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What is the Semantic Rationale for a CNN in the classification of CT Scans to determine if a patient has Covid-19?

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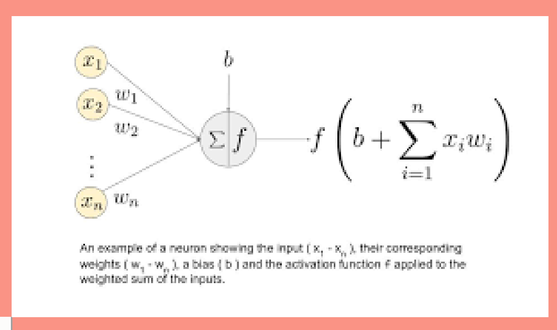
Introduction

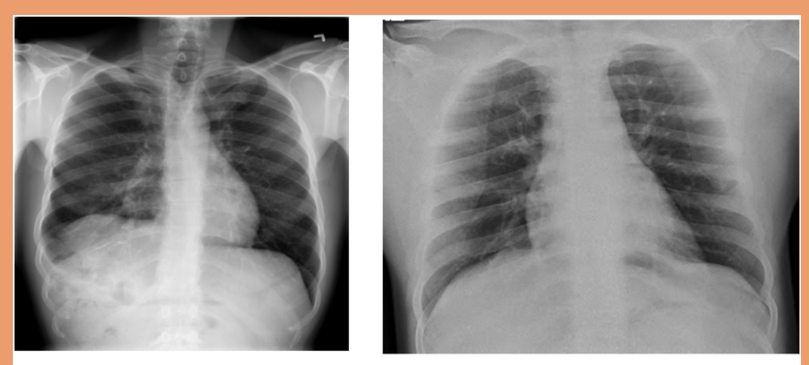


An example of a neuron showing the input (x_1 - x_n), their corresponding weights (w_1 - w_n), a bias (b) and the activation function F applied to the weighted sum of the inputs.

$$(f * g)(t) \stackrel{\text{def}}{=} \int_{-\infty}^{\infty} f(\tau)\, g(t-\tau)\, d\tau$$

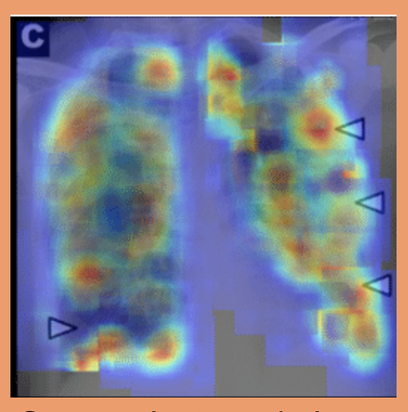
- Convolutional Neural Network (CNN) is a Machine Learning algorithm that can classify different sets of images.
- A CNN can learn and classify patterns in images
- A dataset is needed and the accuracy is much higher than humans

CNNs and Covid-19



- CT scans of the lungs of Covid-19 patients show characteristic patterns
- Differences can be noticed by a medical professional, but not with complete certainty
- CNNs can analyze and recognize these differences in patterns and classify a patient's health condition

Explainable AI



- The field of Explainable AI (XAI) aims to develop mathematical and quantitative explanations for the decisions made by a Neural Network
- A Saliency Map shows which parts of the image are more important for the network to recognize

Implications

- Recognizable differences between patients with healthy lungs, Pneumonia, and Covid-19
- Could potentially help medical researchers make diagnostic claims about Covid-19
- The underlying patterns that would have been recognized by the algorithm could have pointed scientists in the right direction or provided them with more data about the virus behaviour