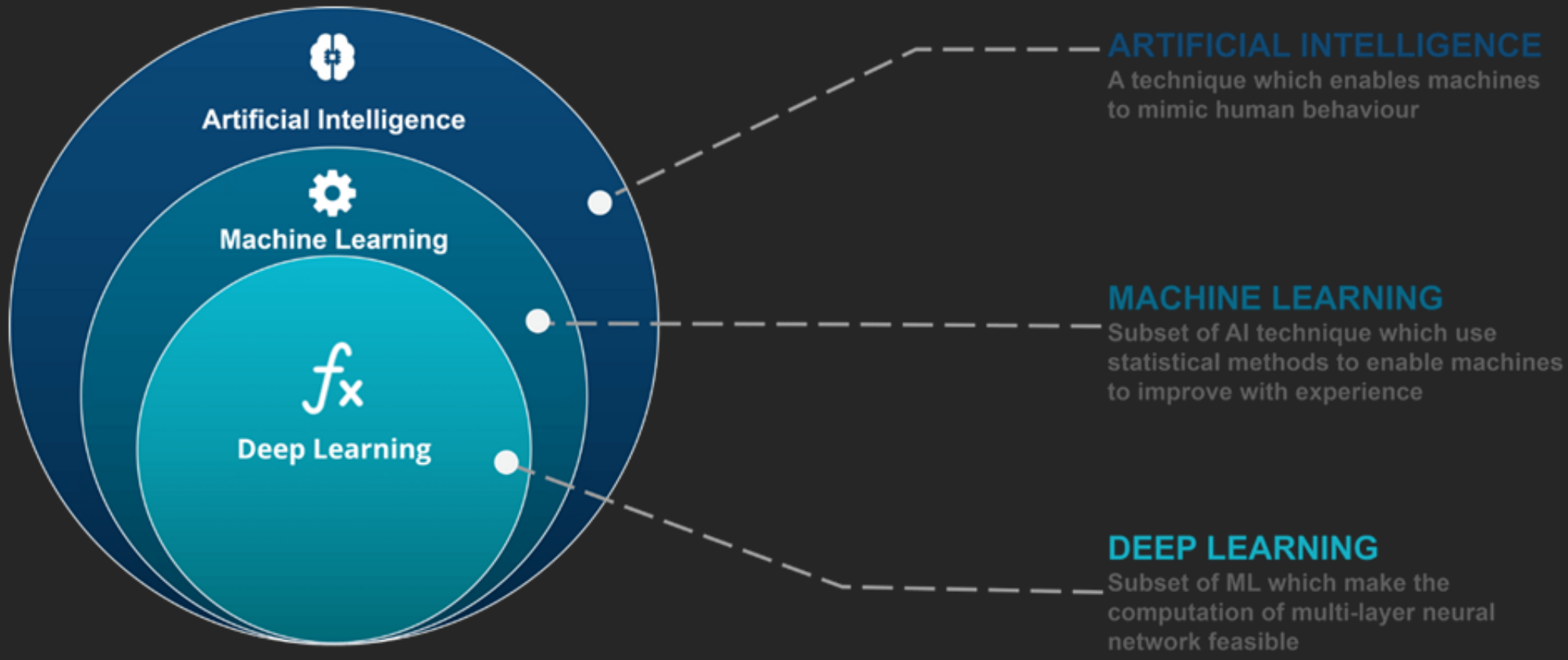
Basics of AI and ML

- Dr. Venkataramana Veeramsetty
- Center for AI and Deep Learning
- SR University, Warangal

What is AI

Artificial intelligence is an intelligence that was developed in the form some mathematical operations and implemented using computer programming in order to make machines behaves like human intelligence to perform some task like

- Decision making
- Language translation
- Visual perceptions
- Speech recognition etc.



What is AI?

- Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind.

Need of AI

AI enables us to build amazing software that can improve health care, enable people to overcome physical disadvantages, empower smart infrastructure, create incredible entertainment experiences, and even save the planet!

https://www.microsoft.com/en-us/videoplayer/embed/RE4vyDl?postJsllMsg=true

Key Elements of AI

Machine learning - This is often the foundation for an AI system, and is the way we "teach" a computer model to make prediction and draw conclusions from data.

Anomaly detection - The capability to automatically detect errors or unusual activity in a system.

Computer vision - The capability of software to interpret the world visually through cameras, video, and images.

Natural language processing - The capability for a computer to interpret written or spoken language, and respond in kind.

Conversational AI - The capability of a software "agent" to participate in a conversation.

Understand machine learning

Machine Learning is the foundation for most AI solutions.

Sustainable farming techniques are essential to maximize food production while protecting a fragile environment. *The Yield*, an agricultural technology company based in Australia, uses sensors, data and machine learning to help farmers make informed decisions related to weather, soil and plant conditions.

https://www.microsoft.com/en-us/videoplayer/embed/RE4voJG?postJsllMsg=true

How machine learning works

https://docs.microsoft.com/en-us/learn/wwl-data-ai/get-started-ai-fundamentals/media/machine-learn.gif

Understand anomaly detection

Imagine you're creating a software system to monitor credit card transactions and detect unusual usage patterns that might indicate fraud.

An application that tracks activity in an automated production line and identifies failures.

A racing car telemetry system that uses sensors to proactively warn engineers about potential mechanical failures before they happen.

https://docs.microsoft.com/en-us/learn/wwl-data-ai/get-started-ai-fundamentals/media/anomaly-detection.gif

Understand computer vision

Computer Vision is an area of AI that deals with visual processing. Seeing AI

Image classification

Object detection

Semantic segmentation

Image analysis

Face detection, analysis, and recognition

Optical character recognition (OCR)

Computer vision services in Microsoft Azure

Computer Vision--You can use this service to analyze images and video, and extract descriptions, tags, objects, and text.

Custom Vision--Use this service to train custom image classification and object detection models using your own images.

