

Traditional and Representational Machine Learning

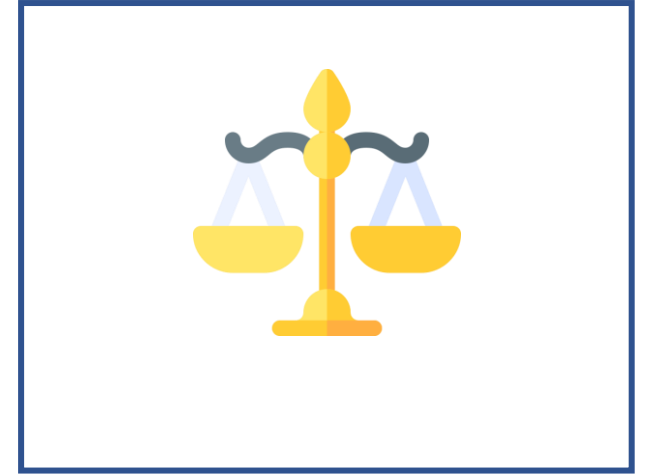
ML-based Binary Classifier



Corpus

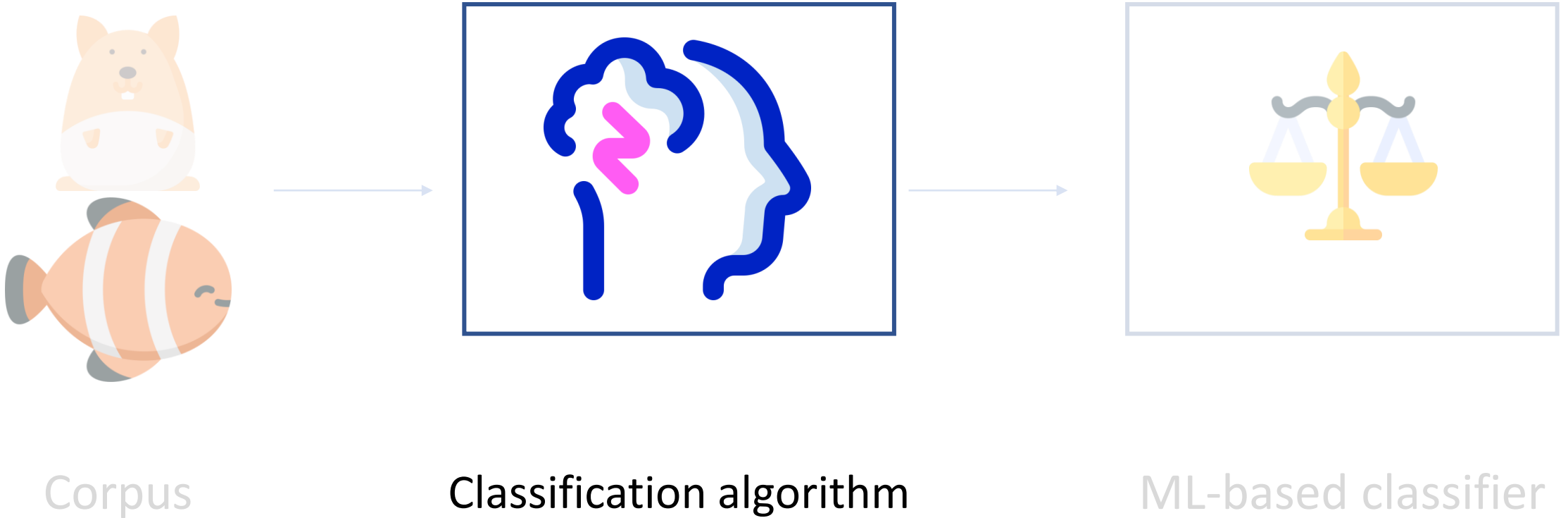


