

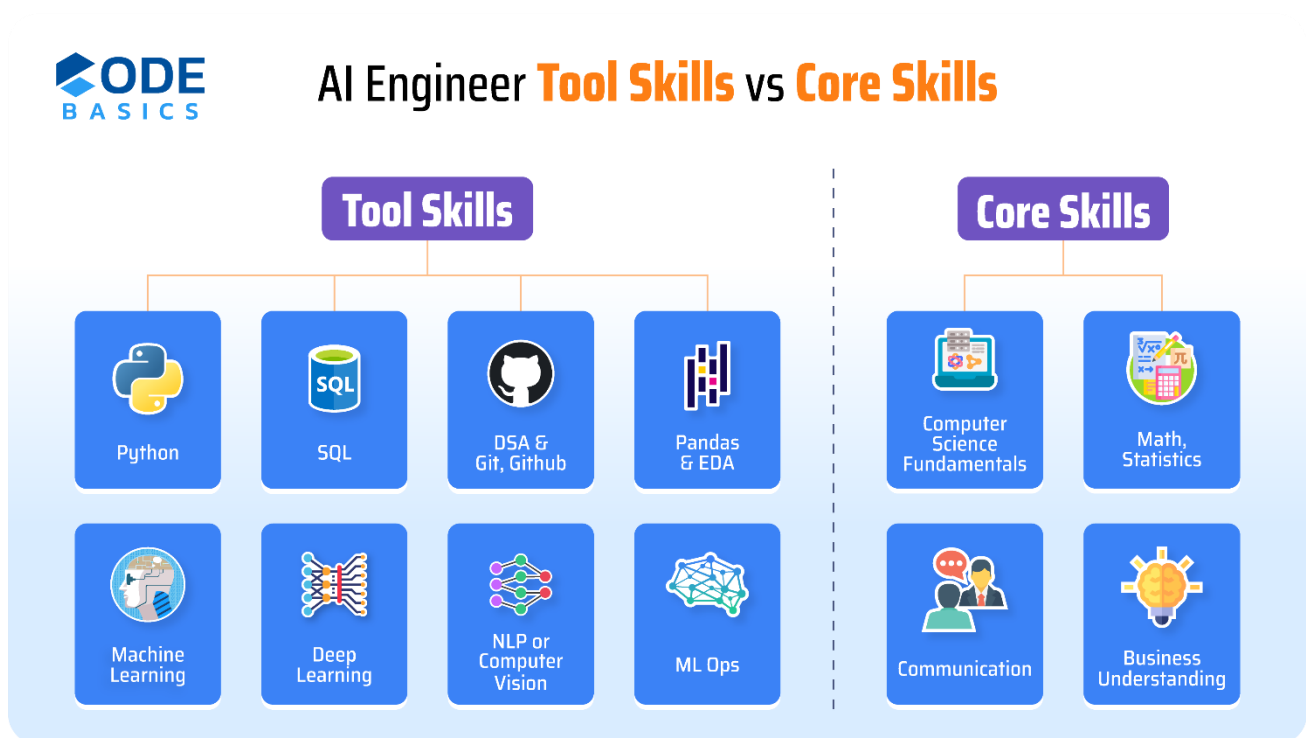
AI Engineer Roadmap for Beginners

Following is the roadmap to learning **AI Engineer** (also known as **ML Engineer**) skills for a total beginner. It includes FREE learning resources for technical skills (or tool skills) and soft (or core) skills 🏃

Prerequisites: You must have skills or interests to build skills in Coding and Math. Without these two you cannot become an AI engineer.

Total Duration: **8 Months** (4 hours of study Every Day)

Also, **AI Engineer = Data Scientist + Software Engineer**



Week 0: Do Proper Research and protect yourself from SCAMS.

Unfortunately, a lot of systematic scams are happening in ed tech, especially in the data field where aspirants are provided with false promises like a 100% job guarantee or trapped into "Masterclasses" which are nothing but sales pitches to upsell their low-grade courses at exorbitant prices. You need to do complete research about the market and mentors before starting your journey. Providing you the links to a few posts that we have made in this regard which will support your research.

