Module 2
Setting up Machine Learning Environment

# Class Modules

- Module 1- Introduction to Deep Learning
- **Module 2- Setting up Machine Learning Environment**
- Module 3- Linear Regression (Econometrics approach)
- Module 4- Machine Learning Fundamentals
- Module 5- Linear Regression (Machine Learning approach)
- Module 6- Penalized Regression (Ridge, LASSO, Elastic Net)
- Module 7- Logistic Regression
- Module 8- K-Nearest Neighbors (KNN)
- Module 9- Classification and Regression Trees (CART)
- Module 10- Bagging and Boosting
- Module 11- Dimensionality Reduction (PCA)
- Module 12- Clustering (KMeans – Hierarchical)
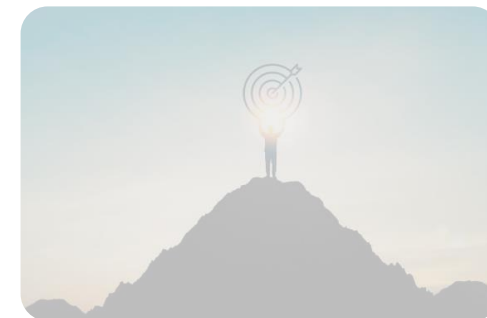
Install 🐍 through ANACONDA

- Anaconda is a distribution of the Python and R programming languages for scientific computing, that aims to simplify package management with conda environments.

- Anaconda offers the easiest way to perform data science and machine learning on a single machine.

