



Global Bootcamp

Oslo

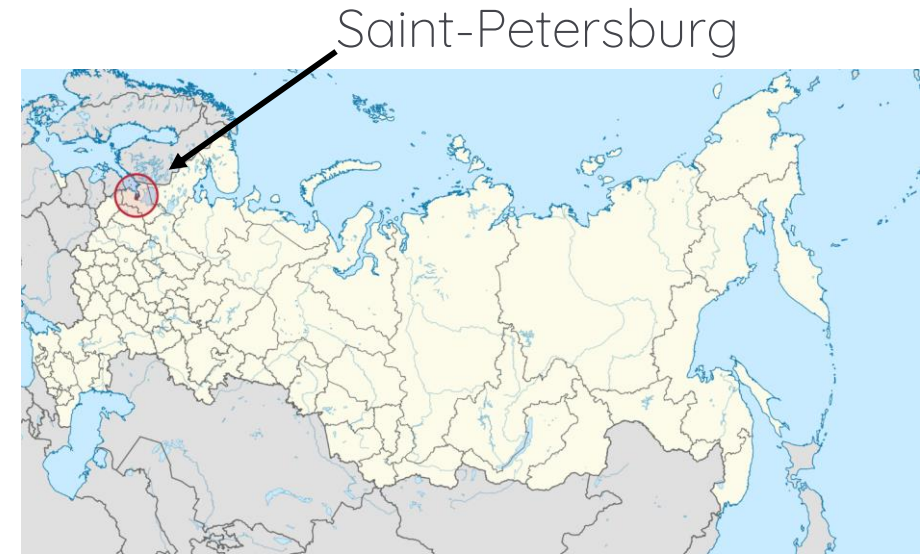
Introduction to ML.NET

Vadim Frolov

Data Scientist @ Inmeta/Crayon

About me

- Graduated in Russia in 2007 (MSc, Information Technology).
- 2008 – 2010 worked in Germany. Pedestrian recognition in scope of autonomous vehicles.
- 2013 – 2018 worked at NTNU in Moser lab. Analysis software for neuroscientists.
- 2018 -> Inmeta/Crayon. Consultant within machine learning area.

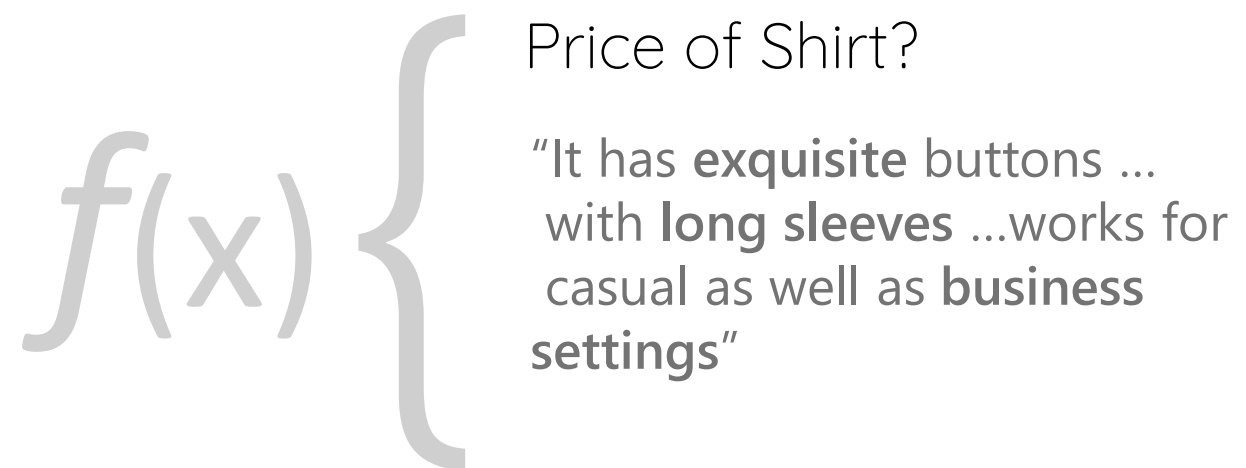
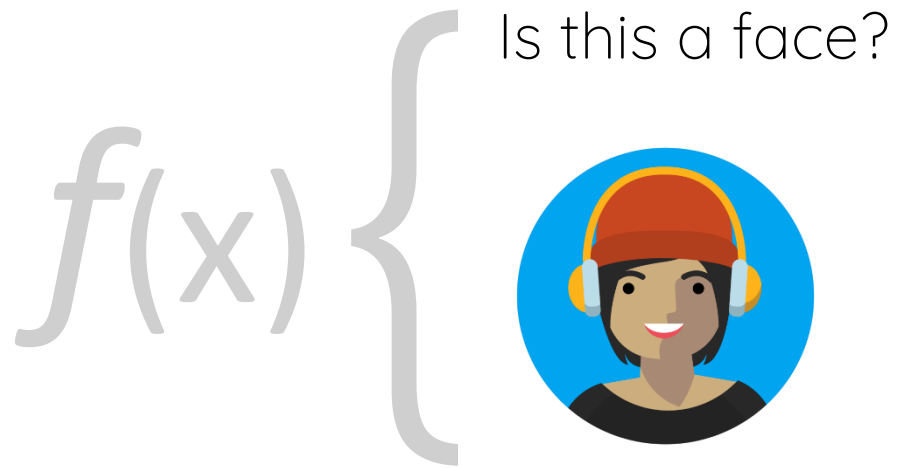


