



Aloha, World! ML.NET and MAUI

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SpaceE

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**Microsoft®**
Most Valuable
Professional



Award Categories
AI, Windows Development,
Internet of Things, Mixed Reality

First year awarded:
2017

Number of MVP Awards:
6

- Machine Learning
- C# Devs
- Maintenance Personnel
- Fortune Tellers
- Crystal Gazing/Scrying



Agenda

- Predictive Maintenance
- What is Machine Learning?
- ML.NET
- ML.NET Model Builder
- Demo

Predictive maintenance

- maintenance strategy
- predict when equipment or machines may fail / need maintenance
- to take care of machines
- to keep running smoothly
- To prevent unexpected break down



A close-up photograph of a person's hands holding a blue clipboard with a white sheet of paper. The person is wearing a dark blue long-sleeved shirt. The background shows the engine compartment of a car, with various mechanical parts and hoses visible. The text "Regular Check-ups" is overlaid in white on the lower left portion of the image.

Regular Check-ups

@rondagdag

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Industrial Machinery

- Advance sensors
- ML Algorithms
- Data Analysis
- Predict future problem
- Fix before breakdown
- Save time and Money -
Unscheduled downtime and
maintenance costs.



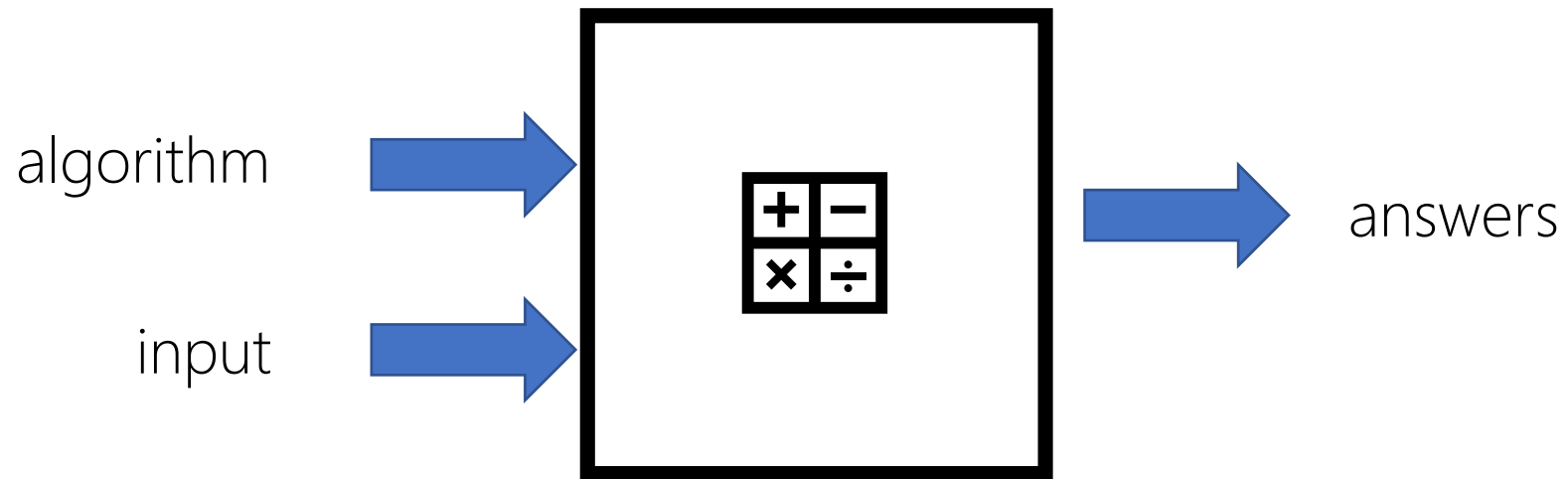
Roman crystal ball with
the Greek palindrome
3rd century CE

