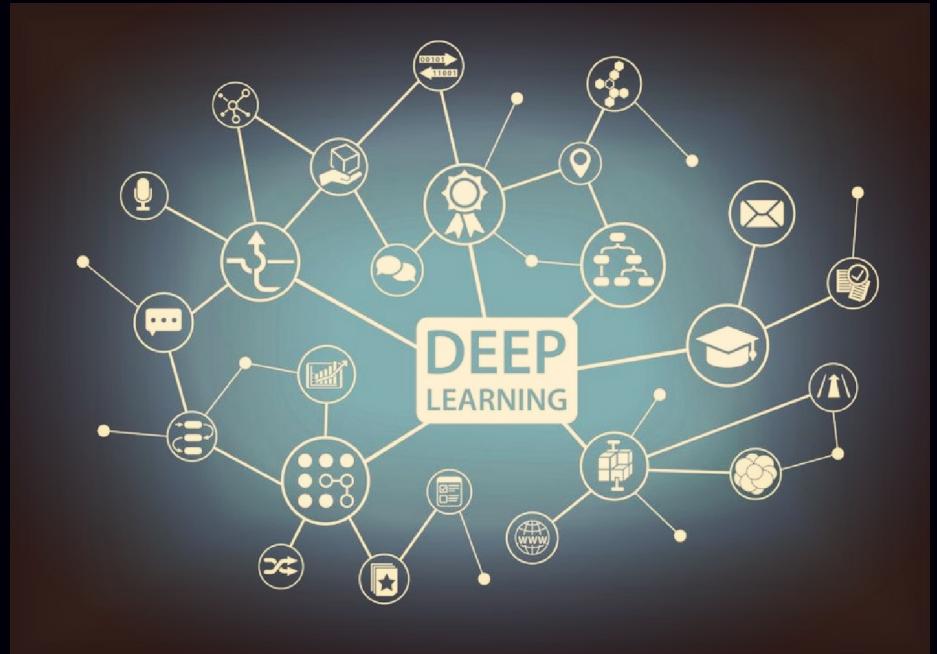


Deep Learning: Artificial Neural Network

Jacques Patricks K.

What is **deep** learning?

AI function that mimics the workings of human brain in processing data for use in detecting objects, recognizing speech, translating languages and making decisions.



KEY TAKEAWAYS

- Deep learning AI is able to learn without human supervision, drawing from data that is both unstructured and unlabeled.
- Deep learning is part of a broader family of machine learning methods based on artificial neural networks with representation learning.
- Also known as deep neural learning or deep neural network.



How does deep learning work?

As a subset of Machine Learning;

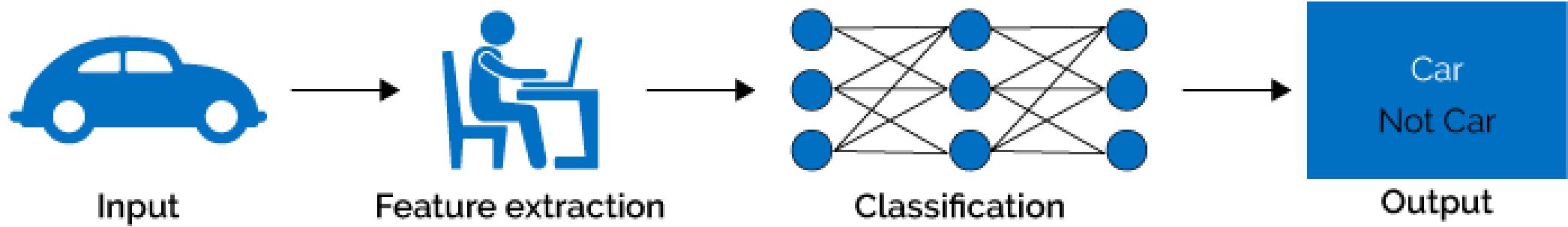
Uses hierarchical neural networks to analyze data

Neuron codes are linked together within these hierarchical neural networks.

