

A tablet is positioned on the left side of the frame, displaying an email inbox interface. The screen shows a list of emails with details like 'From', 'Subject', and 'Date'. The background is a blurred wooden desk with some papers and a laptop keyboard visible at the bottom.

Machine Learning Simplified for Developers with ML.NET

The ML.NET logo is a purple circle with a white diagonal line from the top-left to the bottom-right. The text 'ML.NET' is written in white, sans-serif font across the circle.

ML.NET

AI Hack Day 2021 (Virtual)

Join the Conversation | @aihackday | @jernej_kavka | <https://jkdev.me>



Jernej Kavka (JK)

SSW Senior Software Architect



[@Jernej_kavka](https://twitter.com/Jernej_kavka)



github.com/jernejk



jkdev.me



linkedin.com/in/jernejkavka/




APAC AI User Group



AI - The Podcast

Down Under Edition

.NET Core and EF Core dev by day

Microsoft AI MVP and ML.NET enthusiast at night 

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Table of Contents

My story (why ML.NET?)

What is machine learning

Demo

My goal

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Food & Drink

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Education






Azure ML




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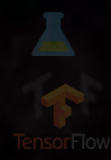


Education



ONE DOES NOT SIMPLY

LEARN MACHINE LEARNING





IF TIME IS INFINITE



**WHY IS THERE NEVER
ENOUGH OF IT?**

An open source and cross-platform machine learning framework

Model Builder

Supported on Windows, Linux, and macOS



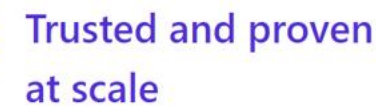
With ML.NET, you can use your existing .NET skills to easily integrate ML into your .NET apps without any prior ML experience.



ML.NET offers AutoML and productive tools to help you easily build, train, and deploy high-quality custom ML models.



ML.NET allows you to leverage other popular ML libraries like Infer.NET, TensorFlow, and ONNX for additional ML scenarios.



Use the same ML framework used by recognized Microsoft products like PowerBI, Microsoft Defender, Outlook, and Bing.

Get started

Model

Supported on Windows, Linux, and



Built for .NET developers

With ML.NET, you can use your existing .NET skills to easily integrate ML into your .NET apps without any prior ML experience.



Custom ML made easy with AutoML

ML.NET offers AutoML and productive tools to help you easily build, train, and deploy high-quality custom ML models.



ML.NET

- MS machine learning SDK that works offline
- Simple yet powerful
- Already powering Microsoft products
- Support major ML models
 - TensorFlow
 - ONNX
- Awesome samples on GitHub
 - <https://github.com/dotnet/machinelearning-samples>



My goal

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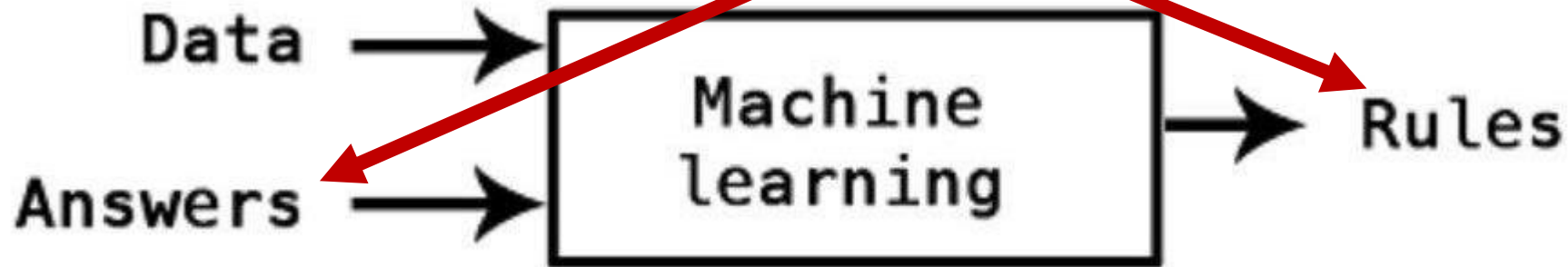
Table of Contents

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What is machine learning

Demo

What is Machine Learning?



Rock, paper, scissors (classic)

If **rock** then **paper**

If **paper** then **scissors**

If **scissors** then **rock**

Rock, paper, scissors (ML)