Face--The Face service enables you to build face detection and facial recognition solutions.

Form Recognizer-- Use this service to extract information from scanned forms and invoices.

https://aidemos.microsoft.com/computer-vision

Image classification

Image classification involves training a machine learning model to classify images based on their contents. For example, in a traffic monitoring solution you might use an image classification model to classify images based on the type of vehicle they contain, such as taxis, buses, cyclists, and so on.

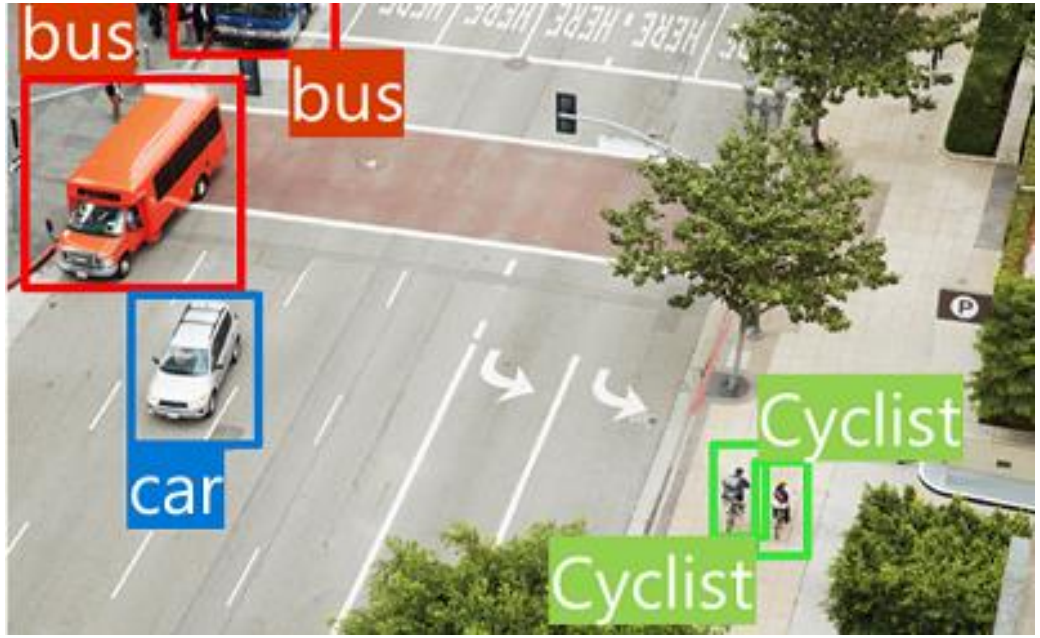
CoinNet: A Mobile App

Center for AI and Deep Learning, Developed an AI based Mobile Application to identify Indian Currency

This app can be helpful for the visually impaired people to recognize currency notes

Object detection

Object detection machine learning models are trained to classify individual objects within an image and identify their location with a bounding box. For example, a traffic monitoring solution might use object detection to identify the location of different classes of vehicle.



Semantic segmentation

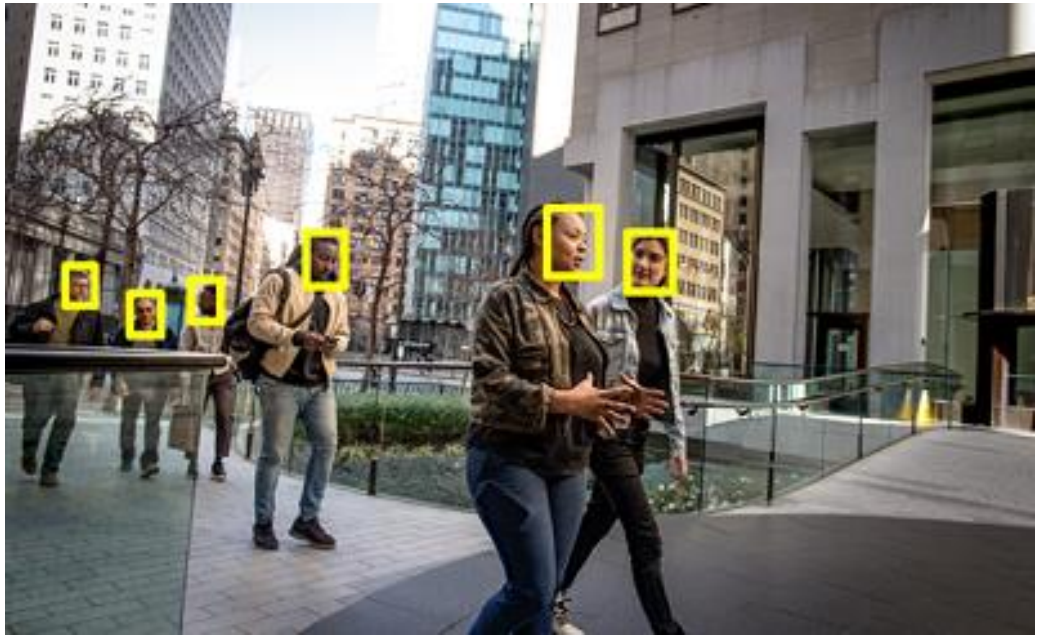
Semantic segmentation is an advanced machine learning technique in which individual pixels in the image are classified according to the object to which they belong. For example, a traffic monitoring solution might overlay traffic images with "mask" layers to highlight different vehicles using specific colors.

Image analysis

You can create solutions that combine machine learning models with advanced image analysis techniques to extract information from images, including "tags" that could help catalog the image or even descriptive captions that summarize the scene shown in the image.

Face detection, analysis, and recognition

Face detection is a specialized form of object detection that locates human faces in an image. This can be combined with classification and facial geometry analysis techniques to infer details such as age and emotional state; and even recognize individuals based on their facial features.



