Az COMMUNITY

Conference 2022

Asia's Largest Azure Community Conference

#AzConfDev

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#AzConfDev

Applying Data Science and Machine Learning Using Microsoft .Net

Praveen Raghuvanshi

Acknowledgements

- Dataset – Cricksheet.org
- Organizers – AzConf 2022
- Sponsors

Identify Language

Maidin mhaith

Guten Morgen

おはよ ございます

शुभ प्रभात

Good Morning

Programming Languages

Source: https://insights.dice.com/2019/10/24/tiobe-top-eight-top-ten-open/

Data Science – Exploratory Data Analysis(EDA)

As per Wiki…

"In statistics, exploratory data analysis (EDA) is an approach of analyzing data sets to summarize their main characteristics, often with visual methods."

- Buy a House
  - No of bedrooms
  - Type (Apartment, Villa)
  - Locality
  - Crime Rate

Source: https://insights.dice.com/2019/10/24/tiobe-top-eight-top-ten-open/

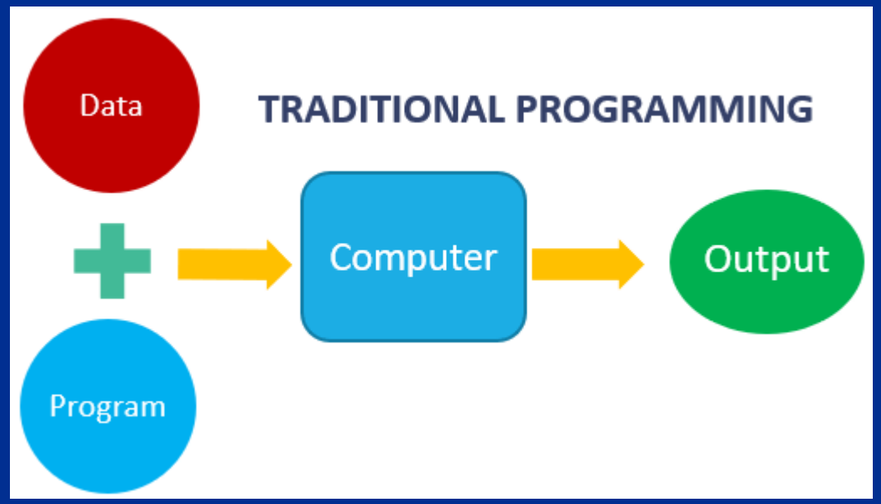
EDA Datastructure : DataFrame

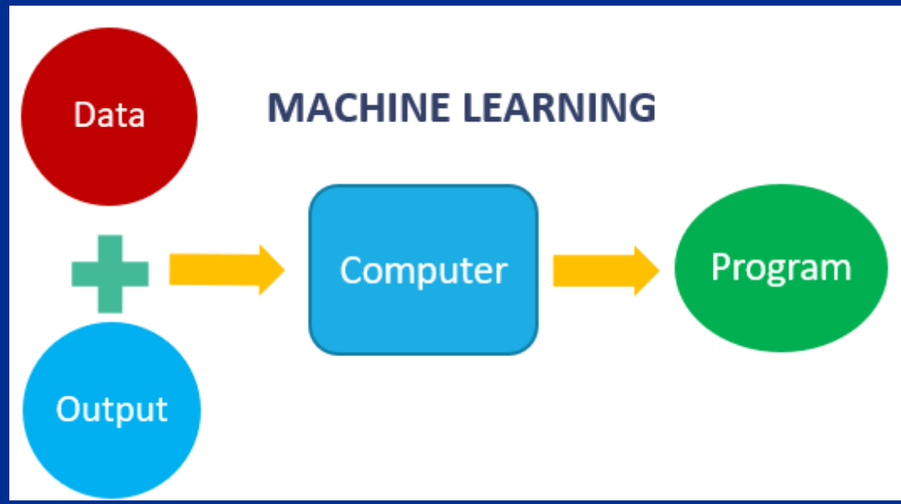
	NAME	AGE	DESIGNATION
1	a	20	VP
2	b	27	CEO
3	c	35	CFO
4	d	55	VP
5	e	18	VP
6	f	21	CEO
7	g	35	MD

	age	designation	name
0	20	VP	a
1	27	CEO	b
2	35	CFO	c
3	55	VP	d
4	18	VP	e
5	21	CEO	f
6	35	MD	g

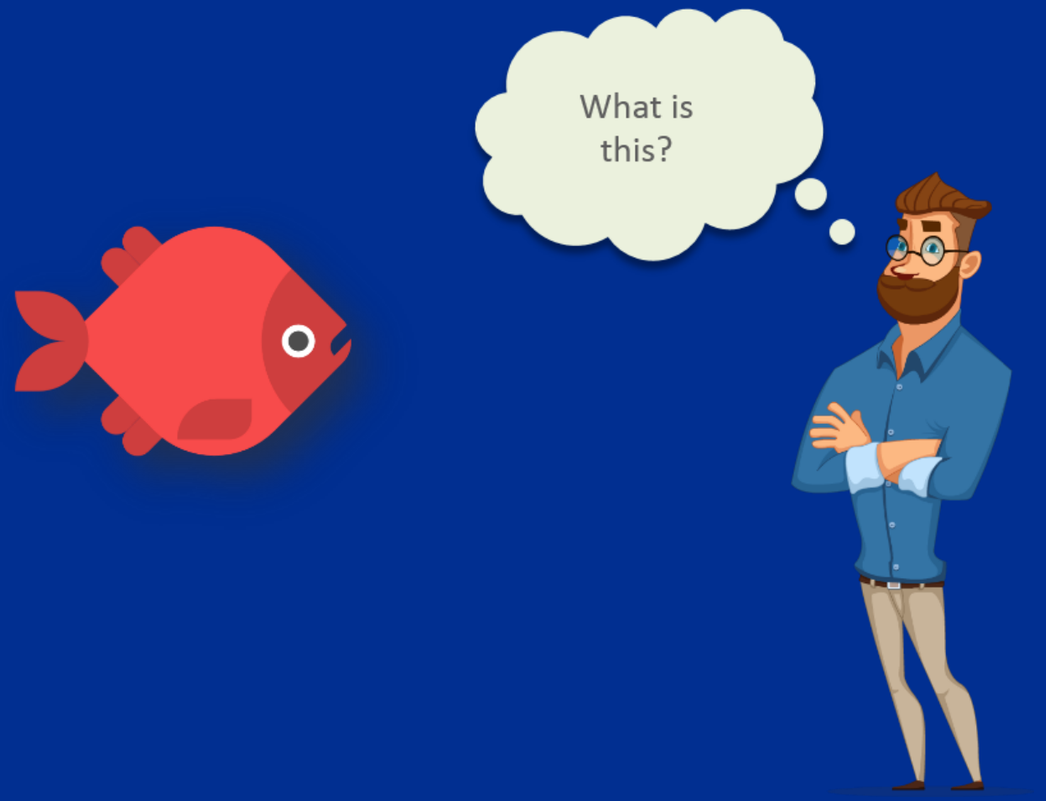
Machine Learning

- Machine learning is getting computers to program themselves
- If programming is automation, then machine learning is automating the process of automation



