Artificial Intelligence

**Github Repository:** <https://github.com/Anikcb/jupyter_Notebook_Practice>

Mathematics

Descriptive statistics, Inferential

Statistics

Supervised learning, Unsupervised learning, Feature engineering

Data cleaning, Data visualization

Python, Pandas, Numpy

Linear algebra, Calculus

Fig: Path to Artificial Intelligence

Artificial Intelligence

Deep learning

Machine Learning

Data Science

Programming

Statistics

Learn Mathematics

**Linear algebra:** Focus on vectors, matrices, and operations like dot product.

**Calculus:** Learn about derivatives and integrals, especially for understanding optimization algorithms.

**Derivatives and Integrals:**

* **Gradient Descent Optimization:**
  + Understanding how derivatives guide optimization algorithms in AI, with a focus on gradient descent.
* **Back propagation in Neural Networks:**
  + Exploring the role of derivatives in back propagation, a key algorithm for training neural networks.
* **Cost Functions in Machine Learning:**
  + Examining the definition, analysis, and minimization of cost functions using derivatives.
* **Mathematical Foundations of AI Models:**
  + Discussing the calculus principles underlying AI models, emphasizing derivatives and integrals.
* **Probability and Statistics in AI:**
  + Integrals and their applications in probability theory and statistics within the context of machine learning.

**Important Links:**

* <https://towardsdatascience.com/a-quick-introduction-to-derivatives-for-machine-learning-people-3cd913c5cf33>
* <https://asharibali.medium.com/deciphering-the-code-the-intricate-math-powering-ais-brain-68ae5107a4b9>
* <https://medium.com/@Coursesteach/machine-learning-part-10-1173d7fc1338>
* <https://www.youtube.com/watch?v=UXWi8uFfQZY&ab_channel=GiseleTannous>
* <https://chelseatroy.com/2017/02/23/machine-learning-intuition-using-derivatives-to-minimize-the-cost-function/>
* <https://medium.com/@Noodle_LLC/the-crucial-role-of-mathematics-in-ai-development-dd31d4d6e55c>
* <https://thedatascientist.com/integration-and-differentiation/>

Study Statistics (At first watch the youtube videos)

**Descriptive statistics:** Learn measures like mean, median, mode, and standard deviation.

**Inferential statistics:** Understand hypothesis testing, confidence intervals, and regression.

**Probability and statistics:** Understand concepts like probability distributions, mean, median, standard deviation.

**Important Links:**

* <https://medium.com/analytics-vidhya/statistics-mean-median-mode-variance-standard-deviation-47fab926465a>
* <https://www.youtube.com/watch?v=X48cZ6DGaSw&ab_channel=KrishNaikHindi>
* <https://www.youtube.com/watch?v=l_YszNIJfFA>
* <https://www.youtube.com/watch?v=OES4fdLEHkw&ab_channel=KrishNaikHindi>
* <https://www.youtube.com/watch?v=XJVTvIz9Tps>
* <https://www.youtube.com/watch?v=2tuBREK_mgE>
* <https://www.youtube.com/watch?v=bcv61eKpYto>
* <https://www.youtube.com/watch?v=layunsQRmYk>

**PDF & Slides:**

* <https://github.com/Anikcb/Learning-AI/tree/main/Statistics>

Understand the Basics of Programming

**Learn a programming language:** Start with Python due to its popularity in AI and data science.

**Basics of programming:** Understand variables, data types, loops, and functions.

**Python Language:**

* **Online Free Course**
  + <https://www.kaggle.com/learn/python>
  + <https://courses.cognitiveclass.ai/courses/course-v1:Cognitiveclass+PY0101EN+v2/course/>
* **Youtube** (If you want to explore more)
  + <https://www.youtube.com/watch?v=rfscVS0vtbw&ab_channel=freeCodeCamp.orgfreeCodeCamp.orgVerified>

**Pandas:**

* **Online Free Course**
* <https://www.kaggle.com/learn/pandas>
* **Youtube** (For better Understanding)
* <https://youtube.com/playlist?list=PLeo1K3hjS3uuASpe-1LjfG5f14Bnozjwy&si=XkyCD3828emVcQp4>
* **Github** (Practice Notes)
  + <https://github.com/Anikcb/jupyter_Notebook_Practice/tree/main/Pandas>

**Data Visualization:**

* **Online Course:**
  + <https://cognitiveclass.ai/courses/data-visualization-with-python>
* **Youtube** (If you want to explore more)
  + <https://youtube.com/playlist?list=PLfP3JxW-T70Gf4iJXPb0Yw5_-tDRCD6LB&si=i6Mjz3HhohahbgCL>

Explore Data Science (Basic Programming)

**Data cleaning:** Learn techniques to handle missing data and outliers.

**Data visualization:** Use libraries like Matplotlib or Seaborn to create plots for data exploration.

Machine Learning

**Supervised learning:** Understand the basics of regression and classification.

**Unsupervised learning:** Explore clustering and dimensionality reduction techniques.

**Ensemble methods:** Learn about bagging and boosting techniques.

**Dimensionality reduction:** Understand methods like Principal Component Analysis (PCA).

**Feature engineering:** Explore techniques to create new features for better model performance.

**Basics of neural networks:** Understand the structure, activation functions, and the concept of weights and biases.

**Backpropagation:** Learn the algorithm used for training neural networks.

**Courses:**

* AI-Quest Online Course
* <https://www.coursera.org/learn/python-machine-learning>
* <https://www.coursera.org/learn/machine-learning-course>

