Receptive Field

Saba Hesaraki · Follow
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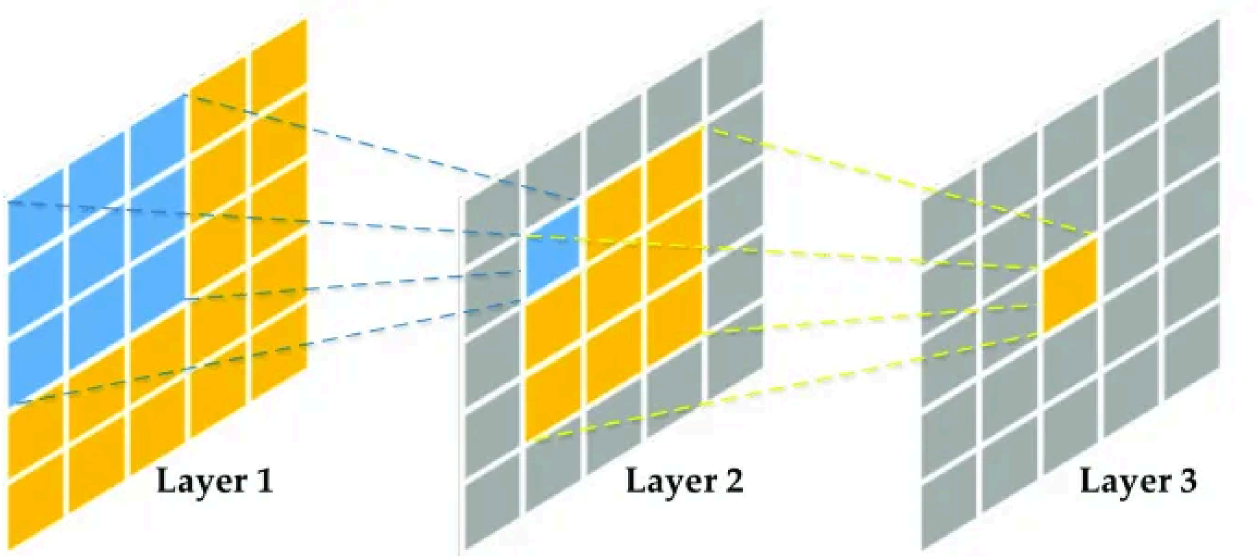
What does the ***Receptive field*** mean in ***CNN*** computer vision?



In Convolutional Neural Networks (CNNs) used in computer vision, the receptive field refers to the region of the input image that a particular neuron in a convolutional layer is "looking at" or taking into account when making its predictions or feature extractions. It is a concept used to understand the context and spatial coverage of neurons within the network.

The receptive field is determined by the size of the convolutional kernel (also known as the filter) and the stride used during the convolution operation. The receptive field of a neuron in a particular layer can be thought of as the area of the input image that directly influences the neuron's output.

Here are some key points to understand about receptive fields in CNNs:

1. ***Local Receptive Field***: In the initial layers of a CNN, individual neurons have a small local receptive field, which means they only look at a small portion of the input image. As you move deeper into the network, the receptive field of neurons typically grows, allowing them to capture information from larger regions of the input.

2. ***Spatial Hierarchy***: CNNs are designed in a hierarchical manner, where each layer captures features from a larger portion of the input than the previous layer. This hierarchy helps in recognizing both low-level features (e.g., edges and textures) and high-level features (e.g., object parts and objects) as you progress through the layers.

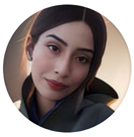
3. ***Receptive Field Size Calculation***: The size of the receptive field for a neuron in a given layer depends on the size of the convolutional kernel and the strides used. If a layer uses larger kernels and strides, its neurons have larger receptive fields. Conversely, smaller kernels and strides result in smaller receptive fields.

4. ***Padding***: Padding is often used to control the size of the output feature maps. Zero-padding the input can be employed to ensure that the output feature maps have the same spatial dimensions as the input. This can be useful for maintaining the spatial hierarchy and avoiding a reduction in spatial resolution too quickly.

