ICN Top Scholar Presentation

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From Machine Learning to Deep Learning

In our previous session, we learned that deep learning is a subset of machine learning. Deep Learning expands on the abilities of a computer to process information and execute tasks. With the help of neurons, deep neural networks, stochastic gradient descent, and binary classification, a deep learning model could be achieved .

Neurons: a connection point in an artificial neural network

Deep Neural Networks: an artificial neural network with multiple layers between the inputs and outputs.

Stochastic gradient descent: a method to optimize a function with smooth properties

Binary classification: the task of classifying the elements of a set into two groups on the basis of a classification rule.

Computer Vision

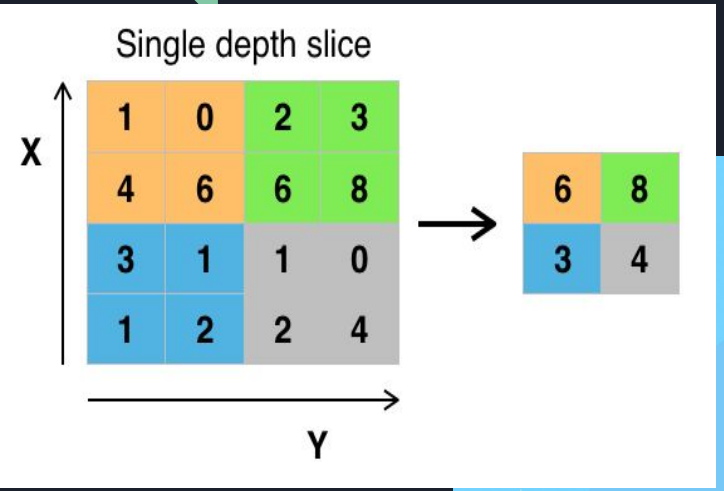
Computer vision is, in essence, a field of study that focuses on how computers gain deep understanding of images or videos. In regards to engineering, computer vision is the attempt to automate the human sense of vision.

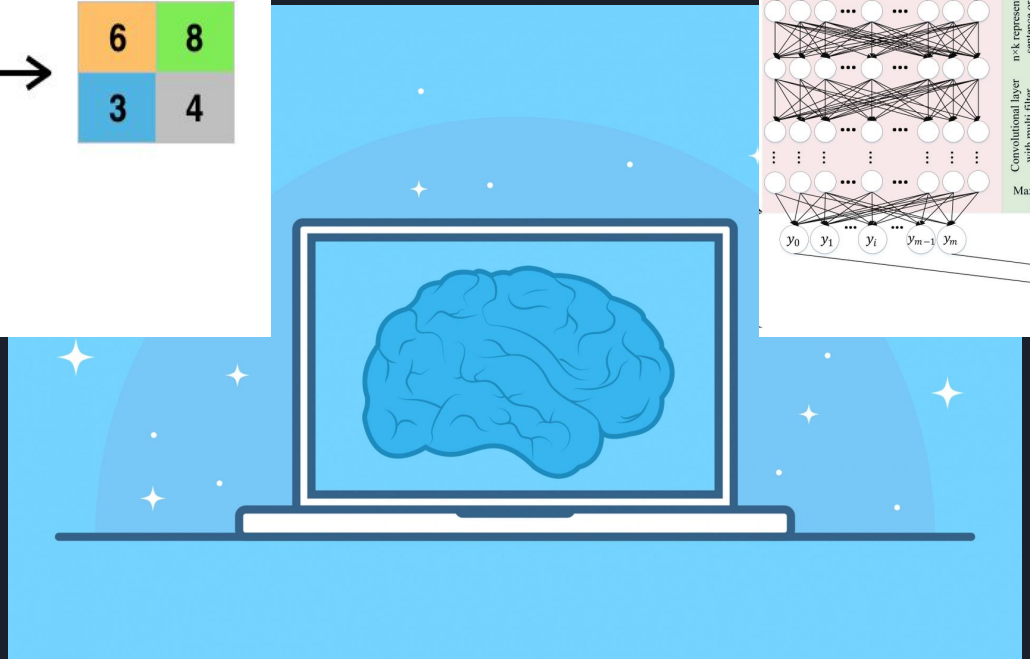
Image classifier: a program that identifies what an image is

