Basics of Neural Network Programming

Broadcasting in Python

deeplearning.ai
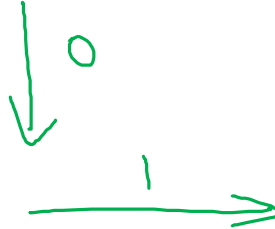
Broadcasting example

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

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

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

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

↓ ↓ ↓

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

(m,n) $(m,1)$ ← ←

(m,n)

General Principle

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

matrix $\dfrac{-}{*}$

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

$(m, 1)$ $+$ $\mathbb{R}$

$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ $+$ 100 $= \begin{bmatrix} 101 \\ 102 \\ 103 \end{bmatrix}$

$\begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$ $+$ 100 $= \begin{bmatrix} 101 & 102 & 103 \end{bmatrix}$

Matlab/Octave: bsxfun