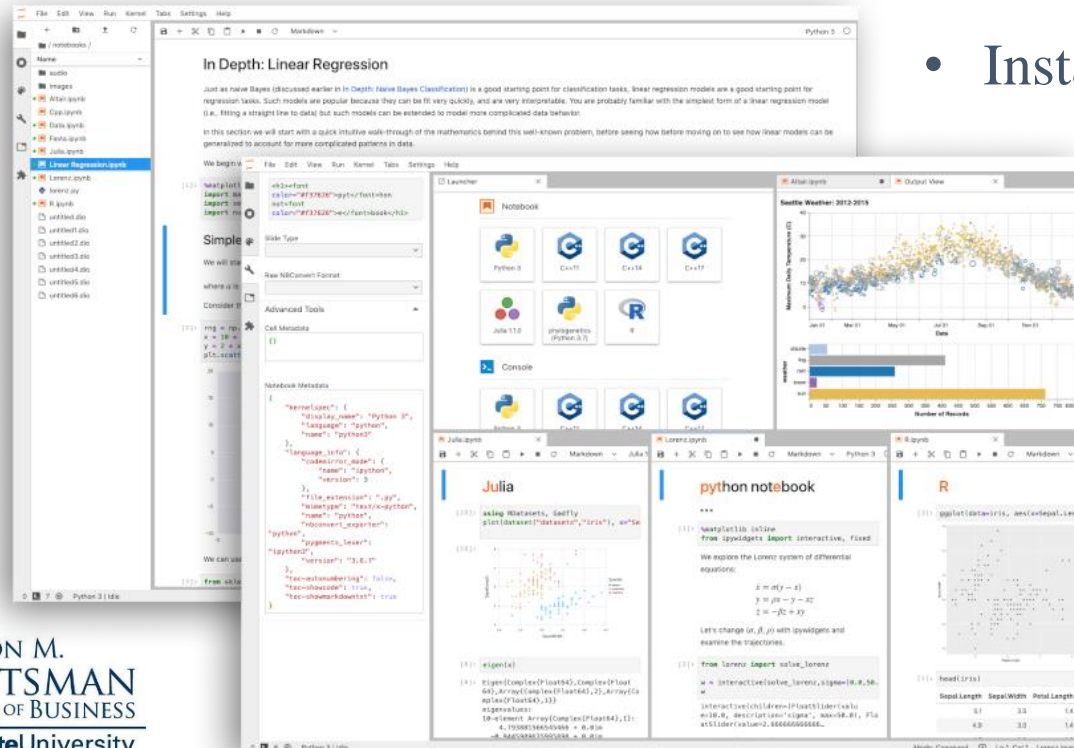- Install Anaconda @ https://www.anaconda.com/products/distribution
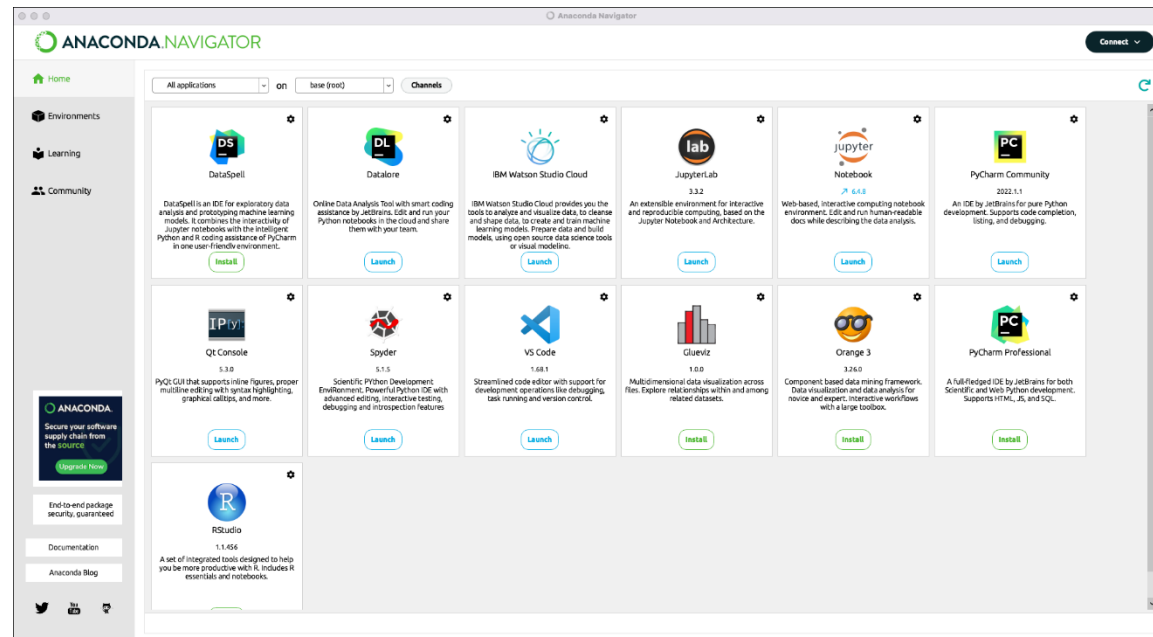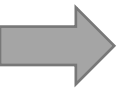
JupyterLab

- <u>JupyterLab</u> is the latest web-based interactive development environment for notebooks, code, and data

- Jupyter's name is a reference to the three core programming languages supported by Jupyter, which are Julia, Python and R

- Install JupyterLab @ http://jupyter.org/install

VS Code

Visual Studio Code

- VS Code is one of the most popular source code editors

- Features include support for debugging, syntax highlighting, intelligent code completion, code refactoring, and embedded Git.