Classification algorithm

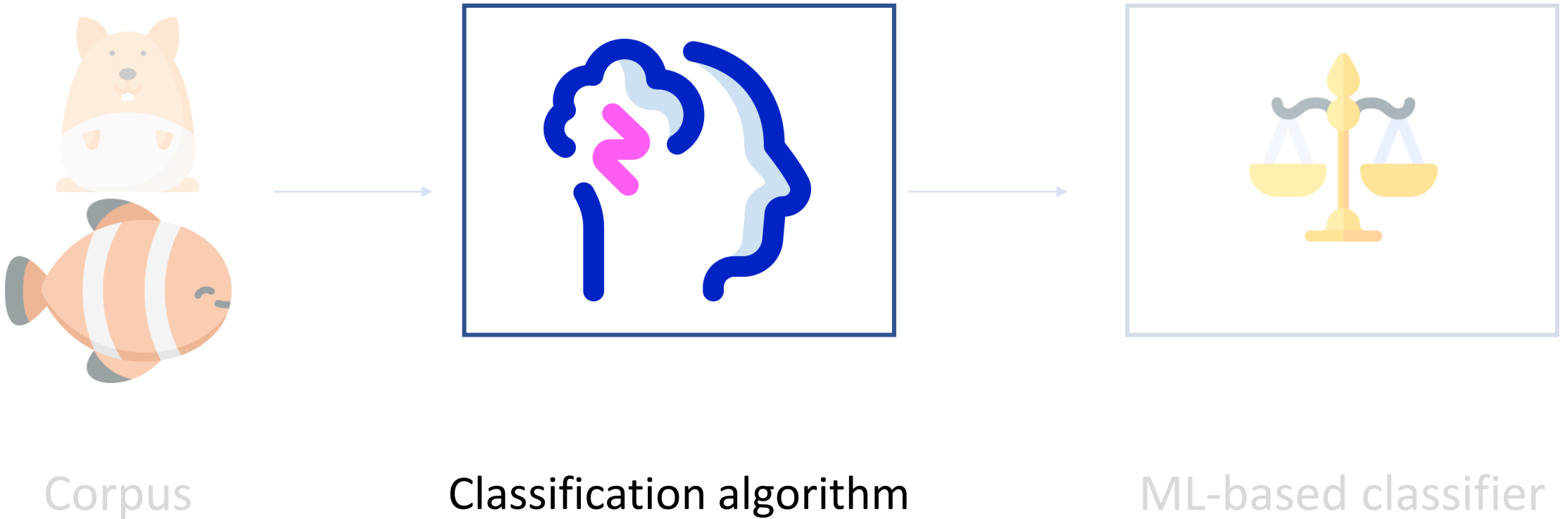


ML-based classifier

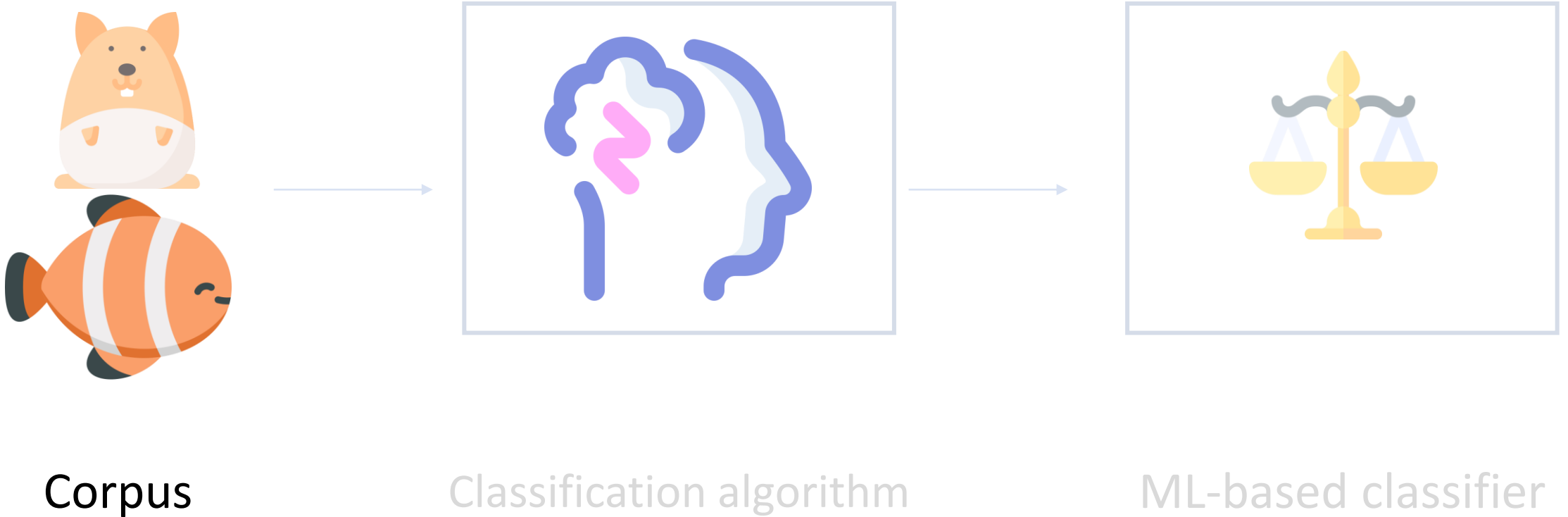
Specific Algorithm Which Learns From Data