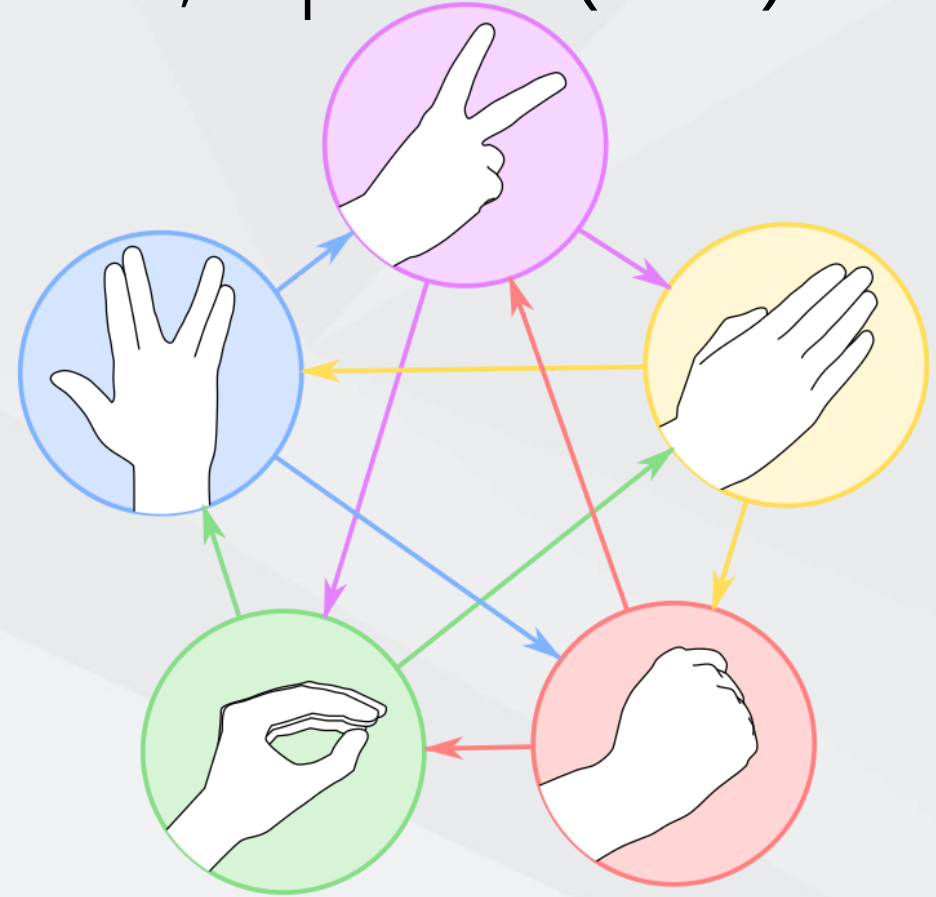
Opponent	Winner
Rock	Paper
Paper	Scissors
Rock	Paper
Scissors	Rock
...	...

Demo

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Rock, paper, scissors, lizard, Spock (ML)

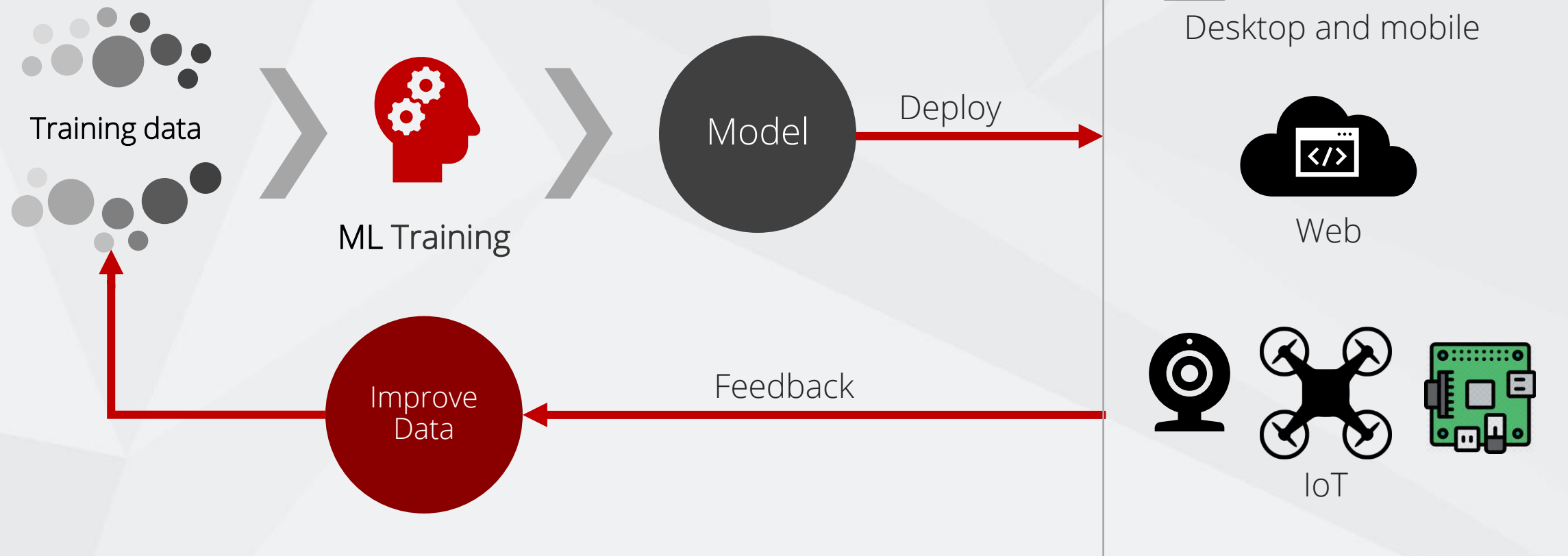
Opponent	Winner
Rock	Paper
Paper	Scissors
Rock	Paper
Scissors	Rock
Lizard	Rock
Spock	Lizard
Scissors	Spock
Paper	Lizard
...	...

