Month 2: Classical Machine Learning

Overview & Schedule (Weeks 5-8)

Week 5: Supervised Learning: Regression

Day	Topic	Theory (Brief)	Practice (Brief)	Time
Day 1	Linear Regression Concept	Watch: StatQuest's Linear Regression, Clearly Explained (27 min). Concept: Fi...	Python: Implement Simple Linear Regression using `scikit-learn` on generated ...	2h
Day 2	Cost Functions & Gradient Descent	Watch: StatQuest's Gradient Descent (23 min). Concept: How the model finds th...	Viz: Plot the Cost Function (MSE) for different slope values `m` on your dumm...	2h
Day 3	Multivariate Regression	Watch: StatQuest's Multiple Linear Regression (20 min). Concept: Hyperplanes,...	Project: Predict Housing Prices (Kaggle). Use `LinearRegression()` with 3+ fe...	2h

Week 6: Supervised Learning: Classification

Day	Topic	Theory (Brief)	Practice (Brief)	Time
Day 1	Logistic Regression	Watch: StatQuest's Logistic Regression (8 min). Concept: Predicting probabili...	Python: Load the Iris dataset. Use `LogisticRegression` to classify 'Setosa' ...	2h
Day 2	Metrics (Precision, Recall, F1)	Read: Accuracy, Precision, Recall or F1? (10 min). Concept: Why accuracy fail...	Python: Calculate Accuracy, Precision, and Recall manually for your Iris mode...	2h
Day 3	KNN & SVM	Watch: StatQuest's K-Nearest Neighbors (10 min) and SVM (20 min).	Compare: Train both KNN and Logistic Regression on the same dataset. Compare ...	2h

Week 7: Trees & Ensembles

Day	Topic	Theory (Brief)	Practice (Brief)	Time
Day 1	Decision Trees	Watch: StatQuest's Decision Trees (18 min). Concept: Gini Impurity, informati...	Python: Train a `DecisionTreeClassifier`. Use `plot_tree` to visualize the ac...	2h
Day 2	Random Forests	Watch: StatQuest's Random Forests Part 1 (14 min). Concept: Bagging (Bootstra...	Python: Train `RandomForestClassifier` on the 'Breast Cancer' dataset. Compar...	2h
Day 3	Project: Predict Customer Churn	Review: Telco Customer Churn Dataset. Read top notebook execution.	Action: Build an end-to-end generic pipeline: cleaning -> encoding (categoric...	3h

Week 8: Unsupervised Learning

Day	Topic	Theory (Brief)	Practice (Brief)	Time
Day 1	Clustering (K-Means)	Watch: StatQuest's K-Means Clustering (9 min). Concept: Centroids, Euclidean ...	Python: Use K-Means on 'Mall Customers' dataset. Plot 'Inertia' vs 'K' (Elbow...	2h
Day 2	Dimensionality Reduction (PCA)	Watch: StatQuest's PCA Main Ideas (5 min). Concept: Projecting data onto axes...	Python: Apply PCA to MNIST (784 dimensions -> 2 dimensions). Scatterplot the ...	2h
Day 3	Month 2 Capstone	Synthesize: Review Regression, Classification, and Clustering. Choose one dom...	Mini-Project: Take a raw dataset (e.g. 'Wine Quality'). Perform EDA, then try...	3h