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Introduction to machine learning

Machine Learning

“Programming the UnProgrammable”



Machine Learning

“Programming the UnProgrammable”

Machine Learning creates a

$f(x)$

Model

using this data



Face



Face



Not a face

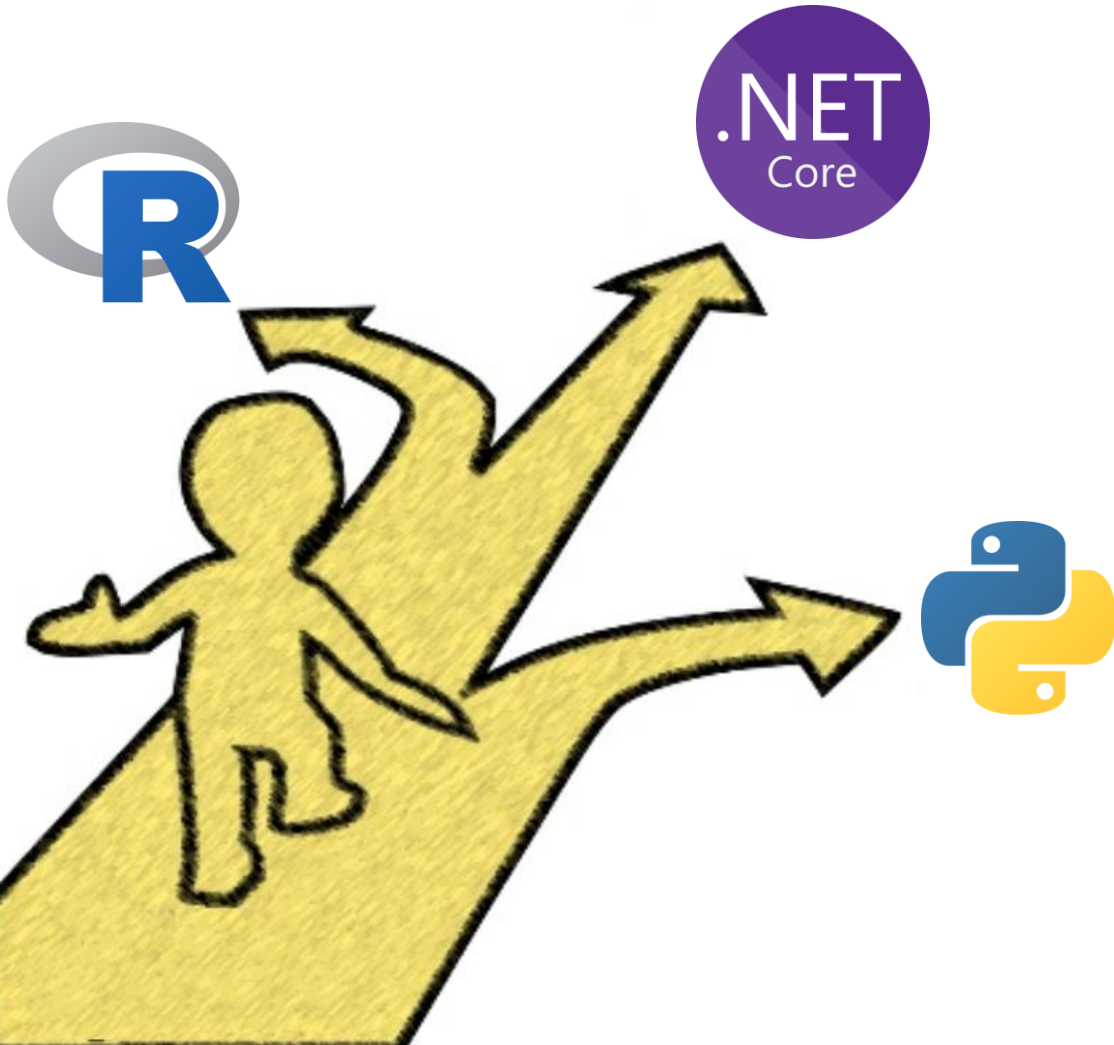


Not a face