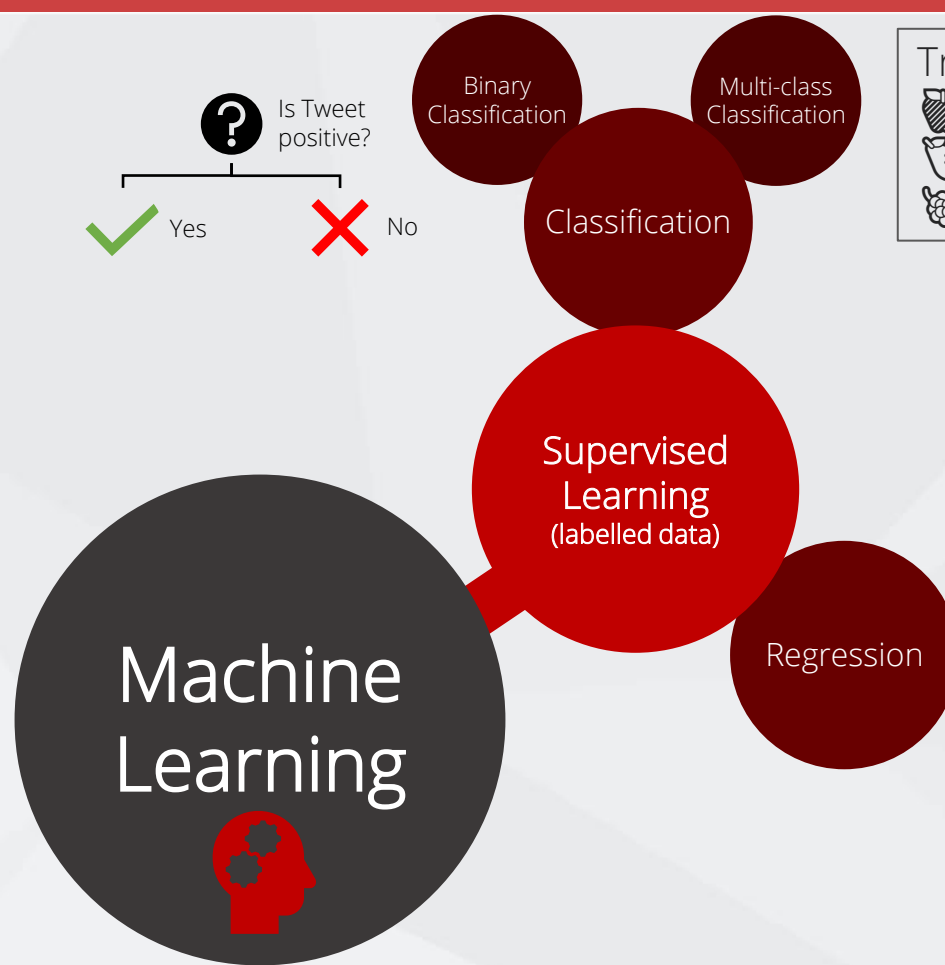


Demo

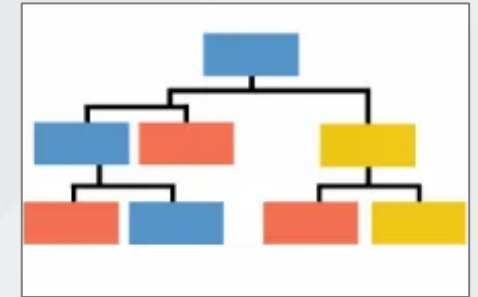
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ML life-cycle (oversimplified)

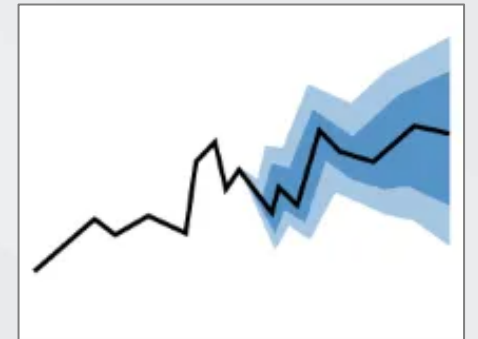




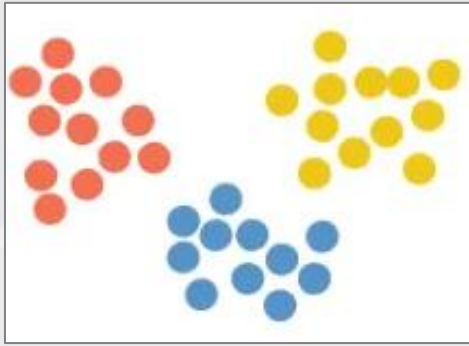
Training data:
🍏 => Apple
🍐 => Pear
🍇 => Grape



