfitting, Regularization, Feature Selection

Unsupervised Learning:

- **Clustering:** KMeans, DBSCAN, Mean-Shift, Hierarchical Clustering
- **Association Rule Learning:** Market Basket Analysis
- **Dimensionality Reduction:** PCA, t-SNE, LDA (supervised)

4. Working with Text Data

- **Libraries:** NLTK, spaCy, regex
- **Vectorization Techniques:** Bag of Words (BOW), TF-IDF, Word2Vec, GloVe, POS, Stemming, Lemmatization

5. Deep Learning

- **Languages:** TensorFlow, PyTorch
- **Architectures:** ANN, CNN, LSTM, GRU, Autoencoders, GANs
- **Concepts:** Batch Normalization, Dropout, Skip Connections, Transfer Learning

Advanced Deep Learning:

- **Architectures:** Encoder-Decoder, Attention Mechanism, Transformers (BERT, DistilBERT, GPT)
- **Libraries:** Hugging Face, Sentence Transformers

6. Generative AI

- **Libraries:** LangChain, LlamaIndex, CrewAI, AutoGen, OpenAI
- **Models:** LLMs (Text, Audio, Image, Video, Multimodal)
- **Concepts:** RAG, Agents, AI Scraper

7. Databases

- **SQL Databases:** MySQL, PostgreSQL, SQLite
- **NoSQL Databases:** MongoDB, DynamoDB

8. Web Scraping

- **Libraries:** Selenium, BeautifulSoup

9. MLOps

- **End-to-End ML Tools:** DVC, Airflow, MLflow, Evidently AI, Kubeflow
- **CI/CD:** Git, GitHub Actions, CircleCI, Jenkins
- **Containerization:** Docker
- **Monitoring:** Prometheus, Grafana

10. Model Deployment

- **UI Libraries:** Streamlit, Gradio
- **Cloud Platforms:**
    - **AWS:** EC2, Lambda, ECS, S3, RDS, DynamoDB, ECR, SageMaker, Bedrock
    - **GCP:** AI Platform, Cloud Functions, BigQuery
    - **Azure:** Azure ML, Functions, Blob Storage

11. Cloud Computing

- **AWS Services in Detail:** EC2, Lambda, ECS, S3, DynamoDB, RDS, ECR, SageMaker, Bedrock
- **Other Skills:** Kubernetes, Pyspark (Big Data)

Suggested Learning Path:

1. **Beginner:** Programming, statistics, linear algebra, basic ML
2. **Intermediate:** Deep Learning, NLP, unsupervised learning, text processing

3. **Advanced:** Generative AI, MLOps, deployment, cloud services
4. **Expert:** Big data tools, advanced transformers, scalable ML systems

Data Science Interview Guide

1. Building Your Portfolio:

- **Portfolio Website:** Showcase your projects and skills.
- **GitHub Updates:** Regularly upload and maintain repositories.
- **Resume Creation:** Use platforms like Overleaf, Google Docs, or MS Word to craft a professional resume.

2. Preparing for Interviews:

- **Mock Interviews:** Build confidence and improve responses through practice.

3. Finding Opportunities:

- **Internships:** Explore platforms like LinkedIn.
- **Fresher Jobs:** Look for opportunities on LinkedIn, or freelance platforms like Upwork and Fiverr.

FAQs:

1. **Is DSA required for Data Science?**
2. **Are course certificates important for Data Science?**
3. **Do unpaid internships hold value for jobs or internships?**
4. **How many projects should I complete before searching for internships?**
5. **Should I pursue an MBA or Master's if I don't get a job?**
6. **What salary should I expect as a fresher?**
7. **What are the scopes in fields other than Data Science?**
8. **Will AI replace developers?**
9. **What should my 2-year plan be to complete Data Science learning?**
10. **How much effort is needed to become data science?**
11. **What should be my steps if I don't get a job?**
12. **How to avoid layoffs?**
13. **Is it ok to do frequent swiches during start of my experience**
14. **How to negotiate salary?**
15. **Startup or big organisation and service based or product based?**
16. **What should be my minimum salary after 3 years?**
17. **Which factors to consider while switching jobs or how to handle multiple offers?**