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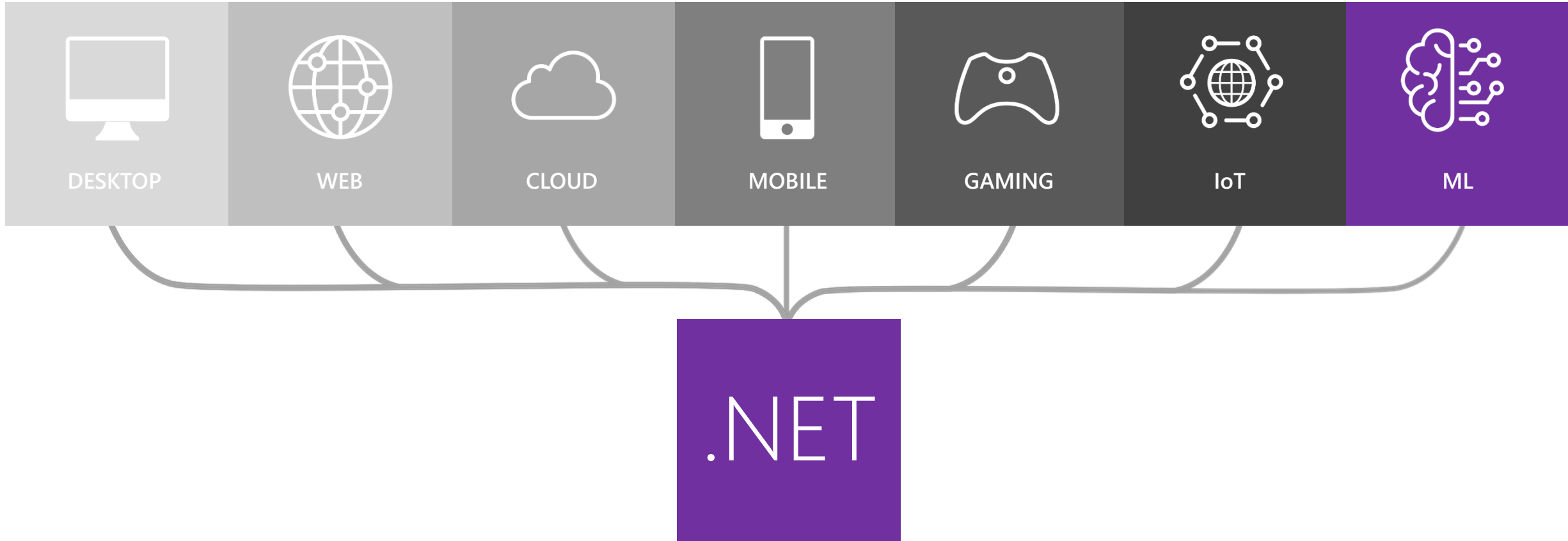
ML.NET

Languages for machine learning



- Existing applications in C#
- .NET developers
- Platform for production

Your platform for building anything



ANNOUNCED @ Build2019

ML.NET

Machine Learning framework for building custom ML Models

Custom ML made easy

Automated ML and Tools (Model Builder and CLI)