Understanding the receptive field in a CNN is crucial because it helps in interpreting what information is being captured by different layers and neurons in the network. As layers capture increasingly larger receptive fields, they can learn to recognize more complex and abstract patterns, making them suitable for tasks like object recognition and scene understanding in computer vision.

Convolutional Network Deep Learning Computer Vision Kernel

Receptive Field



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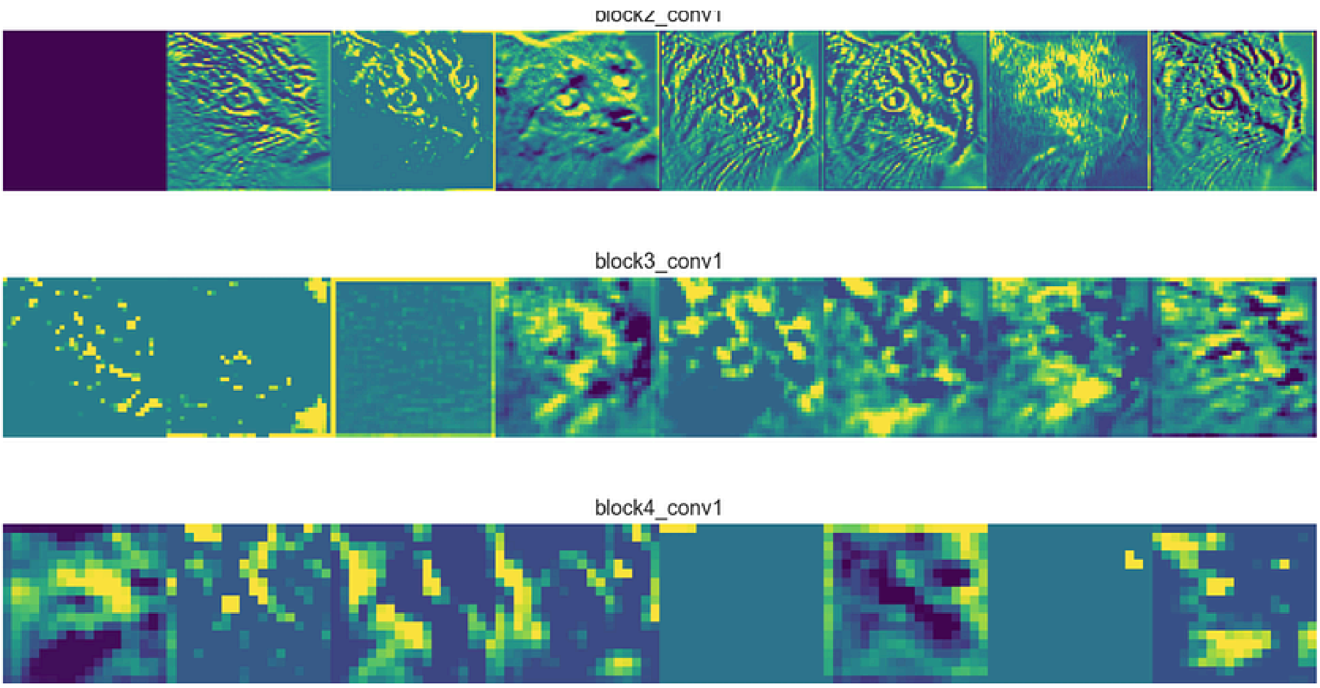