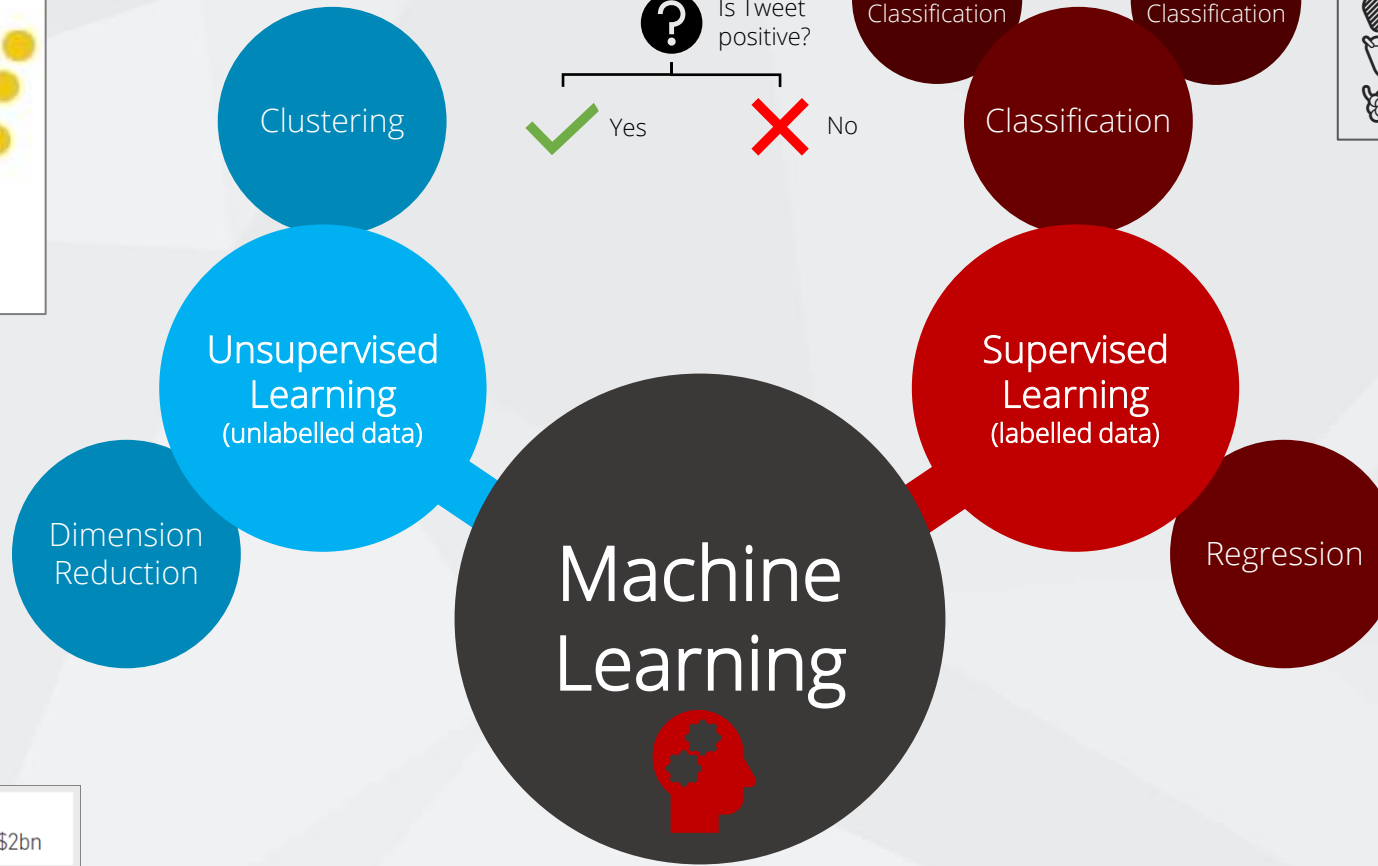
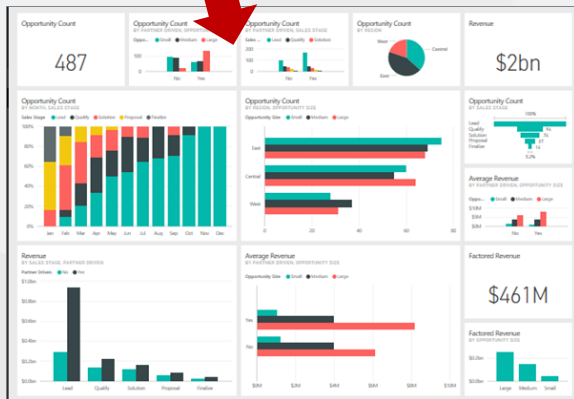
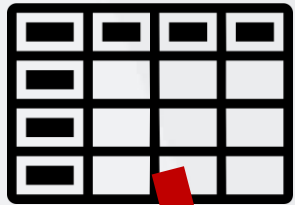
Decision trees



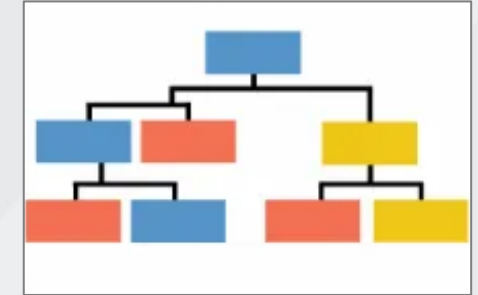
House value estimation



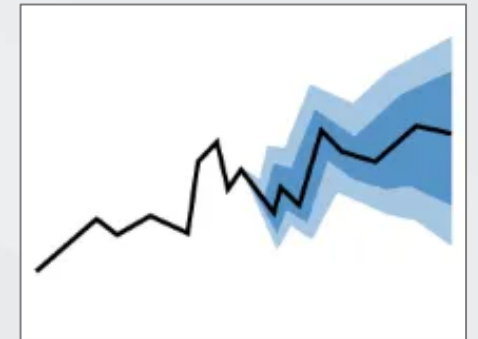
Product recommendations



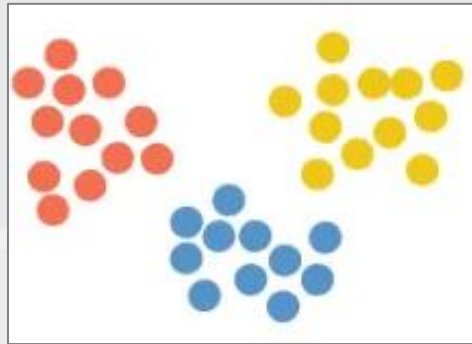
Training data:
 => Apple
 => Pear
 => Grape