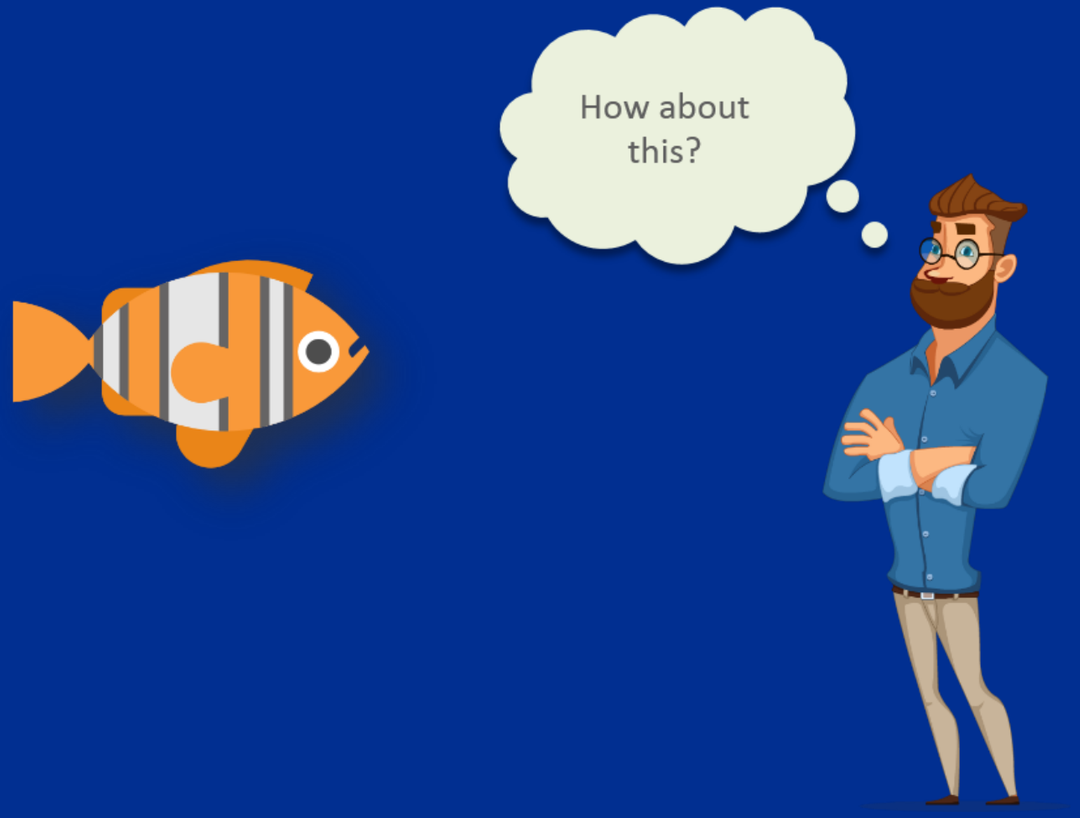


Machine Learning



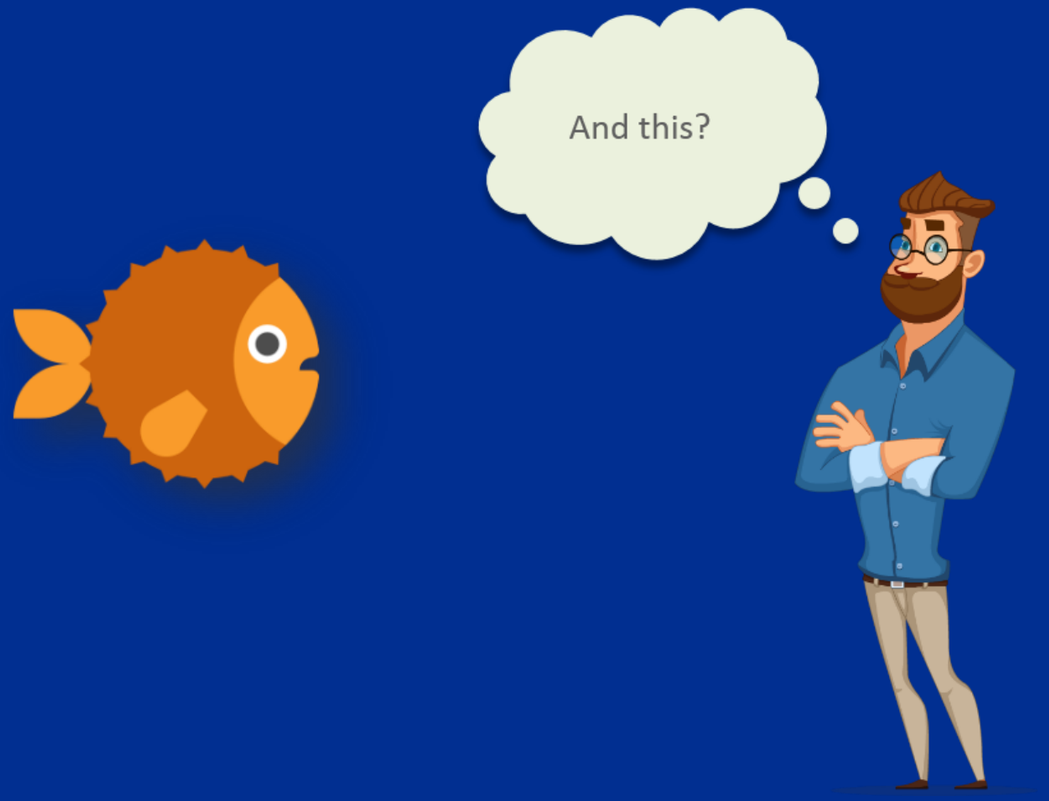
source: https://www.quora.com/What-are-prerequisites-to-start-learning-machine-learning

Machine Learning



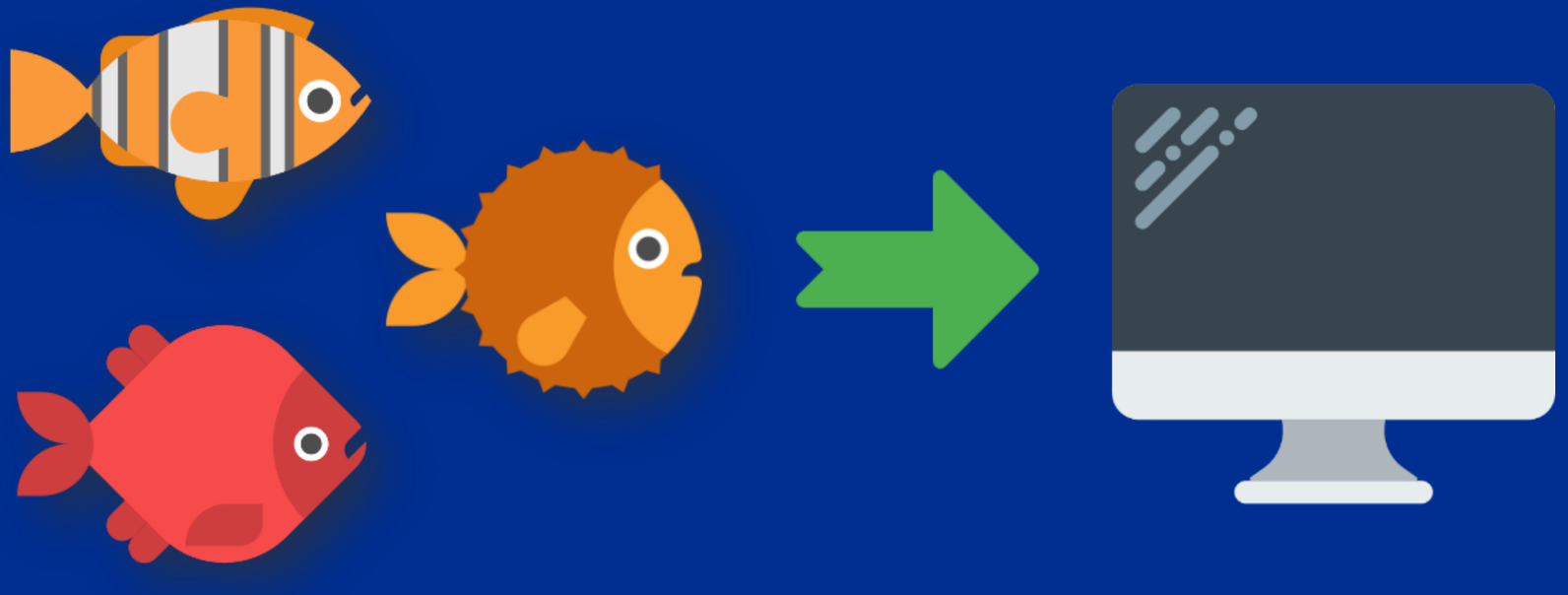
source: https://www.quora.com/What-are-prerequisites-to-start-learning-machine-learning

