Name: Tanisha Pal **Registration No: Intern**

Neuroinformatic **Date: 22/01/24**

DIGITAL ASSIGNMENT 2

Exercises For Script A

Question 1:

Create a 4 × 8 matrix of randomly generated numbers

Answer 1:

```
% Set the size of the matrix
rows = 4;
columns = 8;

% Generating a matrix of random numbers
randomMatrix = rand(rows, columns);

% Display the matrix
disp(randomMatrix);
```

```
Command Window
  >> q1
      0.6034    0.6977    0.5833    0.2586    0.5313    0.7465    0.8076    0.3351
      0.0462    0.3630    0.2405    0.8473    0.9370    0.8639    0.5428    0.7781
      0.4219    0.3246    0.3749    0.4270    0.3334    0.0221    0.4338    0.0967
      0.3559    0.6775    0.2047    0.6570    0.3609    0.8495    0.6024    0.4520

fx >>
```

Question 2:

Loop through all rows and columns, and test whether each element is greater than 0.5.

Answer 2:

```
% Set the size of the matrix
rows = 4;
columns = 8;

% Generate a matrix of random numbers
randomMatrix = rand(rows, columns);

% Print the original matrix with 2 decimals after the decimal point
fprintf('Original Matrix:\n');
disp(randomMatrix);
```

```
% Loop through all rows and columns
for i = 1:rows
    for j = 1:columns
        if randomMatrix(i, j) > 0.5
            % Print the message with 2 decimals after the decimal point
            fprintf('The %dth row and %dth column has a value of %.2f and
is bigger than 0.5.\n', i, j, randomMatrix(i, j));
        end
    end
end
```

```
>> q2
Original Matrix:
    0.4665    0.7109    0.5994    0.6312    0.4406    0.0600    0.2014    0.4514
    0.6584    0.2633    0.7783    0.7653    0.7813    0.7667    0.3238    0.4963
    0.8083    0.2961    0.0958    0.5156    0.9911    0.7249    0.5971    0.9717
    0.8564    0.1858    0.4100    0.0468    0.8493    0.7547    0.9771    0.7630

The 1th row and 2th column has a value of 0.71 and is bigger than 0.5.
The 1th row and 3th column has a value of 0.60 and is bigger than 0.5.
The 1th row and 4th column has a value of 0.63 and is bigger than 0.5.
The 2th row and 1th column has a value of 0.66 and is bigger than 0.5.
The 2th row and 3th column has a value of 0.78 and is bigger than 0.5.
The 2th row and 4th column has a value of 0.77 and is bigger than 0.5.
The 2th row and 5th column has a value of 0.78 and is bigger than 0.5.
The 2th row and 6th column has a value of 0.77 and is bigger than 0.5.
The 3th row and 1th column has a value of 0.81 and is bigger than 0.5.
The 3th row and 4th column has a value of 0.52 and is bigger than 0.5.
The 3th row and 5th column has a value of 0.99 and is bigger than 0.5.
The 3th row and 6th column has a value of 0.72 and is bigger than 0.5.
The 3th row and 7th column has a value of 0.60 and is bigger than 0.5.
The 3th row and 8th column has a value of 0.97 and is bigger than 0.5.
The 4th row and 1th column has a value of 0.86 and is bigger than 0.5.
The 4th row and 5th column has a value of 0.85 and is bigger than 0.5.
The 4th row and 6th column has a value of 0.75 and is bigger than 0.5.
The 4th row and 7th column has a value of 0.98 and is bigger than 0.5.
The 4th row and 8th column has a value of 0.76 and is bigger than 0.5.
```

Question 3:

Report the results of the test along with the value of the matrix element and its row- column position. For example, your MATLAB script should print The 3rd row and 8th column has a value of 0.42345 and is not bigger than 0.5.

