

Building Software Systems

Lecture 5.2

Introduction to MLaaS

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What is Machine Learning?

Machine Learning (ML) is a subset of artificial intelligence

- It refers to the ability to automatically learn and improve from experience without being explicitly programmed
- The system prepares itself to do the task, by “training” models on the provided data

Supervised Learning

- The model is trained on a labelled dataset, where each input is associated to a known output class or value
- Example: Providing sample Question-Answer pairs to a Chatbot to build an Intent Detection model

Unsupervised Learning

- Usually includes statistical techniques to group unlabelled data into “clusters” for further analysis
- Example: Identifying products which are more likely to be bought together by a customer

Reinforcement Learning

- Involves building an agent that performs actions in its environment and learns from the outcomes of these actions
- Example: Used in self-driving cars for defining a reward-based mechanism to cater to safety and traffic laws

Machine Learning as-a-Service (1/2)

Machine Learning as-a-Service (MLaaS) refer to ML techniques being offered as a service

- The services usually require other accompanying services, for instance, for storage and computation
- This is why, MLaaS solutions are often offered by public cloud platforms in a bundled fashion ...
- ... where the bundle includes the storage and computation elements on the cloud

The solution that you pick may be dependent on many factors

For example, are there existing production-grade solutions available for your ML requirements?

- Example 1: Basic Sentiment Analysis (involving the three classes – positive, negative, neutral)
- Example 2: Facial Recognition
- If so, you may pick an out-of-the-box solution to do the same for you
- For instance, IBM Watsonx can be used to perform Sentiment Analysis over text [\[1\]](#)
- Similarly, you can use Amazon Rekognition for your Facial Recognition needs [\[2\]](#)

Machine Learning as-a-Service (2/2)

In some cases, the task may be generic, but customisations may be required for your use case

- Example: Detecting custom objects in an image
- Example: Detecting Intents during conversations with a Unified Smart Home Device
- While you can get general object detection services out-of-the-box, you can customise them for specific cases [3]
- Similarly, custom intents may be added to a chatbot alongside the existing intents (e.g., to play music) [4]
- In this case, you are required to provide some training data – usually not enough to build a generic model ...
- ... – but enough to customise or fine-tune a model

Finally, there may be cases where your ML task is too specific or customised to your requirements

- In such cases, you need a platform where you can try out multiple ML pipelines
- This may include steps for data filtering and sanitisation (e.g., handling missing/incorrect data)
- It may also involve dimensionality reduction (i.e., transforming data to a smaller number of input parameters)
- You may also like to apply different techniques (such as SVM, Random Forest or CNN) to check their efficacy
- There are general-purpose ML services [5][6] which may be used for this purpose

Check out the Video Resources for the Lecture

https://drive.google.com/drive/folders/17JZL_bIbIjU_Ampv3mgeTu1eo5CBJaxu?usp=sharing

Check out the Video Recording of the Lecture

<https://www.youtube.com/watch?v=LP7w3VwOHDU>

References

- [1]** Sentiment Detection using the IBM watsonx.ai
<https://kapilrajyaguru.medium.com/sentiment-detection-using-the-ibm-watsonx-ai-53a88f5d795e>
- [2]** What is Amazon Rekognition?
<https://opensource.google/projects/tesseract>
- [3]** Domain-specific content detection – Azure AI Vision
<https://learn.microsoft.com/en-us/azure/ai-services/computer-vision/concept-detecting-domain-content>
- [4]** Design the Custom Intents for Your Skill - Alexa Skills Kit
<https://developer.amazon.com/en-US/docs/alexa/interaction-model-design/design-the-custom-intents-for-your-skill.html>
- [5]** IBM Watsonx
<https://www.ibm.com/watsonx>
- [6]** Vertex AI - Google Cloud
<https://cloud.google.com/vertex-ai?hl=en>