Machine Learning



source: https://www.quora.com/What-are-prerequisites-to-start-learning-machine-learning

Machine Learning



Input data

Machine

Source: https://www.quora.com/What-are-prerequisites-to-start-learning-machine-learning

Machine Learning

New Data

New Data

Machine

Machine

Result

Result

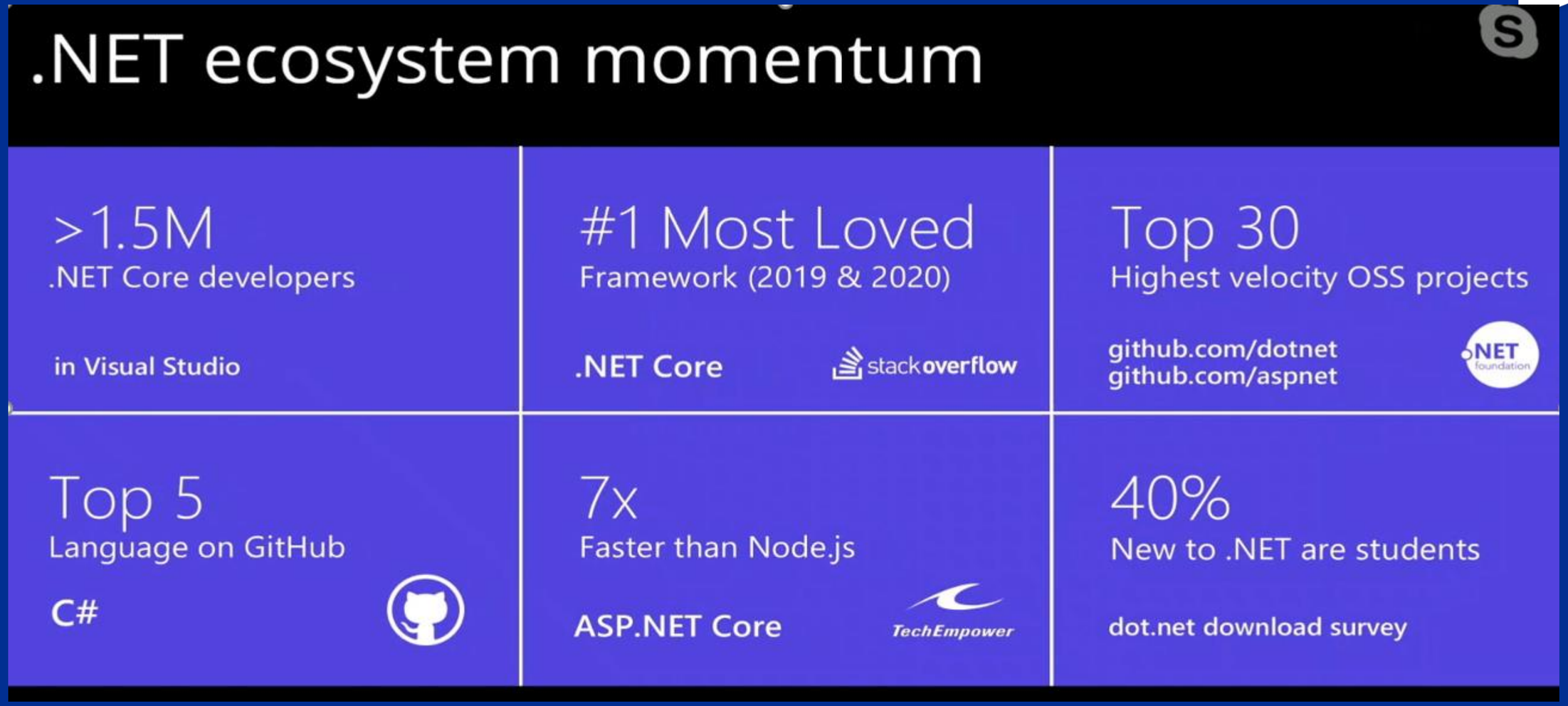
Source: https://www.quora.com/What-are-prerequisites-to-start-learning-machine-learning

Pre-Requisites of ML

- A Pattern should exist
- Mathematical model/algorithm is unknown
- Abundant data

ML Frameworks

Why .NET ?

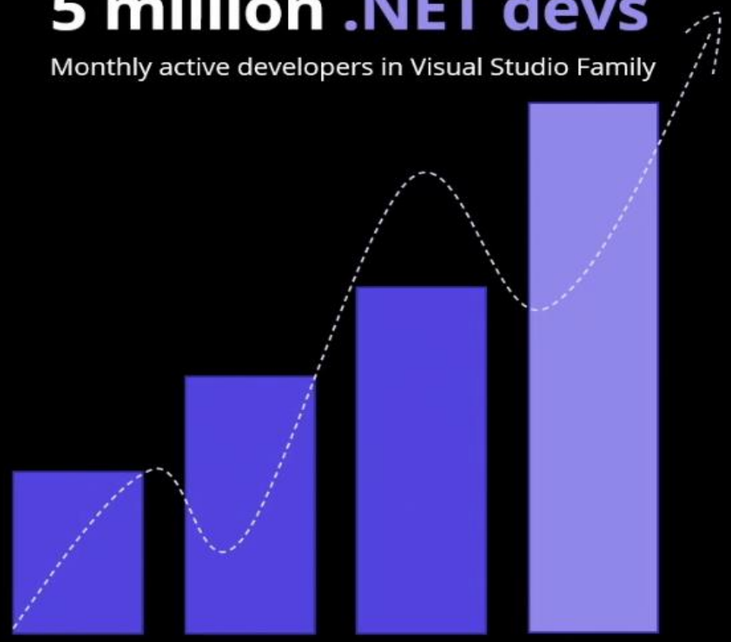

.NET ecosystem momentum
>1.5M
.NET Core developers
in Visual Studio
#1 Most Loved
Framework (2019 & 2020)
.NET Core
stackoverflow
Top 30
Highest velocity OSS projects
github.com/dotnet
github.com/aspnet
.NET foundation
Top 5
Language on GitHub
C#
7x
Faster than Node.js
ASP.NET Core
TechEmpower
40%
New to .NET are students
dot.net download survey

Why .NET ?