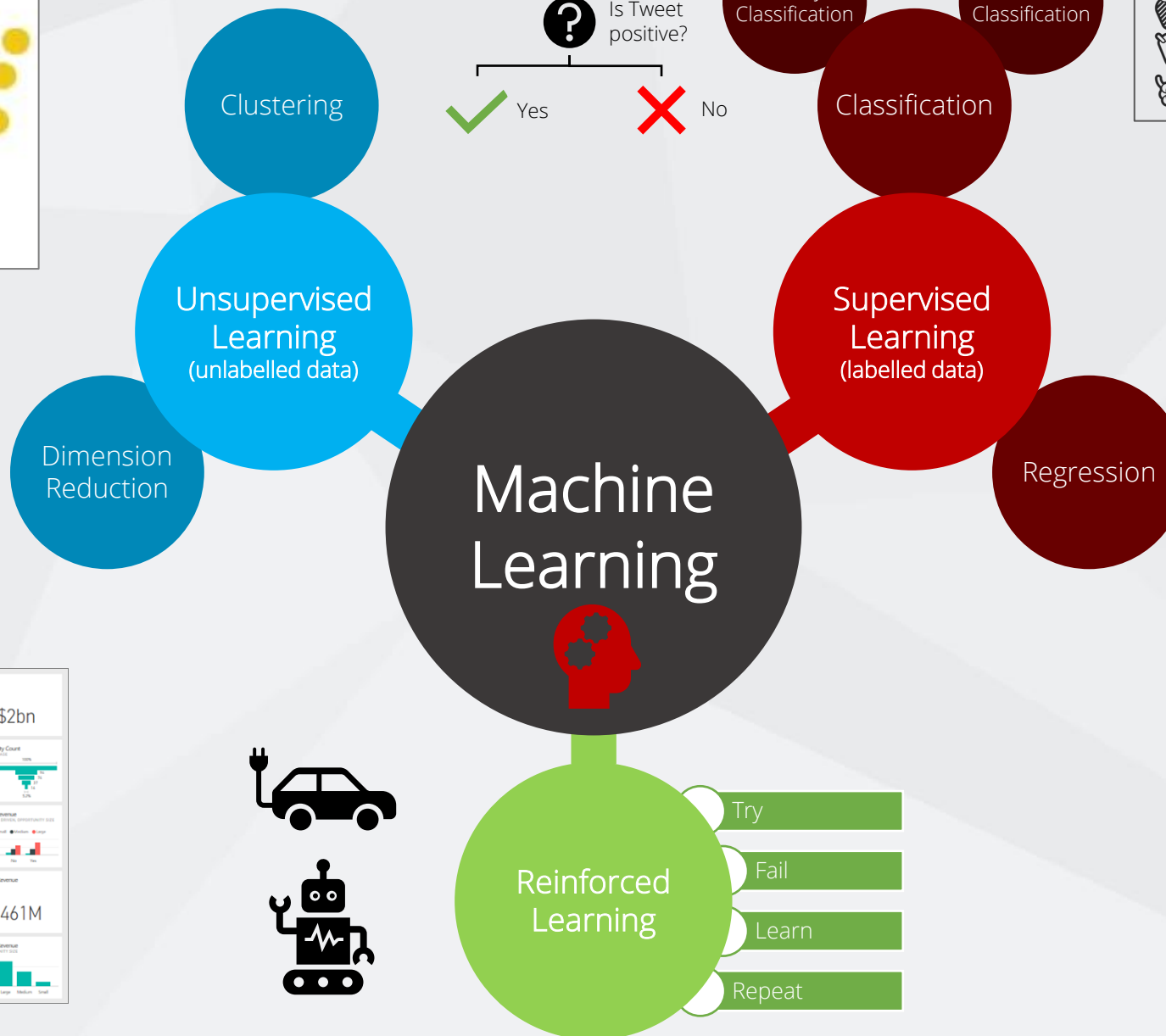
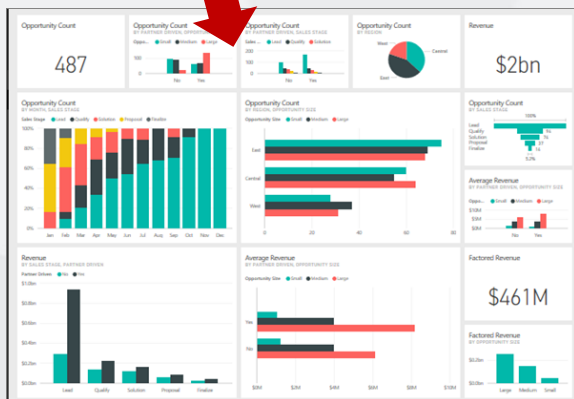
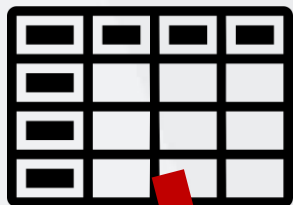
Decision trees



