deeplearning.ai

Basics of Neural Network Programming

Broadcasting in Python

Broadcasting example

Calories from Carbs, Proteins, Fats in 100g of different foods:

	Apples	Beef	Eggs	Potatoes
Carb	56.0	0.0	4.4	68.0
Protein	1.2	104.0	52.0	8.0
Fat	1.8	135.0	99.0	0.9

$= A$

$(3,4)$

59 cal

$\frac{56}{59} \approx 94.9\%$

Calculate % of calories from Carb, Protein, Fat. Can you do this without explicit for-loop?

```
cal = A.sum(axis = 0)
percentage = 100*A/(cal.reshape(1,4))
```

↑(3,4)   /   (1,4)

Broadcasting example

$$\begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} \quad + \quad \begin{bmatrix} 100 \\ 100 \\ 100 \\ 100 \end{bmatrix} ~100$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \quad + \quad \begin{bmatrix} 100 & 200 & 300 \\ 100 & 200 & 300 \end{bmatrix}$$

(m,n) $(2,3)$ $\qquad\qquad (1,n) \rightsquigarrow (m,n) \qquad (2,3)$

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \quad + \quad \begin{bmatrix} 100 & 100 & 100 \\ 200 & 200 & 200 \end{bmatrix} \quad =$$

(m,n) $\qquad\qquad\qquad (m,1)$
$\qquad\qquad\qquad\qquad \ell$
$\qquad\qquad\qquad (m,n)$

General Principle

(m, n)

$\underline{\text{matrix}}$

$\begin{array}{c} + \\ - \\ * \\ / \end{array}$

$(1, n) \quad \leadsto \quad (m, n)$

$(m, 1) \quad \leadsto \quad (m, n)$

$(m, 1)$

$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

$+$

$+$

$\mathbb{R}$

100

$=$

$\begin{bmatrix} 101 \\ 102 \\ 103 \end{bmatrix}$

$[1 \quad 2 \quad 3] \qquad + \qquad 100 \qquad = \quad [101 \quad 102 \quad 103]$

Matlab/Octave: $\underline{\text{bsxfun}}$