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Math for Intelligent Systems
HW 1

MIS HW #1

1.11(a) $1^T w$ is equal to the total number of words in the document.

(b) $w_{282} = 0$ means that word 282 does not show up in the document.

(c) $w = \beta h$ where β is equal to the total number of words in the document.

1.12 Let f be a vector of size 5 with the following form (1, 0.14, 1.11, 1.25, 0.0095) where each value represents the respective currency exchanges. Then the total holding in USD (U) will be the following

$$U = c^T \begin{bmatrix} 1 \\ 0.14 \\ 1.11 \\ 1.25 \\ 0.0095 \end{bmatrix}$$

1.13(a) Total number of people $= 1^T x = t$

(b) The total number of people older than or equal to 65 $= x^T \begin{bmatrix} 0 \\ \vdots \\ 65 \\ 66 \\ \vdots \\ 100 \end{bmatrix}$

(c) The average age of the population $= \begin{bmatrix} 0 \\ 1 \\ 2 \\ \vdots \\ 98 \\ 99 \end{bmatrix}^T x$

t

1.19(a) Tomorrows forecast is based upon the first day of the 10 day cycle.

(b) Tomorrows forecast is based on two times what was made on the first day minus what was made on the second day.

(c) Tomorrows forecast is based on what was made during the sixth day of the 10 day cycle.

(d) Tomorrows forecast is based on half of what was made on the first and second day of the 10 day cycle.

1.20 It takes $100 \times 10^5 \times 8 = 80{,}000{,}000$ bytes to store if not sparse vectors.

A linear combination will take $10^5 \times 100$ multiplications and $10^5 \times 99$ additions so

$$\#\text{flops} = 10^5 \times 99 + 10^5 \times 100 \approx 2 \times 10^7 \text{ flops}$$

$$2 \times 10^7 \text{ flops} \left| \frac{\text{Gflop}}{10^9 \text{ flops}} \right| \frac{\text{s}}{\text{Gflop}} = \frac{2}{10^2} = \frac{1}{50} \text{ s}$$