.NET adoption

5 million .NET devs

Monthly active developers in Visual Studio Family



Visual Studio — **+1 million new**

Monthly active .NET developers in the last year

.NET Core — **+600K new**

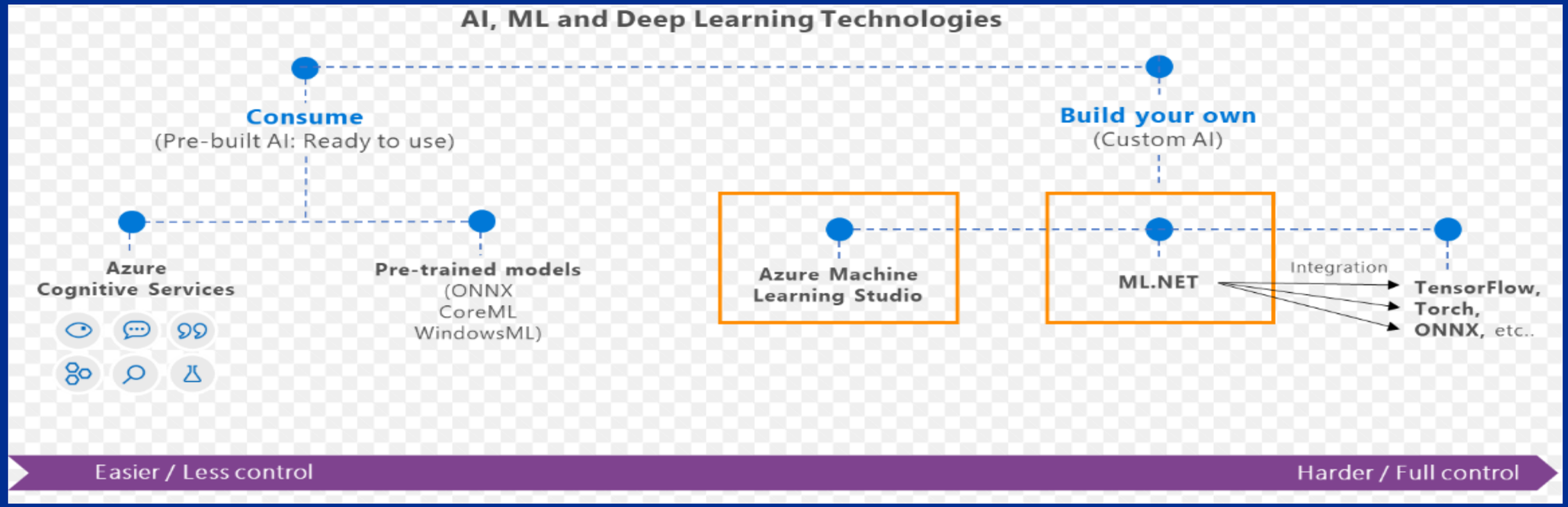
Monthly active .NET Core developers in the last year

.NET on Linux — **2 million**

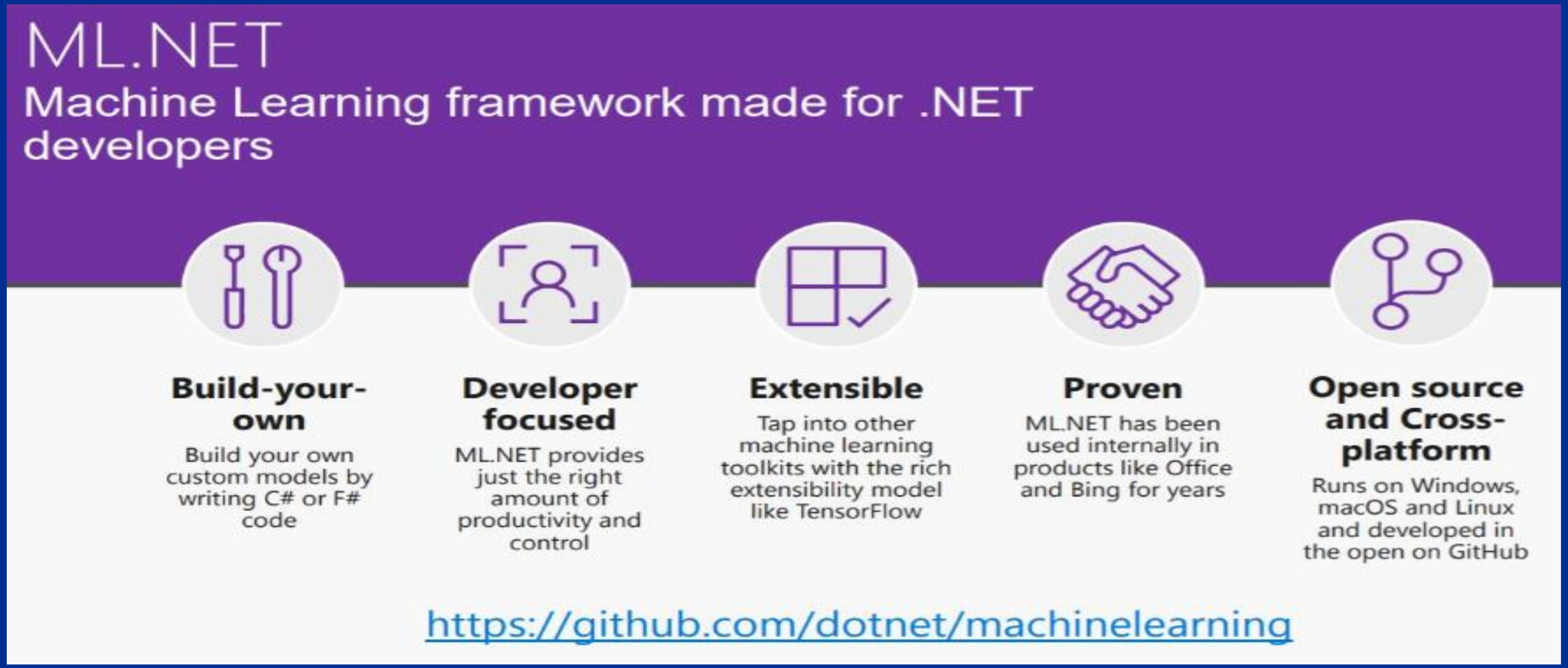
Publishes to Linux from Visual Studio

What is ML.Net ?