ΑΒΛΑΘΑΝΑΛΒΑ

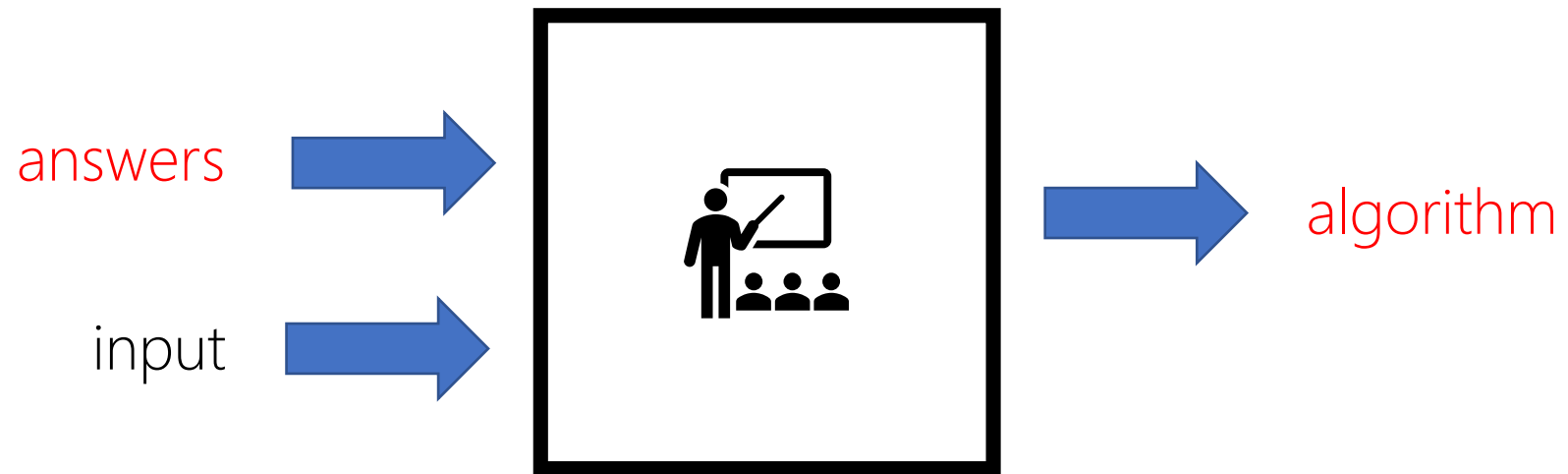
ABLANATHANALBA
“You are our father”



programming



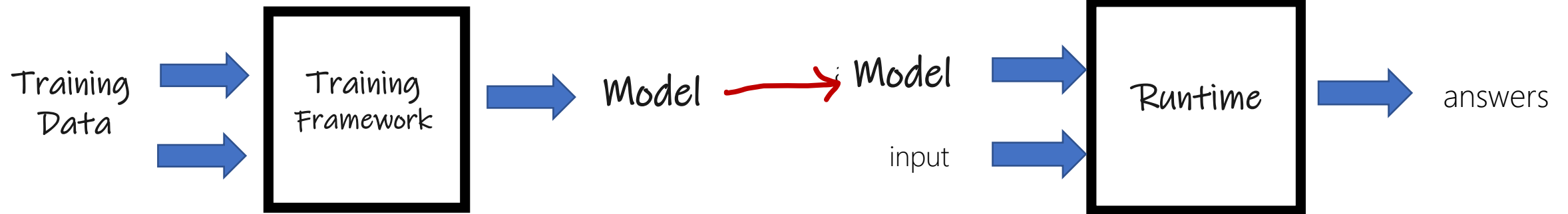
machine learning



ML Primer

machine Learning

Inferencing



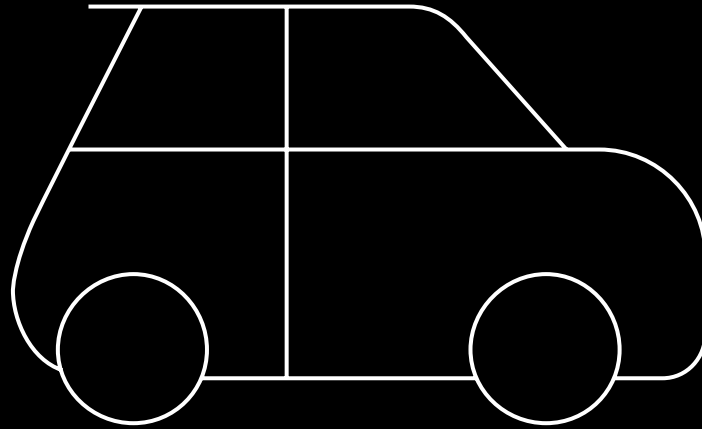
ML.NET

- machine learning to .NET applications
- Add automatic predictions to apps
- online or offline
- ML.NET can generate machine learning **model**.
- **model** = steps to transform input data into a prediction
- import pre-trained TensorFlow and ONNX models
- Supports Windows, Linux, and macOS



AutoML with ML.NET

ML.NET tool accelerates productivity



How much is the taxi fare for 1 passenger going from Airport to Downtown?

machine learning made easy

ML.NET takes the guess work out of data prep, feature selection & hyperparameter tuning

Which features?