Choice of Algorithm Determined by Experts



Features Determined by Experts



Traditional ML Models



Regression models: Linear, Lasso, Ridge, SVR

Classification models: Naive Bayes, SVMs, Decision trees, Random forests

Dimensionality Reduction: Manifold learning, Factor analysis

Clustering: K-means, DBSCAN, Spectral clustering

Traditional ML Models



Have a fundamental algorithmic structure to solve problems

The algorithm is fed data which trains the algorithms parameters

Called **model parameters**

Traditional ML Models

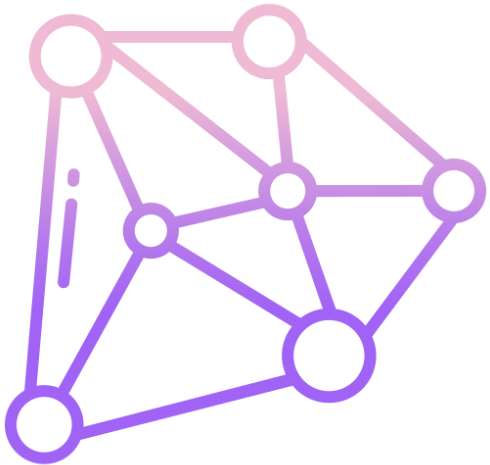
Build a tree
structure to classify
instances

Fit a line or a curve
on data to make
predictions

Apply probabilities
on input data to
get output
probabilities

“Traditional” ML-based systems rely on experts to decide what features to pay attention to – and how

Representation ML Models



Also used to solve classification, regression, clustering, and dimensionality reduction

Learn significant features from the underlying data

Deep learning models such as neural network

“Representation” ML-based systems figure out by themselves what features to pay attention to – and how

What Is a Neural Network?