**YouTube:** (If you want to explore more)

* <https://youtube.com/playlist?list=PLPbgcxheSpE0aBsefANDYe2X_-tyJbBMr&si=0glN-unZGA1euX-r>

**Topics:**

* [Linear Regression](https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-linear-regression/)
* [Logistic Regression](https://www.analyticsvidhya.com/blog/2021/08/conceptual-understanding-of-logistic-regression-for-data-science-beginners/) (Class 12)
* [Feature Transformation (Scaling)](https://www.kaggle.com/code/aimack/complete-guide-to-feature-scaling)
  + [Normalization](https://www.kdnuggets.com/2020/04/data-transformation-standardization-normalization.html)
  + [Standardization](https://www.kdnuggets.com/2020/04/data-transformation-standardization-normalization.html)
  + [Roust Scaler](https://medium.com/@hhuseyincosgun/which-data-scaling-technique-should-i-use-a1615292061e)
  + [Max Absolute Scaler](https://nightlies.apache.org/flink/flink-ml-docs-master/docs/operators/feature/maxabsscaler/)
* [Unsupervised Learning](https://cloud.google.com/discover/what-is-unsupervised-learning)
  + [K-means Clustering](https://www.analyticsvidhya.com/blog/2019/08/comprehensive-guide-k-means-clustering/)
  + [K-NN Algorithm](https://medium.com/swlh/k-nearest-neighbor-ca2593d7a3c4)
* Feature Engineering
  + [Encoding](https://medium.com/anolytics/all-you-need-to-know-about-encoding-techniques-b3a0af68338b)
  + [Fill Null Values](https://medium.com/@sagnikkundu25/the-pandas-fillna-and-dropna-methods-1fecad724aa9)
  + [Decision Tree](https://youtu.be/coOTEc-0OGw?si=WwYO7VkagN8bLCAy)
* [Decision](https://www.youtube.com/watch?v=coOTEc-0OGw) [Tree](https://medium.com/@MrBam44/decision-trees-91f61a42c724) (Class 9)
* [Gradient Descent](https://www.analyticsvidhya.com/blog/2020/10/how-does-the-gradient-descent-algorithm-work-in-machine-learning/) (Class 11)
* [R-Squared Error](https://medium.com/@erika.dauria/looking-at-r-squared-721252709098)
* Overfitting and Underfitting (Class 13)
  + [Feature Importance](https://medium.com/swlh/feature-importance-hows-and-why-s-3678ede1e58f)
    - [Extra Trees Classifier](https://towardsdatascience.com/what-when-how-extratrees-classifier-c939f905851c)
  + [Principal Component Analysis](https://www.analyticsvidhya.com/blog/2022/07/principal-component-analysis-beginner-friendly/)
  + [Cross Validation](https://www.analyticsvidhya.com/blog/2021/05/4-ways-to-evaluate-your-machine-learning-model-cross-validation-techniques-with-python-code/)
  + [imblearn Library](https://medium.com/thecyphy/handling-imbalanced-datasets-with-imblearn-library-df5e58b968f4)
* Text Preprocessing (Class 15)
  + [Stemming](https://medium.com/@tusharsri/nlp-a-quick-guide-to-stemming-60f1ca5db49e)
  + [Lemmat](https://towardsdatascience.com/text-preprocessing-with-nltk-9de5de891658)[ization](https://medium.com/@tusharsri/nlp-a-quick-guide-to-stemming-60f1ca5db49e)
  + [Vectorization](https://heartbeat.comet.ml/vectorization-in-machine-learning-2e3bdce7dbe)
  + [Tokenization](https://neptune.ai/blog/tokenization-in-nlp)
* [Naive Bayes](https://www.analyticsvidhya.com/blog/2017/09/naive-bayes-explained/) (Class 16)
* [Random](https://builtin.com/data-science/random-forest-algorithm) [Forest](https://medium.com/@mrmaster907/introduction-random-forest-classification-by-example-6983d95c7b91) (Class 17)
* [Pre & Post Pruning in decision tree](https://medium.com/analytics-vidhya/post-pruning-and-pre-pruning-in-decision-tree-561f3df73e65) (Class 17)
* [Ensemble Learning](https://medium.com/ml-research-lab/ensemble-learning-the-heart-of-machine-learning-b4f59a5f9777) (Class 17)
* [Hyperparameter Tuning](https://www.analyticsvidhya.com/blog/2022/11/hyperparameter-tuning-using-randomized-search/) (Class 17)
* [Support Vec](https://medium.com/low-code-for-advanced-data-science/support-vector-machines-svm-an-intuitive-explanation-b084d6238106)[tor Machine](https://www.analyticsvidhya.com/blog/2021/10/support-vector-machinessvm-a-complete-guide-for-beginners/) (Class 18)
* [Confusion Matrix](https://www.coursera.org/learn/python-machine-learning/lecture/90kLk/confusion-matrices-basic-evaluation-metrics)