Distance

Trip time

Car type

Passengers

Time of day

...

Which algorithm?

Gradient Boosted

Nearest Neighbors

SGD

Bayesian Regression

LGBM

...

Which parameters?

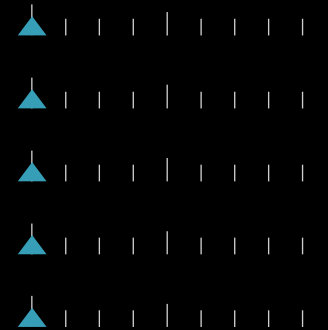
Criterion

Loss

Min Samples Split

Min Samples Leaf

XYZ



30%

Model

machine learning made easy

ML.NET takes the guess work out of data prep, feature selection & hyperparameter tuning

Which features?

Distance

Trip time

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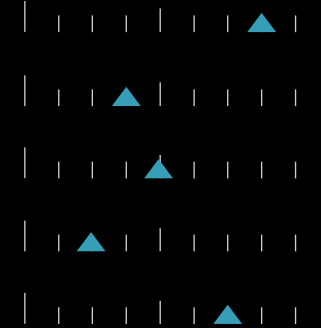
Neighbors

Weights

Min Samples Split

Min Samples Leaf

XX



30%

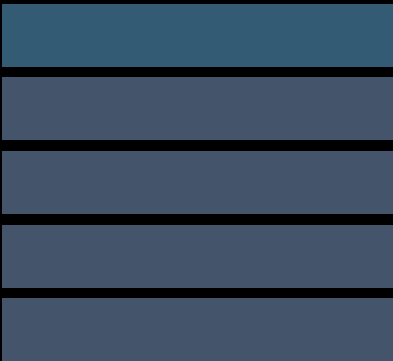
Model

Iterate

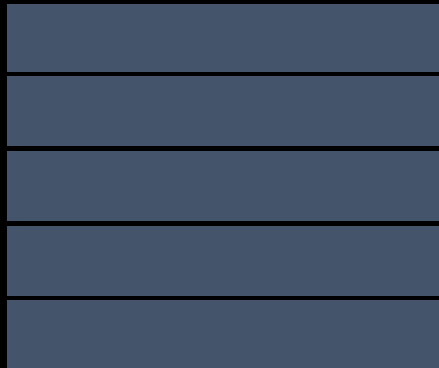
machine learning made easy

ML.NET takes the guess work out of data prep,
feature selection & hyperparameter tuning

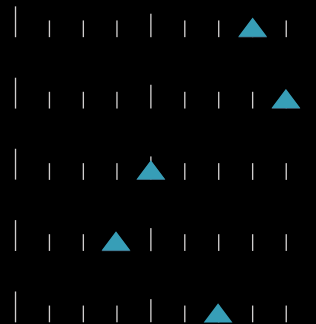
Which features?



Which algorithm?



Which parameters?