Even though these posts are **NOT** sufficient, do your additional research.

- <https://bit.ly/4at9Jaw>
- <https://bit.ly/477lOOs>
- <https://bit.ly/3GPD7dp>

Week 1 and 2: Computer Science Fundamentals

- **Topics**
 - Data representation: Bits and Bytes, Storing text and numbers, Binary number system.
 - Basics of computer networks, IP addresses, Internet routing protocol
 - UDP, TCP, HTTP, and The World Wide Web
 - Programming basics: variables, strings, and numbers, if condition, loops
 - Algorithm basics
- **Learning Resources**
 - Khan Academy course: <https://bit.ly/42DUXtW>
 - In the above course, only follow the first 4 sections (1) Digital Information (2) The Internet (3) Programming (4) Algorithms. Completing the remaining sections is optional. Do it if you have time and interest.

Week 3 and 4: Beginners Python

- **Topics**
 - Variables, Numbers, Strings
 - Lists, Dictionaries, Sets, Tuples
 - If condition, for loop
 - Functions, Lambda Functions
 - Modules (pip install)
 - Read, Write files
 - Exception handling
 - Classes, Objects
- **Learning Resources**
 - Track A (Free)
 - Python Tutorials (Codebasics) on YouTube (first 16 videos)
- <https://bit.ly/3X6CCC7>
 - Corey's Python Tutorials: <https://bit.ly/3uqUgaZ>
 - Codebasics python HINDI tutorials
- <https://bit.ly/3vmXrgw>

- Track B (Affordable Fees)
 - Python course: <https://codebasics.io/courses/python-for-beginner-and-intermediate-learners>
- **LinkedIn - Core Skill**
 - ☐ Create a professional-looking LinkedIn profile.
 - Have a clear profile picture and banner image.
 - Add tags such as: Open to work etc.
 - ☐ Use this LinkedIn Checklist to create a profile: [Click here.](#)
- **Assignment**
 - ☐ Track A: Finish all these exercises: <https://bit.ly/3k1mof5>
 - ☐ Track B: Finish exercises and quizzes for relevant topics
 - ☐ Create a professional-looking LinkedIn profile.

Week 5 and 6: Data Structures and Algorithms in Python

- **Topics**
 - Data structures basics, Big O notation
 - Data structures: Arrays, Linked List, Hash Table, Stack, Queue
 - Data structures: Tree, Graph
 - Algorithms: Binary search, Bubble sort, quick sort, merge sort
 - Recursion
- **Learning Resources**
 - DSA YouTube Playlist: <https://bit.ly/3uiW2Lf>
- **Motivation**
 - How Kaggle helped this person become ML engineer: <https://bit.ly/3RFVruy>
- **Assignment**
 - ☐ Finish all these exercises in this same playlist: <https://bit.ly/3uiW2Lf>

Week 7, 8: Advance Python

- **Topics**

- Inheritance, Generators, Iterators
- List Comprehensions, Decorators
- Multithreading, Multiprocessing

- **Learning Resources**

- Python Tutorials (Codebasics) on YouTube (17th to 27th video)
- <https://bit.ly/3X6CCC7>

- **Assignment**

- ☐ Finish all these exercises in this same playlist: <https://bit.ly/3X6CCC7>

- **Core/Soft Skills**

- **Linkedin**

- Start following prominent AI influencers.
 - Daliana Liu: <https://www.linkedin.com/in/dalianaliu/>
 - Nitin Aggarwal: <https://www.linkedin.com/in/ntnaggarwal/>
 - Steve Nouri: <https://www.linkedin.com/in/stevenouri/>
 - Dhaval Patel: <https://www.linkedin.com/in/dhavalays/>
- Increase engagement.
 - Start commenting meaningfully on AI and career-related posts.
 - Helps network with others working in the industry build connections.
 - Learning and brainstorming opportunity.
- Remember ***online presence is a new form of resume***

- **Business Fundamentals - Soft Skill**

- Learn business concepts from ThinkSchool and other YT Case Studies
- Example: How Amul beat competition: <https://youtu.be/nnwqtZiYMxQ>

- **Discord**

- Start asking questions and get help from the community. This post shows how to ask questions the right way: <https://bit.ly/3I70Ebl>
- Join codebasics discord server: <https://discord.gg/r42Kbuk>

- **Assignment**

- ☐ Write meaningful comments on at least **10 AI related LinkedIn posts**
- ☐ Note down your key learnings from **3 case studies** on ThinkSchool and share them with your friend.