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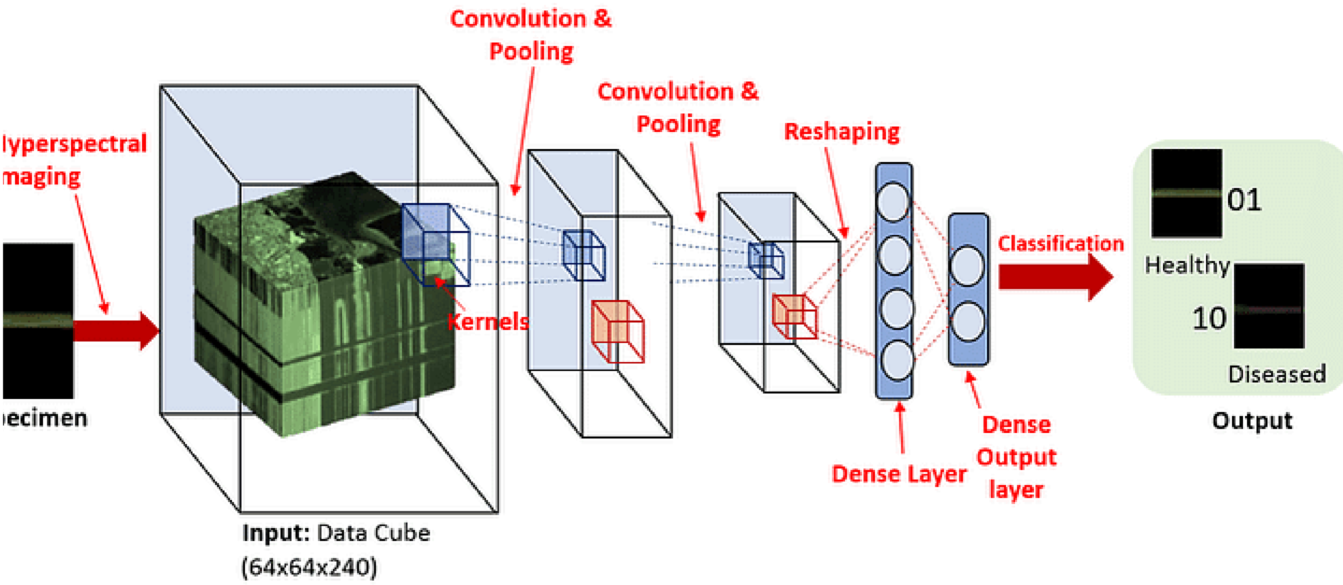

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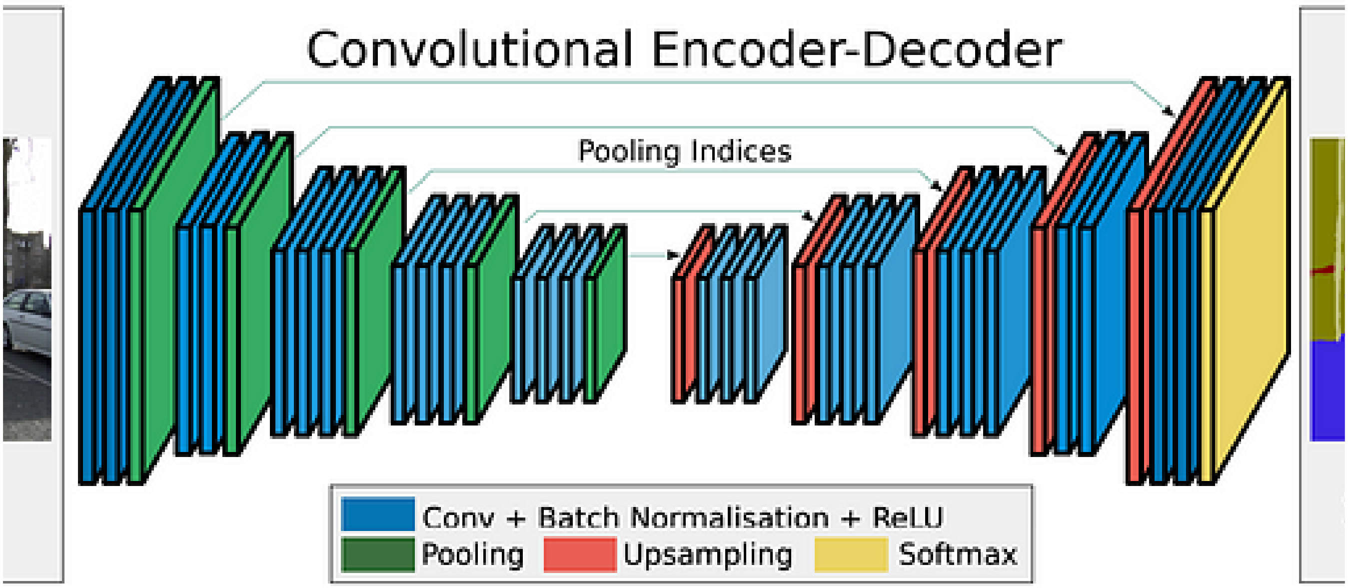