30%

15%

Iterate

ML.NET accelerates model development

Input

101010
010101
101010

Enter data

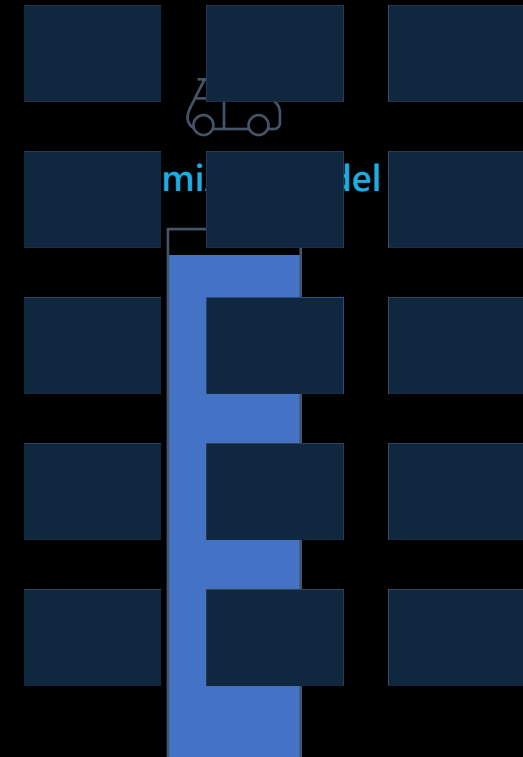
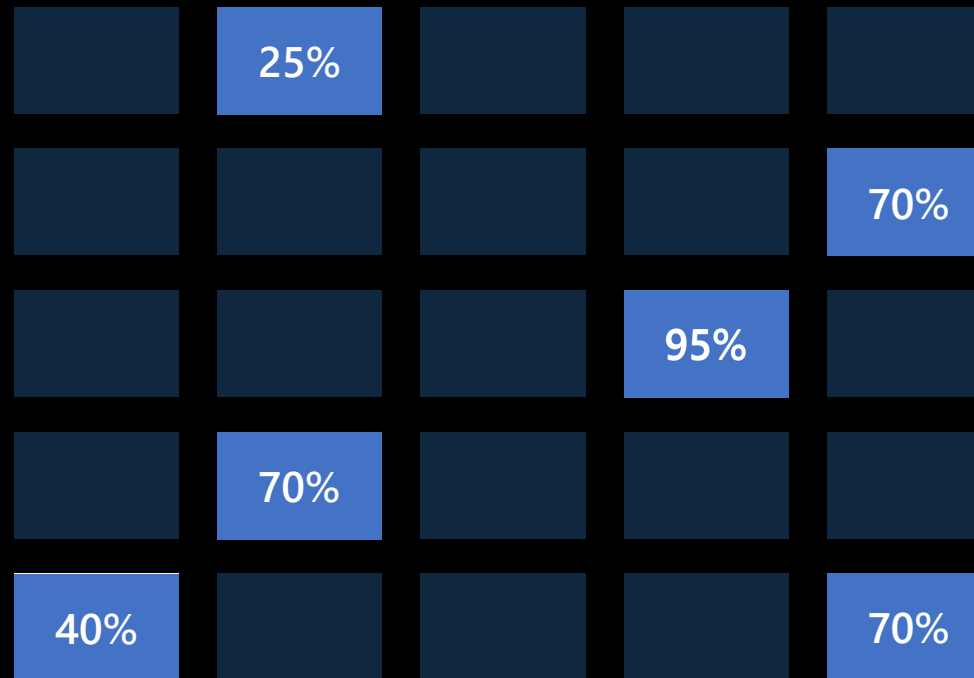


