



CLOUD COMPUTING APPLICATIONS

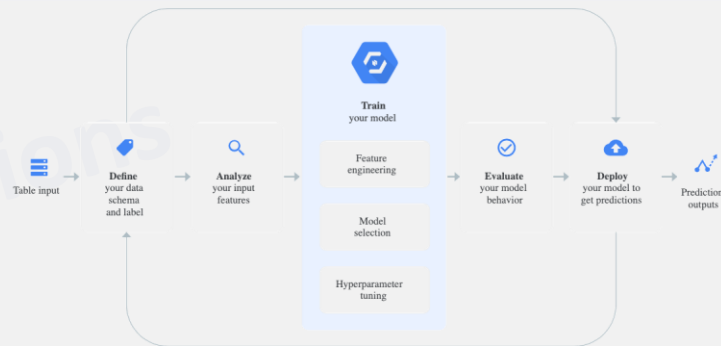
Cloud Machine Learning: Cloud Providers
Prof. Reza Farivar

Cloud Based Machine Learning

- ML frameworks on virtual machines
 - Pre-built images
 - Tensorflow
 - MXNet
 - Mahout
- Cloud Managed platforms

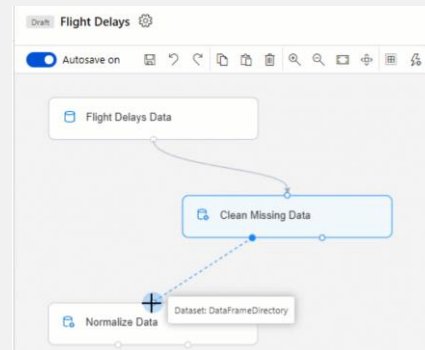
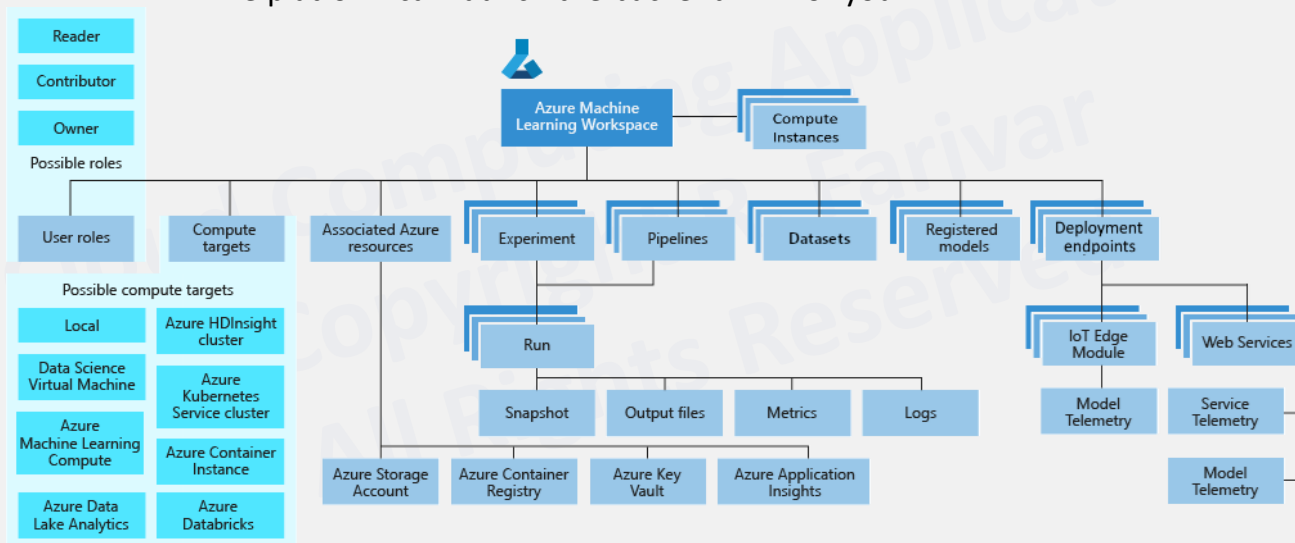
Google Cloud AI Platform

- AI Platform Notebooks
 - Managed notebooks
- AI Platform Training
 - Training with hyperparameter optimizations
- Continuous Evaluation
 - Model optimization
- AI Platform Predictions
 - Server model hosting deployment
- Kubeflow
 - Deployment of machine learning workflows on Kubernetes
- AutoML Tables



MS Azure Machine Learning

- Managed Platform
- Visual workflow design for no-code ML tasks: designer
- Managed Jupyter notebooks
 - The platform can launch the backend VM for you