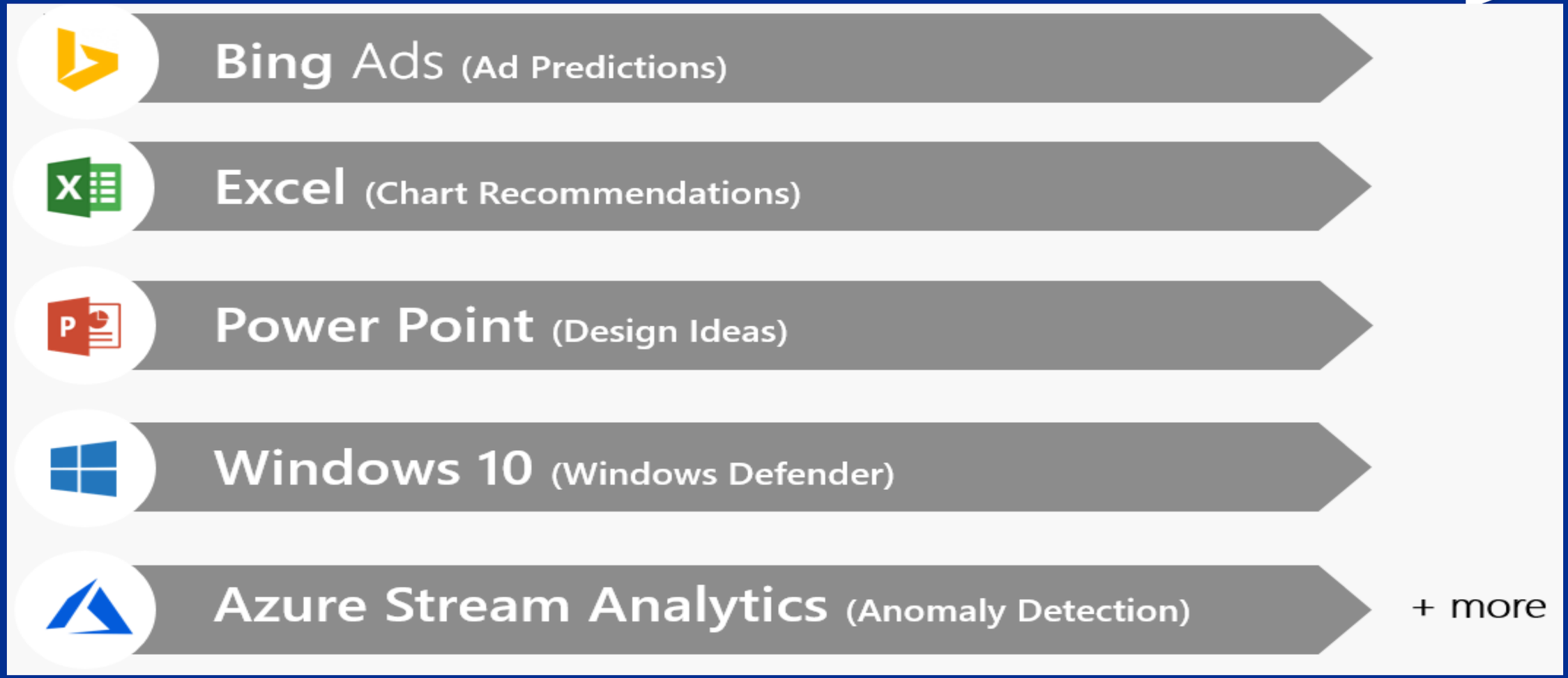
- ML Framework from Microsoft for developing custom AI/ML applications.
- Originated in 2002 as part of Microsoft Research Project



What is ML.Net ?