- Install VS code @ https://code.visualstudio.com/
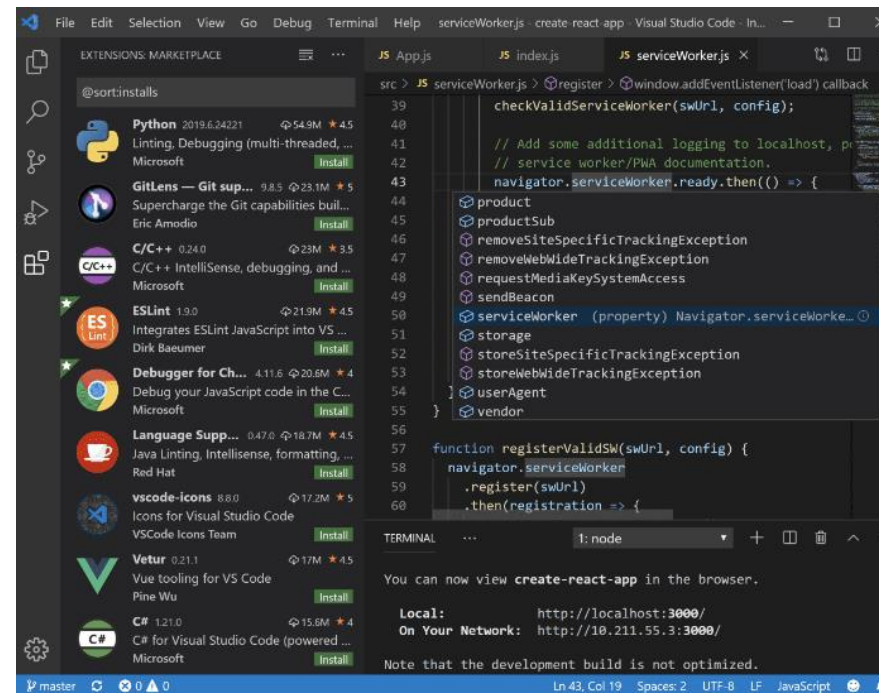
- <u>Colab</u> is a free hosted Jupyter notebook-style environment that runs entirely in the cloud and requires no setup to use. It also provides access to machine learning libraries and computing resources including GPU.

- Colab allows anybody to write and execute arbitrary python code through the browser, and is especially well suited to machine learning, data analysis and education. https://colab.research.google.com/
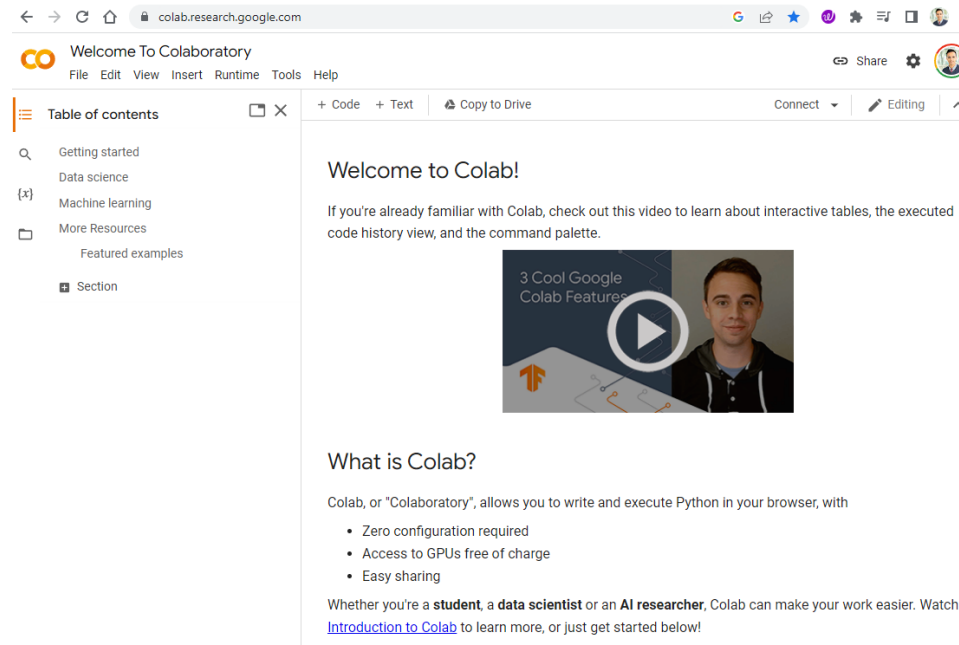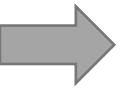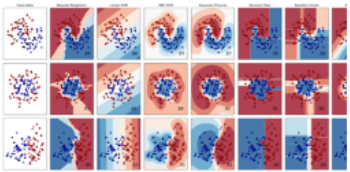
Classification

Identifying which category an object belongs to.

