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) | Only one resource best teacher (ChatGPT) | scams

- ☐ **SWE skills 8 weeks**
    - CS fundamentals
    - Math/Statistics
    - 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
    - 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 ঘন্টায় পাইথন শিখুন"

☐ 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

☐ 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

☐ Week 12: Data Cleaning & Preprocessing

- Topics
- Resource
  - My tutorial

☐ 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
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  - 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 MLDAG lab as a PhD student
    a. Cancer classification, prediction.....
3. In 2022: interviewed at FAANG as MLE