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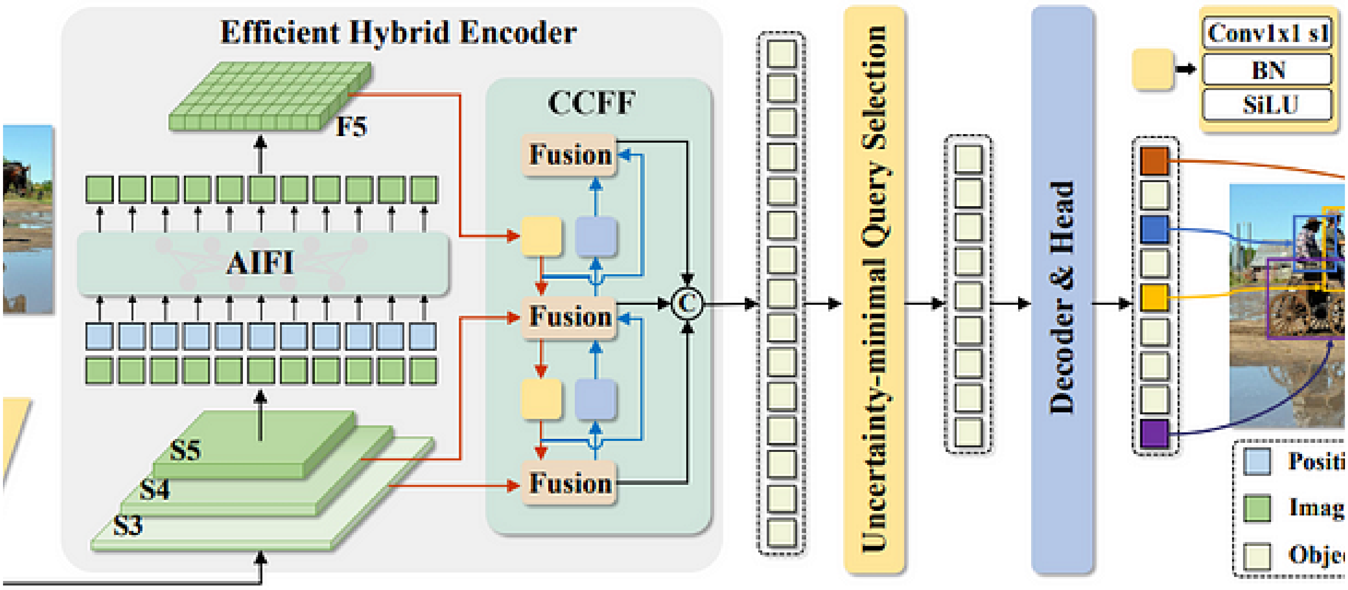

