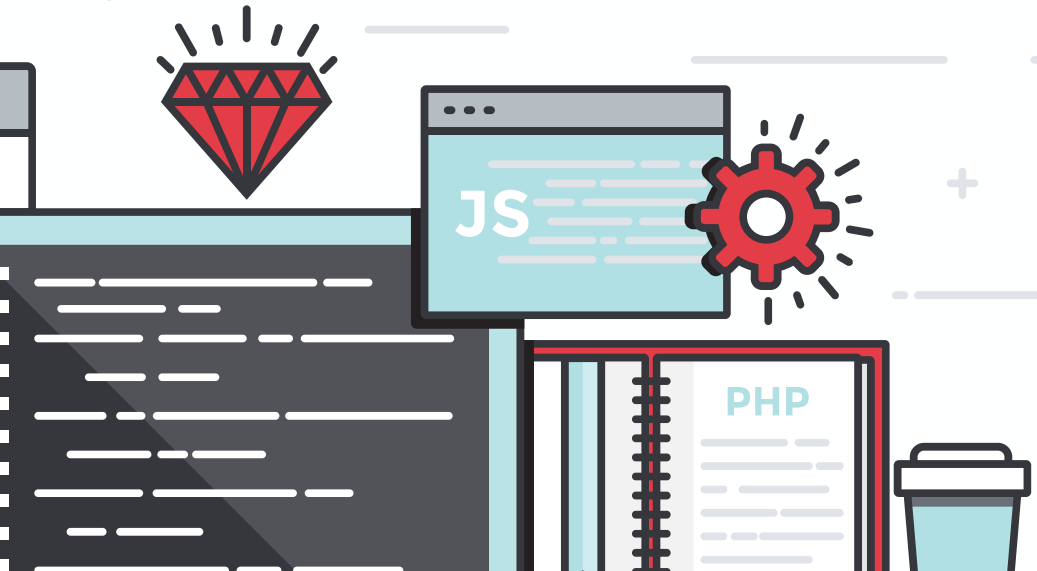
Building Deep Neural Networks in .NET

Alexander Slotte @alexslotte



Excella

excella.com | @excellaco

- Microsoft MVP
- Based out of Washington DC
- Lead Consultant @Excella
- Runs .NET DC
- Speaker
- Runner

alexanderslotte.com

Alexander Slotte

@alexslotte

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Agenda

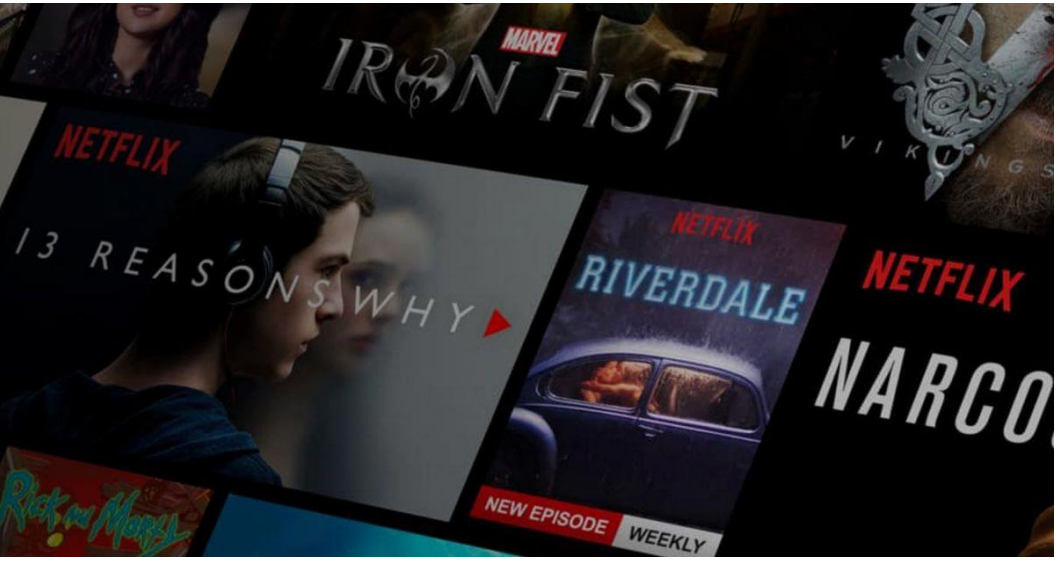
- Machine Learning
- Deep Neural Networks
- ML.NET
- Demo(s)