Deep Learning

Algorithm that learn
what features matter

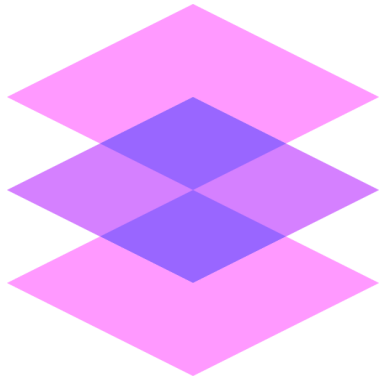
Neural Networks

The most common
class of deep learning
algorithm

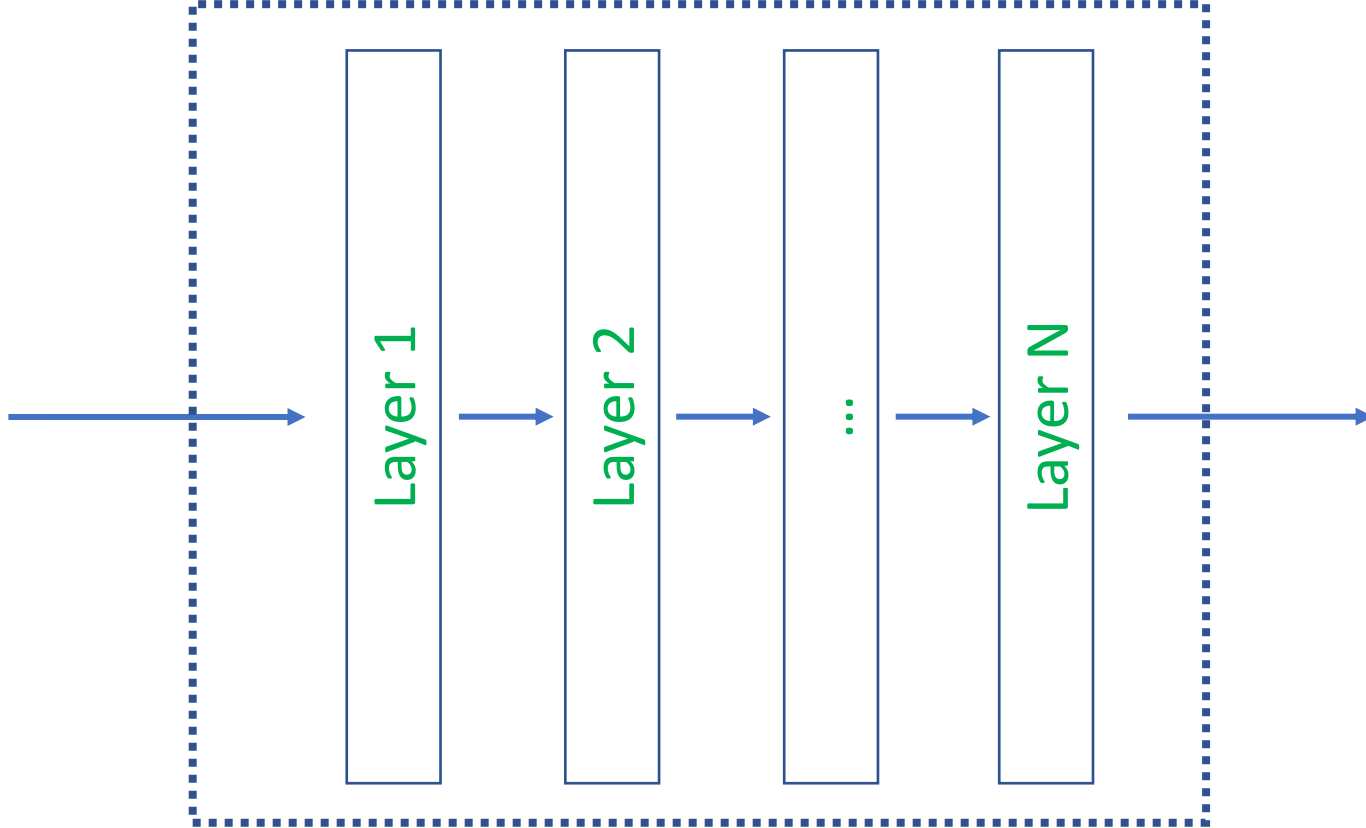
Neurons

Simple building blocks
that actually “learn”

