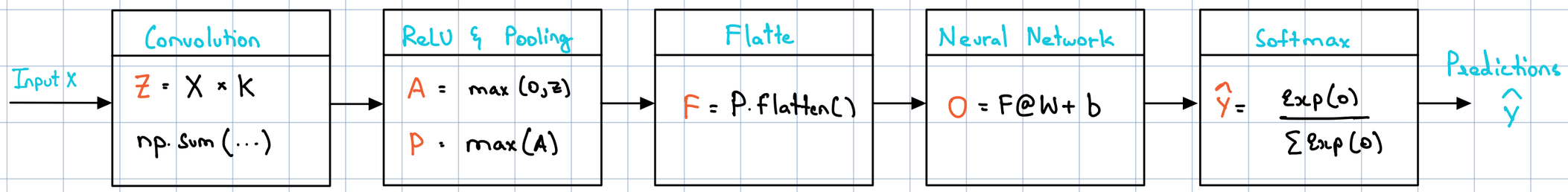
CNN from Scratch

1) Notations:

- X - Input Image
- k - Kernal/Filter
- Z - Conv Ouptput Map
- A - ReLU Activation
- P - Pooled Map
- F - Flattened Vector
- W, b - Weights & Bias
- α - Learning Rate
- $\hat{y}$ - Predicted Probabilities

2) Forward Propagation:



3) Loss Function:

J = Cross-Entropy

$J = -\ln(\text{pred}[Y])$

4) Gradient Descent:

$W = W - \alpha \cdot \partial W$

$b = b - \alpha \cdot \partial b$

- kernels k are static

5) Accuracy:

$$\text{Accuracy} = \frac{1}{m} \sum 1(\text{argmax}(\hat{Y}) == Y)$$

6) BackWard Propagation:

$\partial O = \hat{y} - y$

grad[label] -= 1

Dense Weights ∂W:

$\partial W = (\hat{Y} - Y) \cdot F^T$

np.outer(self.x, grad)

Dense Bias ∂B:

$\partial B = (\hat{Y} - Y) \cdot 1$

grad (for batch = 1)

by
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