Welcome to "Machine Learning Models – Learning from models to make predictions."

After watching this video, you will be able to

define a machine learning model,

describe the different learning model types, and

describe how to use a learning model to solve a problem.

Now data contains a wealth of information that can be used to solve certain types of problems.

Traditional data analysis approaches can be a person manually inspecting the data

or a specialized computer program that automates the human analysis.

These approaches reach their limits due to

the amount of data to be analyzed or the complexity of the problem.

Machine learning (ML) uses algorithms – also known as "models" - to identify patterns in the data.

The process by which the model learns these patterns from data is called "model training".

Play video starting at :1:1 and follow transcript1:01

Once a model is trained, it can then be used to make predictions.

When the model is presented with new data,

it tries to make predictions or decisions based on the patterns it has learned from past data.

Machine Learning models can be divided into three basic classes:

Supervised Learning, Unsupervised Learning, and Reinforcement Learning.

The most commonly used type of machine learning is Supervised Learning.

In Supervised Learning, a human provides input data and correct outputs.

The model tries to identify relationships and

dependencies between the input data and the correct output.

This type of learning comprises two types of models, regression and classification.

Regression models are used to predict a numeric (or "real") value.

For example, if information is given about past home sales,

such as geographic location, size, number of bedrooms, and sales price,

you can train a model to predict the estimated

sales price for other homes with similar characteristics.

Classification models are used to predict whether some information

or data belongs to a category (or "class").

For example, for a set of emails along with a designation you can

classify whether they are to be considered as spam or not.

And so, you can train an algorithm to identify unsolicited emails.

In Unsupervised Learning, the data is not labeled by a human.

The models must analyze the data and try to

identify patterns and structure within the data based on its characteristics.

Clustering is an example of this learning style.

Clustering models are used to divide each record of a dataset into one of a similar group.

An example of a clustering model could be providing purchase recommendations

for an e-commerce store, based on past shopping behavior and the content of a shopping basket.

Another example is anomaly detection that identifies outliers in a dataset,

such as fraudulent credit card transactions or suspicious online log-in attempts.

And the third type of learning, Reinforcement Learning,

is loosely based on the way human beings and other organisms learn.

So, think about a mouse in a maze.

If the mouse gets to the end of the maze, it gets a piece of cheese.

This is the "reward" for completing a task.

The mouse learns through trial and error how to

get through the maze to get as much cheese as it can.

In a similar way, a reinforcement learning model learns the best set of actions to take,

given its current environment, to get the most rewards over time.

This type of learning has recently been very successful in beating the

best human players in games such as Go, chess and popular strategy video games.

Deep learning is a specialized type of machine learning.

It refers to a general set of models and techniques that loosely emulate the way

the human brain solves a wide range of problems.

It is commonly used to analyze natural language (both spoken and text),

images, audio, video, to forecast time series data and much more.

Deep learning has recently been very successful in these and other

areas and hence is becoming an increasingly popular and important tool for data science.

It requires large datasets of labeled data to train a model, is compute intensive,

and usually requires special purpose hardware to achieve acceptable training times.

Now you can build a custom Deep Learning model from

scratch or use pre-trained models from public model repositories.

Deep Learning models are implemented using popular frameworks such as TensorFlow, PyTorch and Keras.

The learning frameworks provide a Python API and many support other

programming languages, such as C++ and JavaScript.

You can download pre-trained state-of-the-art

models from repositories that are commonly referred to as model zoos.

Popular model zoos include those provided by TensorFlow, PyTorch, Keras, and ONNX.

Models are also published by academic and commercial research groups.

Let's briefly outline the high-level tasks involved in building a model using an example.

Assume you want to enable an application

to identify objects in images by training a deep learning model.

First, you collect and prepare data that will be used to train a model.

Data preparation can be a time-consuming and labor-intensive process.

In order to train a model to detect objects in images, you need to label the raw training data.

For example, you can draw bounding boxes around objects and label them.

Next, you build a model from scratch or select an existing model that might be

well suited for the task from a public or private resource.

You can then train the model on your prepared data.

During training, your model learns from the labeled data

how to identify objects that are depicted in an image.

Once training has commenced, you analyze the training results and

repeat the process until the trained model performance meets your requirements.

When the trained model performs as desired,

you deploy it to make it available to your applications.

Play video starting at :6:36 and follow transcript6:36

In this video you learned that:

Machine learning (ML) uses algorithms – also known as "models" – to identify patterns in the data.

The process by which the model learns data patterns is called "model training".

Types of ML are Supervised, Unsupervised, and Reinforcement.

Supervised learning comprises two types of models, regression and classification. And deep learning refers to a general set of models and techniques that loosely emulate the way the human brain solves a wide range of problems.