Neural Networks



Corpus

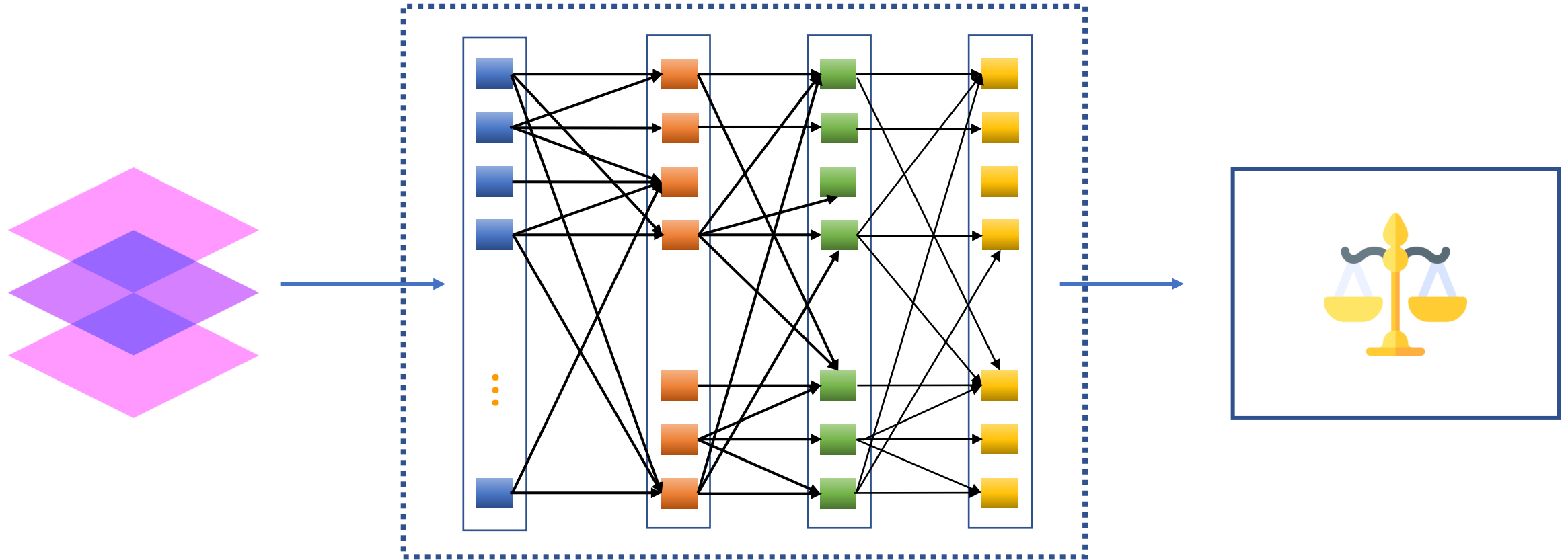


Layers in a neural network



ML-based classifier

Neural Networks

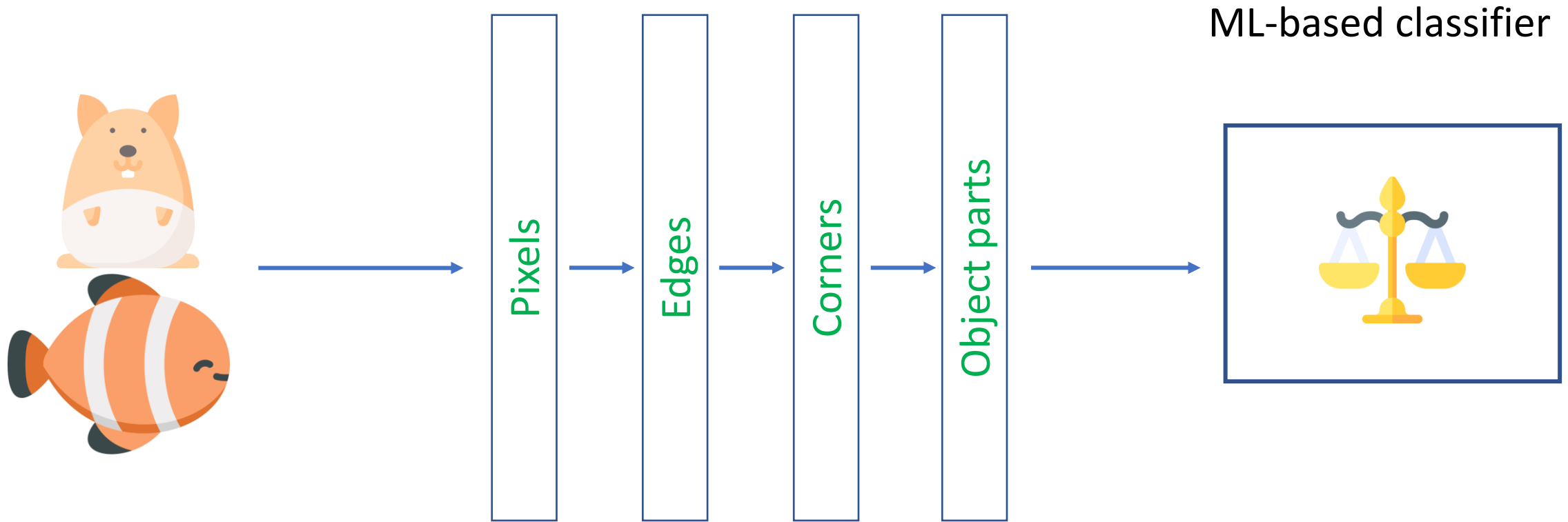


Corpus

Each layer consists of individual
interconnected neurons

ML-based classifier

Each Layer Extracts Information from Data



Traditional vs. Deep Learning Models

Traditional ML Model

Features used in models explicitly chosen by domain experts

Structured data such as numbers and probabilities

Classification, regression, clustering, and dimensionality reduction

Deep Learning ML Model

Features used in models explicitly chosen by model itself

Unstructured data such as images and movies

Classification, regression, clustering, and dimensionality reduction

Traditional vs. Deep Learning Models

Traditional ML Model

Wide range of problem-specific solution techniques

Each solution technique adopts characteristic approach

User has more insight into mechanics and internals of models

Scikit-learn

Deep Learning ML Model

Neural networks by far the most common solution technique

All solution techniques rely on neurons and interconnections between them

Black-box models that are hard to question or reverse-engineer

TensorFlow, Keras, PyTorch