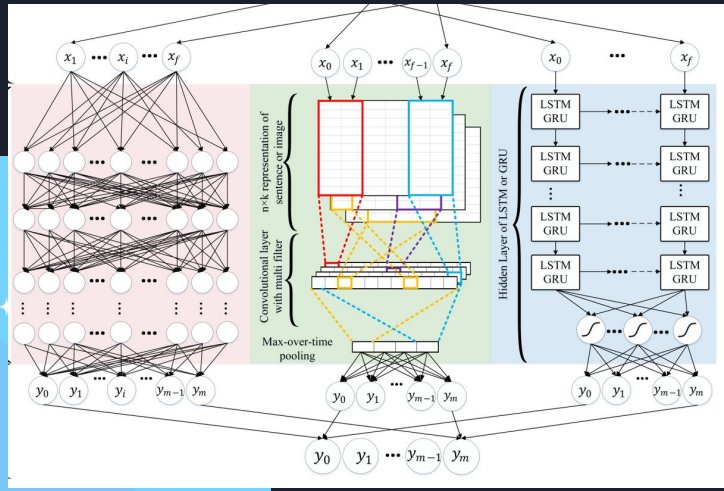
Feature Extraction: exactly what the name implies, features are extracted from an image to identify what it is

Data augmentation: a strategy that enables practitioners to significantly increase the diversity of data available for training models, without collecting new data.

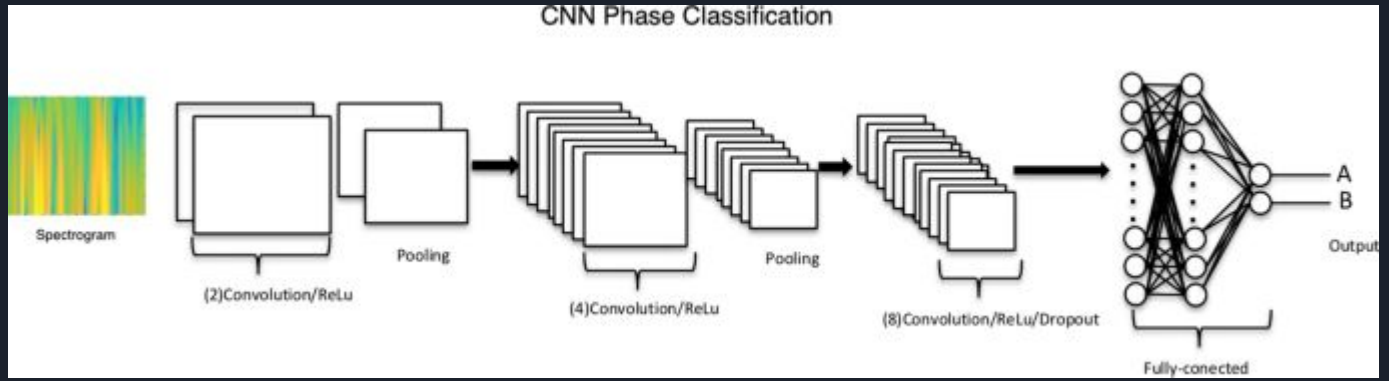
The Convolutional Classifier







What is a Convolutional Classifier?



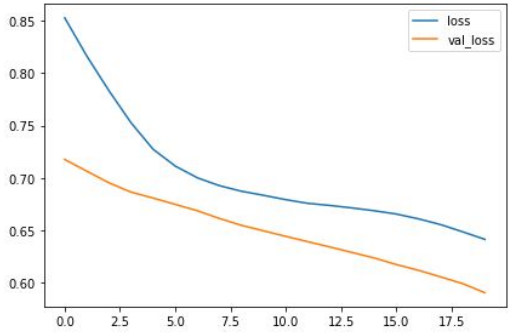
- A convolutional classifier(CNN) is a neural network that is used for processing 2D images.
- CNN consists of two parts: a dense head and a convolutional base.
  - Dense Head - Used to determine the class of an image.
  - Convolutional base - Used to extract features from an image.
- CNN algorithms are more commonly used, due to their high rate of accuracy and little preprocessing.

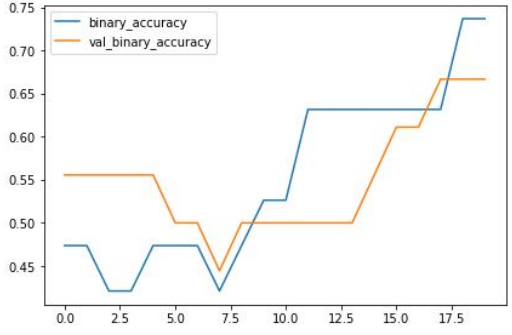
Applications

One major application in use today is facial recognition. The technology has been rapidly implemented into mainstream media with the FaceID on iPhones.