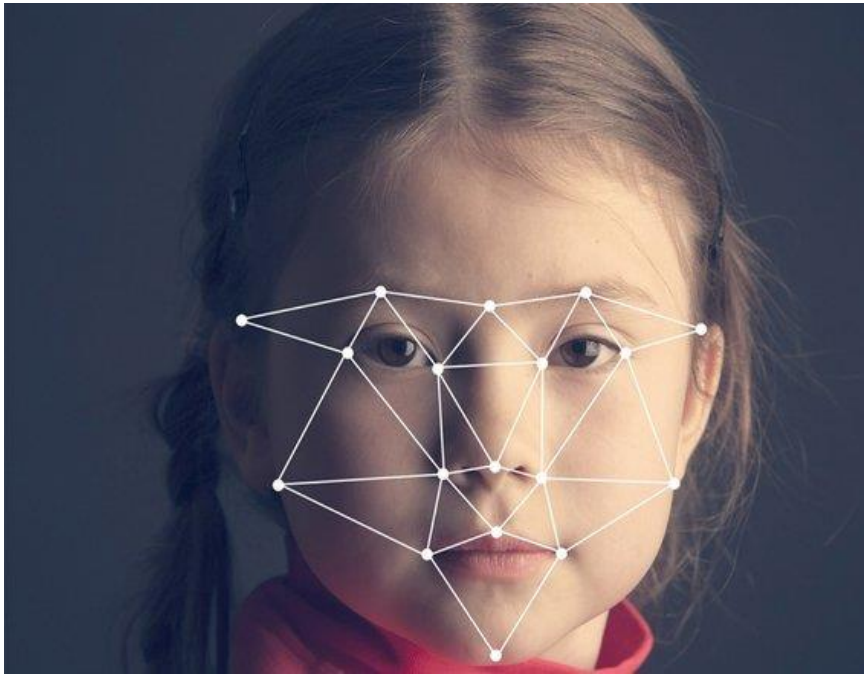
ML.NET

PYTORCH

scikit
learn

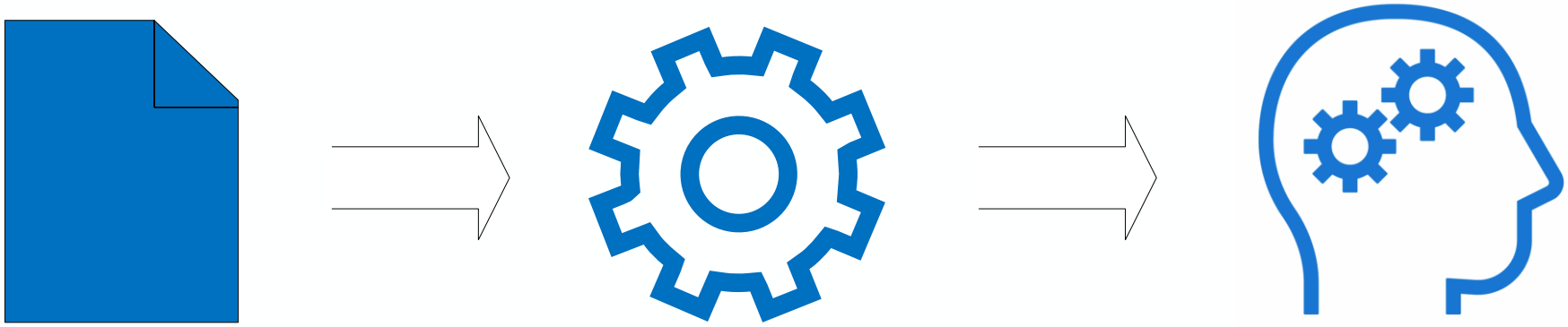
Machine Learning?


MARVEL
IRON FIST
NETFLIX
13 REASONS WHY
NETFLIX
RIVERDALE
NETFLIX
NARCO
NEW EPISODE
WEEKLY



How can we define ML?