ML.Net – Proven at Scale, Enterprise ready



ML.Net – Possibilities

Sentiment Analysis

Forecasting

Issue Classification

Predictive maintenance

Image classification

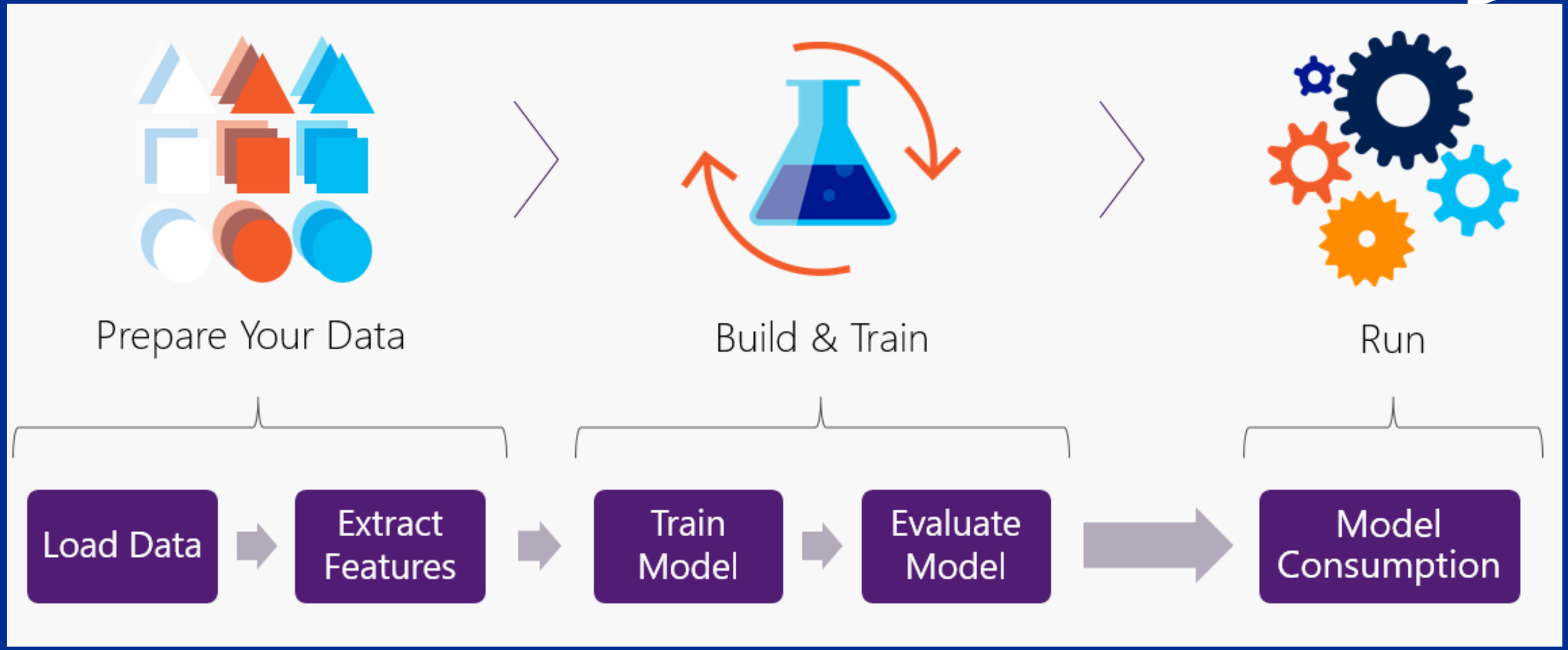
Recommendations

Object detection

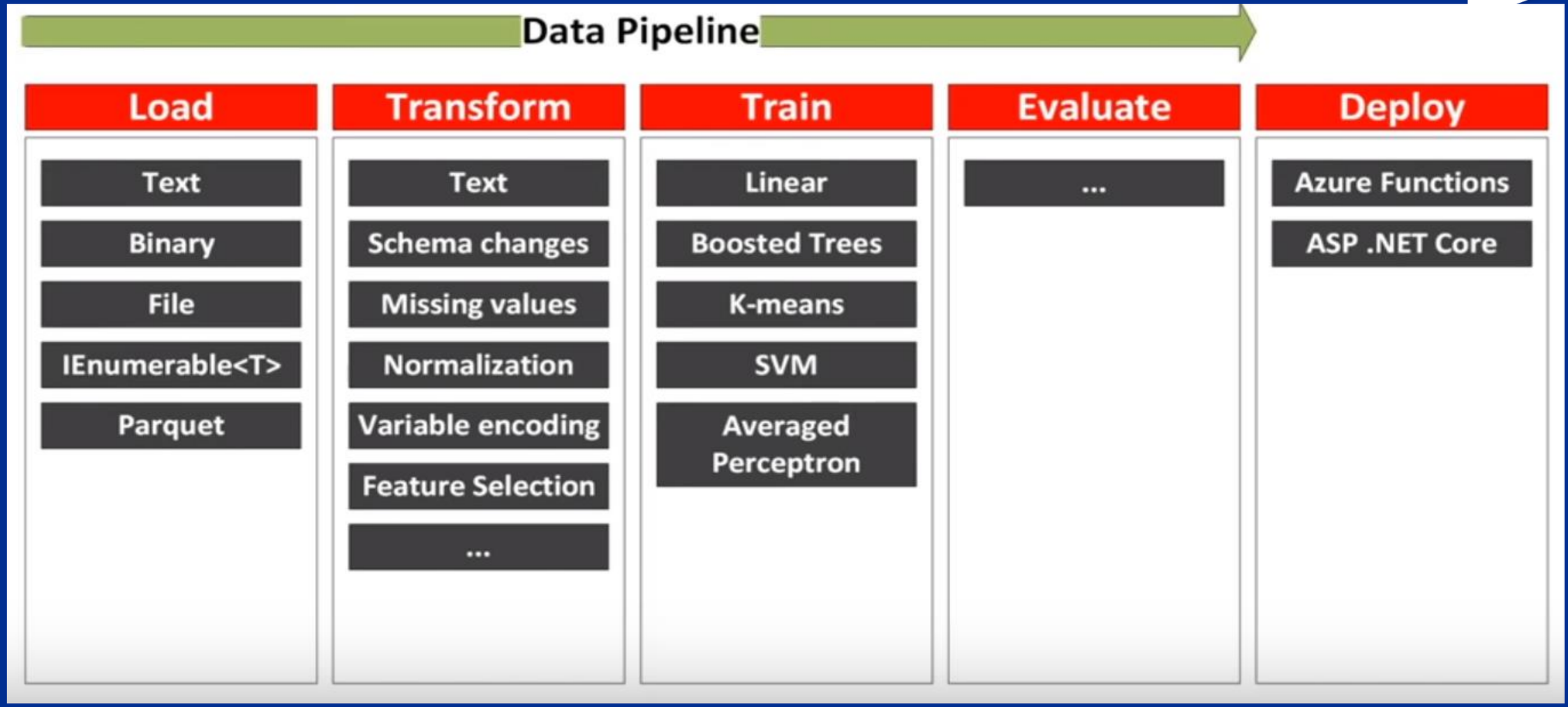
Customer segmentation

And more! Samples @ https://github.com/dotnet/machinelearning-samples

ML.Net – Workflow



ML.Net – Data Pipeline

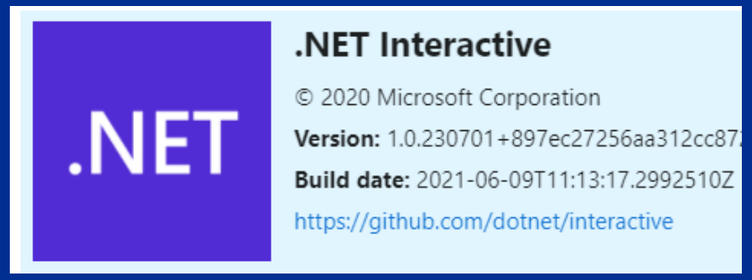


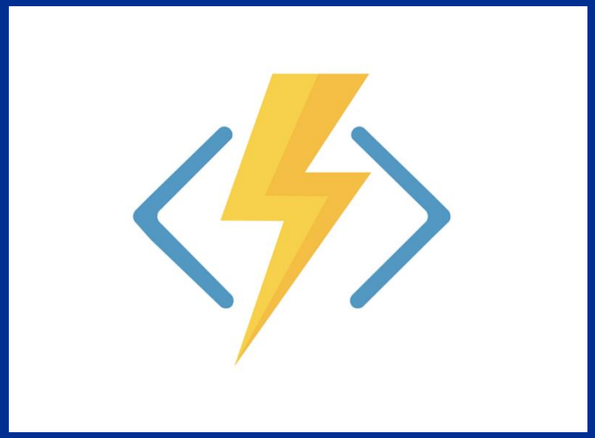
Cricket – EDA and Prediction

Statistics(2019-2020)

- Played by 104 Nations
- IPL Valuation: $6.7 billion
- IPL Viewers : 370 Million

Tools and Frameworks





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Cricket : Problem Statement

- Perform analysis on cricket dataset
- Predict score on a specific ball within 6 overs

Dataset

T20 Match - Men

- Duration: 2017 – 2021
- Matches : 1010
- Teams: 56
- Columns: 22
- Records: 231 K
- Mix of number and strings

- match_id
- season
- start_date
- venue
- innings
- ball
- batting_team
- bowling_team
- striker
- non_striker
- bowler
- runs_off_bat
- extras
- wides
- noballs
- byes
- legbyes
- penalty
- wicket_type
- player_dismissed
- other_wicket_type
- other_player_dismissed

Data Cleaning

- Filter dataset to include records till 6 over.

  Low memory and fast execution
- Check for Null Values
- Aggregation : Score per ball →

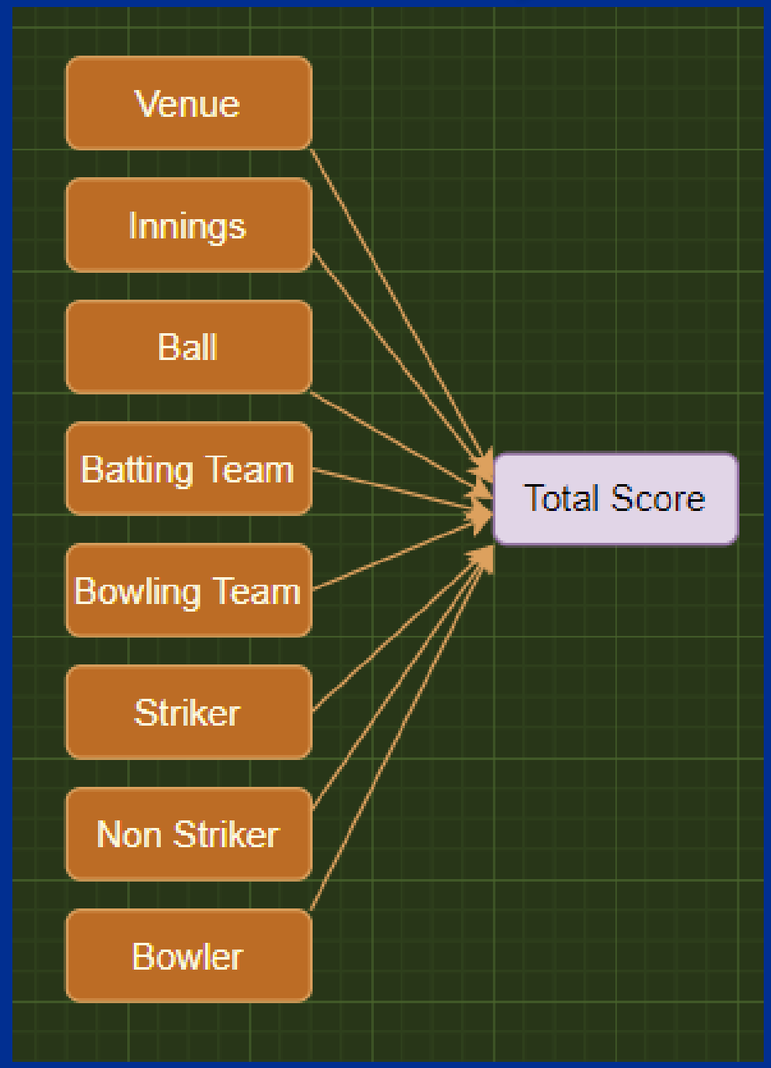
  runs_off_bat + extras
- Cumulative sum : Total Score per ball
- Remove features/columns