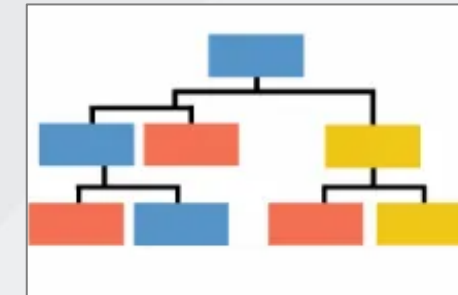
House value estimation



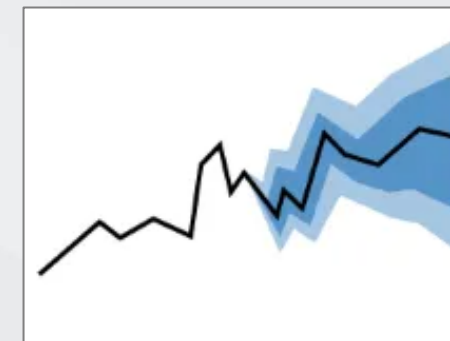
Product recommendations



Training data:
 => Apple
 => Pear
 => Grape

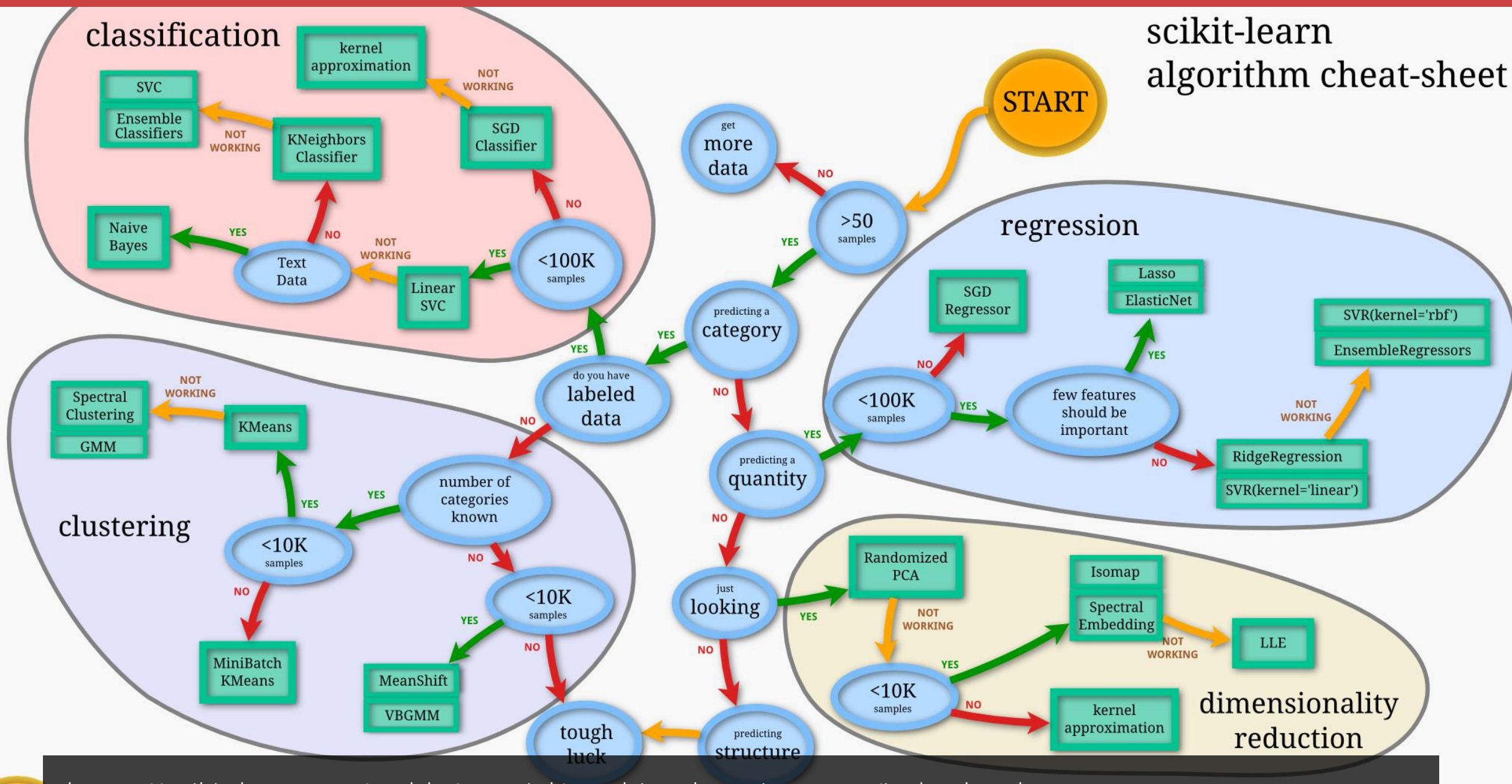


Decision trees



House value estimation

scikit-learn algorithm cheat-sheet

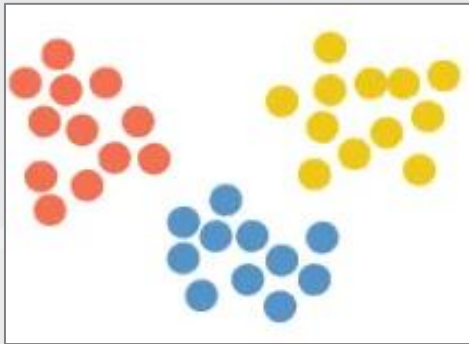


https://scikit-learn.org/stable/tutorial/machine_learning_map/index.html

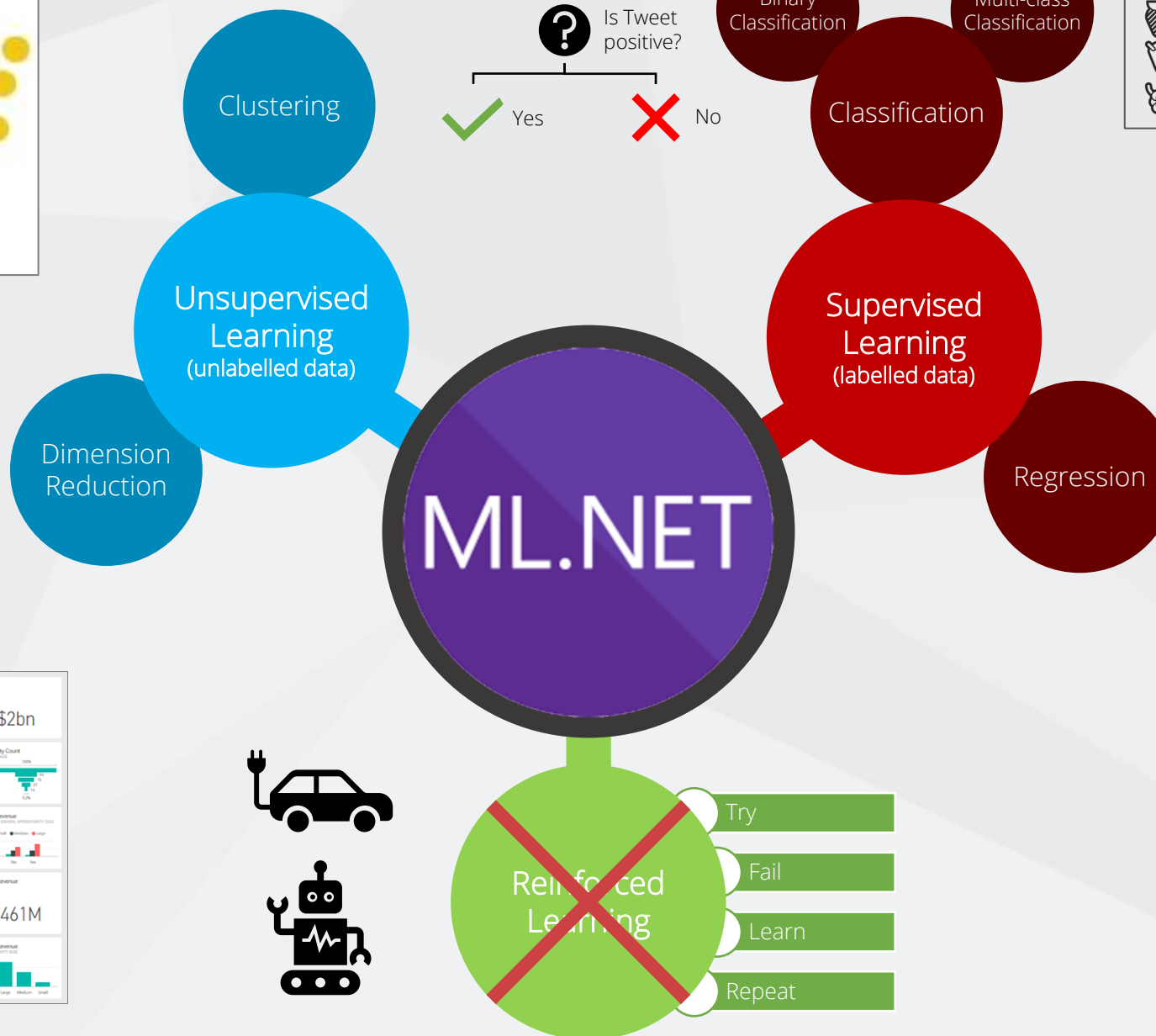
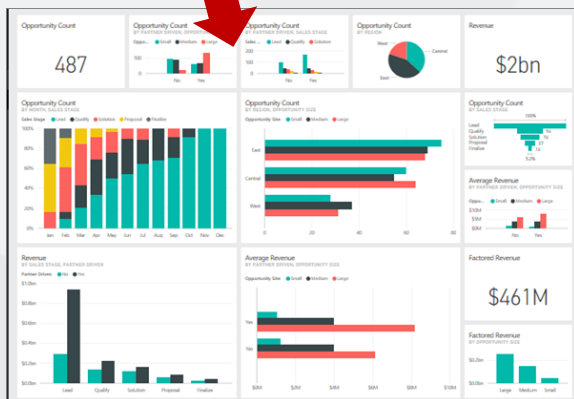
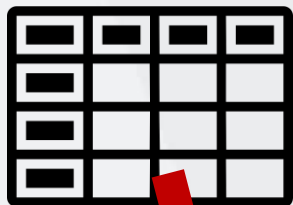
Back

scikit

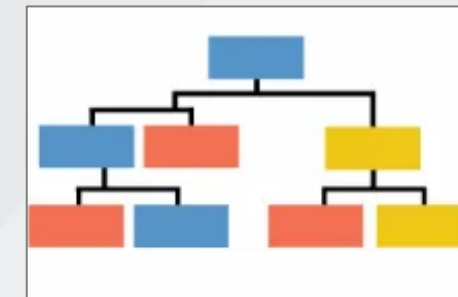
learn



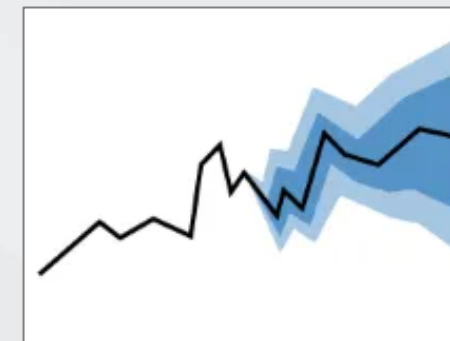
Product recommendations



Training data:
 => Apple