Programming the unprogrammable



Data

Training

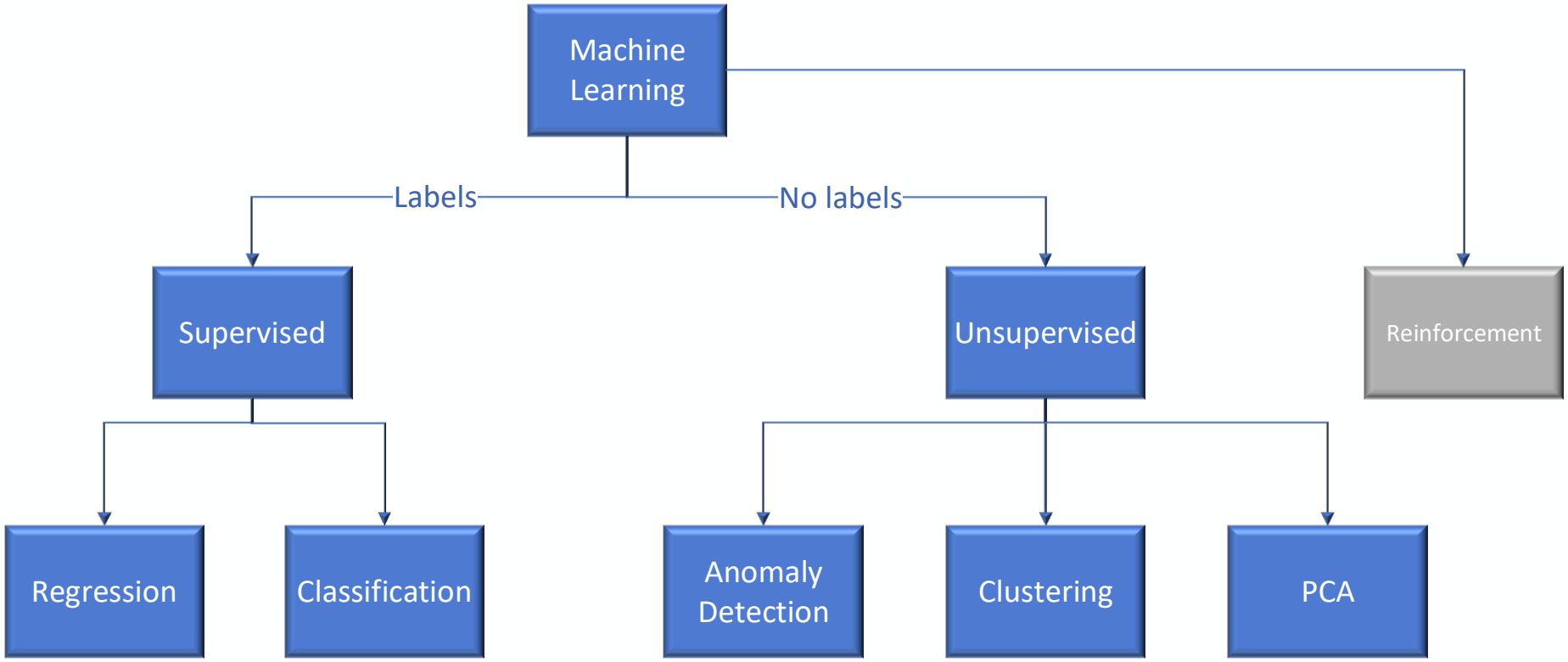
Model

Features

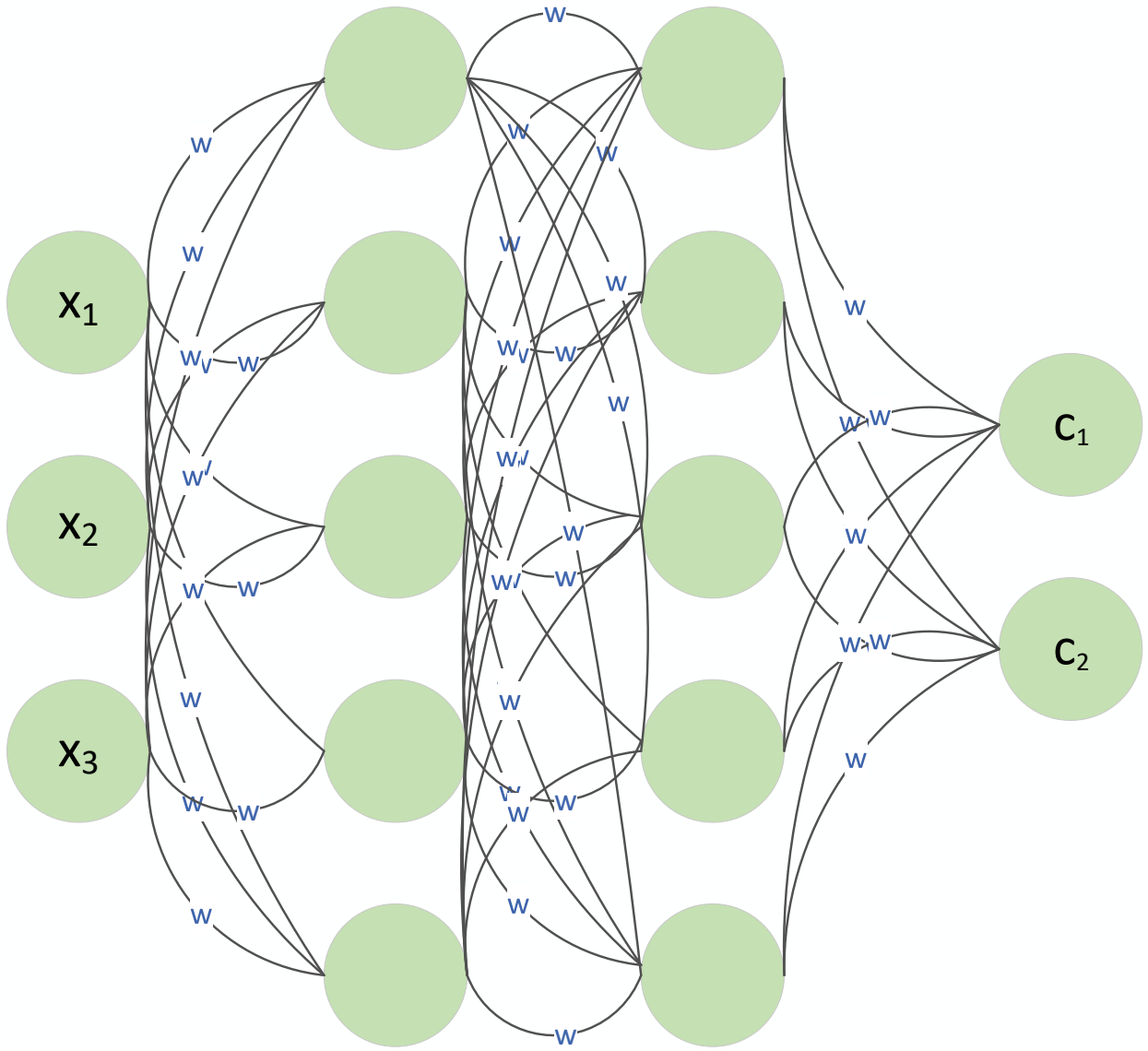
$$y = f(x_1, x_2 \ldots x_n)$$

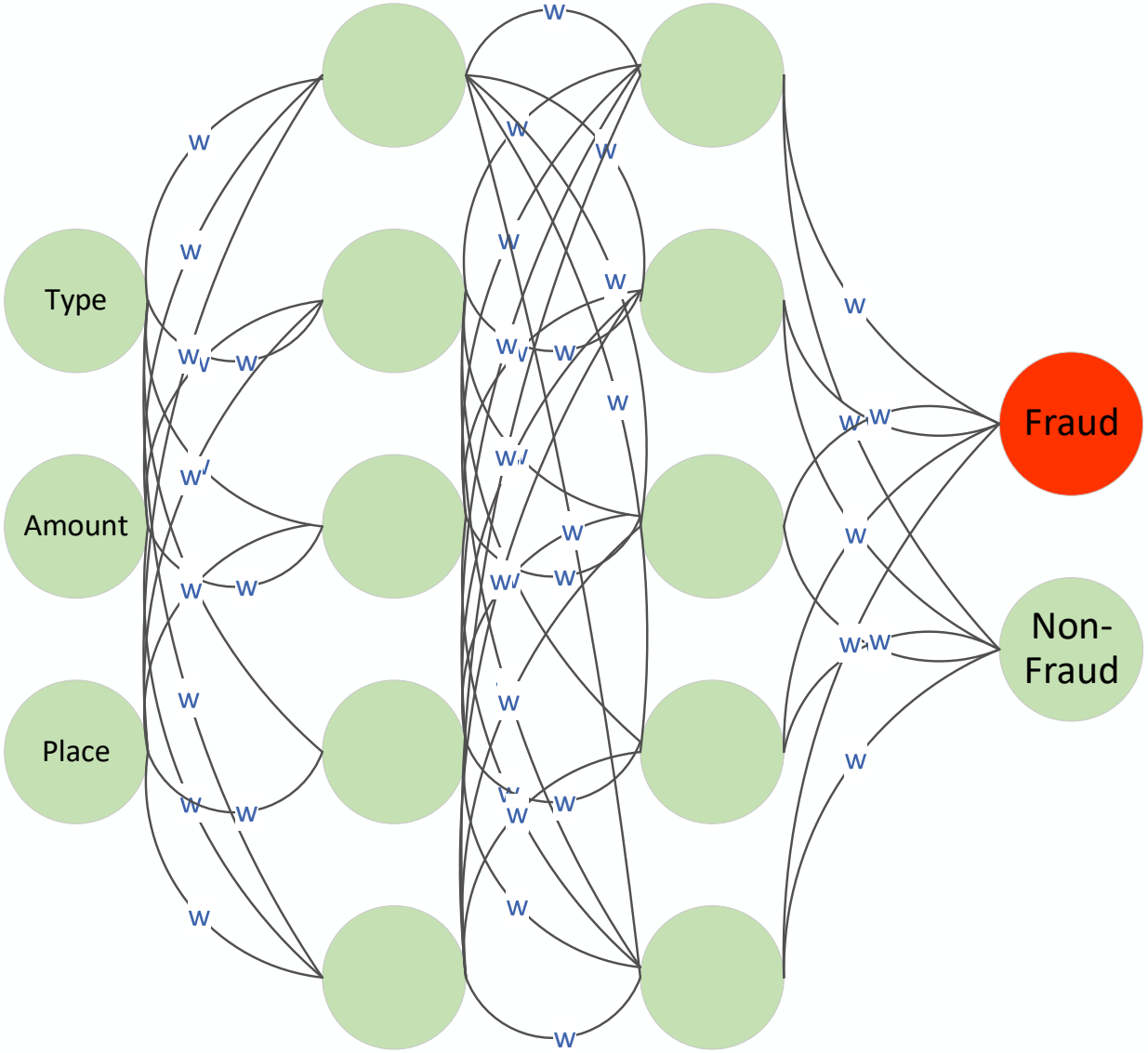
Label

Types of Machine Learning