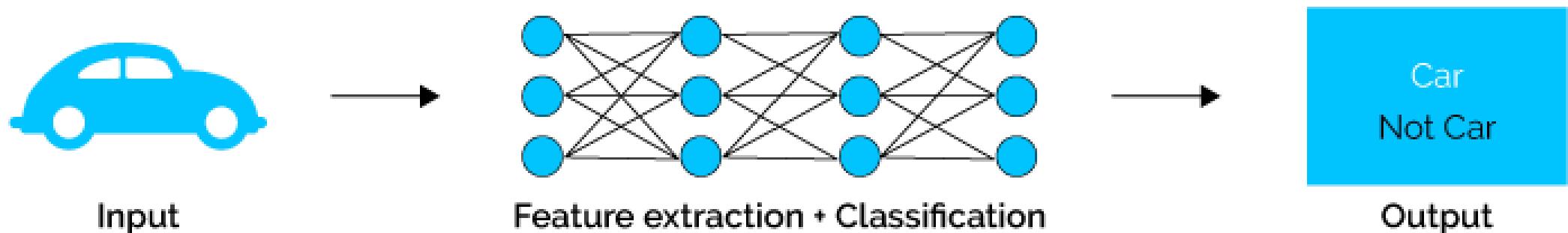
Allows it to take a nonlinear approach, processing data across a series of layers

Deep learning Vs Machine Learning

Machine Learning



Deep Learning



Applications of Deep Learning

- Autonomous vehicle, driverless car, robo-car.
- News Aggregation and Fraud News Detection.
- Deep Learning in Healthcare (Breast or Skin-Cancer diagnostics)
- Voice Search & Voice-Activated Assistants.
- Visual Recognition.
- Fraud Detection.
- Automatic Machine Translation.
- Automatic Text Generation.

Deep learning libraries

Tensorflow

End-to-end open source platform for machine learning.

Easy model building
Build and train ML models easily using intuitive high-level APIs like Keras with eager execution, which makes for immediate model iteration and easy debugging.

Robust ML production anywhere
Easily train and deploy models in the cloud, on-prem, in the browser, or on-device no matter what language you use.

Powerful research experimentation
A simple and flexible architecture to take new ideas from concept to code, to state-of-the-art models, and to publication faster.

Keras

Offers consistent & simple APIs, it minimizes the number of user actions required for common use cases, and it provides clear & actionable error messages.

Simple

Makes it easier to run new experiments, it empowers you to try more ideas.

Exascale ML

Built on top of TensorFlow 2.0, can scale to large clusters of GPUs or an entire TPU pod. It's not only possible; it's easy.

Deploy Anywhere

You can export Keras models to JavaScript to run directly in the browser, to TF Lite to run on iOS, Android, and embedded devices. It's also easy to serve Keras models as via a web API.

PyTorch

Open source machine learning framework that accelerates the path from research prototyping to production deployment.

Production ready

Transition seamlessly between eager and graph modes with TorchScript, and accelerate the path to production with TorchServe.

Distributed training

Scalable distributed training and performance optimization in research and production is enabled by the `torch.distributed` backend.

Cloud support

PyTorch is well supported on major cloud platforms, providing frictionless development and easy scaling.

Conclusion

You can build and train deep neural network architectures such as Convolutional Neural Networks, Recurrent Neural Networks, LSTMs, Transformers, and how to make them better with strategies like Dropout, BatchNorm, and Xavier/He initialisation.

Simple Neuron

We will see how you can think of a logistic regression as a neuron.

