Computer science 373

TUTORIAL 1 : VECTORS AND MATRICES

Welcome

- **Time and Location**
  - Monday, 09:00am. – 10:00am. Location: 403.402
  - Tuesday, 12:00pm. – 01:00pm. Location: 403.403
  - Wednesday, 12:00pm. – 01:00pm. Location: 260-051
- **Website:** http://www.cs.auckland.ac.nz/courses/compsci373s1c/
- **Tutors:**
  - Nick: nsto032@aucklanduni.ac.nz
    - Office hours: Monday to Friday 3pm-4pm
    - City campus, Building 303S, Area outside 396
  - Trevor: tgee862@aucklanduni.ac.nz
    - Office hours: Monday 11am-12pm, Tuesday 2pm-3pm, Wednesday 1pm-2pm
    - City Campus, Building 303S, Area outside 396

Moodle/CodeRunner

- **Website:** https://www.coderunner.auckland.ac.nz/moodle/
- **Getting in:**
  - Type above URI into your favourite browser.
  - Login using your UPI and university account password.
  - Contact me if you have a problem logging in.
- **Assignment 1:**
  - Should be online right now!

Vector Representation

Assume that we have a 2D vector **J**. Vector **J** extends +3 units along the x-axis and +4 units along the y-axis.

a) What is the magnitude of the vector **J**?

b) Evaluate the unit vector $\hat{\mathbf{J}}$ of vector **J**?

c) If we chose to represent vector **J** in matrix form, what would the dimensions of the matrix be?

Vector Arithmetic

a) Triangle ABC has point A at position $\begin{bmatrix}1\\2\\3\end{bmatrix}$ in 3D Cartesian space. Assume that the *vector* **AB** is $\begin{bmatrix}1\\1\\1\end{bmatrix}$ and *vector* **BC** is $\begin{bmatrix}2\\3\\2\end{bmatrix}$. What is the location of point C?

b) Consider the point J at location $\begin{bmatrix}1\\1\\1\end{bmatrix}$ and point K at location $\begin{bmatrix}2\\2\\2\end{bmatrix}$. Find the vector **H** that is the same direction as **JK** but *double* the magnitude.

Matrix Multiplication

a) Find the matrix product of $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \times \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$.

b) Find the matrix product of $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \times \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$.

c) Use the dot product to represent the result of the following matrix multiplication: $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$ where **A** = $\begin{bmatrix} a \\ b \end{bmatrix}$, **B** = $\begin{bmatrix} c \\ d \end{bmatrix}$ and **C** = $\begin{bmatrix} x \\ y \end{bmatrix}$.

Matrix Inverse

Find the inverse of $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

Matrix Transpose

Given the following two matrices: M = $\begin{bmatrix} 1 & 4 \\ 5 & 6 \end{bmatrix}$ and N = $\begin{bmatrix} 2 & 3 \\ 1 & 5 \end{bmatrix}$

a) Evaluate the matrix product MN.

b) Evaluate $(MN)^T$

c) Evaluate $N^T M^T$

d) What do you notice?