Optical character recognition (OCR)

Optical character recognition is a technique used to detect and read text in images.

Natural language processing

Natural language processing (NLP) is the area of AI that deals with creating software that understands written and spoken language

- Analyze and interpret text in documents, email messages, and other sources.
- Interpret spoken language and synthesize speech responses.
- Automatically translate spoken or written phrases between languages
- Interpret commands and determine appropriate actions.

Example

Starship Commander, is a virtual reality (VR) game from Human Interact, that takes place in a science fiction world. The game uses natural language processing to enable players to control the narrative and interact with in-game characters and starship systems.

https://www.microsoft.com/en-us/videoplayer/embed/RE4vyDj?postJsllMsg=true

Conversational AI

Conversational AI is the term used to describe solutions where AI agents participate in conversations with humans

Conversational AI solutions use *bots* to manage dialogs with users.

These dialogs can take place through web site interfaces, email, social media platforms, messaging systems, phone calls, and other channels.

Conversational AI

Conversational AI is the term used to describe solutions where AI agents participate in conversations with humans

Conversational AI solutions use *bots* to manage dialogs with users.

These dialogs can take place through web site interfaces, email, social media platforms, messaging systems, phone calls, and other channels.

You want to create a model to predict sales of ice cream based on historic data that includes daily ice cream sales totals and weather measurements. Which Azure service should you use?

A. Azure Machine Learning

B. QnA Maker

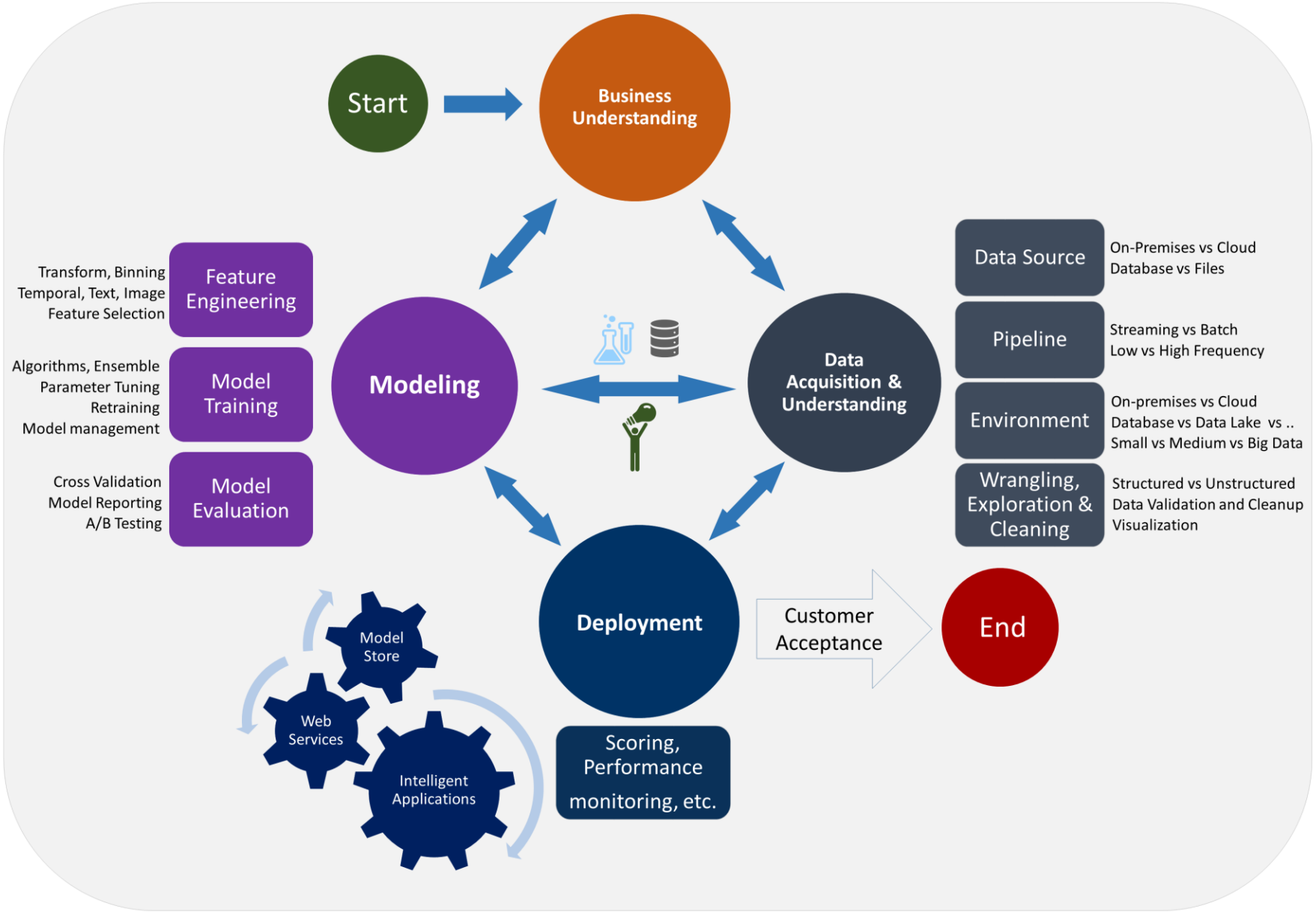
C. Text Analytics

You want to train a model that classifies images of dogs and cats based on a collection of your own digital photographs. Which Azure service should you use?

