



AI/ML Project Lifecycle

TAKEAWAYS

10 Stages of AI Project Lifecycle

- 1** A typical ML project goes through 10 different stages starting from requirement gathering to monitoring/looping feedback.
- 2** Think about the pizza making process to recollect different stages of a typical AI/ML project.

Requirements and Scope of Work (SOW)

- 1** A SOW document is a mix of business requirement and the technology being used. This acts as a reference point for all stakeholders involved.
- 2** Project estimation needs to be done with a consideration that in the initial phase the requirements are vague, and the timeline estimate typically gets better as the time passes.
- 3** JIRA is a popular software used in the industry to manage AI/ML projects.
- 4** Other popular tools used for project management are confluence, Notion, Asana, Excel etc.

Data Collection

- 1** Data collection for an AI/ML project, typically happens from the data collected inside organization.
- 2** In some cases, companies do buy additional data from vendors outside the organization.
- 3** Data can be extracted from website using python library like BeautifulSoup or a readymade software like BrightData.

Data Preparation & Exploratory Data Analysis

- 1** In the data preparation stage following processes are typically done - Cleaning and transforming raw data into a format that can be analyzed, involving tasks like handling missing values, encoding categorical variables, and normalizing or scaling features.
- 2** EDA is performed to analyze the quality and characteristics of data with respect to the requirement of the model.
- 3** In Jupyter notebook you can run a python code to quick analysis and create visualizations.
- 4** Apache spark takes care of work distribution of computing complex calculations to different computing nodes on cloud and aggregates the final answer. As an end user, one would feel that every calculation is performed in the local computer.

Feature Engineering

- 1 Feature engineering is way to help the machine learning model with additional features derived from the given data so that it can make better predictions.

Model Selection & Training

- 1** Model selection is based on the use case for a classification task.
- 2** Naive Bayes is used for small datasets with text data.
- 3** Decision tree is used for decision analysis problems like salary prediction which is based on multiple decisions.
- 4** For complex datasets, Random Forest is preferred.
- 5** XG Boost is best suited for problems where predictive accuracy is of high importance.
- 6** The test dataset is tested for its predictive accuracy by comparing the values it predicted with the true values.

Model Evaluation Metrics (Accuracy, Prediction, Recall & F1 Score)

- 1 Model evaluation metrics are Accuracy, Precision, Recall and F1 score.
- 2 Each of these metrics are used for evaluating a model based on the use case.

Model Evaluation Metrics: When to use which Metric?

- 1 Email Spam Classification** is a use case where precision is prioritized than recall. Here the aim is to make right predictions even if there are a smaller number of attempts to predict because the impact of classifying a legitimate email as spam has higher negative impact than the impact of missing a spam email.
- 2 Disease Detection** is a use case where recall is prioritized than precision. Here the focus is to not miss out on any possible disease prediction even though some of the predictions are wrong because the impact of missing a patient with disease has higher negative impact than the impact of a diagnosing someone with a disease who do not have it which can be clarified in subsequent tests.

Model Fine Tuning

- 1** Hyperparameter tuning is a critical step to improve the performance of the model by figuring out the best parameters.
- 2** Grid Search CV is a part of in Scikit learn model which does the hyperparameter tuning.
- 3** Transfer learning is another technique used to improve the model performance faster by using a model which is already trained.

Model Deployment

- 1** The trained model need to be deployed in a server so that the model can be used by applications.
- 2** FastAPI, Flask, NodeJS are some servers in which the model can be deployed.
- 3** The end user application connects with the server to request or send data using API endpoints.
- 4** Any server or application using API service will provide API end points which the user can use to send or receive data.
- 5** AWS, Azure, Google Cloud are some of the leading providers to deploy the model.

Deployment & Monitoring Using ML Ops

- 1** AI engineers write their code initially in the development environment.
- 2** The model moves to a staging or testing area where necessary checks are performed before moving it to production environment.
- 3** Once the model is deployed in production monitoring is done to take feedback and improve the model.
- 4** The feedback is provided by combining feedback from both humans and algorithms.
- 5** A model is regularly updated with new datasets to avoid data drifts.