- match_id
- season
- start_date
- venue
- innings
- ball
- batting_team
- bowling_team
- striker
- non_striker
- bowler
- runs_off_bat
- extras
- wides
- noballs
- byes
- legbyes
- penalty
- wicket_type
- player_dismissed
- other_wicket_type
- other_player_dismissed

Prediction

Regression using ML.Net

- Define Classes : Match, MatchScorePrediction
- Load Dataset
- Split Dataset: Train/Test : 80/20
- One Hot Encoding
- Model Algorithm : FastTree
- Train → Evaluate → Predict the Model



ML.Net – API (Jupyter Notebook)

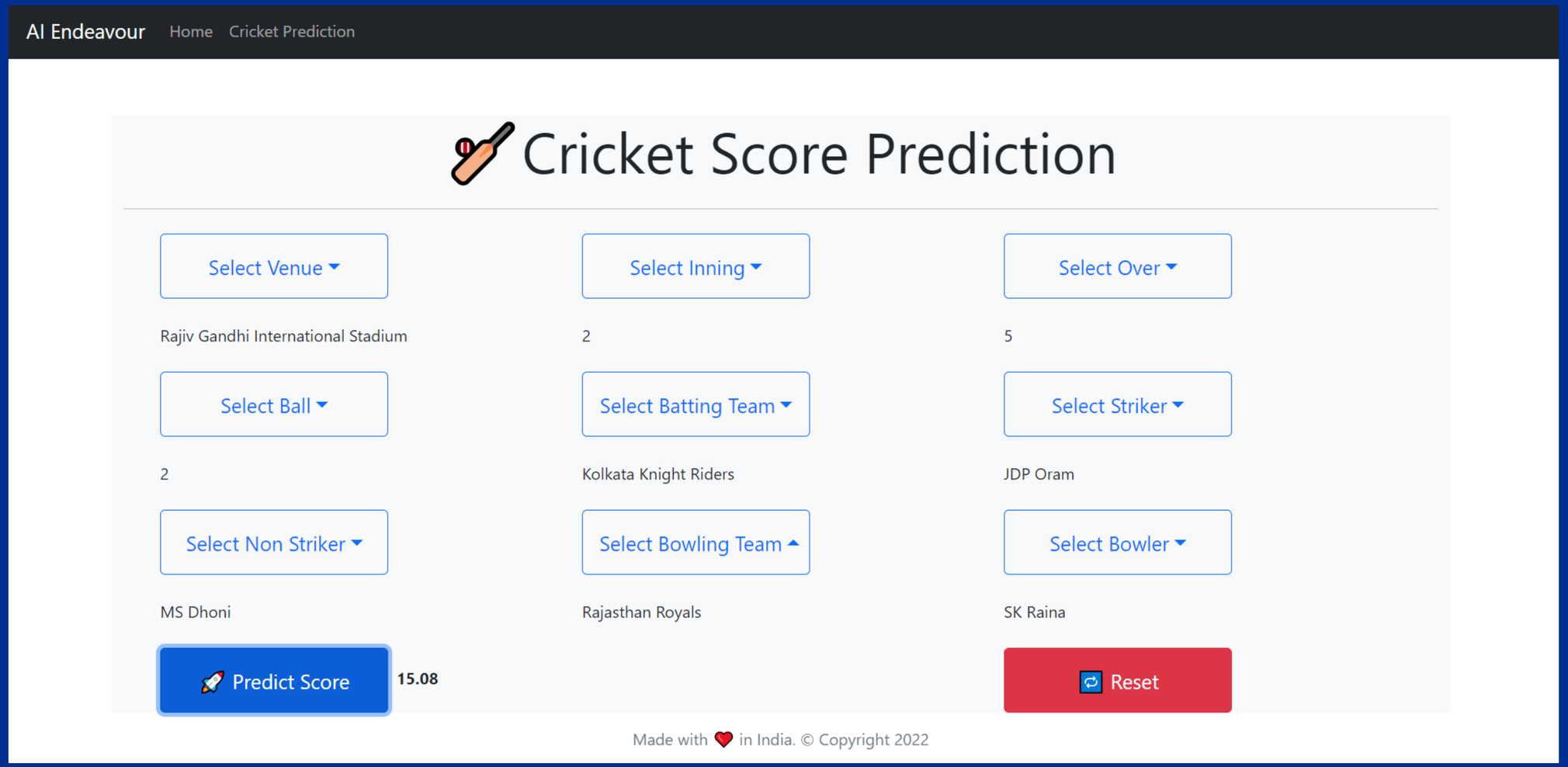
```
*************************************************
*       Model quality metrics evaluation
*------------------------------------------------
*       RSquared Score:      0.82
*       Root Mean Squared Error:      6.73


********** Predict...
Match Info:

Venue: Vidarbha Cricket Association Stadium_ Jamtha
Batting Team: India
Bowling Team: New Zealand
Inning: 1
Ball: 3.4
Striker: V Kohli
Non-Striker: Yuvraj Singh
Bowler: CJ Anderson
^^^^^^ Prediction:  24.15512
*************************************************************************
Predicted score: 24.1551, actual score: 20
*************************************************************************
```

ML.Net – AutoML (Model Builder)