Proven at scale

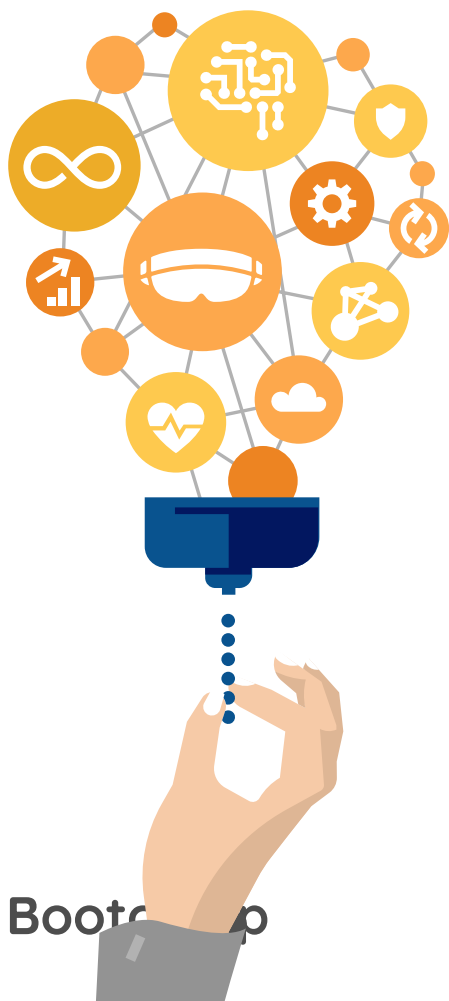
Azure, Office, Windows

Extensible

TensorFlow, ONNX and Infer.NET

Cross-platform and open-source

Runs everywhere



ML.NET Open Source Momentum

 dotnet / machinelearning

 Watch ▾

621

 Star

6.6k

 Fork

1.4k



150K+
Downloads

1,979
Commits

2,117
Pull requests

106+
Contributors

A few things you can do with ML.NET



Sentiment analysis

Analyze the sentiment of customer reviews using a binary classification algorithm.

[Sentiment analysis sample >](#)



Product recommendation

Recommend products based on purchase history using a matrix factorization algorithm.

[Product recommendation sample >](#)



Price prediction

Predict taxi fares based on distance traveled etc. using a regression algorithm.

[Price prediction sample >](#)



Customer segmentation

Identify groups of customers with similar profiles using a clustering algorithm.

[Customer segmentation sample >](#)



GitHub labeler

Suggest the GitHub label for new issues using a multi-class classification algorithm.

[GitHub labeler sample >](#)



Fraud detection

Detect fraudulent credit card transactions using a binary classification algorithm.

[Fraud detection sample >](#)



Spam detection

Flag text messages as spam using a binary classification algorithm.

[Spam detection sample >](#)



Image classification

Classify images (e.g. broccoli vs pizza) using a TensorFlow deep learning algorithm.

[Image classification sample >](#)



Sales forecasting

Forecast future sales for products using a regression algorithm.

[Sales forecasting sample >](#)