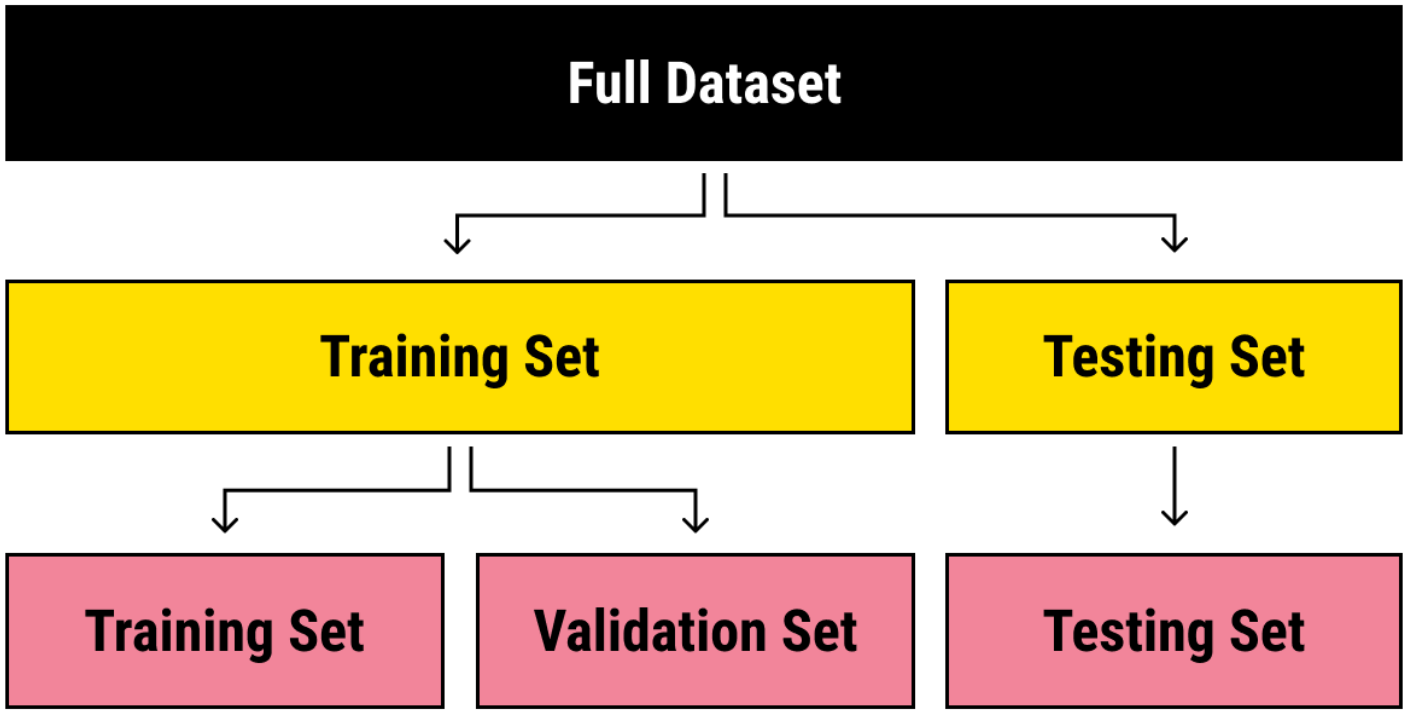
A. Computer Vision

B. Custom Vision
Azure Bot Service

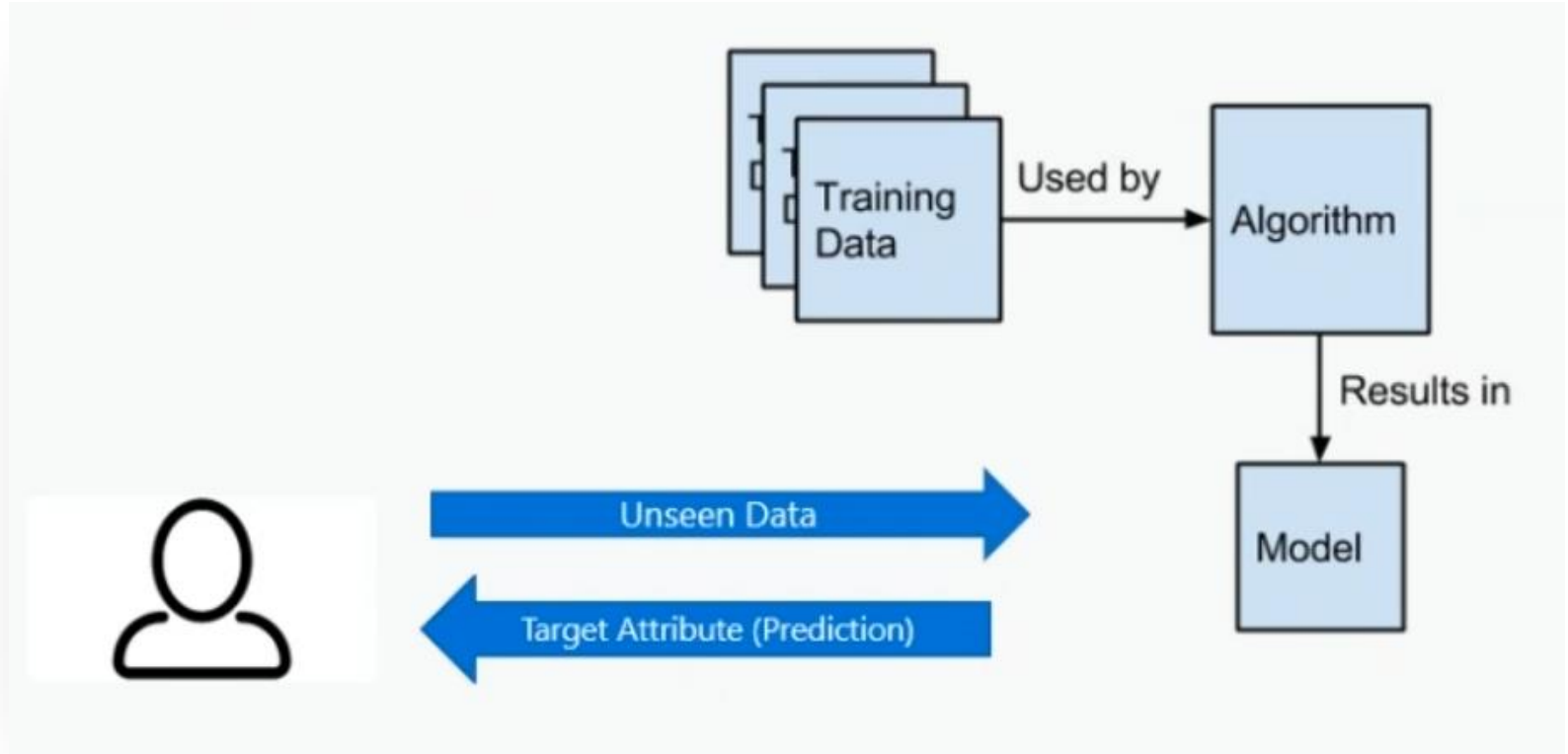
Data Science Lifecycle



Data Split


Full Dataset
Training Set
Testing Set
Training Set
Validation Set
Testing Set

What is a Model



Principals of Responsible AI

Fairness

Reliability & Safety

Privacy & Security

Inclusiveness

Transparency

Accountability

Responsible AI

Learning Algorithms

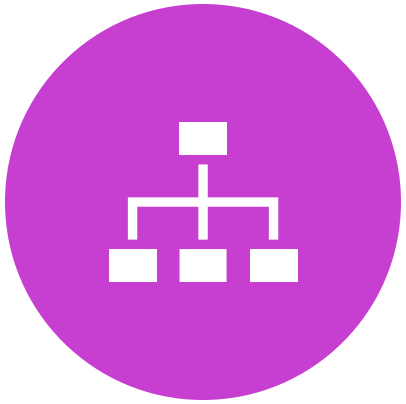
SUPERVISED LEARNING

UNSUPERVISED LEARNING
(CLUSTERING & ASSOCIATION)

SEMI SUPERVISED LEARNING
(LABEL AND UNLABEL)

Real time problems