Week 9: Version Control (Git, Github)

- **Topics**

- What is the version control system? What is Git and GitHub?
- Basic commands: add, commit, push.
- Branches, reverting change, HEAD, Diff and Merge
- Pull requests.

- **Learning Resources**

- YT playlist (codebasics): <https://bit.ly/3SECQQ7>
- YT playlist (Corey): <https://bit.ly/3T0Yrmb>

- **Motivation**

- Mechanical to Deep Learning Engineer: <https://bit.ly/48IX9aR>

- **Core/Soft Skills**

- Presentation skills
 - Death by PowerPoint: <https://youtu.be/lwpi1Lm6dFo>

Week 10, 11: SQL

- **Topics**

- Basics of relational databases.
- Basic Queries: SELECT, WHERE LIKE, DISTINCT, BETWEEN, GROUP BY, ORDER BY
- Advanced Queries: CTE, Subqueries, Window Functions
- Joins: Left, Right, Inner, Full
- Database creation, indexes, stored procedures.

- **Learning Resources**

- Track A
 - Khan academy SQL course: <https://bit.ly/3WFku20>
 - <https://www.w3schools.com/sql/>
 - <https://sqlbolt.com/>
 - YT video: <https://youtu.be/Rm0xH2Vpfi0?si=6ZLK8A5LvGqN4NmT>
- Track B
 - SQL course for data professionals: <https://codebasics.io/courses/sql-beginner-to-advanced-for-data-professionals>

- **Assignment**

- ☐ Participate in SQL resume project challenge on <https://codebasics.io/>
 - Link: <https://codebasics.io/challenge/codebasics-resume-project-challenge/7>
 - These challenges help you improve technical skills, soft skills and business understanding.
- ☐ Make a LinkedIn post with a submission of your resume project challenge
Sample post: <https://bit.ly/48Bg5mB>

Week 12: Numpy, Pandas, Data Visualization

- **Tech Skills**

- **Numpy**
 - numpy YouTube playlist: <https://bit.ly/3GTppa8>
- **Pandas, Matplotlib, Seaborn**
 - Go through chapter 3 in this course (entire chapter is free):
<https://codebasics.io/courses/math-and-statistics-for-data-science>

Week 13, 14, 15, 16: Math & Statistics for AI

- **Math and Statistics for AI**

- Topics to Learn
 - Basics: Descriptive vs inferential statistics, continuous vs discrete data, nominal vs ordinal data
 - Linear Algebra: Vectors, Metrics, Eigenvalues and Eigenvectors
 - Calculus: Basics of integral and differential calculus

- Basic plots: Histograms, pie charts, bar charts, scatter plot etc.
 - Measures of central tendency: mean, median, mode
 - Measures of dispersion: variance, standard deviation
 - Probability basics
 - Distributions: Normal distribution
 - Correlation and covariance
 - Central limit theorem
 - Hypothesis testing: p value, confidence interval, type 1 vs type 2 error, Z test
- Learning Resources
 - Track A (Free)
 - Learn the above topics from this excellent Khan academy course on statistics and probability.
 - Course link: <https://www.khanacademy.org/math/statistics-probability>
 - While doing khan academy course, when you have doubts, use statquest YouTube channel: <https://www.youtube.com/@statquest>
 - Use this free YouTube playlist: <https://bit.ly/3QrSXis>
 - Another great youtube channel: <https://www.youtube.com/@3blue1brown>
 - Track B (Affordable Fees)
 - Learn the key concepts of Math and Statistics that lay the foundations for a strong data science career: <https://codebasics.io/courses/math-and-statistics-for-data-science>
- **Assignment**
 - ☐ Finish all exercises in this playlist: <https://bit.ly/3QrSXis>
 - ☐ Finish all exercises in Khan academy course.
 - ☐ Track B: Finish exercises and quizzes for relevant topics.

