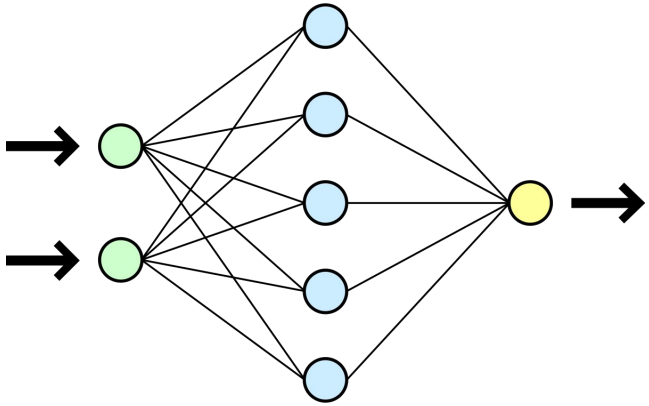

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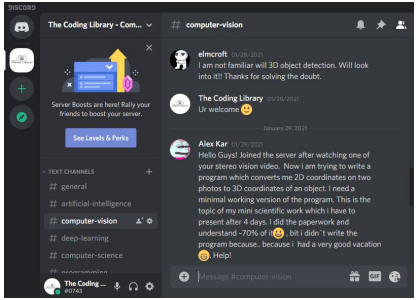
Neural Networks

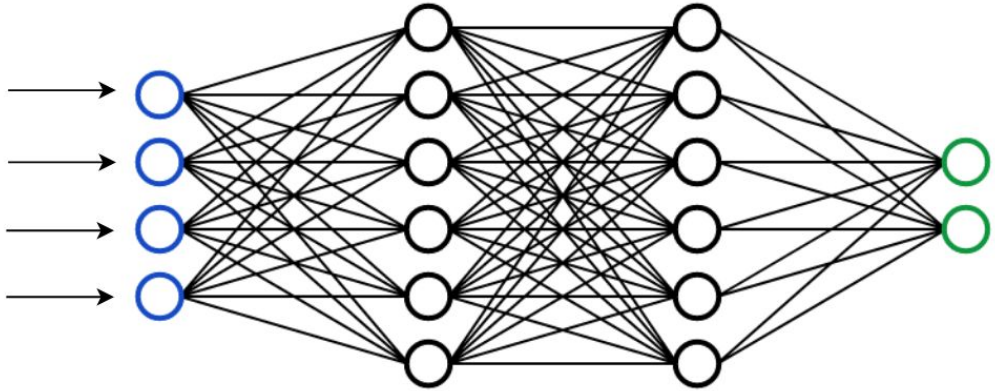
Batch and Batch Normalization



Discord Link in Description

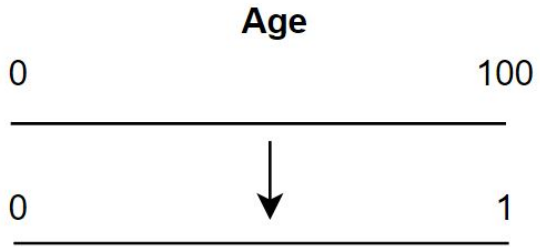
Batch

- Number of samples that will be passed through to the network at each epoch
- What is the best batch size? How to find it?



Batch Normalization

- Transformation that maintains the mean output close to 0 and the standard deviation close to 1
- Used to make Neural Networks faster and more stable
- Works differently during training and during prediction



$$z = \frac{x - m}{s}$$

Batch Normalization - Procedure

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1. Normalize output from activation function

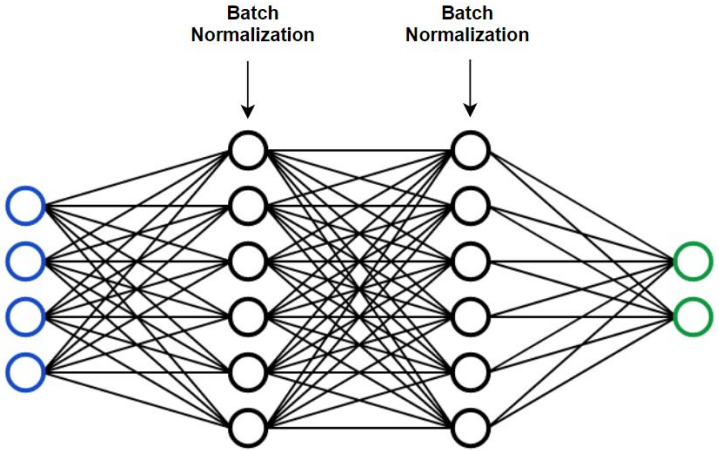
$$z = \frac{x - m}{s}$$

2. Multiply by parameter g

$$z \cdot g$$

3. Add parameter b to the product

$$(z \cdot g) + b$$



Batch Normalization - Keras

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`BatchNormalization` class

```
tf.keras.layers.BatchNormalization(
    axis=-1,
    momentum=0.99,
    epsilon=0.001,
    center=True,
    scale=True,
    beta_initializer="zeros",
    gamma_initializer="ones",
    moving_mean_initializer="zeros",
    moving_variance_initializer="ones",
    beta_regularizer=None,
    gamma_regularizer=None,
    beta_constraint=None,
    gamma_constraint=None,
    renorm=False,
    renorm_clipping=None,
    renorm_momentum=0.99,
    fused=None,
    trainable=True,
    virtual_batch_size=None,
    adjustment=None,
    name=None,
    **kwargs
)
```