REGRESSION



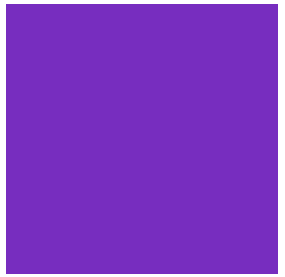
CLASSIFICATION

CLUSTERING

Regression

Simple Linear Regression

Multiple Linear Regression



Polynomial Regression

Advantages & Limitations of Regression

Continues value prediction

Simple to understand and implement

Simple mathematics

Much lower training time as it is simple model

Cannot perform well on complex real time problems

Applications

Load demand prediction

Stock price prediction

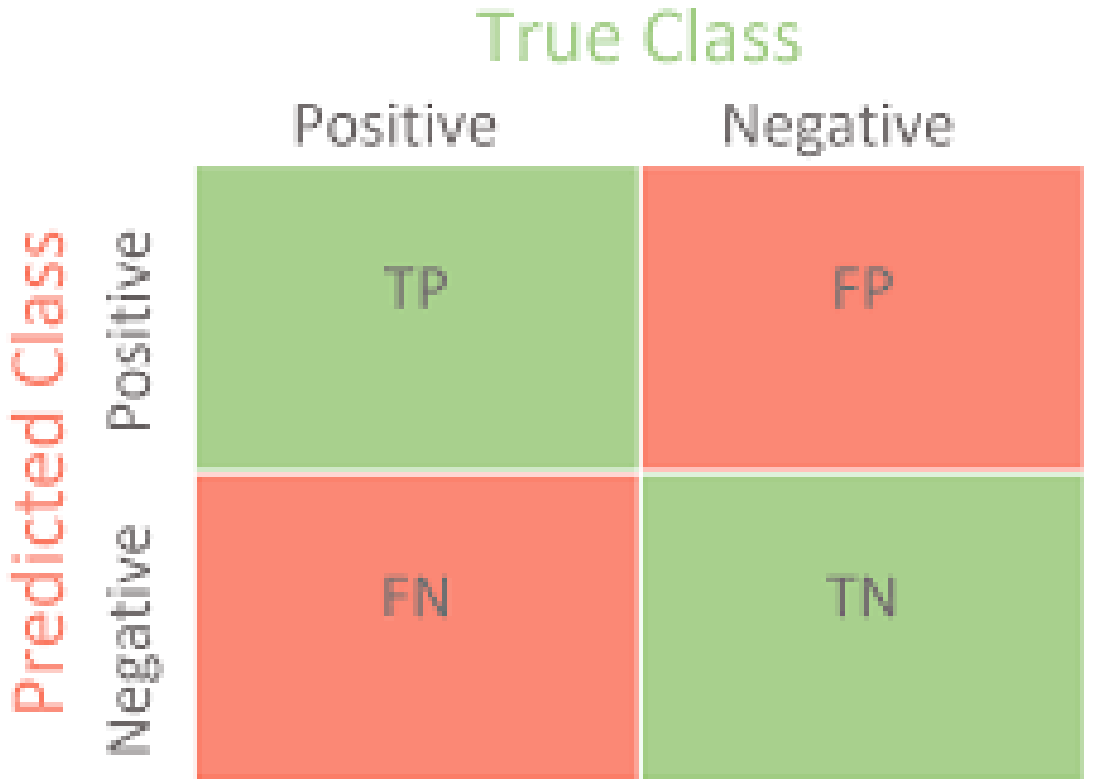
Credit score assessment

Binary Classification Problems

Patient affected with covid or not?

Can issue credit card or not?