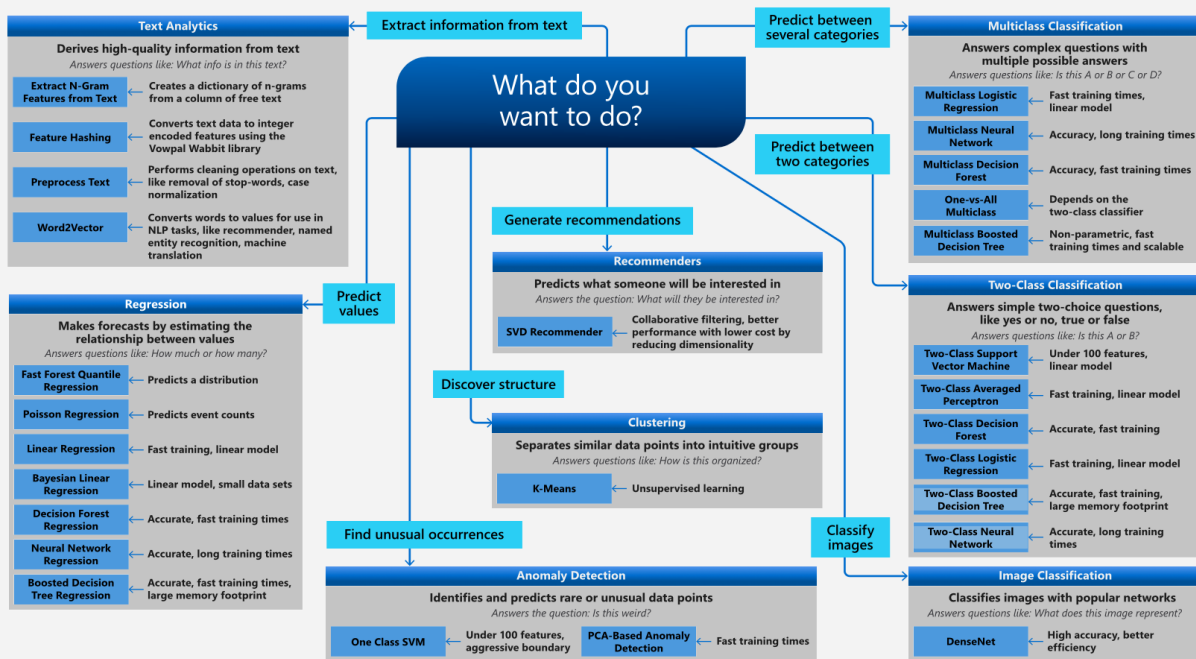


Azure Machine Learning Algorithm Cheat Sheet



Microsoft Azure Machine Learning Algorithm Cheat Sheet

This cheat sheet helps you choose the best machine learning algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the goal you want to achieve with your data.



Big Data Deployment on the Cloud

- Azure Databricks
 - Managed Spark Deployment
 - Spark MLlib
 - RDD based API
 - Older, will be deprecated
 - DataFrame based API
 - Also called Spark ML
- Azure HDInsight
 - Hadoop → Mahout
 - Spark
 - ML Services
 - Python and R-based analytics

AWS SageMaker

Label

Amazon SageMaker Ground Truth

Build and manage training data sets

Build

Train & Tune

Deploy & Manage

Amazon SageMaker Studio

Integrated development environment (IDE) for machine learning

Amazon SageMaker Autopilot

Automatically build and train models

Amazon SageMaker Model Monitor

Automatically detect concept drift

Amazon SageMaker Notebooks

One-click notebooks with elastic compute

Amazon SageMaker Experiments

Capture, organize, and search every step

Amazon SageMaker Neo

Train once, deploy anywhere

AWS Marketplace

Pre-built algorithms and models

Amazon SageMaker Debugger

Debug and profile training runs

Amazon Augmented AI

Add human review of model predictions

Automatic Model Tuning

One-click hyperparameter optimization

Cloud Machine Learning Artifacts Case Study

- Sagemaker training algorithms are packaged as Docker images
- Training
 - Any training algorithm can be utilized as long as properly packaged
 - Sagemaker training job:
 - Launches a ML compute instance
 - Runs the train docker image
 - Creates the docker container in the ML compute instance
 - Injects the training data from an S3 location into the container
 - Uses the training code and training dataset to train the model
 - Saves the resulting model artifacts and other output in the output S3 bucket
- Model deployment
 - Creates the model resource
 - S3 path where the model artifacts are stored
 - Docker registry path for the image that contains the inference code
 - Creates an HTTPS endpoint
 - ML compute instances to deploy the model resource
- Model Usage
 - The client application sends requests to the Sagemaker HTTPS endpoint to obtain inferences from a deployed model