Define goals



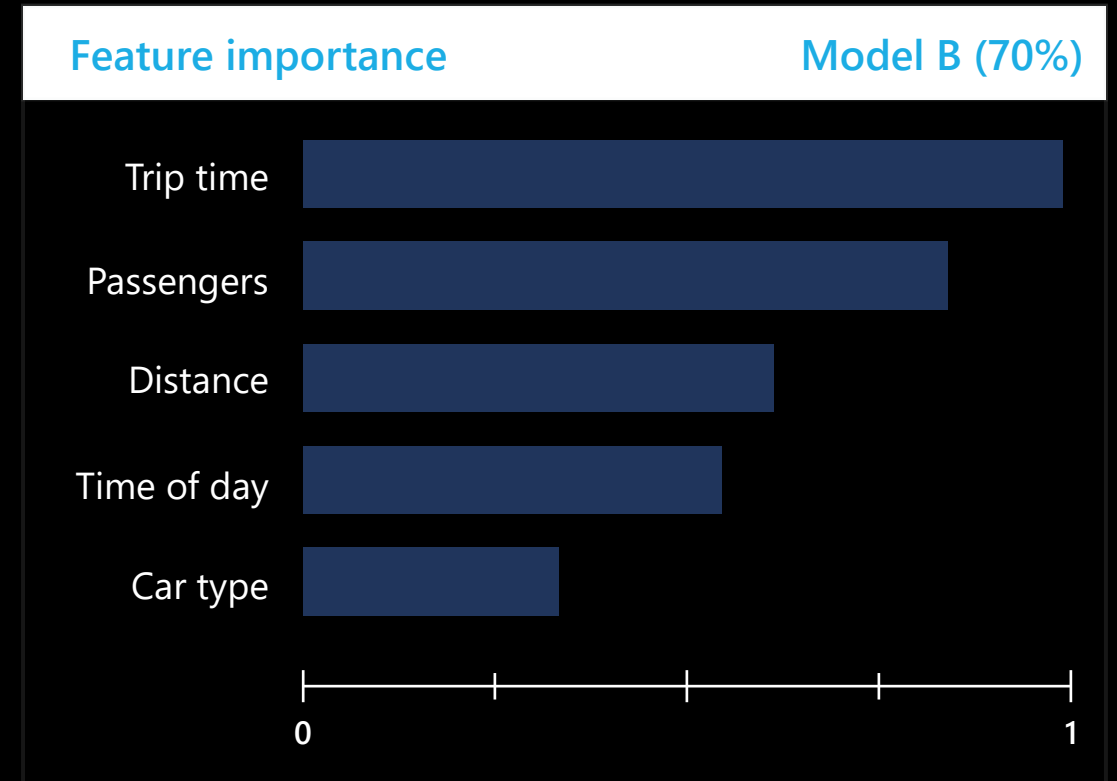
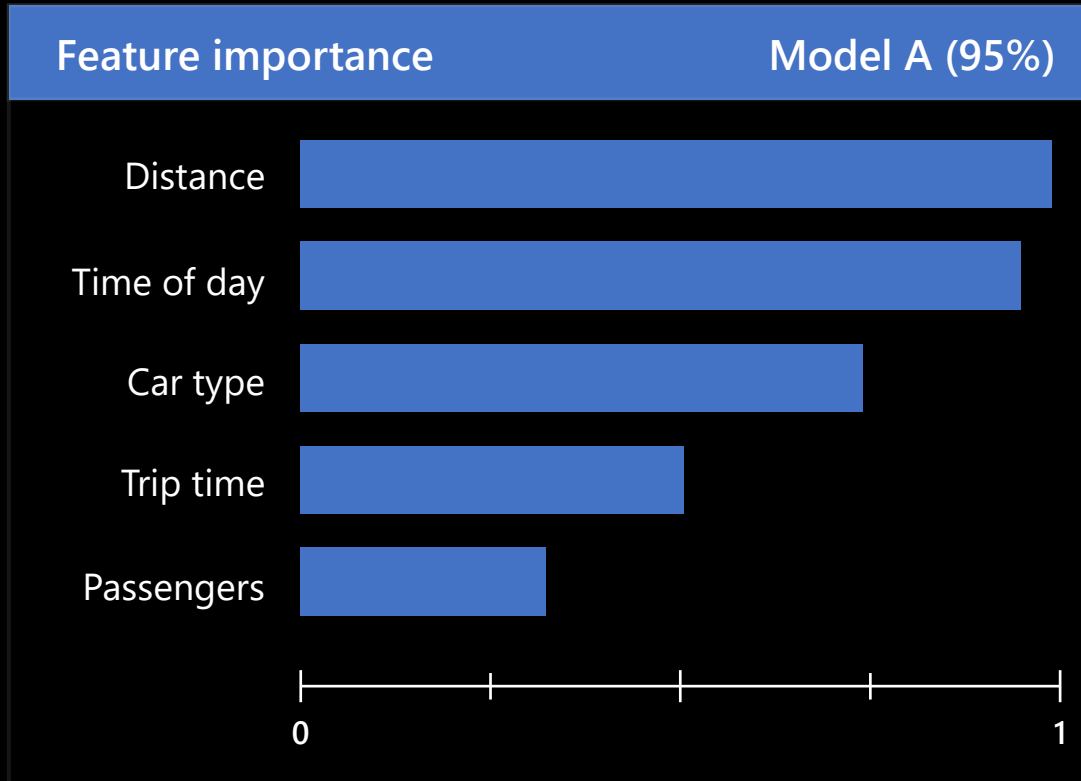
Apply constraints