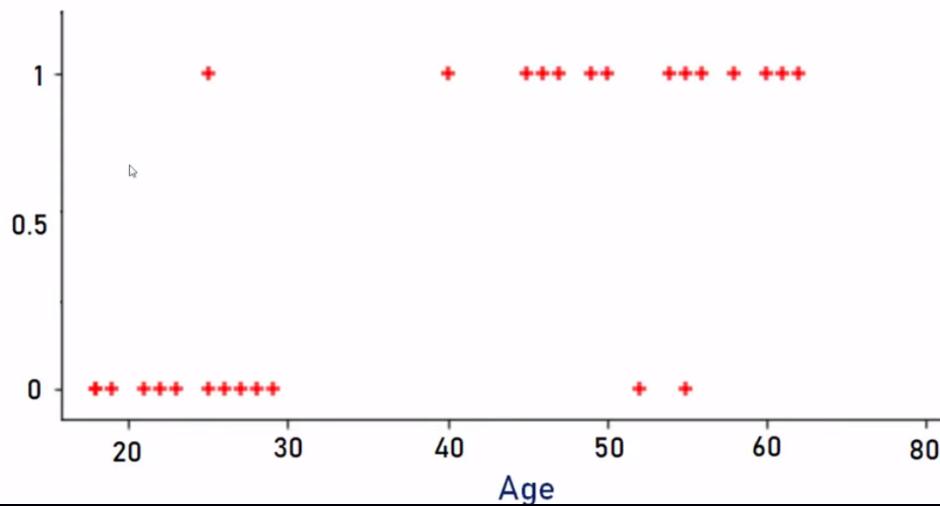
INSURANCE DATASET

age	have_insurance
22	0
25	0
47	1
52	0
46	1
56	1
55	0
60	1
62	1
61	1
18	0
28	0

Binary Classification

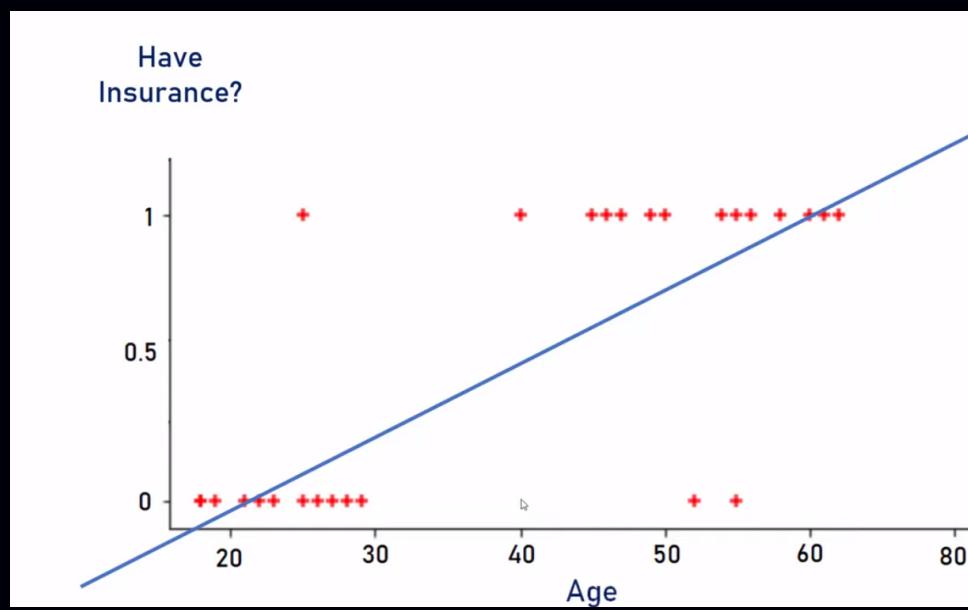
Given an age of a person, come up with a **function** that can predict if person will buy insurance or not

Have
Insurance?