Week 17: Exploratory Data Analysis (EDA) 🧑

- **Exploratory Data Analysis (EDA)**

- <https://www.kaggle.com/code?searchQuery=exploratory+data+analysis>
- Use the above link to search for exploratory data analysis notebooks.
- Practice EDA using at least 3 datasets.
 - e.g. <https://www.kaggle.com/datasets/rishabhkarn/ipl-auction-2023/data>

- **Assignment**

- ☐ Perform EDA (Exploratory data analysis on **at least 2 additional datasets** on Kaggle)

Week 18, 19, 20, 21: Machine Learning 🛠️

- **Machine Learning: Preprocessing**

- Handling NA values, outlier treatment, data normalization
- One hot encoding, label encoding
- Feature engineering
- Train test split
- Cross validation

- **Machine Learning: Model Building**

- Types of ML: Supervised, Unsupervised
- Supervised: Regression vs Classification
- Linear models
 - Linear regression, logistic regression
 - Gradient descent
- Nonlinear models (tree-based models)
 - Decision tree
 - Random forest
 - XGBoost
- Model evaluation
 - Regression: Mean Squared Error, Mean Absolute Error, MAPE
 - Classification: Accuracy, Precision-Recall, F1 Score, ROC Curve, Confusion matrix
- Hyperparameter tuning: GridSearchCV, RandomSearchCV

- Unsupervised: K means, Hierarchical clustering, Dimensionality reduction (PCA)
- **Learning Resources**
 - Track A
 - YouTube playlist (more than 2 million views): <https://bit.ly/3io5qqX>
 - First 21 videos
 - Feature engineering playlist: <https://bit.ly/3lFa3Yf>
 - Track B (Affordable Fees)
 - Master Machine Learning for Data Science & AI: This course takes you from beginner to advanced levels, providing deep intuition on algorithms, engaging cinematic experiences, end-to-end projects, and hands-on coding practice: <https://codebasics.io/courses/machine-learning-for-data-science-beginners-to-advanced>
- **Core/Soft Skills**
 - **Project Management**
 - Scrum: <https://scrumtrainingseries.com/>
 - Kanban: <https://youtu.be/jf0tlbt9lx0>
 - Tools: JIRA, Notion
- **Assignment**
 - ☐ Complete all exercises in ML playlist: <https://bit.ly/3io5qqX>
 - ☐ Work on **2 Kaggle ML notebooks**
 - ☐ Write **2 LinkedIn posts** on whatever you have learnt in ML
 - ☐ Discord: Help people with **at least 10 answers**
 - ☐ Track B: Finish exercises and quizzes for relevant topics

Week 22: ML Ops

- **Topics**
 - What is API? FastAPI for Python server development
 - DevOps Fundamentals: CI/CD pipelines, containerization (Docker, Kubernetes)
 - Familiarity with at least one cloud platform (AWS, Azure etc.)
- Learning Resources
 - Track A:
 - FastAPI tutorial: <https://bit.ly/497p6Ex>
 - Docker tutorial: <https://bit.ly/3uCNpeE>

- Track B (Affordable Fees):
 - Included in the above Master Machine Learning for Data Science & AI

Week 23, 24: Machine Learning Projects with Deployment

- You need to finish **two** end to end ML projects. One on **Regression**, the other on **Classification**
- Regression Project: Bangalore property price prediction
 - YouTube playlist link: <https://bit.ly/3ivycWr>
 - Project covers following
 - Data cleaning
 - Feature engineering
 - Model building and hyper parameter tuning
 - Write flask server as a web backend
 - Building website for price prediction
 - Deployment to AWS
- Classification Project: Sports celebrity image classification
 - YouTube playlist link: <https://bit.ly/3ioaMSU>
 - Project covers following
 - Data collection and data cleaning
 - Feature engineering and model training
 - Flask server as a web backend
 - Building website and deployment
- **ATS Resume Preparation**
 - Resumes are dying but not dead yet. Focus more on online presence.
 - Here is the resume tips video along with some templates you can use for your data analyst resume: <https://www.youtube.com/watch?v=buQSI8NLOMw>
 - Use this checklist to ensure you have the right ATS Resume: [Check here.](#)
- **Portfolio Building Resources:**

You need a portfolio website in 2024. You can build your portfolio by using these free resources.