Intelligently test multiple models in parallel



ML.NET accelerates model development

with **model explainability**

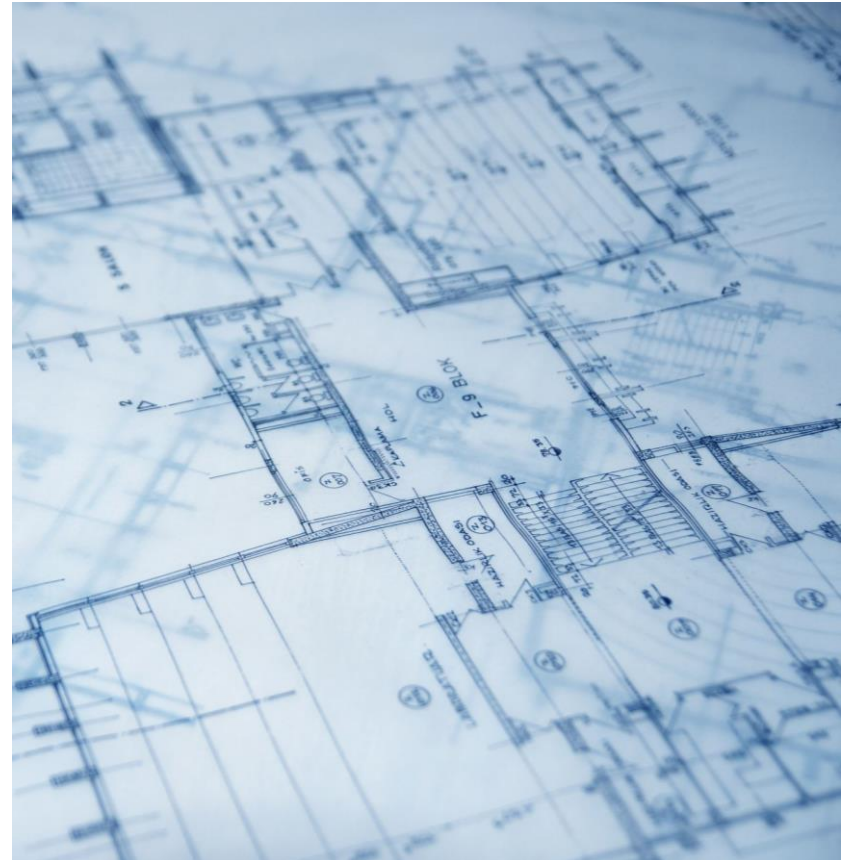


- 
- Largest-known true crystal ball
 - Smithsonian in Washington, D.C.
 - 106.75 lbs. (48.42 kg)
 - 12.9 in diameter (32.7 cm)
 - 1800s in China, mineral is from Burma
-

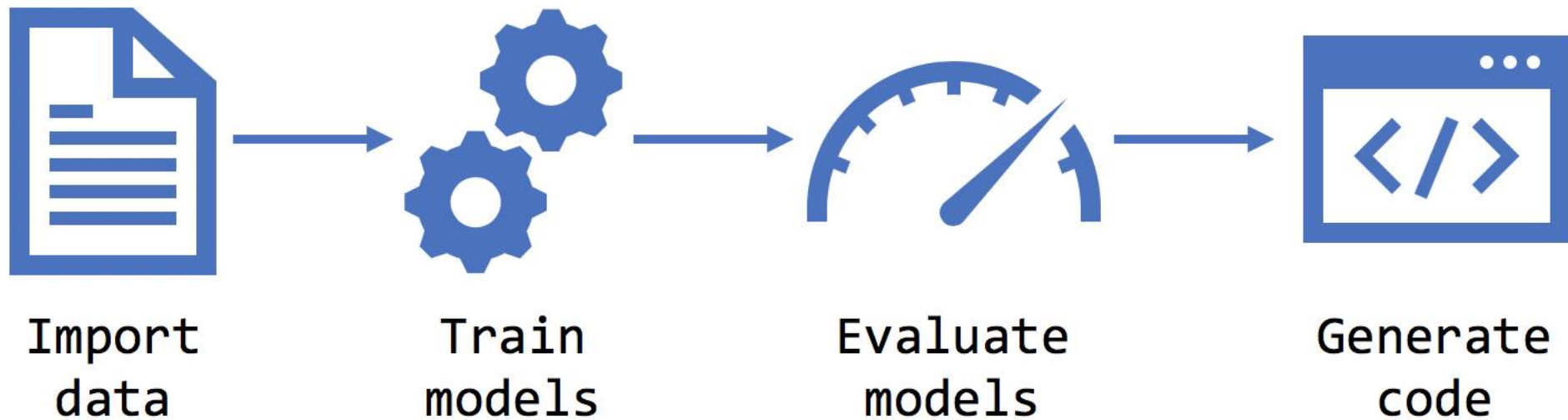


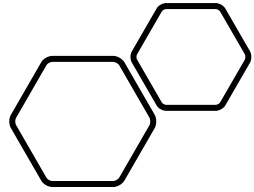
ML.NET Model Builder

- Simple UI tool in Visual Studio
- Runs locally to build, train and ship ML projects
- build/train in Azure
- Generates Custom ML models