The technology can be used in the criminal justice systems as a way to recognize perpetrators caught on camera or over the internet through avatars they post under.

Our Convolutional Classifier Project: Is it a Train or a Bus?



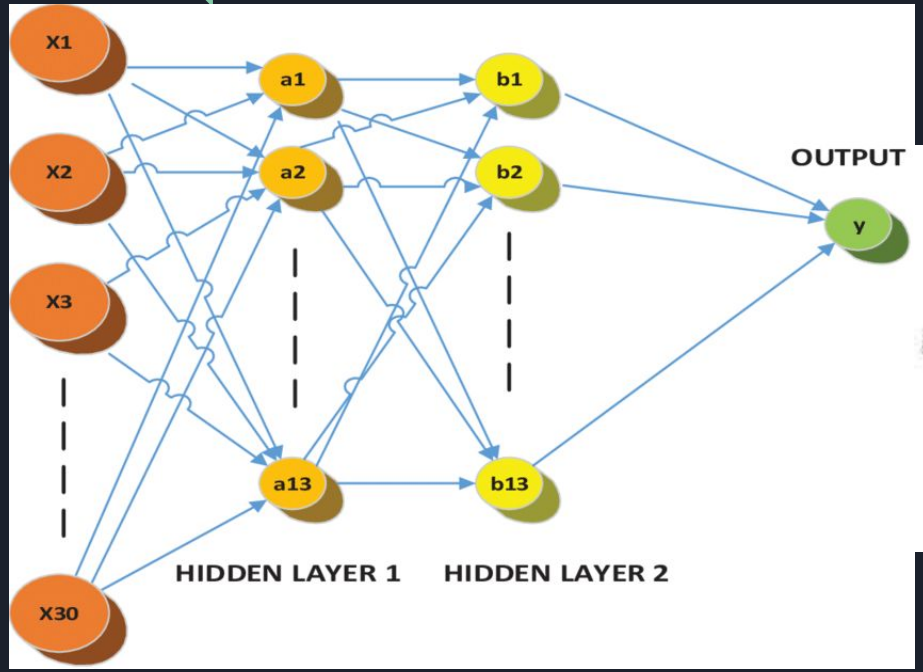


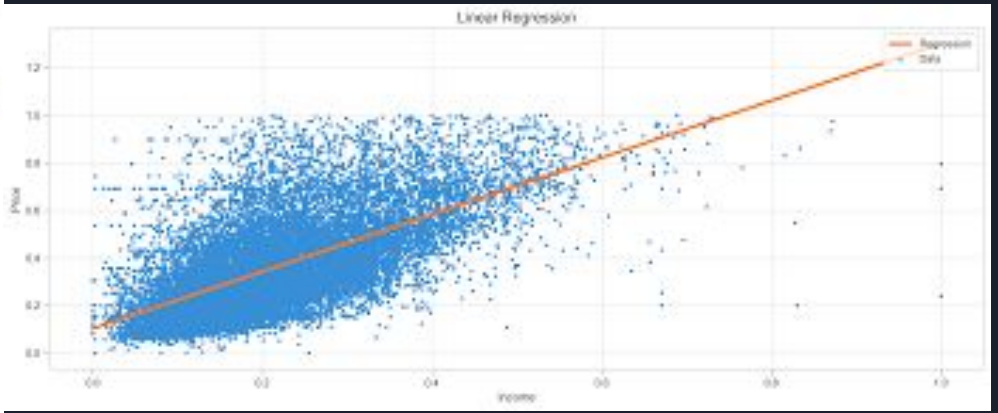

```
from learntools.core import binder
binder.bind(globals())
from learntools.computer_vision.ex1 import *

import os, warnings
import matplotlib.pyplot as plt
from matplotlib import gridspec

import numpy as np
import tensorflow as tf
from tensorflow.keras.preprocessing import image_dataset_from_directory
```

```
history = model.fit(
    ds_train,
    validation_data=ds_valid,
    epochs=20,
)

import pandas as pd
history_frame = pd.DataFrame(history.history)
history_frame.loc[:, ['loss', 'val_loss']].plot()
history_frame.loc[:, ['binary_accuracy', 'val_binary_accuracy']].plot();
```

```
Epoch 1/20
1/1 [==============================] - 9s 9s/step - loss: 0.8529 - binary_accuracy: 0.4737 - val_loss: 0.7178 - val_binary_accuracy: 0.5556
Epoch 2/20
1/1 [==============================] - 0s 425ms/step - loss: 0.8163 - binary_accuracy: 0.4737 - val_loss: 0.7066 - val_binary_accuracy: 0.5556
Epoch 3/20
1/1 [==============================] - 0s 428ms/step - loss: 0.7834 - binary_accuracy: 0.4211 - val_loss: 0.6955 - val_binary_accuracy: 0.5556
Epoch 4/20
1/1 [==============================] - 0s 467ms/step - loss: 0.7528 - binary_accuracy: 0.4211 - val_loss: 0.6866 - val_binary_accuracy: 0.5556
Epoch 5/20
1/1 [==============================] - 0s 423ms/step - loss: 0.7275 - binary_accuracy: 0.4737 - val_loss: 0.6810 - val_binary_accuracy: 0.5556
Epoch 6/20
```