Applications: Spam detection, image recognition.
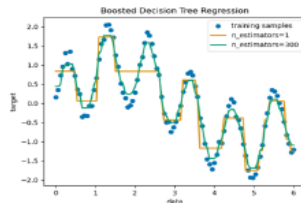**Algorithms:** SVM, nearest neighbors, random forest, and more...

Examples

Regression

Predicting a continuous-valued attribute associated with an object.

Applications: Drug response, Stock prices.
Algorithms: SVR, nearest neighbors, random forest, and more...

Examples

Clustering

Automatic grouping of similar objects into sets.

Applications: Customer segmentation, Grouping experiment outcomes
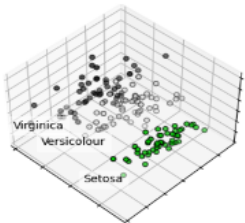**Algorithms:** k-Means, spectral clustering, mean-shift, and more...

Examples

Dimensionality reduction

Reducing the number of random variables to consider.

Applications: Visualization, Increased efficiency
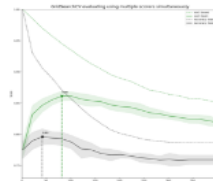**Algorithms:** PCA, feature selection, non-negative matrix factorization, and more...

Examples

Model selection

Comparing, validating and choosing parameters and models.

Applications: Improved accuracy via parameter tuning
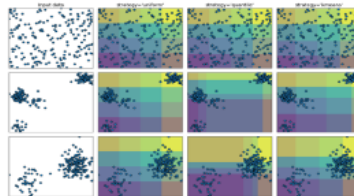**Algorithms:** grid search, cross validation, metrics, and more...

Examples

Preprocessing

Feature extraction and normalization.

Applications: Transforming input data such as text for use with machine learning algorithms.
Algorithms: preprocessing, feature extraction, and more...

Examples

- Scikit-learn is an open-sourced Python library and includes a variety of unsupervised and supervised learning techniques.

- It is based on technologies and libraries like Matplotlib, Pandas and NumPy and helps simplify the coding task.

- Install Scikit-learn @ https://scikit-learn.org/stable/install.html

PYCARET

- PyCaret is an open-source, low-code machine learning library in Python that automates machine learning workflows.

- PyCaret is essentially a Python wrapper around several machine learning libraries and frameworks

- Install PyCaret @ https://pycaret.gitbook.io/docs/get-started/installation

```python
# load dataset
import pandas as pd
train = pd.read_csv('train.csv')
test  = pd.read_csv('test.csv')

# init setup
from pycaret.classification import *
s = setup(train, target= 'target')

# model training and selection
best = compare_models()

# analyze best model
evaluate_model(best)


# predict on new data
predictions = predict_model(best, data =test )

# save best pipeline
save_model(best, 'my_best_pipeline')
```
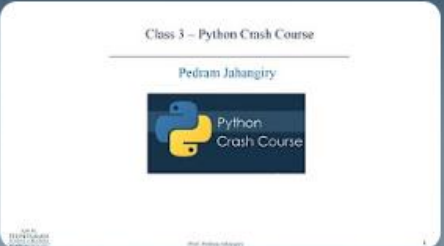
ID	Name
'lr'	Logistic Regression
'knn'	K Nearest Neighbour
'nb'	Naives Bayes
'dt'	Decision Tree Classifier
'svm'	SVM – Linear Kernel
'rbfsvm'	SVM – Radial Kernel
'gpc'	Gaussian Process Classifier
'mlp'	Multi Level Perceptron
'ridge'	Ridge Classifier
'rf'	Random Forest Classifier
'qda'	Quadratic Discriminant Analysis
'ada'	Ada Boost Classifier
'gbc'	Gradient Boosting Classifier
'lda'	Linear Discriminant Analysis
'et'	Extra Trees Classifier
'xgboost'	Extreme Gradient Boosting
'lightgbm'	Light Gradient Boosting
'catboost'	CatBoost Classifier