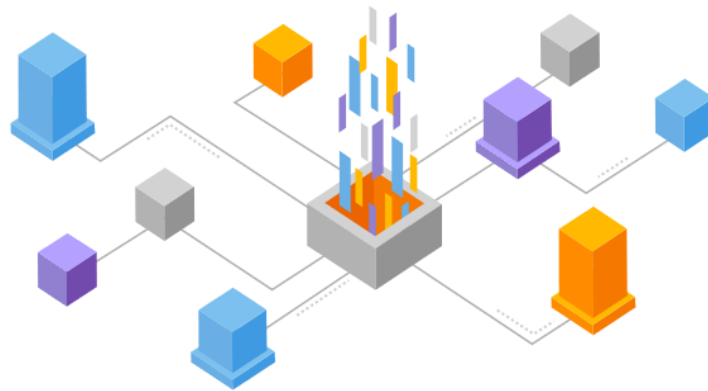
.NET for Apache® Spark™

A free, open-source, and cross-platform big data analytics framework

Get Started

Request a Demo

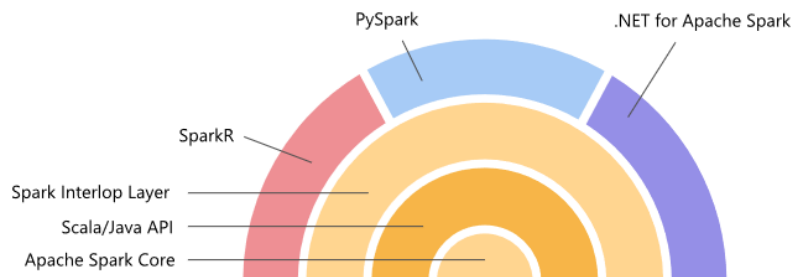
Supported on Windows, Linux, and macOS



What is Apache Spark?

[Apache Spark™](#) is a general-purpose distributed processing engine for analytics over large data sets—typically terabytes or petabytes of data. Apache Spark can be used for processing batches of data, real-time streams, machine learning, and ad-hoc query.

Processing tasks are distributed over a cluster of nodes, and data is cached in-memory, to reduce computation time.



<https://dotnet.microsoft.com/apps/data/spark>

Jupyter Notebook ❤️ C#

The screenshot shows a Jupyter Notebook interface in a web browser. The address bar indicates the URL is `localhost:8888/lab/workspaces/auto-J`. The notebook is titled "Hello.ipynb" and is in "Code" mode. The left sidebar shows a file explorer with a "Last Modified" column. The main area displays five code cells with C# code and their outputs.

File Explorer (Last Modified):

- a day ago
- a day ago
- a day ago
- 2 minutes ago
- a day ago

Code Cells:

```
[1]: // ML.NET Nuget packages installation
#r "nuget:Microsoft.ML,1.4.0"

// Install XPlot package
#r "nuget:XPlot.Plotly,3.0.1"
```

Output for [1]:

```
Installing package Microsoft.ML, version 1.4.0.....done!
Successfully added reference to package Microsoft.ML, version 1.4.0
Installing package XPlot.Plotly, version 3.0.1.....done!
Successfully added reference to package XPlot.Plotly, version 3.0.1
```

```
[2]: using System;
using System.IO;
using Microsoft.ML;
```

```
[4]: Console.WriteLine("C# in a notebook. Right!")
```

Output for [4]:

```
C# in a notebook. Right!
```

```
[5]: class Person
{
    public string Name {get; set;}
    public string Role {get; set;}
}

display(new Person {Name = "Ola Norman", Role = "Data scientist"})
```

Output for [5]:

Name	Role
Ola Norman	Data scientist

Input prompt: []:

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ML.NET Key Concepts

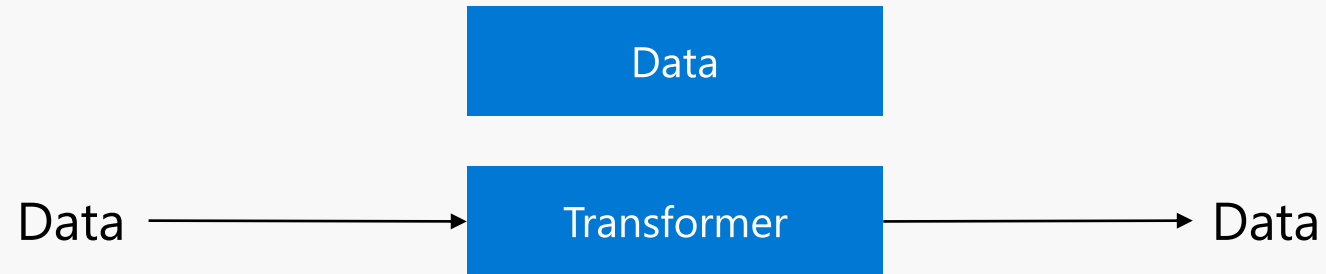
1. Data

Data

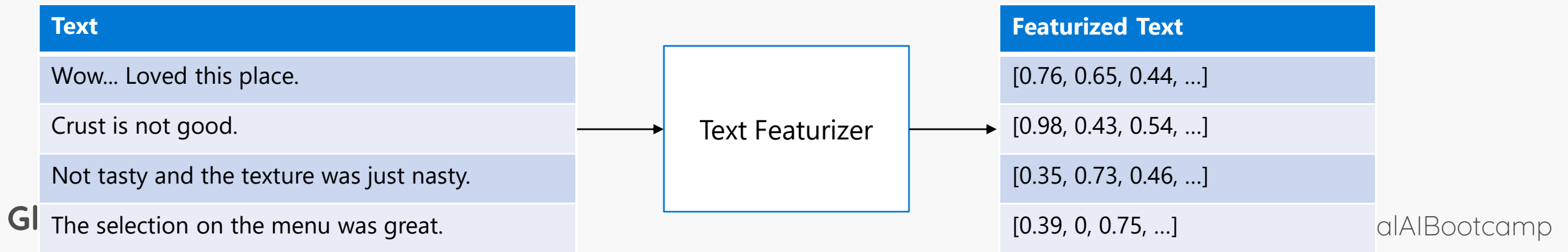
Example

Comment Text	Sentiment
Wow... Loved this place.	1
Crust is not good.	0
Not tasty and the texture was just nasty.	0
The selection on the menu was great.	1

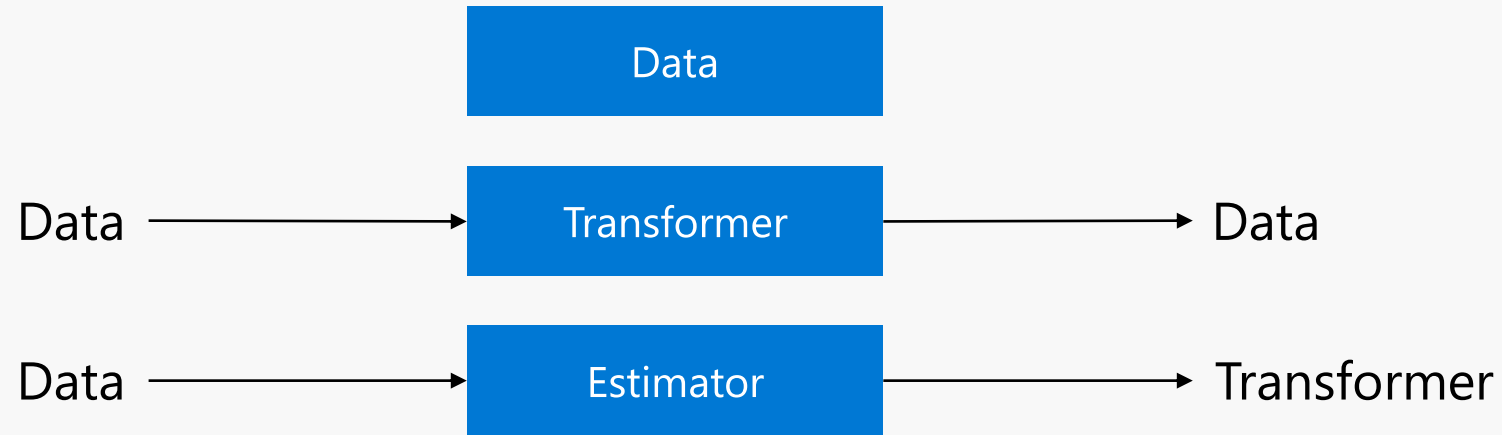
2. Transformers



Example

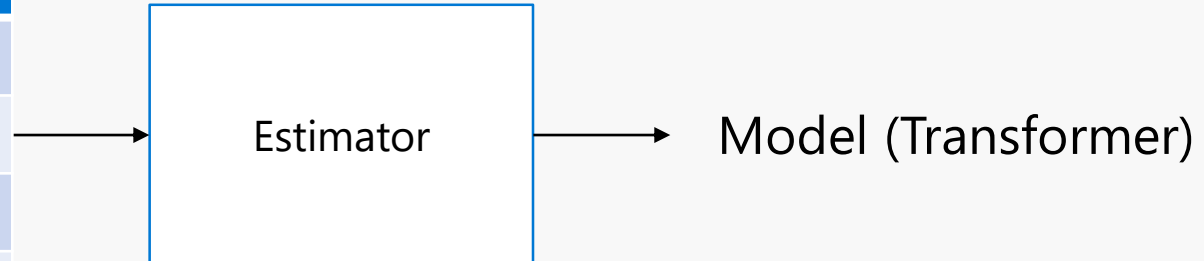


3. Estimators



Example

Comment	Sentiment
Wow... Loved this place.	1
Crust is not good.	0
Not tasty and the texture was just nasty.	0
The selection on the menu was great.	0



