

Python basics w/ numpy overview

1. Building basic functions w/ numpy

1.1. sigmoid, np.exp()

- Rarely use math lib in DL because the inputs of the functions are real numbers. In DL we mostly use matrices and vectors. This is why np is more useful

~~2D, 3D basic arrays~~

- If $x = (x_1, x_2, \dots, x_n)$ is a row vector, then $\text{np.exp}(x)$ apply the exponential function to every element of x
 $x = \text{np.array}([1, 2, 3])$

- Also, if x is a vector, an operation such as $s = x + 3$ or $s = \frac{1}{x}$ will output s as a vector of the same size as x
- For quick access to docs (e.g.): $\text{np.exp}?$

1.2. Sigmoid gradient

sigmoid - ~~derivative~~ derivative $(x) = \sigma'(x) = \sigma(x)(1 - \sigma(x))$

1.3. Reshaping arrays

- $X.\text{shape}$: get shape (dimension) of matrix/vector X

$X.\text{reshape}$: reshape X

- Images: (length, height, depth = 3) \rightarrow (length * height * 3, 1)

- $v = v.\text{reshape}((v.\text{shape}[0] * v.\text{shape}[1], v.\text{shape}[2]))$

1.4. Normalising rows

- $x \rightarrow \frac{x}{\|x\|}$

- E.g.: $x = \begin{bmatrix} 0 & 3 & 4 \\ 2 & 6 & 4 \end{bmatrix}$, $\|x\| = \text{np.linalg.norm}(x, \text{axis}=1, \text{keepdims}=1)$
 $= \begin{bmatrix} 5 \\ \sqrt{56} \end{bmatrix}$

$$x_{\text{-normalized}} = \frac{x}{\|x\|} = \begin{bmatrix} 0 & 3/5 & 4/5 \\ 2/\sqrt{56} & 6/\sqrt{56} & 4/\sqrt{56} \end{bmatrix}$$