 => Pear
 => Grape



Decision trees



House prices predictions

How do I start?

- Start with a scenario

Scenarios

- Is Tweet positive?
Binary classification – How much or how many?
- Categorize bank transactions
Multi-class classification – Which category?
- House price estimation
Regression – How much or how many?
- Product recommendation
Clustering – Which group?
- Crypto currency forecast
Forecast – How will it change over time?

Table of Contents

My story (why ML.NET?)

What is machine learning

Demo

Let's do it

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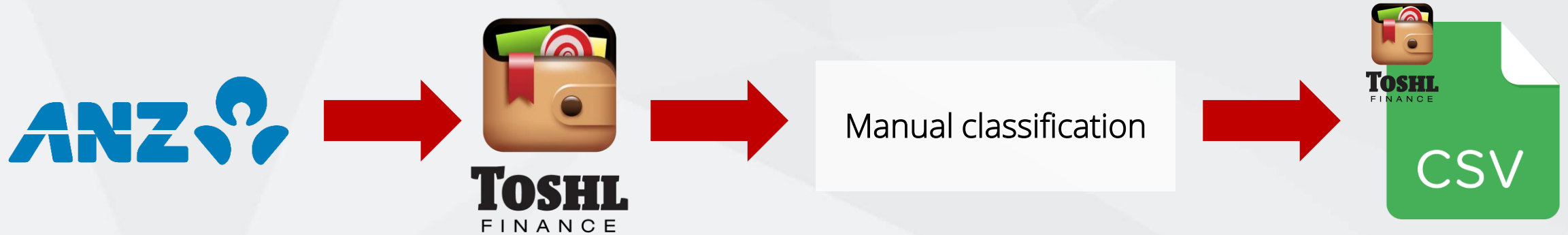
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Training data preparation



