

ML Engineer Roadmap 2024

High demand | Highest paying job 150k-400k | Extreme dedication, Consistency | top futuristic jobs | International job (not only for BD) | for everyone(novice to expert)(entry-senior) | total 6 months (24 weeks), ext to 1year | Structure: Topics, tools, resources (+exercise) | use ChatGPT | be safe from scams

☐ **SWE skills 8 weeks**

- CS fundamentals
- Math/Statistics ¹
- Programming language
- DSA
- SQL
- System design

☐ **Soft skills**

- Communication
- Leadership skills
- Networking

☐ **ML skills 16w**

- Data Cleaning & Preprocessing
- Machine Learning
- Deep Learning
- ML System design
- Specialization/research: MLOps, CV, NLP, GenAI 22-24

☐ **Job**

- Apply, Interview, Offer, Join

☐ **Week 0: Do you really want to be an ML Engineer?**

☐ **Week#1: CS fundamentals**

- Topics
 - Operating System
 - Hardware: CPU, RAM, SSD, etc
 - Bit/bytes

¹ prepared by Abdullah Al Mamun, Machine Learning Engineer, Meta. California, USA.

- Internet: DNS, HTTP, and HTTPS
- Resource
 - Khan Academy

□ Week#2: Math/Statistics

- Topics:
 - Linear Algebra
 - Calculus
 - Probability theory
- Resource
 - Khan Academy

□ Week 3-4: Programming language

- Language: Python and C++ or Java
- Topics
 - Variables
 - Lists, Dictionaries, Tuples, Sets
 - Conditional statements: If else
 - Loop: for loop/while
 - Functions
 - File read/write
 - Exception handling
- Resources:
 - My course on Python ১ ঘণ্টায় পাইথন শিখুন:
<https://youtu.be/E1eKW6OiyiE?si=WPTzLm2VDJerLFJd>

□ Week 5: Data Structure and Algorithm (DSA)

- Topics
 - DS: Array/list, Hashmap, String, Stack/Q/Heap, Tree/Graph, LinkedList
 - Algorithm: Binary search, BFS/DFS, Sorting, two pointers, sliding window, topological sort, dynamic programming
- Resource
 - My Course on Python
 - Abdul Bari: https://www.youtube.com/@abdul_bari

☐ Week 6: SQL

- Topics
 - Basic database operations: CRUD, Join, Basic queries, Hive, noSQL
- Resource
 - w3 school

☐ Week 7-8: System design (only for level 4)

- Topics
 - Communication protocols, server models, storage, latency/throughput, caching, load balancer, hashing, database, rate limiting, HTTPS, API
- Resource
 - Book: System Design Interview – An Insider's Guide by Alex Xu
 - ebook: Grokking Modern System Design Interview by educative io
 - SystemsExpert by AlgoExpert

☐ Week 9: Communication

- Topics
- Resource

☐ Week 10: Leadership skills

- Topics
- Resource
 - Amazon leadership principles:
<https://www.amazon.jobs/content/en/our-workplace/leadership-principles>

☐ Week 11: Networking

- Topics
 - Resume, LinkedIn, personal referral
- Resource

- My tutorials:
<https://youtube.com/playlist?list=PLmsdj6pyguI5K48IGw4Wm4ANm4-wTatV0&si=2QvksfE6wErc7M1m>

□ Week 12: Data Cleaning & Preprocessing

- Topics
- Resource
 - My tutorial:
<https://youtube.com/playlist?list=PLmsdj6pyguI4SI2krlzldj5UUHMSwudSJ&si=coQUy5ERztTqkmWR>

□ Week 13-15: Machine Learning

- Topics
 - Cost function, gradient descent, train-test split, model training, prediction, evaluation, Hyper parameter tuning, k-fold cross validation, Data sampling, Gradient descent, Bias variance, Overfit vs underfit
 - Performance metrics
 - ML models: linear regression, Logistic regression, Naive bayes, SVM, Random forest, K-Nearest Neighbors
 - Ensemble learning: Bagging
 - Boosting: Ada boost; XG boost
 - Regularizations: L1, L2, Lasso, ridge, elastic net
 - Clustering: PCA/tsne, K-means clustering
 - Feature engineering
- Resource
 - My Playlist:
<https://youtube.com/playlist?list=PLmsdj6pyguI4SI2krlzldj5UUHMSwudSJ&si=coQUy5ERztTqkmWR>
 - Book1: ML for absolute beginners by Oliver
 - Book2: Pattern Recognition and Machine Learning by Bishop
 - Online course: Intro ML by Andrew Ng

- Notebooks:
https://github.com/Anello92/Machine_Learning_Python/blob/main/machine-learning-algorithms-template.ipynb

□ Week 16-18: Deep Learning

- Topics
 - NN Neural Network
 - CNN Convolutional Neural Network
 - RNN Recurrent Neural Network
 - GAN Generative Adversarial Network
 - DBN Deep Belief Network
 - LSTM Long Short Term Memory Network
- Resource
 - Book: DL by Ian Goodfellow
 - Course: Intro to DL by Andrew Ng

□ Week 19-21: ML System design

- Topics
 - FB news feed ranking, ads ranking, YouTube/Netflix video recommendation, etc.
- Resource
 - eBook: ML system design by Educative io
 - Course: MLExpert by AlgoExpert

□ Week 22-24: Specialization/research: MLOps, CV, NLP, GenAI 22-24

- Resource
 - Top conferences: NeurIPS, ICLR, ICML, AAAI, CVPR
 - Company blog posts: FAIR by Meta, Google Brain, OpenAI, OpenCV, MIT

My story

1. In 2017: joined QU, started working on ML
 - a. Sleep stage classification
2. In 2018-2021: 3.5 years: joined ML DAG lab as a PhD student
 - a. Cancer classification, prediction.....

3. In 2022: interviewed at FAANG as MLE