Stochastic Gradient Descent





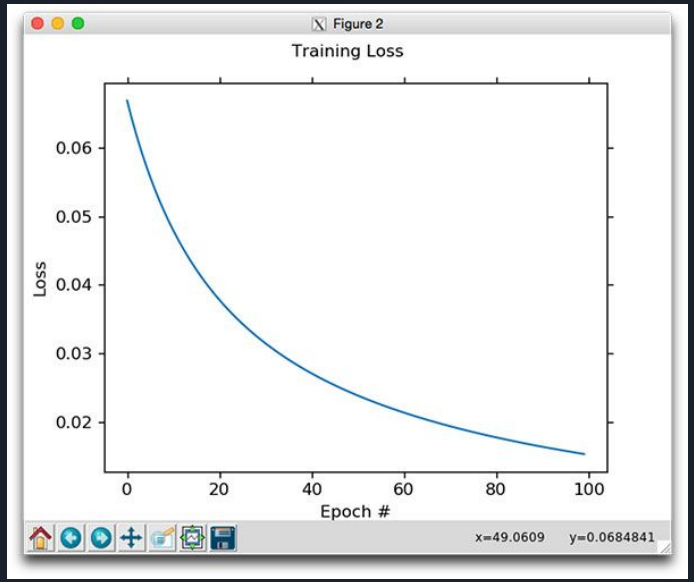
What is Stochastic Gradient Descent?

Stochastic Gradient Descent is an optimizer that is used to decrease loss in training networks by using the following steps:

1. Sampling data and running it through a network to make predictions
2. Measuring the loss between Predictions and true values
3. Adjusting the weights in a direction that makes the loss smaller

This process is run constantly until the loss is as small as the user likes, or until it is as low as possible.

Loss and Epochs



Loss is a measure of prediction inaccuracy.

Loss is calculated by Training Loss and Validation Loss.

Training loss is calculated during each epoch.

Validation loss is calculated after each epoch.

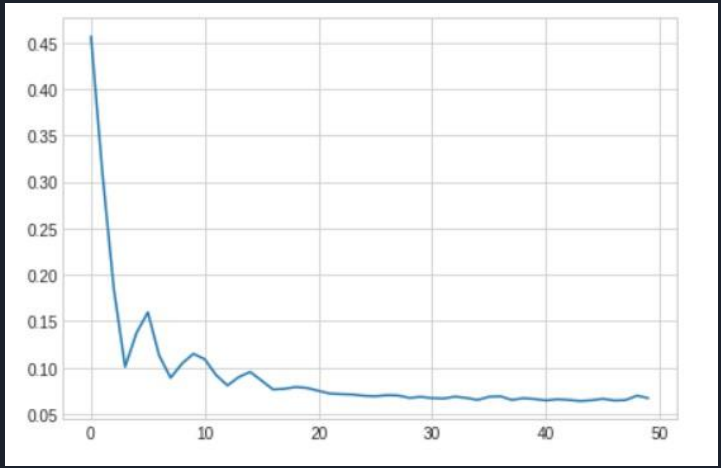
An Epoch is what is used to measure the loss between training and validation loss

Applications

Stochastic Gradient Descent can be used to more efficiently help make predictions in current Artificial Intelligence, and Datasets by minimizing Loss.

When applied to other instances of numerical data analysis such as predicting quality from certain parameters based on current and past trends, the Stochastic optimizer can yield more accurate predictions of quality such as : water, food, air, fuel, etc.

Our Stochastic Gradient Descent Project: Graduate Admissions



Questions?