Confusion Matrix



Categorical Classification Problem

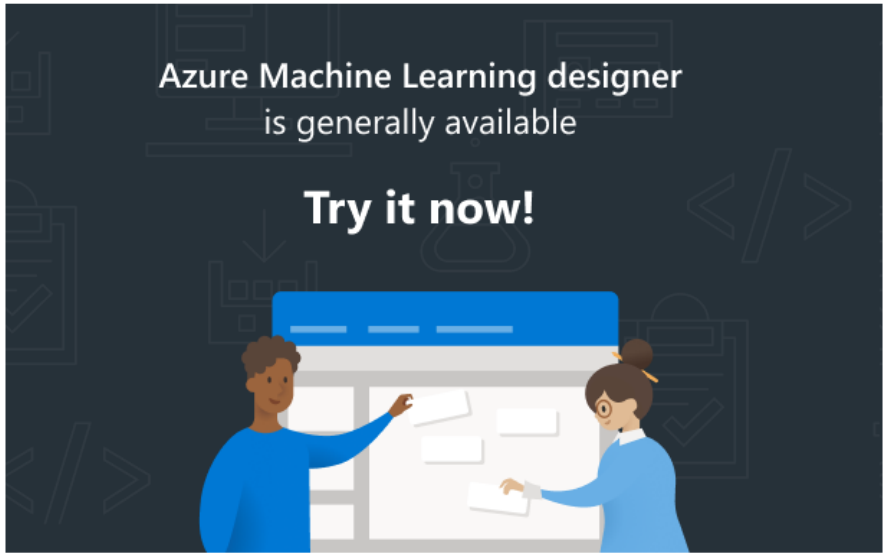
Type of faults (Ex, LG, LL, LLG, LLLG)

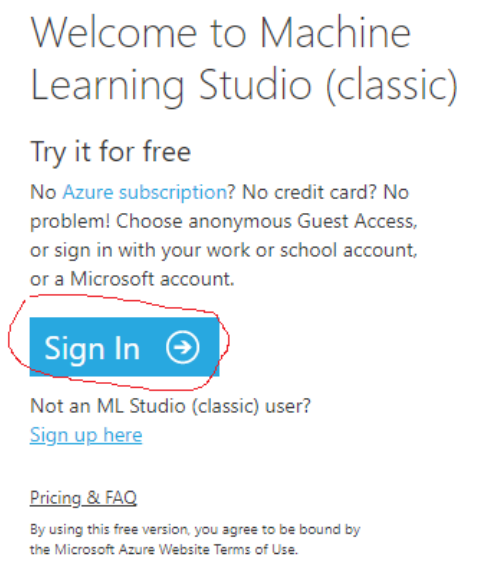
Mood of tweet (Ex. Happy, Sad, Angry)

ML Studio Classic

ML studio Classic

Login to portal ML studio classic : https://studio.azureml.net/





Symboling: 06

normalized-losses:
41

num-of-doors, horsepower, peak-rpm, :2

Bore, stroke, Price:4

wheel-basefuel-type, Make,body-style, Aspiration, Curb weight,engine-type,num-of-cylinders, engine-location, drive-wheel, length, width,hight, fuel type, engine-size, fuel system, compression-ratio, city-mpg, highway-mpg, :0

Missing Value Information for each Column

Microsoft Office Home | Presentation9.pptx | Basics of AI and ML | Experiments - Microsoft Machin | Load Forecasting - Google Drive | ZCP-2021-2022 - Online LaTeX E | WhatsApp

studio.azureml.net/Home/ViewWorkspaceCached/7f7b11c3179c498e95985ddfb79e2c33#Workspaces/Experiments/Experiment/7f7b11c3179c498e95985ddfb79e2c33.f-id.6e4358d95542499b9daccd51eede2317/ViewExperiment

Microsoft Machine Learning Studio (classic)

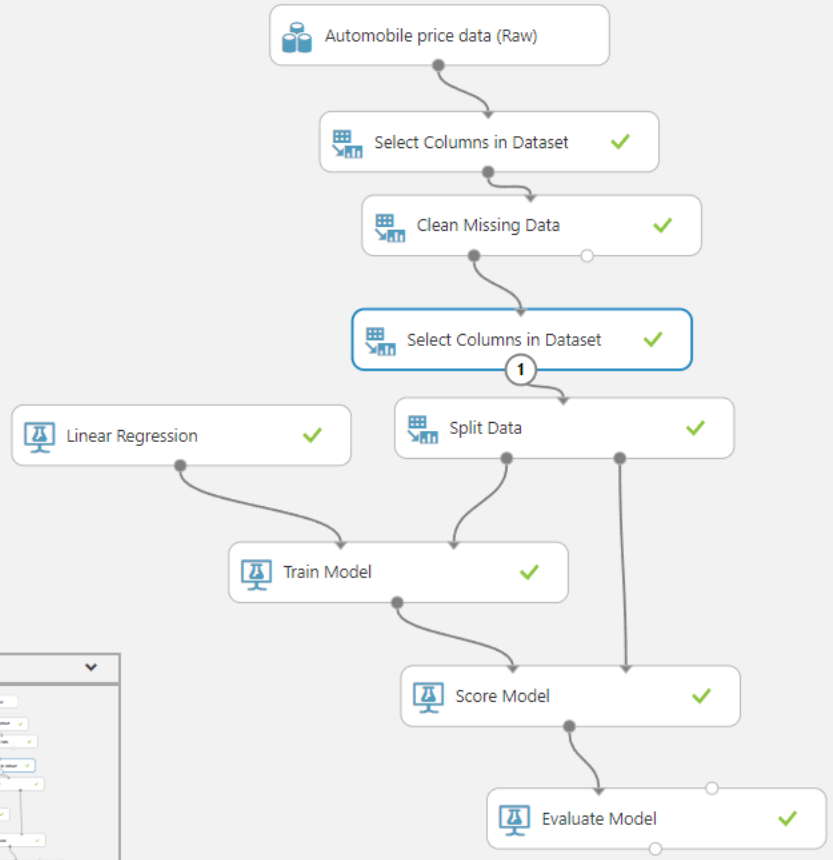
CSE 3B-Free-Workspace

Search experiment items

- Saved Datasets
  - Samples
    - Adult Census Income...
    - Airport Codes Dataset
    - Automobile price dat...
    - Bike Rental UCI dataset
    - Bill Gates RGB Image
    - Blood donation data
    - Book Reviews from A...
    - Breast cancer data
    - Breast Cancer Features
    - Breast Cancer Info
    - CRM Appetency Labe...
    - CRM Churn Labels Sh...
    - CRM Dataset Shared
    - CRM Upselling Label...
    - Energy Efficiency Reg...
    - Flight Delays Data
    - Flight on-time perfor...
    - Forest fires data
    - fraudTemplateLtiLzip

