Image Processing Project Club 2025

Session (3) – Image Classification Using Convolutional Neural Networks

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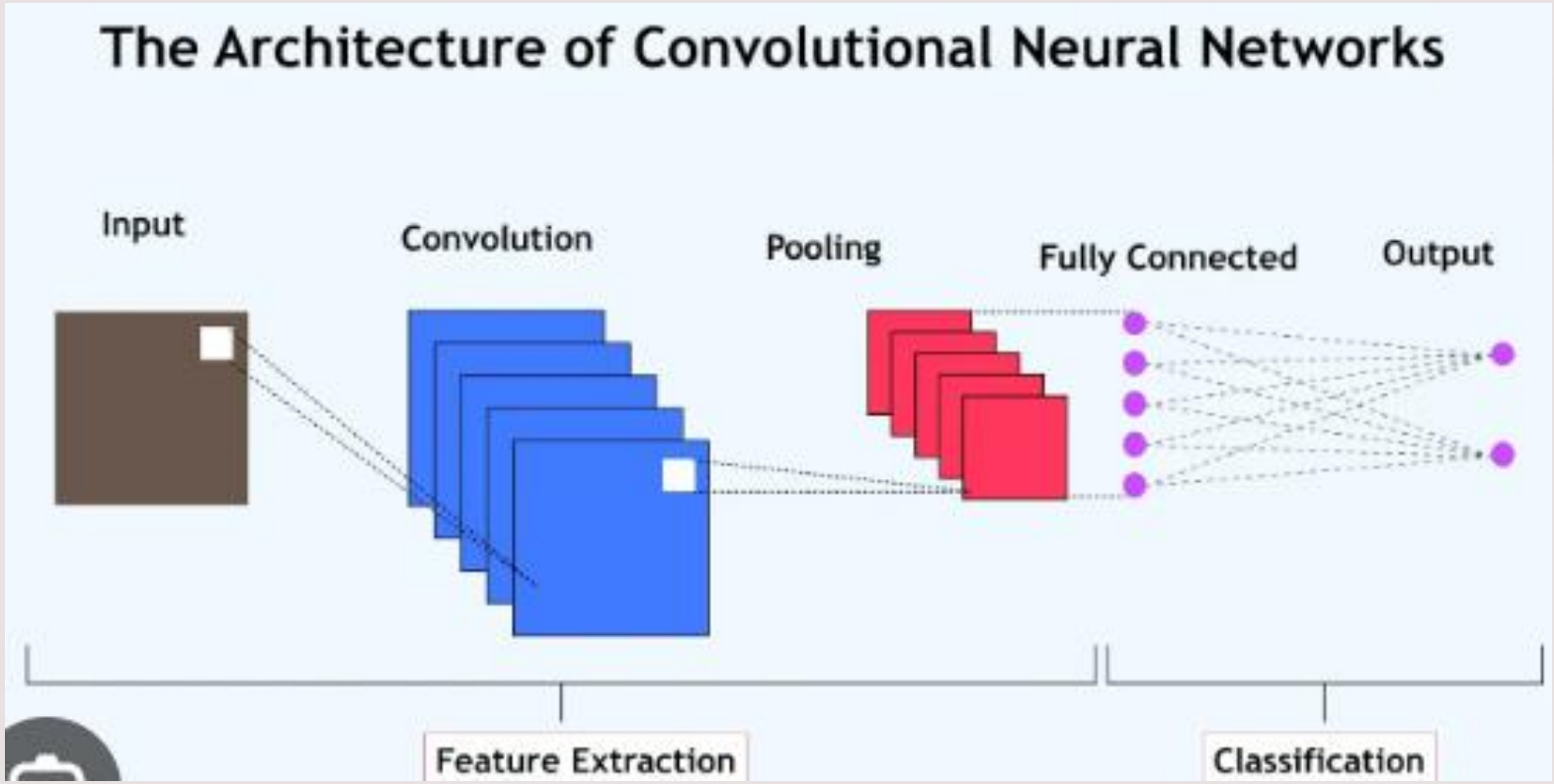
Dr. Yi Sun

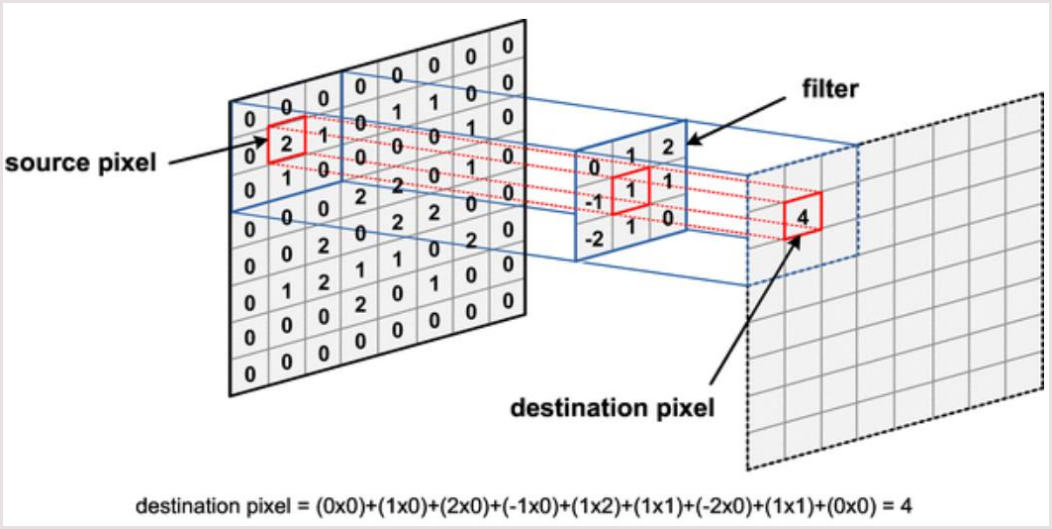
Image Source: Internet (Used for Educational Purposes)