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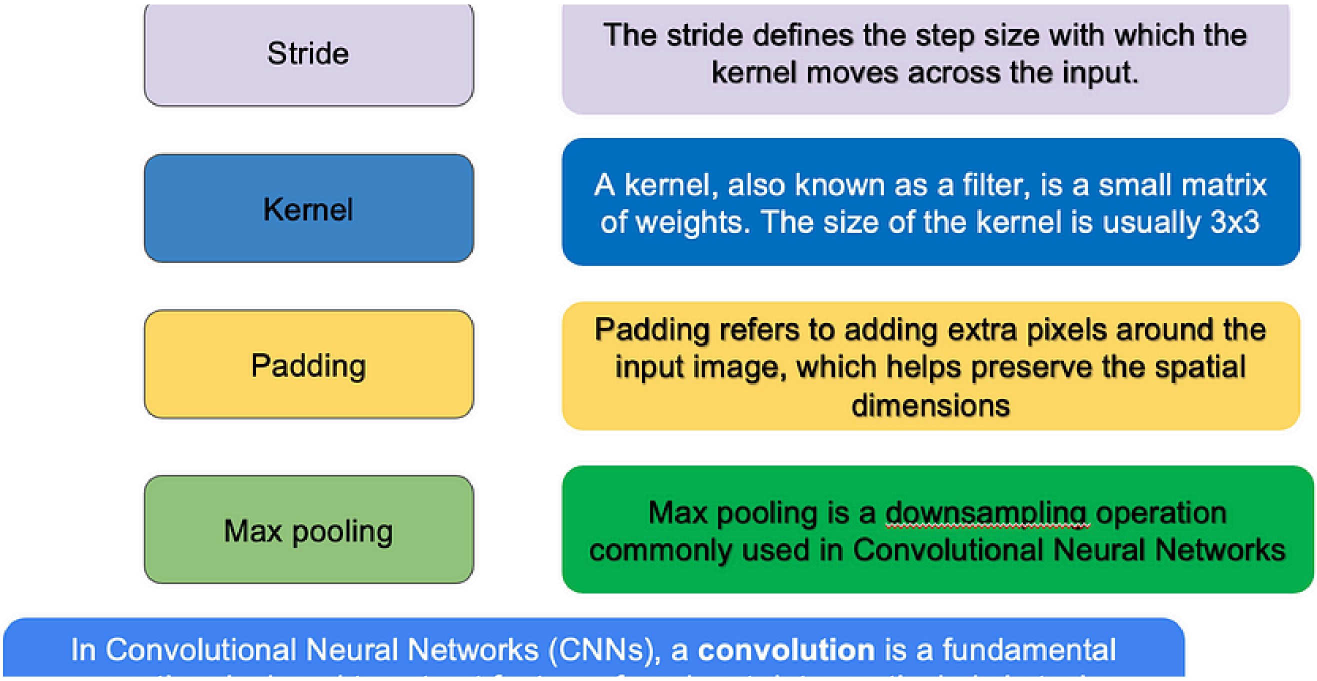

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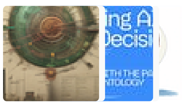

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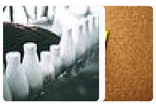