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Available YouTube playlists

Platforms and Packages

Listed below are some Python packages and platforms that will be used in the deep learning and deep forecasting courses.
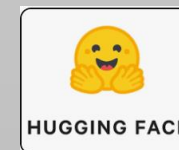
Setting up Deep Learning Environment

	Personal Workstation	Cloud Platforms	Google Colaboratory
Pros	• Full control over hardware and software • Work offline • Fixed cost	• Powerful computing resources • Scalability • Ease of use • Cost-effective: Pay-as-you-go • Collaboration	• Powerful computing resources (GPU, TPU) • Ease of use • Collaboration • No need to set up a local environment
Cons	• Scalability • Maintenance (both hardware and software)	• Expensive for large-scale experiments • Dependency on the provider • Limited control • Internet connection • Security	• Time limit • Hardware limitation • Data storage • Limited control • Internet connection • Security

The modern machine learning landscape

- From 2016 to 2020, the entire machine learning and data science industry has been dominated by these two approaches:
  1. Deep learning
  2. Gradient boosted trees

- Most practitioners of deep learning use Keras, often in combination with its parent framework TensorFlow.

- This means you'll need to be familiar with Scikit-learn, XGBoost, and Keras
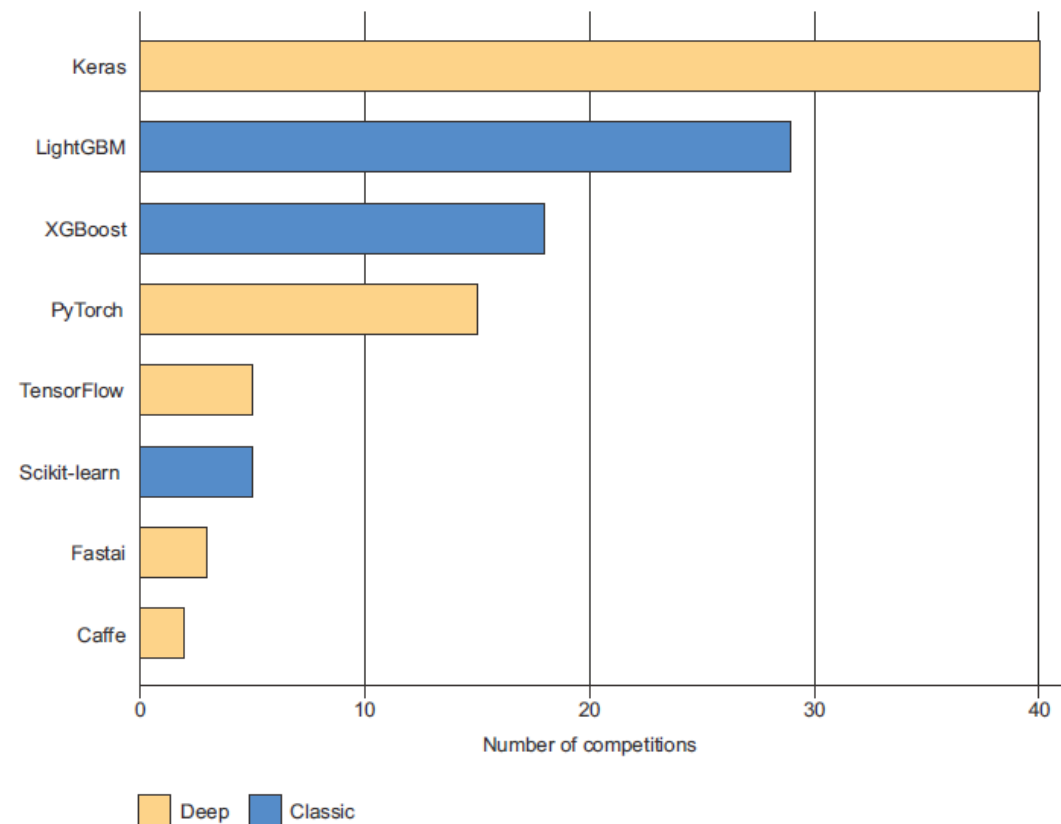