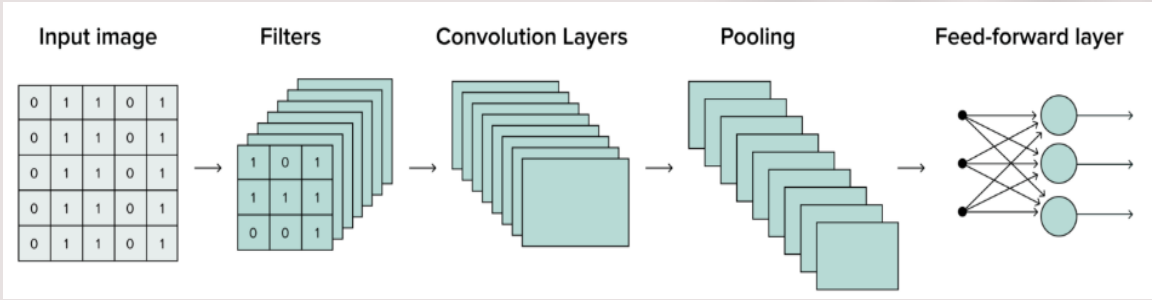
Overview of Deep Learning Networks for Image Classification



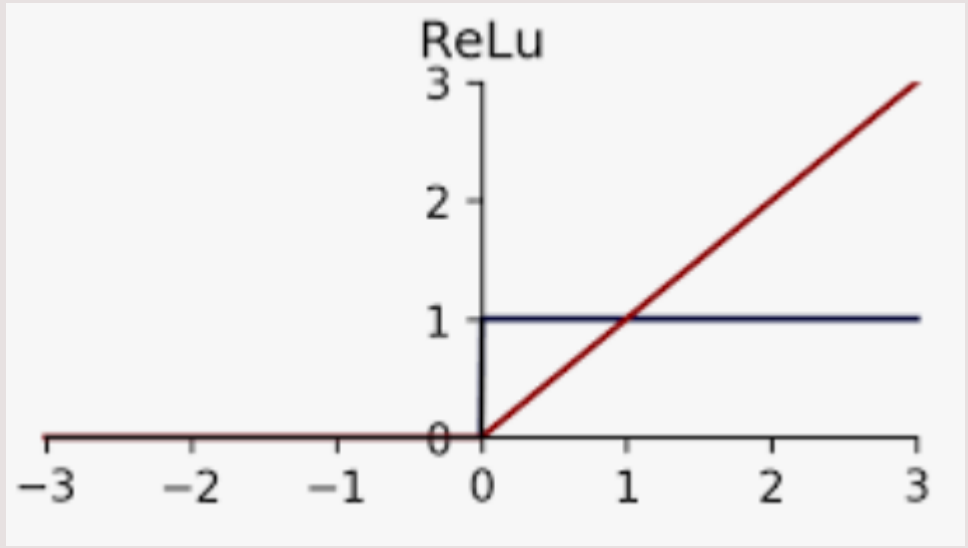
https://www.upgrad.com/blog/basic-cnn-architecture/

The Convolution Operator in A CNN





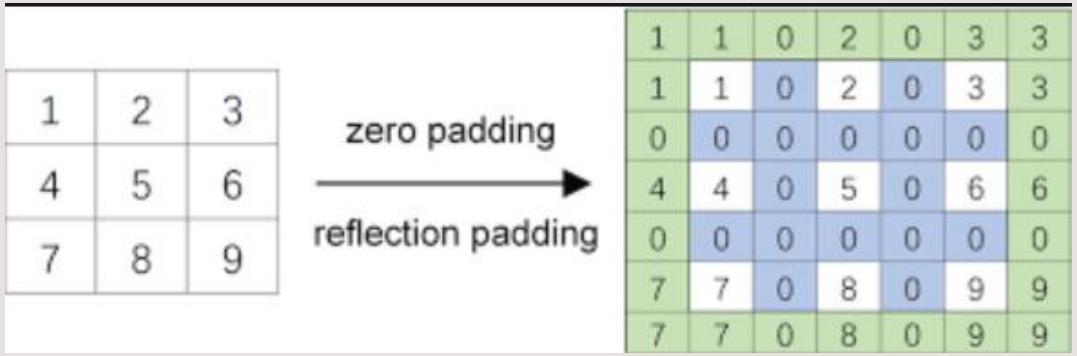
The Rectified Linear Unit (ReLU) Activation Function



Input			ReLU		
-249	-91	-37	0	0	0
250	-134	101	250	0	101
27	61	-153	27	61	0

Padding in CNN

- **Ensures output maps remain large enough for deeper networks.**
- **Avoids rapid reduction in size, which can cause loss of fine details.**
- **With padding, the CNN can still detect features near the edges.**
- **Without padding, CNNs learn features mostly from the center of the image.**



The Pooling Layer

The Fully Connected Layer (Dense Layer)

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense

model = Sequential([
    Conv2D(32, (3,3), activation='relu', input_shape=(32,32,3)),
    MaxPooling2D((2,2)),
    Conv2D(64, (3,3), activation='relu'),
    MaxPooling2D((2,2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dense(10, activation='softmax')
])
```

Tasks

- Try different parameters in the given code.
- Run the given code on different images.
- Read the following

https://ujjwalkarn.me/2016/08/11/intuitive-explanation-convnets/

https://www.datacamp.com/tutorial/introduction-to-convolutional-neural-networks-cnns