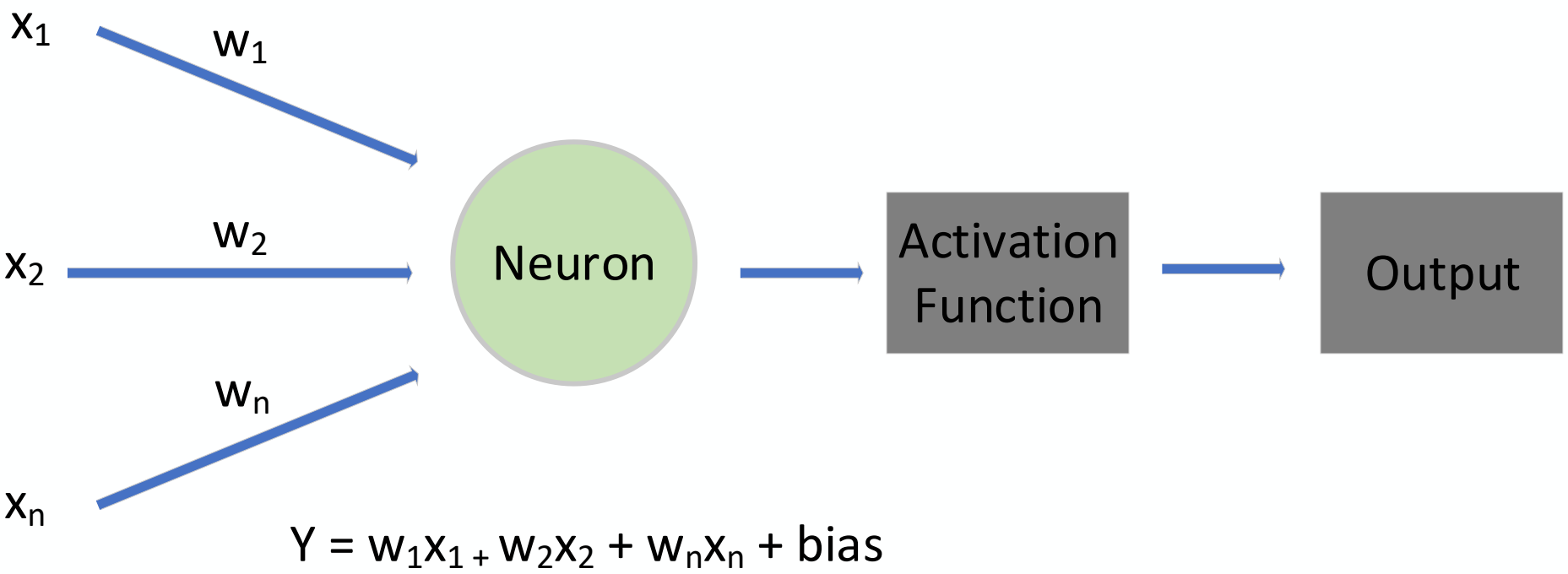


Deep Learning 101


x1
x2
x3
c1
c2
w


Type
Amount
Place
Fraud
Non-
Fraud

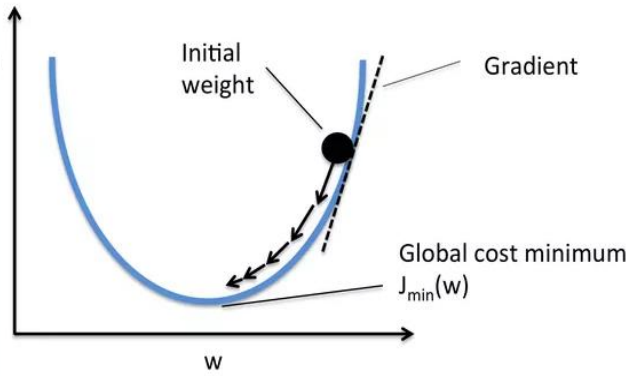
Anatomy of a Neuron

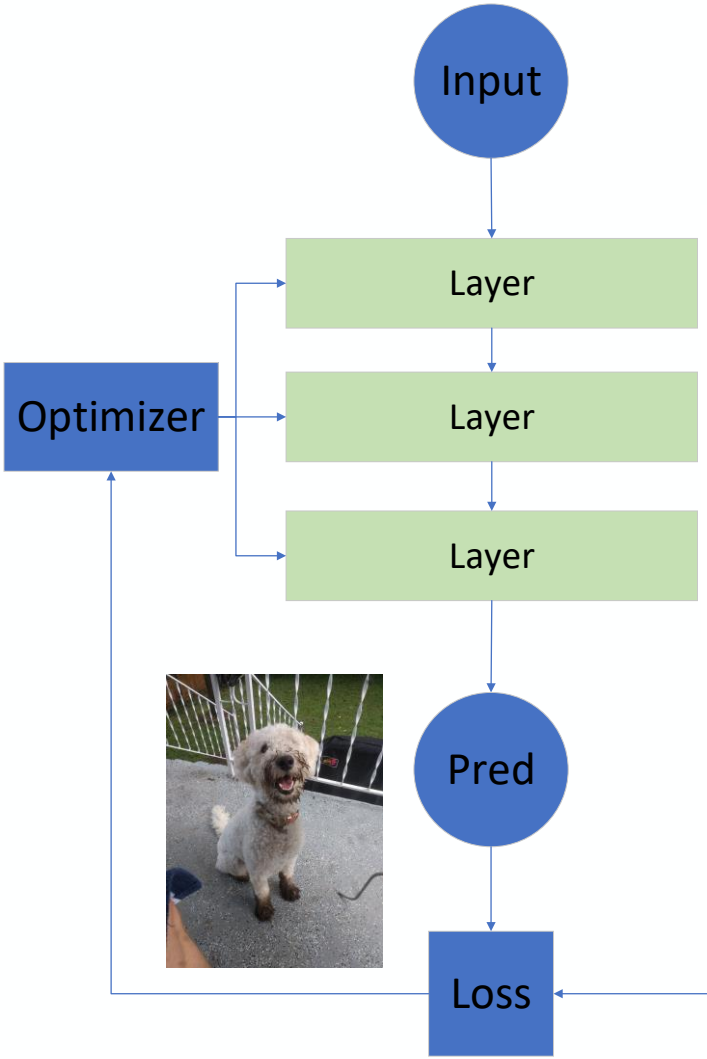


Neural Networks | Building Blocks

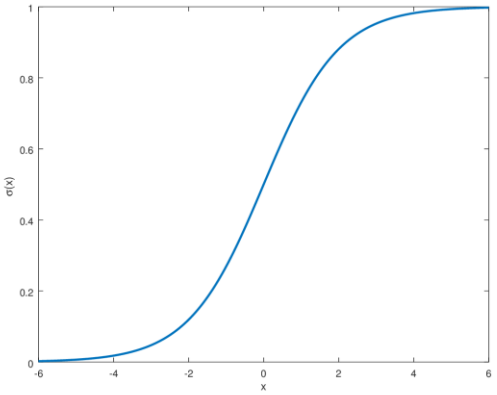
Neuron	|	An abstraction of linear algebra
Epoch	|	One pass through the network
Weights/Biases	|	Stores the knowledge
Loss Function	|	Feedback mechanism
Optimizers	|	How the network learns
Activators	|	Introduces a non-linear behavior