Figure 1.12   Machine learning tools used by top teams on Kaggle
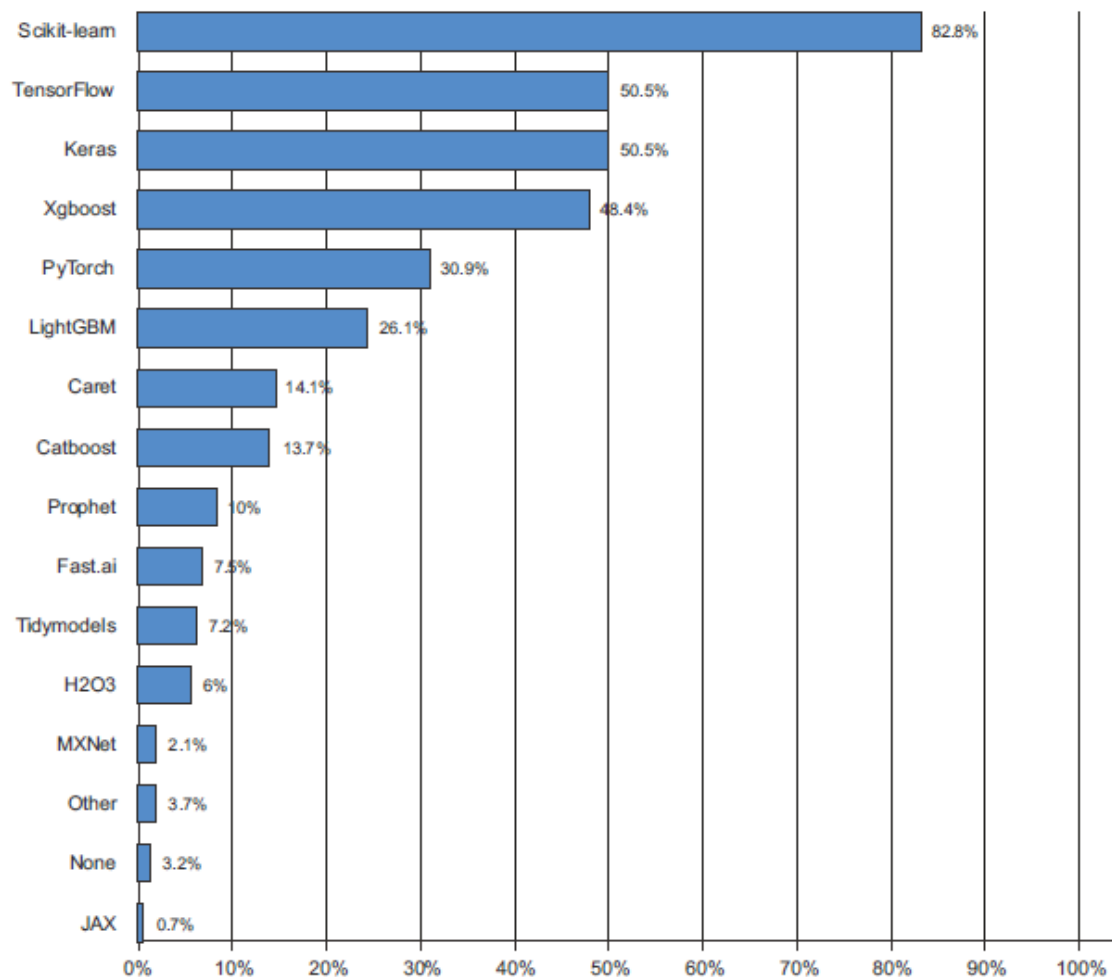
The modern machine learning landscape

Figure 1.13 Tool usage across the machine learning and data science industry (Source: www.kaggle.com/kaggle-survey-2020)

- Kaggle also runs a yearly survey among machine learning and data science professionals worldwide.

- This survey is one of our most reliable sources about the state of the industry!!!

- This figure shows the percentage of usage of different machine learning software frameworks.

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