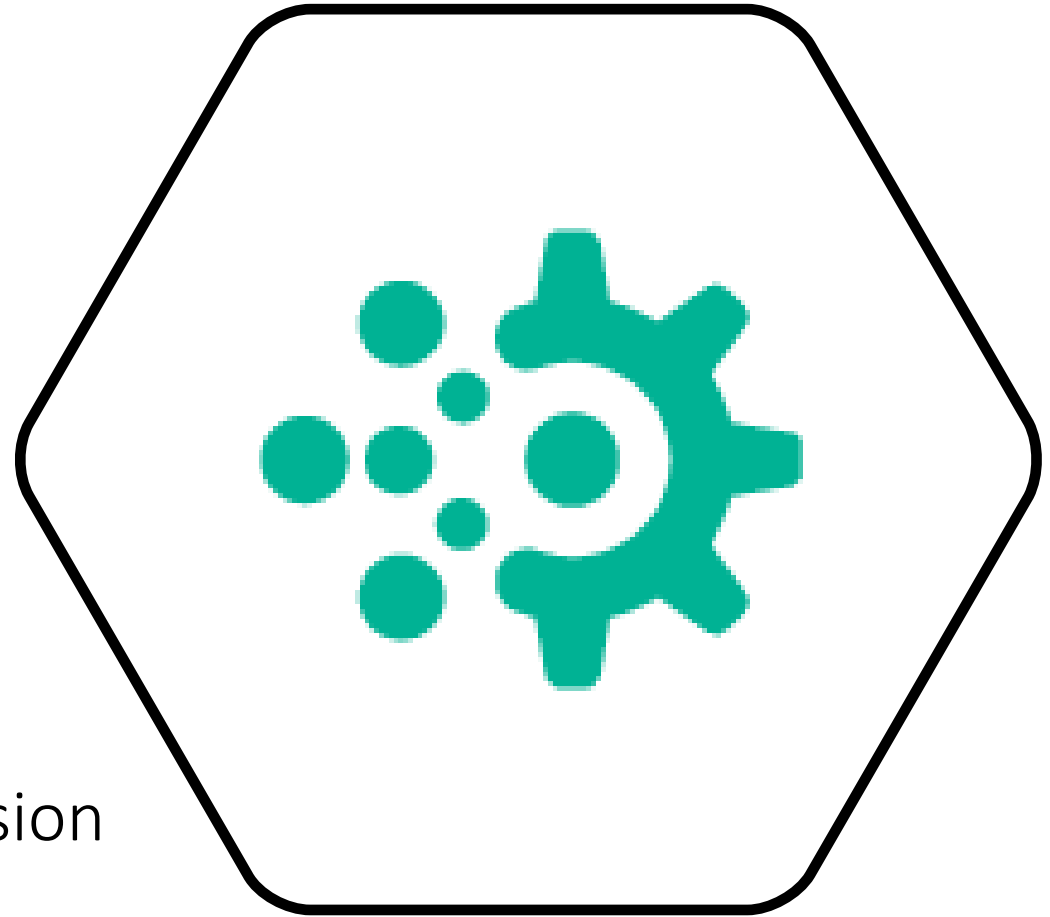
Model Builder





Model Builder DEMO

In Visual Studio, install:
ML.NET Model Builder VS Extension



Model Builder

Scenario	Local CPU	Local GPU	Azure
Data classification	✓	×	×
Value prediction	✓	×	×
Recommendation	✓	×	×
Forecasting	✓	×	×
Image classification	✓	✓	✓
Object detection	×	×	✓
Text classification	✓	✓	×

Model Builder

Dataset size	Average time to train
0 - 10 MB	10 sec
10 - 100 MB	10 min
100 - 500 MB	30 min
500 - 1 GB	60 min
1 GB+	3+ hours

These numbers are a guide only. The exact length of training is dependent on:

- the number of features (columns) being used to as input to the model
- the type of columns
- the ML task
- the CPU, disk, and memory performance of the machine used for training



- 2nd largest perfect crystal sphere known
- Japan, Meiji period, 19th century
- Crow Collection of Asian Art, Dallas
- silica and oxygen—in the form of silicon dioxide

What is .NET MAUI?

- .NET MAUI is open-source
- cross-platform framework
- native mobile and desktop apps with C# and XAML.
- develop apps on Android, iOS, macOS, and Windows
- single shared code-base
- evolution of Xamarin.Forms

.NET MAUI provides:

- Layout engine for designing pages
- Multiple page types for rich navigation types.
- Data-binding support
- Customize handlers
 - UI elements are presented
- Cross-platform APIs
 - native device features

