HEALTHCARE APPLICATIONS OF DEEP CONVOLUTIONAL NEURAL NETWORKS (CNN)

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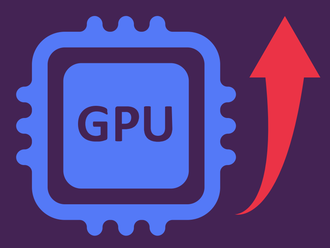
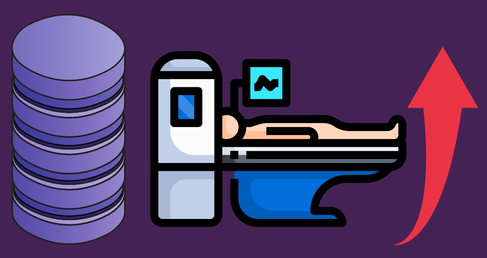


Development of Graphics Processing Units[1]



Volume of medical images[2]

Numbers of Radiologists[2]

30% RISE IN CT-SCANS IN NHS BETWEEN 2013-2016 [2]

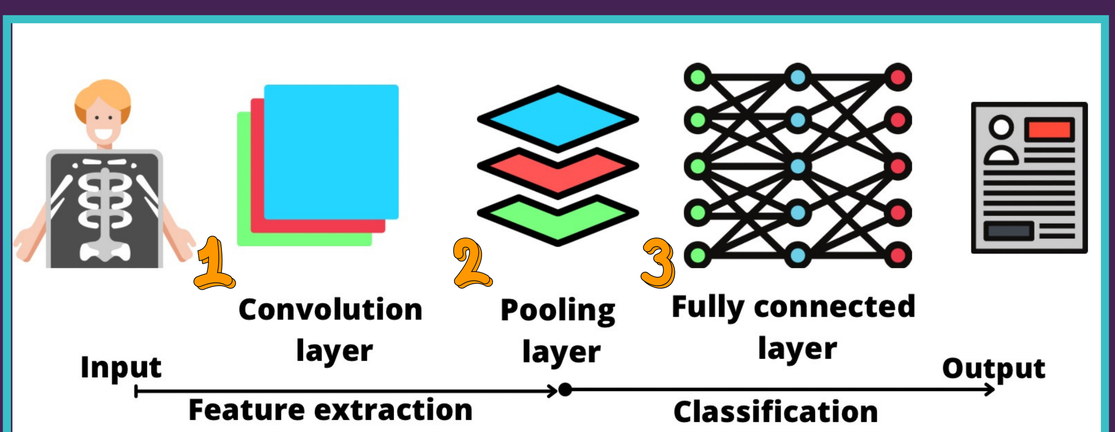
CNN

Pattern recognition[1]
Object detection[3]
Image classification[3]

DID YOU KNOW?

- IT WAS INSPIRED BY VISUAL NEURONS IN ANIMALS[3]
- CNN WORKS WITHOUT HUMAN SUPERVISION[3]
- DETECTING TUBERCULOSIS ON CHEST X-RAYS: SENSITIVITY 97.3% SPECIFICITY 100%[4]

HOW DOES IT WORK?



1. The convolutional layer consists of multiple filters called kernels. Each kernel is responsible for a feature in the image (e.g. edges), which is presented in a feature map
2. The pooling layer then starts subsampling this feature map to produce a smaller map
3. Finally, the activation function selects the important neurons, then presents the distinct features to be used in the fully connected layer[3]

BENEFITS

Identifying tumors[3]
Diagnosing rare diseases[3]
Reconstruct[3] CT images
Better health services[2]
79% Quicker diagnosis[2]
Image segmentation[3] by volume & shape
Classifying disease[3] (e.g. cancer stages)

LEGAL AND ETHICAL ISSUES

Big Data
To achieve high accuracy, CNNs need big datasets for training[5]

Data Protection
For automated decisions, patients need to know how the decision was made[5]

Transparency
Researchers do not know-how and why CNNs work[5]

Algorithmic Bias
If datasets have bias, this will result in algorithm bias[5]

FAILURE

As a result of algorithmic bias, millions of patients In the USA did not receive appropriate care[6]

LIMITATIONS

1. Overfitting - not suitable for generalization[3]
2. Lack of labelled datasets[3]
3. Costly devices[3]

REFERENCES

https://github.com/AsalaAljazaery/CNN-Poster.git