Top 3 models explored

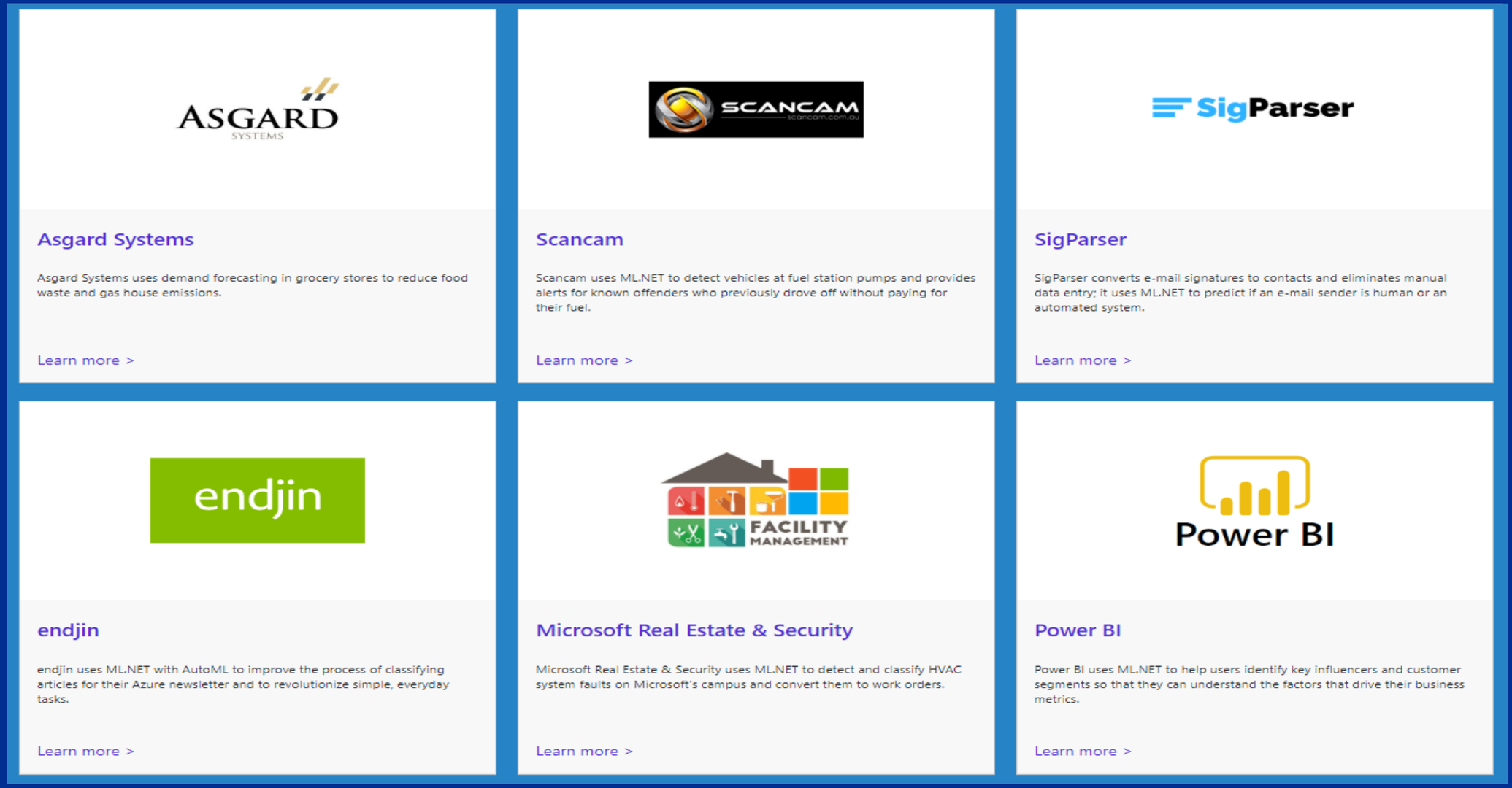
	Trainer	RSquared	Absolute-loss	Squared-loss	RMS-loss	Duration	#Iteration
1	LightGbmRegression	0.9012	3.72	25.48	5.05	6.7	1
2	SdcaRegression	0.8234	5.09	45.56	6.75	4.0	2
3	FastTreeRegression	0.8213	5.08	46.09	6.79	4.7	3

ML.Net – Web App



Demo

ML.Net : Customer Stories



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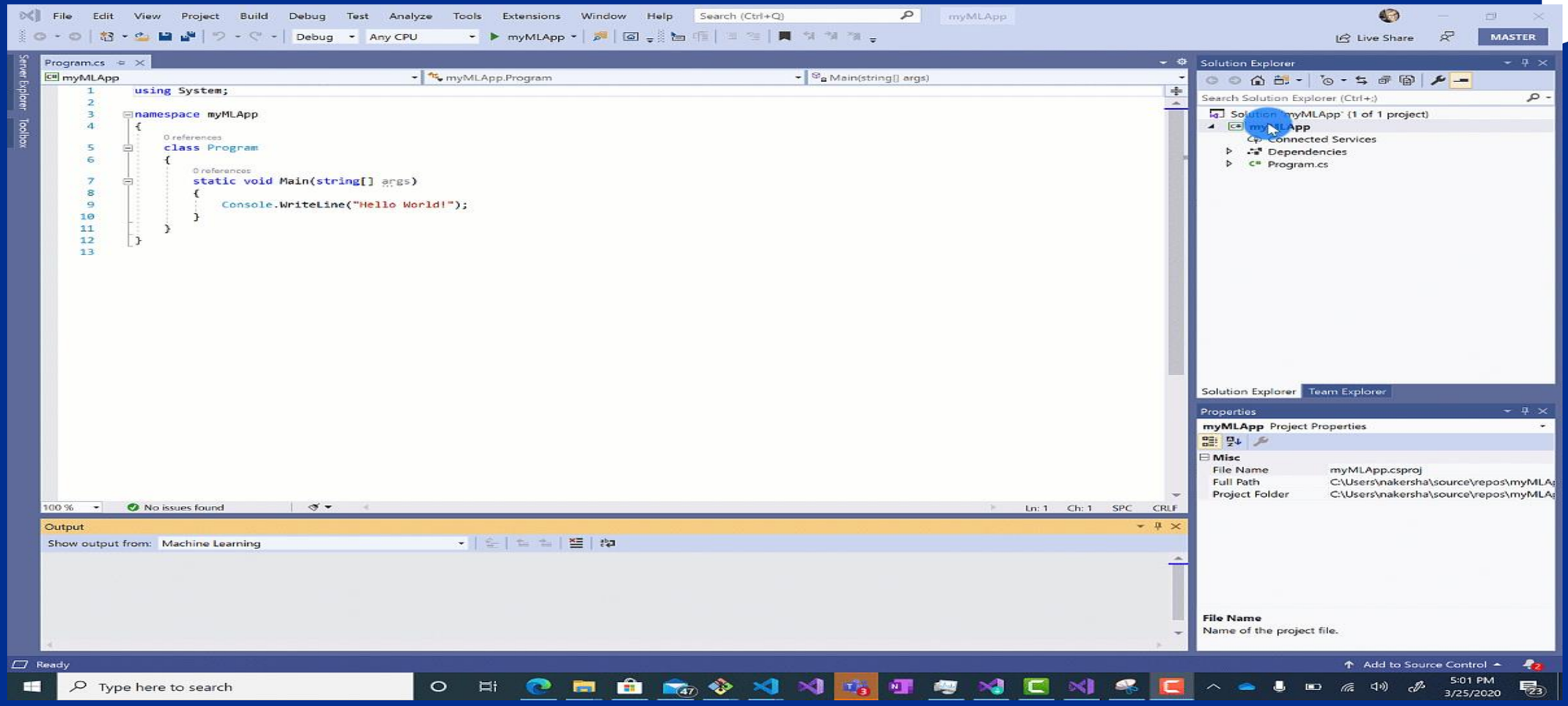
https://dotnet.microsoft.com/apps/machinelearning-ai/ml-dotnet/customers

ML.Net : Model Builder(AutoML)



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- ML.Net: https://devblogs.microsoft.com/cesardelatorre/what-is-ml-net-1-0-machine-learning-for-net/
- ONNX : https://onnx.ai/
- Photo-Search (ONNX) : https://github.com/Tak-Au/Photo-Search
- Music Repair : https://www.youtube.com/watch?v=nnV-1q-z9uE
- ML Cookbook : https://github.com/dotnet/machinelearning/blob/master/docs/code/MlNetCookBook.md
- Deploy to Azure functions : http://luisquintanilla.me/2018/08/21/serverless-machine-learning-mlnet-azure-functions/
- https://rubikscode.net/2019/02/18/ultimate-guide-to-machine-learning-with-ml-net/
- https://www.youtube.com/watch?v=dojO4zEL9sg
- https://www.youtube.com/watch?v=zy7Y9CHji2k

https://dotnet.microsoft.com/apps/machinelearning-ai/ml-dotnet/customers

Resource

- Github: https://github.com/praveenraghuvanshi/tech-sessions/tree/master/21102022-AI-ML-using-ml-dotnet-azconf-2022

- Dev.to : Cricket Analysis and Prediction using ML.Net(C#) - DEV Community

- Short Url: https://bit.ly/3MH34hv

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Q & A

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