Experiment created on 2/17/2022

Finished running



Properties | Project

Select Columns in Dataset

Select columns

Selected columns:
All columns
Column names:
symboling,make,num-of-doors,drive-wheels,wheel-base,price

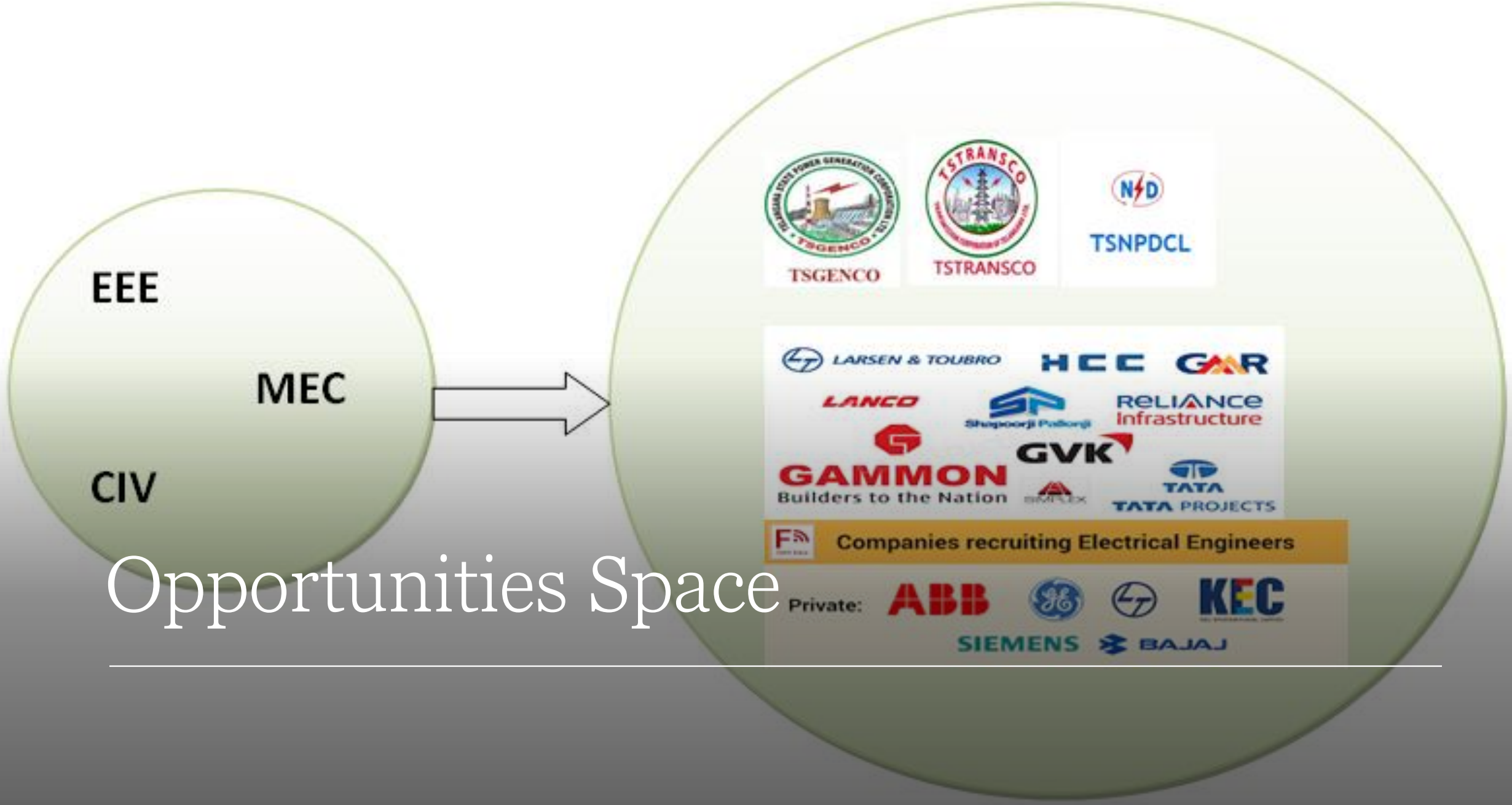
Launch column selector

START TIME	2/17/2022 ...
END TIME	2/17/2022 ...
ELAPSED TIME	0:00:00.000
STATUS CODE	Finished
STATUS DETAILS	Task output was present in output cache