 - [GitHub](#)
 - Upload your projects with code on github and using github.io create a portfolio website
 - Sample portfolio website: <http://rajag0pal.github.io/>

- [Linktree](#)
 - Helpful to add multiple links in one page.
- **Assignment**
 - In above two projects make following changes
 - ☐ Use **FastAPI** instead of **flask**. FastAPI tutorial: <https://youtu.be/Wr1JjhTt1Xg>
 - ☐ **Regression project**: Instead of property prediction, take any other project of your interest from Kaggle for regression
 - ☐ **Classification project**: Instead of sports celebrity classification, take any other project of your interest from Kaggle for classification and build end to end solution along with **deployment to AWS or Azure**
 - ☐ Add a link of your projects in your resume and LinkedIn.

(Tag Codebasics, Dhaval Patel and Hemanand Vadivel with the hashtag #dsroadmap24 so we can engage to increase your visibility)

Week 25, 26, 27: Deep Learning 🤖

- **Topics**
 - What is a neural network? Forward propagation, back propagation
 - Building multilayer perceptron
 - Special neural network architectures
 - Convolutional neural network (CNN)
 - Sequence models: RNN, LSTM
- **Learning Resources**
 - Deep Learning playlist (tensorflow): <https://bit.ly/3vOZ3zV>
 - Deep learning playlist (pytorch): <https://bit.ly/3TzDbWp>
 - End to end potato disease classification project: <https://bit.ly/3QzkVJi>
- **Assignment**
 - ☐ Instead of potato plant images use tomato plant images or some other image classification dataset.
 - ☐ Deploy to Azure instead of GCP.
 - ☐ Create a presentation as if you are presenting to stakeholders and upload video presentation on LinkedIn.

Week 28, 29, 30: NLP or Computer Vision & GenAI

- Many AI engineers choose a specialized track which is either NLP or Computer vision. You don't need to learn both.
- **Natural Language Processing (NLP)**
 - Topics
 - Regex
 - Text presentation: Count vectorizer, TF-IDF, BOW, Word2Vec, Embeddings
 - Text classification: Naïve Bayes
 - Fundamentals of Spacy & NLTP library
 - One end to end project
 - Learning Resources
 - NLP YouTube playlist: <https://bit.ly/3XnjfEZ>
- **Computer Vision (CV)**
 - Topics
 - Basic image processing techniques: Filtering, Edge Detection, Image Scaling, Rotation
 - Library to use: OpenCV
 - Convolutional Neural Networks (CNN) – Already covered in deep learning.
 - Data preprocessing, augmentation – Already covered in deep learning.
- **Assignment**
 - ◻ NLP Track: Complete exercises in this playlist: <https://bit.ly/3XnjfEZ>

Week 31, 32: LLM & Langchain

- Topics
 - What is LLM, Vector database, Embeddings?
 - RAG (Retrieval Augmented Generation)
 - Langchain framework
- Learning Resources
 - Langchain, LLM playlist: <https://bit.ly/3RYpxuw>

Week 33 onwards.... 😊😊😊

- More projects 🧠
- Online brand building through LinkedIn, Kaggle, Discord, Opensource contribution 👥
- Job application and Success 🚀

Tips of effective learning 🔥

- **Spend less time in consuming information, more time in**
 - Digesting
 - Implementing
 - Sharing
- **Group learning**
 - Use **partner-and-group-finder** channel on codebasics discord server for group study and hold each other accountable for the progress of your study plan. Here is the discord server link: <https://discord.gg/r42Kbuk>