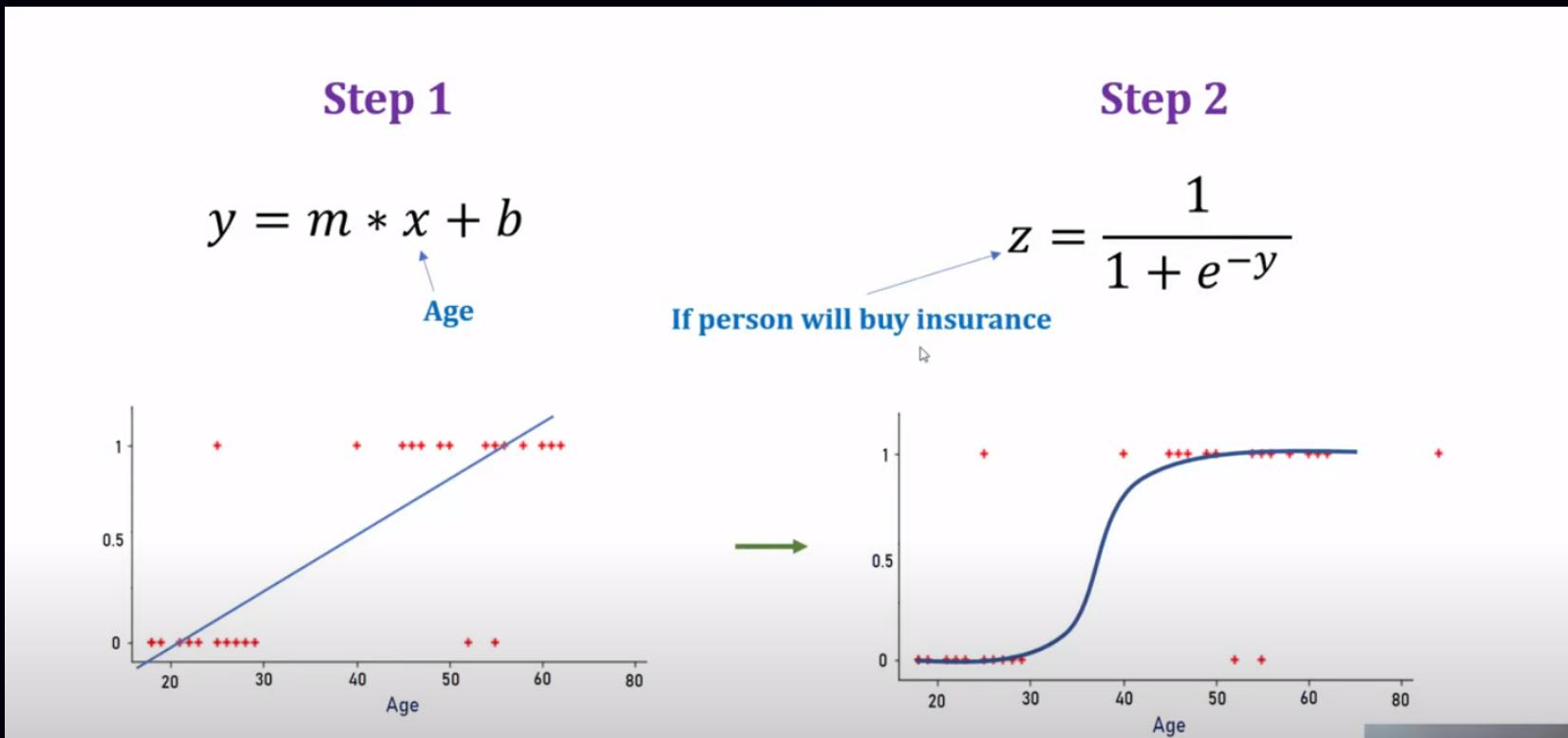




step 1: linear regression to find best fit line for given dataset



step 2: sigmoid or logit function to convert this line into values between 0 and 1



value < 0.5 = person **will not** buy insurance

value >= 0.5 = person **will** buy insurance

Age = 35

$$y = 0.042 * x - 1.53$$

$$z = \frac{1}{1 + e^{-y}}$$

0.48

$$y = 0.042 * x - 1.53$$

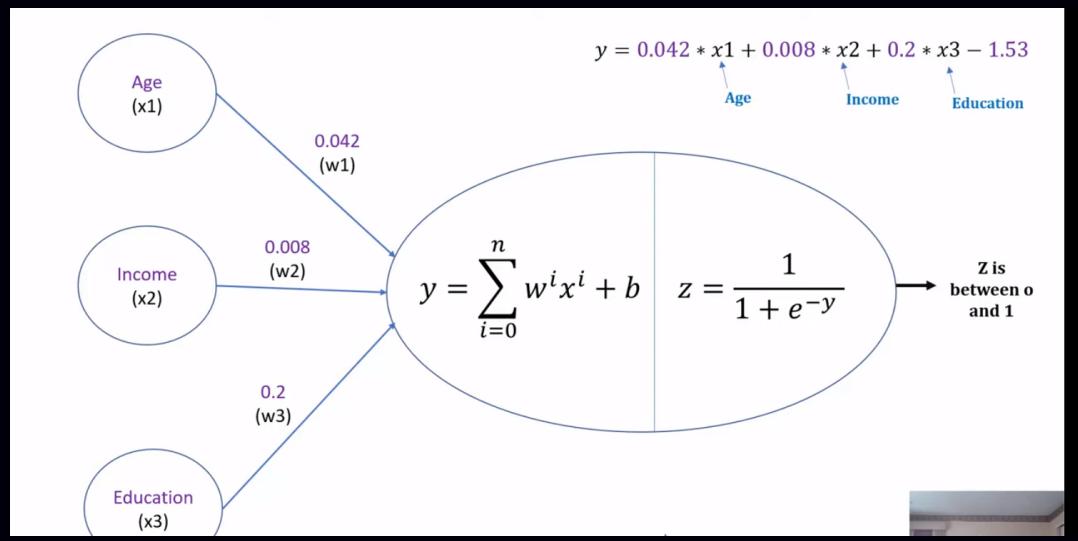
Age

$$y = 0.042 * x_1 + 0.008 * x_2 + 0.2 * x_3 - 1.53$$

Age Income Education

$$y = w_1 * x_1 + w_2 * x_2 + w_3 * x_3 + b$$

$$y = \sum_{i=0}^n w^i x^i + b$$



Additional Resources

- Class Notebooks

https://github.com/Africa-Data-School/ADS_Course_Material

- Tensorflow documentation

<https://www.tensorflow.org/>

- Keras documentation

<https://keras.io/>

- PyTorch documentation

<https://pytorch.org/>