Optimizer



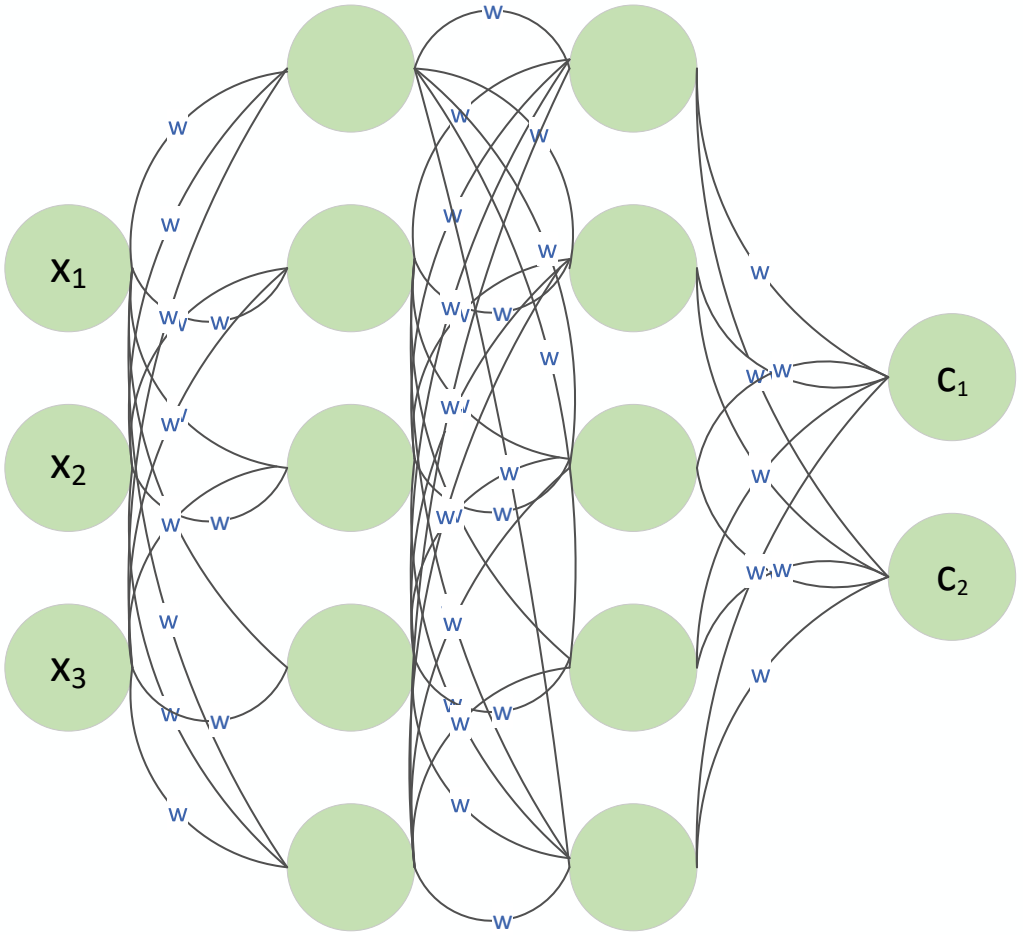


Activation Function

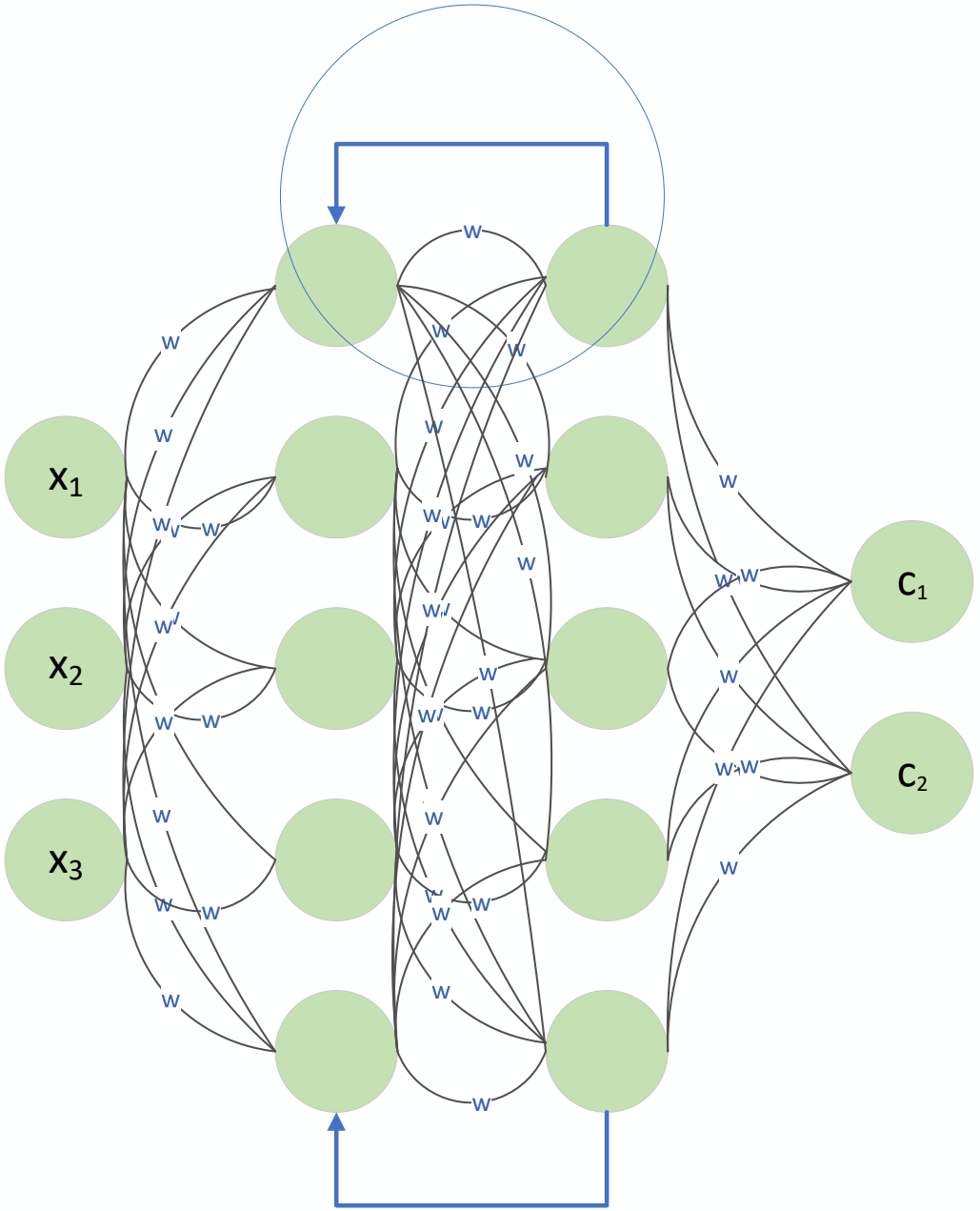


Types of Networks

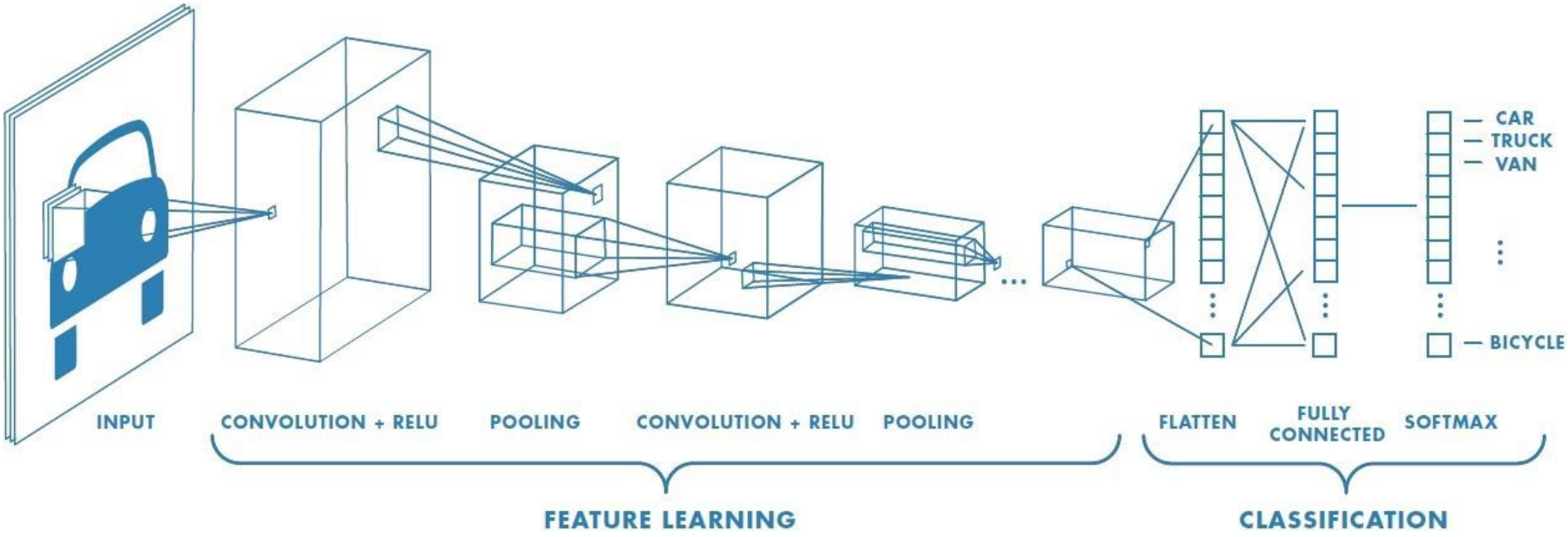
Multi-Layer Perceptron



Recurrent Neural Network



Convolutional Neural Network



Transfer Learning

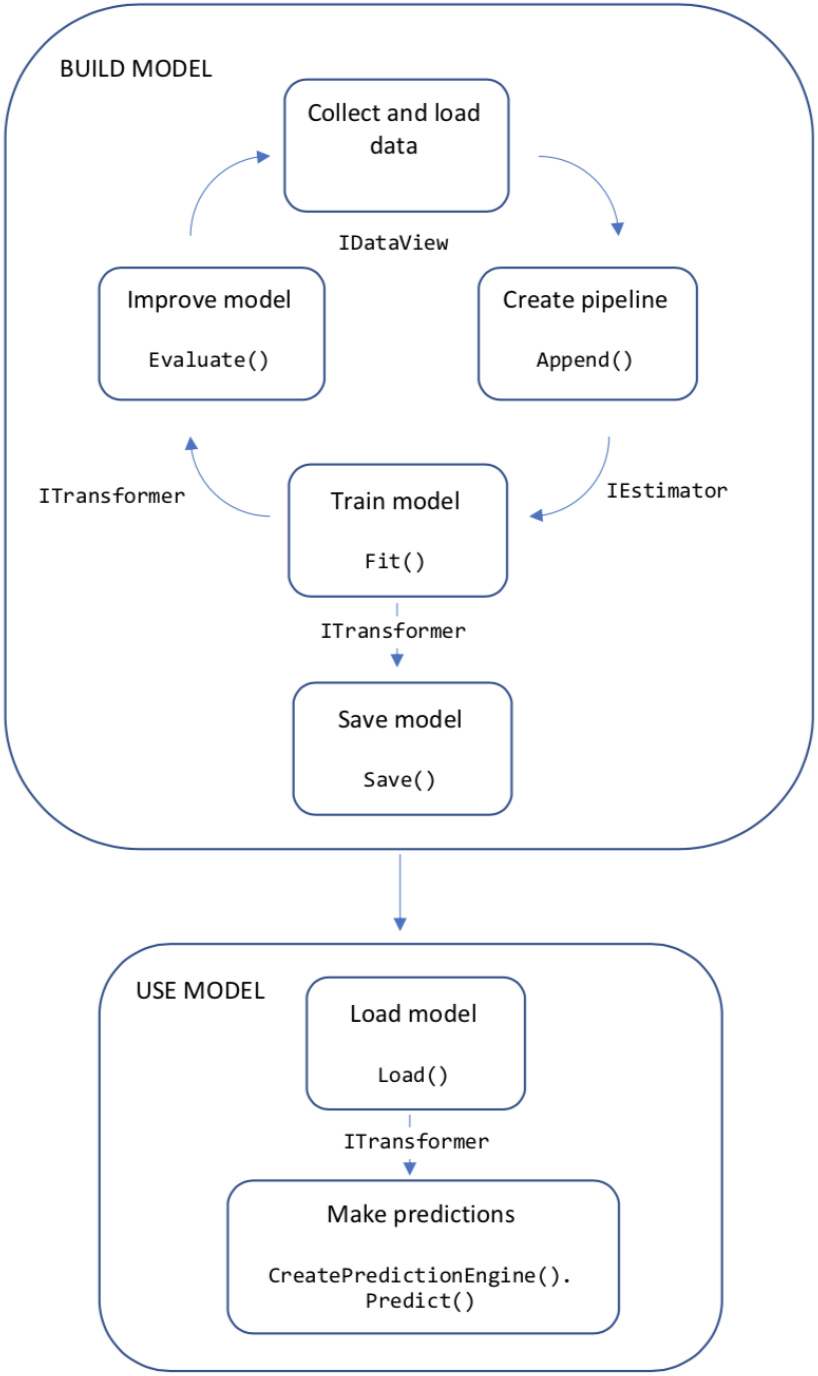
- Leverage state-of-the-art architectures
- Re-train a DNN on a similar problem

Why is Transfer Learning important?

- Training a DNN can take hours to weeks
- Limited access to large amount of data

ML.NET

- Machine Learning for .NET Developers
- Open-source and cross-platform
- Deploy the model as
  - Azure Function
  - ASP.NET Core App
  - Desktop App
- AutoML
- Supports Transfer Learning
- Jupyer Notebooks


BUILD MODEL
Collect and load data
IDataView
Create pipeline
Append()
IEstimator
Train model
Fit()
ITransformer
Save model
Save()
ITransformer
Improve model
Evaluate()
ITransformer
USE MODEL
Load model
Load()
ITransformer
Make predictions
CreatePredictionEngine().
Predict()

What types of Deep Learning can you perform with ML.NET?

Image Classification

- Transfer learning
- ONNX

Object Detection

- ONNX
- Azure custom vision

ML.NET

PYTORCH

scikit
learn

Get started

/dotnet/machinelearning

/dotnet/machinelearning-samples

ML.NET

Code Demo

Image Classification

Thank you!

aslotte

@alexslotte

alexanderslotte.com