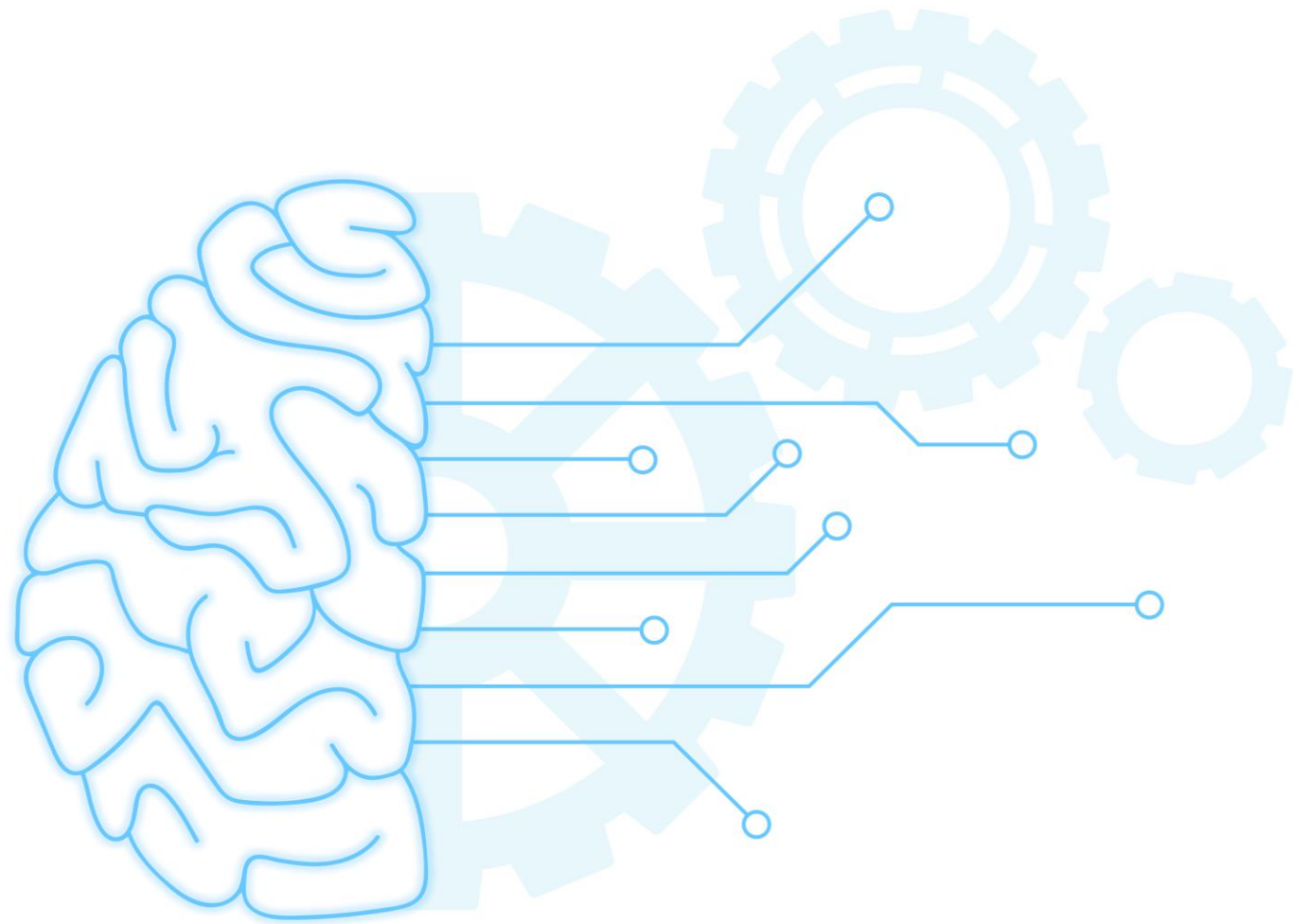


.NET MAUI provides:

- Cross-platform graphics functionality,
 - supports drawing and painting shapes and images
 - compositing operations
 - graphical object transforms
- A single project system
- multi-targeting to target
 - Android
 - iOS
 - macOS
 - Windows
- .NET hot reload



MAUI and ML.NET



DEMO

Wicked Witch's crystal ball

- From the movie "The Wizard of Oz"
- sold for \$129,000 at an auction in 2001
- Walker Library of the History of Human Imagination
- 25 inches in diameter
- handblown glass and is actually slightly egg-shaped



Summary

- Predictive Maintenance
 - Predict before equipment fail
- What is Machine Learning?
 - training and inferencing
- ML.NET
 - Machine Learning for .NET Developers

Summary

- AutoML
 - Machine Learning made easy
- ML.NET Model Builder
 - Generates Custom ML models in Visual Studio
- MAUI
 - develop apps Android, iOS, macOS, and Windows

Let Me Predict
your future!



<https://github.com/rondagdag/predictive-maintenance-mlnet-talk>



@rondagdag

About Me

Ron Dagdag



Award Categories

AI, Windows Development,
Internet of Things, Mixed Reality

First year awarded:
2017

Number of MVP Awards:
6

Director of Software Engineering at SpaceE

6th year Microsoft MVP awardee

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Thanks for geeking out with me about Machine Learning, ML.NET, AutoML, MAUI, Crystal Ball

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