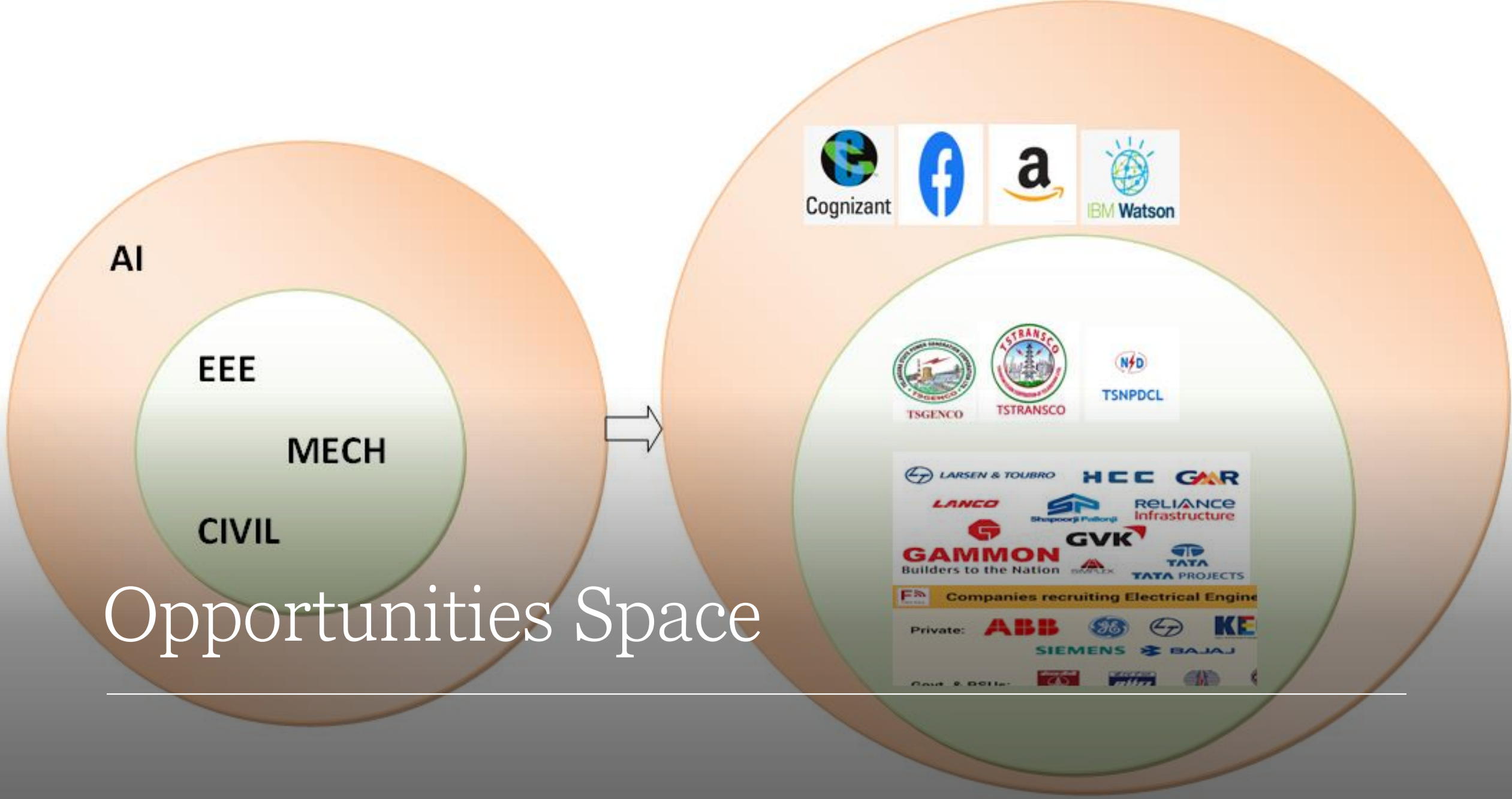
Quick Help

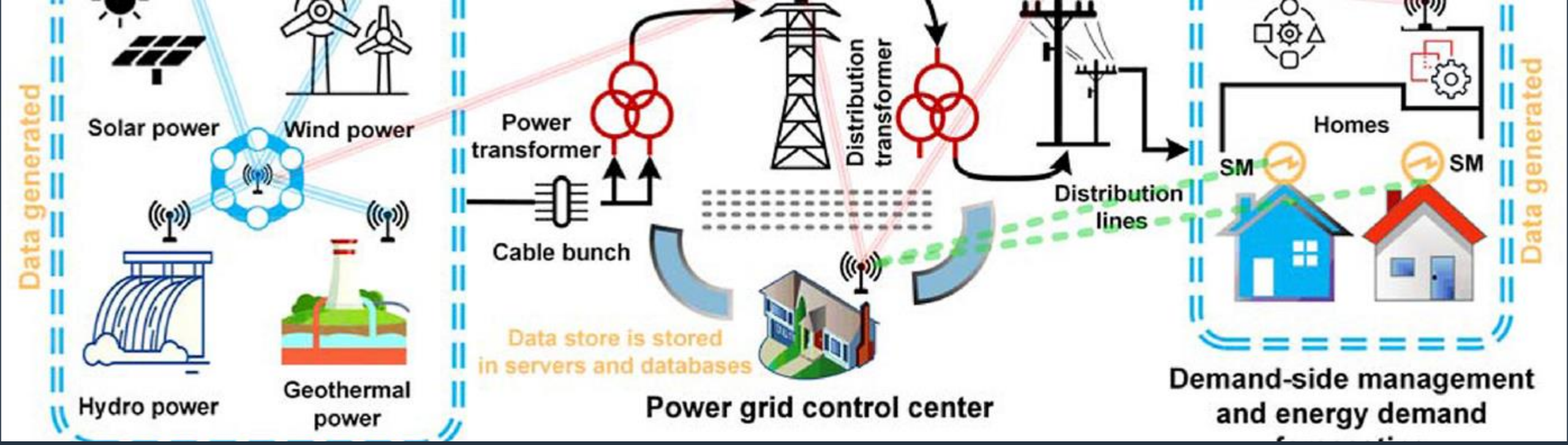
Selects columns to include or exclude from a dataset in an operation. Formerly known as Project Columns.
(more help...)

Opportunities Space



Opportunities Space





Domain Applications : Electrical Engineering

- Wind and Solar Energy Forecasting
- Load frequency control
- Load and market price forecasting
- Speed control
- Faults Identification

Domain Applications : Civil Engineering

Innovative concrete mix proportion

Strength prediction of concrete

Structural analysis of members by special concrete

Water quality assurance

Special concrete mix design and strength prediction

THANK YOU