Training data (CSV)

Date	Account	Category	Tags	Expense am	Income am	Currency	In main cur	Main curre	Description						
17/05/2018	ANZ Rewards	 Leisure	movies & music	11.99	0	AUD	11.99	AUD	Spotify P05F97AC4B Sydney						
17/05/2018	Online Shopping	 Food & Drinks	 restaurants	15.15	0	AUD	15.15	AUD	VISA DEBIT PURCHASE CARD 0012 NAVALA CHURRASCARIA BRISBANE						
17/05/2018	ANZ Rewards	 Transport	 taxi	23.25	0	AUD	23.25	AUD	PAYPAL *UBER AU 4029357733						
17/05/2018	Online Shopping	 Food & Drinks	 coffee & tea	5.5	0	AUD	5.5	AUD	VISA DEBIT PURCHASE CARD 0012 AMERICAN CONCEPTS PT BRISBANE						
17/05/2018	Online Shopping	 Food & Drinks	 bar	7	0	AUD	7	AUD	VISA DEBIT PURCHASE CARD 0012 RIVERLAND BRISBANE BRISBANE CITY						
17/05/2018	Online Shopping	 Food & Drinks	 coffee & tea	24.91	0	AUD	24.91	AUD	VISA DEBIT PURCHASE CARD 0012 AT BROTHERS PTY LTD BRISBANE CITY						
17/05/2018	Online Shopping	 Food & Drinks	 groceries	19	0	AUD	19	AUD	VISA DEBIT PURCHASE CARD 0012 RAW GROUP STAFFORD P STAFFORD						
17/05/2018	Online Shopping	 Leisure	movies & music	17.25	0	AUD	17.25	AUD	VISA DEBIT PURCHASE CARD 0012 THE HOYTS CORPORATIO STAFFORD						
17/05/2018	Online Shopping	 Food & Drinks	 groceries	9.5	0	AUD	9.5	AUD	VISA DEBIT PURCHASE CARD 0012 RAW GROUP STAFFORD P STAFFORD						
17/05/2018	Online Shopping	 Food & Drinks	 restaurants	15.15	0	AUD	15.15	AUD	VISA DEBIT PURCHASE CARD 0012 NAVALA CHURRASCARIA BRISBANE						



Demo

AutoML CLI

- ML.NET in command line
- Model Builder is using this behind the scenes
- It works on Linux, Mac and Windows
- Install: **dotnet tool install -g mlnet**

```
JK@JACKDAWTOWER C:\..\Workshop mlnet classification --dataset "from-bank-unfiltered.csv" --label-col Category --has-header true --train-time 30
```

Welcome to the ML.NET CLI!

Learn more about the ML.NET CLI: <https://aka.ms/mlnet-cli>
Use 'mlnet --help' to see available commands and options.

Telemetry

The ML.NET CLI tool collects usage data in order to help us improve your experience.
The data is anonymous and doesn't include personal information or data from your datasets.
You can opt-out of telemetry by setting the MLDOTNET_CLI_TELEMETRY_OPTOUT environment variable to '1' or 'true' using your favorite shell.

Read more about ML.NET CLI telemetry: <https://aka.ms/mlnet-cli-telemetry>

Start Training

	Trainer	MicroAccuracy	MacroAccuracy	Duration	#Iteration
1	AveragedPerceptronOva	0.9469	0.8074	9.0	1
2	SdcaMaximumEntropyMulti	0.9354	0.8035	4.8	2
3	LightGbmMulti	0.9156	0.8578	12.5	3

=====Experiment Results=====

Summary					
ML Task: multiclass-classification					
Dataset: C:\DataJK\Workshop\from-bank-unfiltered.csv					
Label : Category					
Total experiment time : 26.3612011 Secs					
Total number of models explored: 3					

Top 3 models explored					
	Trainer	MicroAccuracy	MacroAccuracy	Duration	#Iteration
1	AveragedPerceptronOva	0.9469	0.8074	9.0	1
2	SdcaMaximumEntropyMulti	0.9354	0.8035	4.8	2
3	LightGbmMulti	0.9156	0.8578	12.5	3

mlnet classification --dataset "from-bank-unfiltered.csv" --label-col Category --has-header true --train-time 30

Predict bank transaction category

Bank transaction description:

Predict

Predictions

DotNetFoundation.org - investment

coffee & tea	7 %
rent	1 %
groceries	1 %
investment	86 %
transport	1 %
entertainment	1 %
health	1 %
conference	3 %

Examples of predictions

- DotNetFoundation.org - investment
- Coffee - coffee & tea
- Fitness - health
- Uber - transport

Now also works in Blazor Wasm (client-side)
<https://github.com/jernejk/MLSample.SimpleTransactionTagging>

Summary

- Import CSV file
- Tweak columns to get better results
 - A little data science knowledge can have major impact
- Generate project with ML
- We can run it anywhere on .NET (Core)

with ML NET

Arafat (@arafattehsin)

GLOBAL
THE PODCAST

Jernej Kavka (JK) - @jernej_kavka

AI with ML.NET Podcast - https://www.youtube.com/watch?v=GjSTIXf_xro

Bri Achtman (@briacht)

Luis Quintanilla (@ljquintanilla)

Goal achieved

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Thank you!

[@Jernej_kavka](https://twitter.com/Jernej_kavka)

<http://bit.ly/jk-ml-interview-blog>

info@ssw.com.au

www.ssw.com.au

Sydney | Melbourne | Brisbane | Canberra