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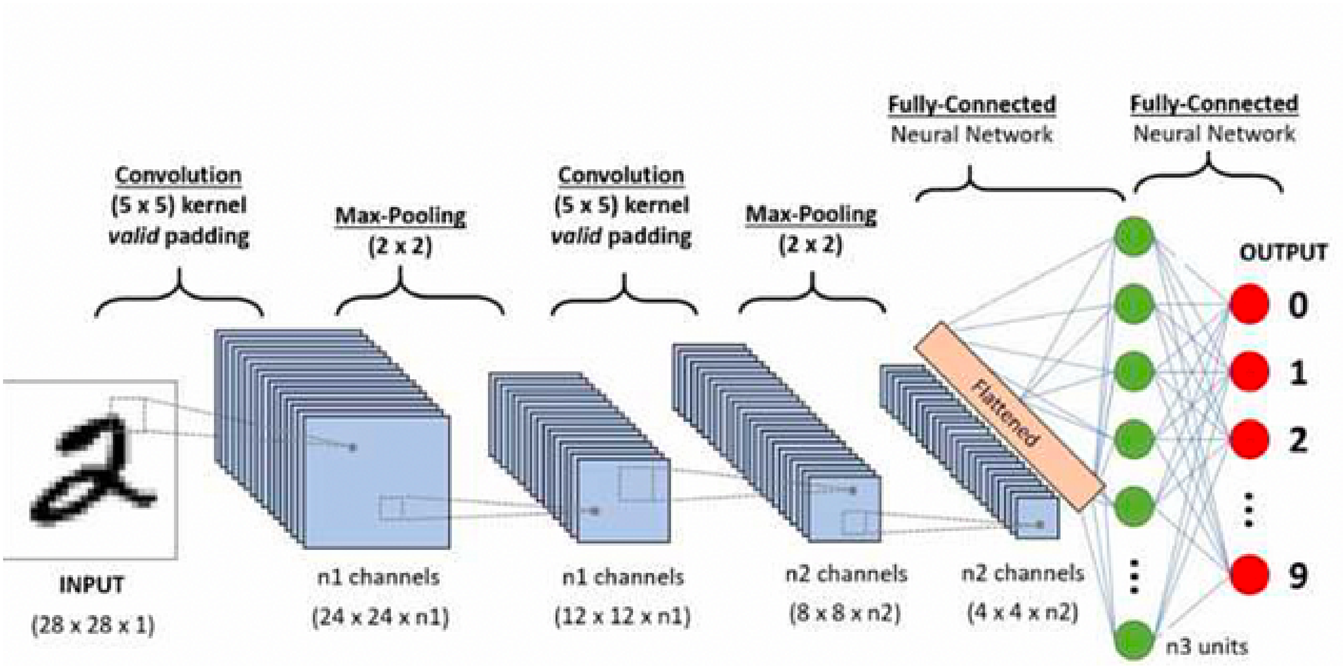

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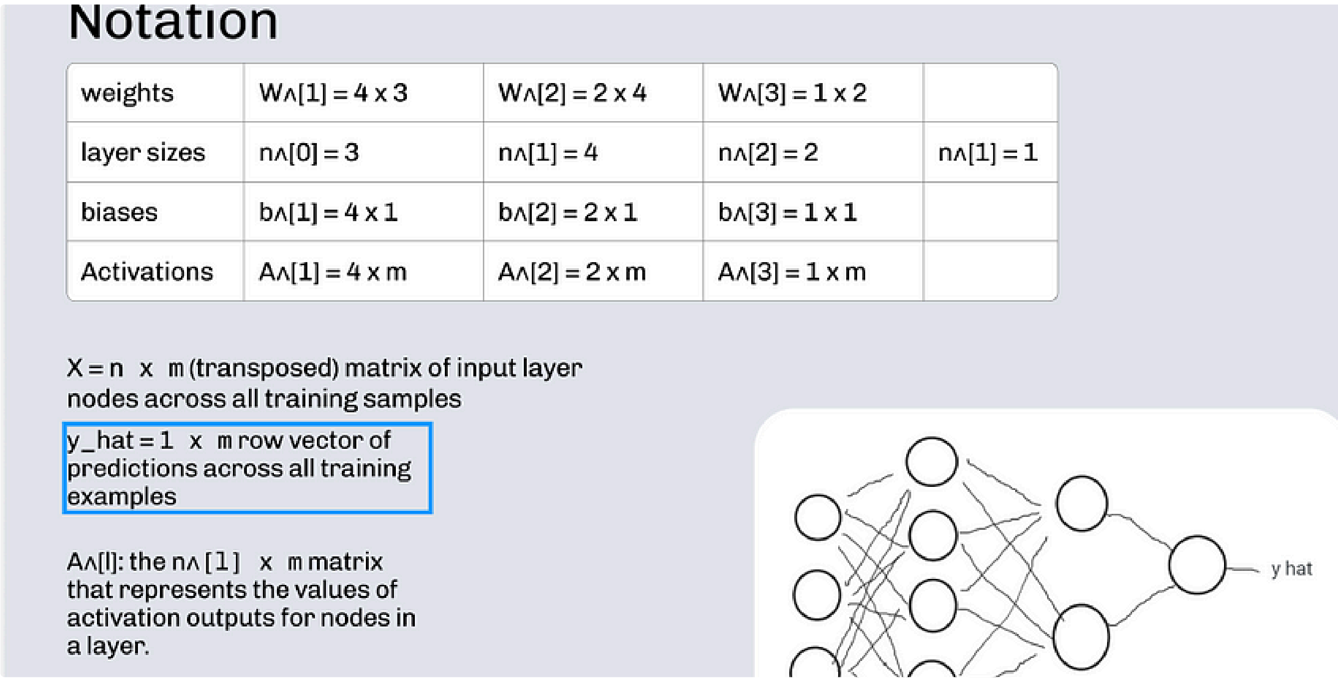