Sentiment Analysis

Comment	Toxic? (Sentiment)
==RUDE== Dude, you are rude ...	1
== OK! == IM GOING TO VANDALIZE ...	1
I also found use of the word "humanists" confusing ...	0
Ooooooh thank you Mr. DietLime ...	0

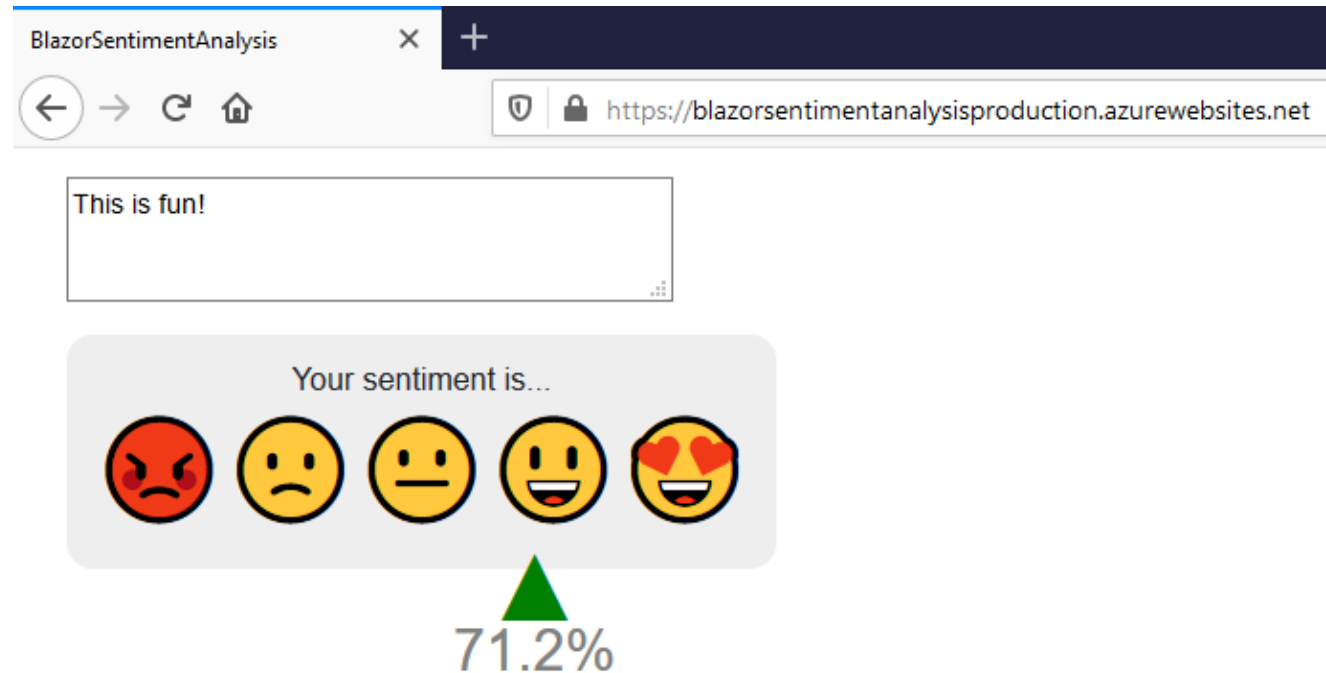
Features (input)

Label (output)

Sentiment analysis live demo

Let's try it out at

<https://blazorsentimentanalysisproduction.azurewebsites.net/>



Try ML.NET today!



Get started at <http://dot.net/ml>



Try samples at <http://aka.ms/mlnetsamples>



Read the docs at <http://aka.ms/mlnetdocs>



Submit issues or contribute <http://aka.ms/mlnet>

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Any Questions?



Thanks!

Help us grow!



Introduction to ML.NET

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<https://github.com/fralik/workshop-mlnet/>

<https://www.linkedin.com/in/vadimfrolov/>



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