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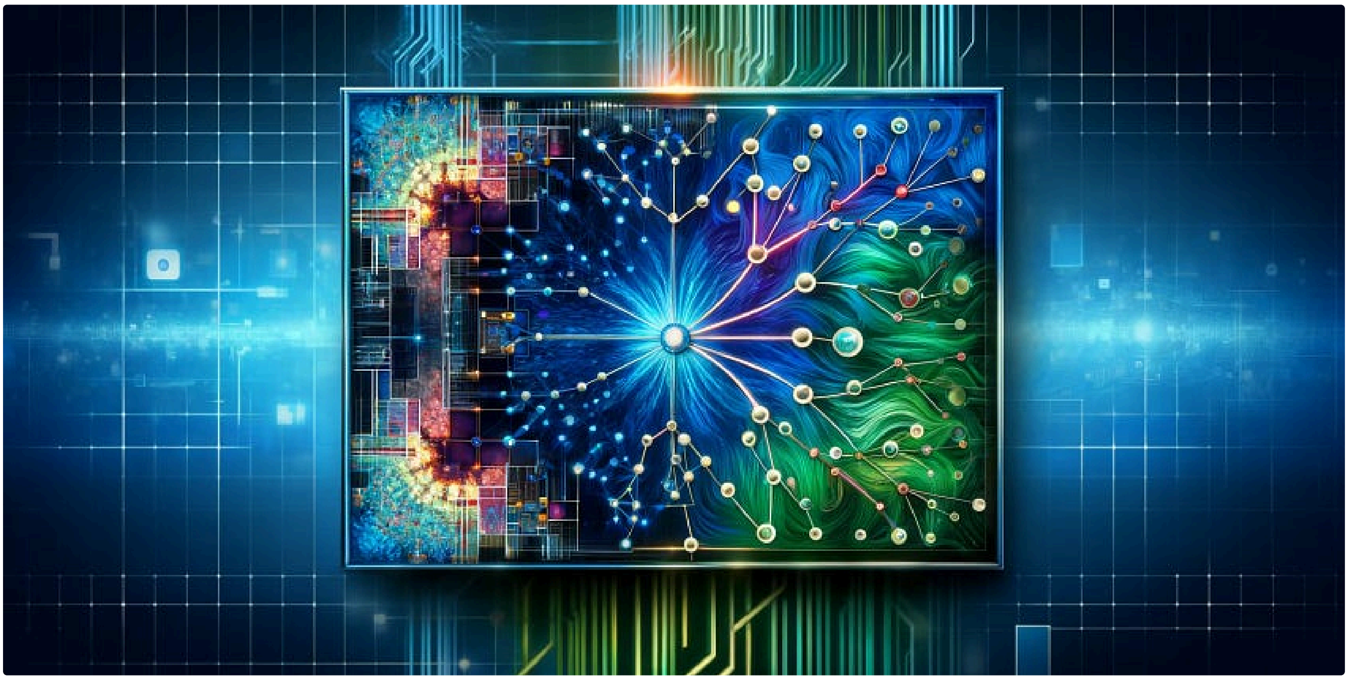

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