Answer 3:

```
% Set the size of the matrix
rows = 4;
columns = 8;

% Generate a matrix of random numbers
randomMatrix = rand(rows, columns);

% Loop through all rows and columns
for i = 1:rows
    for j = 1:columns
        % Test whether each element is greater than 0.5
        if randomMatrix(i, j) > 0.5
            % Print the message for values greater than 0.5
```

```
            fprintf('The %dth row and %dth column has a value of %.2f and
is bigger than 0.5.\n', i, j, randomMatrix(i, j));
        else
            % Print the message for values not greater than 0.5
            fprintf('The %dth row and %dth column has a value of %.5f and
is not bigger than 0.5.\n', i, j, randomMatrix(i, j));
        end
    end
end
```

```
Command Window
>> q3
The 1th row and 1th column has a value of 0.91 and is bigger than 0.5.
The 1th row and 2th column has a value of 0.18786 and is not bigger than 0.5.
The 1th row and 3th column has a value of 0.23578 and is not bigger than 0.5.
The 1th row and 4th column has a value of 0.24778 and is not bigger than 0.5.
The 1th row and 5th column has a value of 0.66 and is bigger than 0.5.
The 1th row and 6th column has a value of 0.69 and is bigger than 0.5.
The 1th row and 7th column has a value of 0.38359 and is not bigger than 0.5.
The 1th row and 8th column has a value of 0.56 and is bigger than 0.5.
The 2th row and 1th column has a value of 0.16069 and is not bigger than 0.5.
The 2th row and 2th column has a value of 0.69 and is bigger than 0.5.
The 2th row and 3th column has a value of 0.48934 and is not bigger than 0.5.
The 2th row and 4th column has a value of 0.65 and is bigger than 0.5.
The 2th row and 5th column has a value of 0.95 and is bigger than 0.5.
The 2th row and 6th column has a value of 0.66 and is bigger than 0.5.
The 2th row and 7th column has a value of 0.84 and is bigger than 0.5.
The 2th row and 8th column has a value of 0.63 and is bigger than 0.5.
The 3th row and 1th column has a value of 0.74 and is bigger than 0.5.
The 3th row and 2th column has a value of 0.29982 and is not bigger than 0.5.
The 3th row and 3th column has a value of 0.76 and is bigger than 0.5.
The 3th row and 4th column has a value of 0.33079 and is not bigger than 0.5.
The 3th row and 5th column has a value of 0.84 and is bigger than 0.5.
The 3th row and 6th column has a value of 0.51 and is bigger than 0.5.
The 3th row and 7th column has a value of 0.25084 and is not bigger than 0.5.
The 3th row and 8th column has a value of 0.44972 and is not bigger than 0.5.
The 4th row and 1th column has a value of 0.56 and is bigger than 0.5.
The 4th row and 2th column has a value of 0.63 and is bigger than 0.5.
The 4th row and 3th column has a value of 0.62 and is bigger than 0.5.
The 4th row and 4th column has a value of 0.11920 and is not bigger than 0.5.
The 4th row and 5th column has a value of 0.14639 and is not bigger than 0.5.
The 4th row and 6th column has a value of 0.43472 and is not bigger than 0.5.
The 4th row and 7th column has a value of 0.29148 and is not bigger than 0.5.
The 4th row and 8th column has a value of 0.86 and is bigger than 0.5.
fx >>
```

Question 4:

Make sure to add exceptions to print out 1st, 2nd, and 3rd, instead of 1th, 2th, and 3th.

Answer 4:

```
rows = 4;
columns = 8;

% Generate a matrix of random numbers
randomMatrix = rand(rows, columns);

% Print the original matrix with 2 decimals after the decimal point
fprintf('Original Matrix:\n');
disp(randomMatrix);
```

```
% Loop
for i = 1:rows
    for j = 1:columns
        % Testing element is greater than 0.5
        if randomMatrix(i, j) > 0.5
            suffix = '';
            if i == 1
                suffix = 'st';
            elseif i == 2
                suffix = 'nd';
            elseif i == 3
                suffix = 'rd';
            else
                suffix = 'th';
            end

            suffix1 = '';
            if j == 1
                suffix1 = 'st';
            elseif j == 2
                suffix1 = 'nd';
            elseif j == 3
                suffix1 = 'rd';
            else
                suffix1 = 'th';
            end

            % Print
            fprintf('The %d%s row and %d%s column has a value of %.2f and
is bigger than 0.5.\n', i, suffix, j, suffix1, randomMatrix(i, j));
        end
    end
end
```

```
Command Window
  >> q4
  Original Matrix:
      0.5767    0.0287    0.7127    0.6820    0.0967    0.1499    0.6490    0.8253
      0.1829    0.4899    0.5005    0.0424    0.8181    0.6596    0.8003    0.0835
      0.2399    0.1679    0.4711    0.0714    0.8175    0.5186    0.4538    0.1332
      0.8865    0.9787    0.0596    0.5216    0.7224    0.9730    0.4324    0.1734

  The 1st row and 1st column has a value of 0.58 and is bigger than 0.5.
  The 1st row and 3rd column has a value of 0.71 and is bigger than 0.5.
  The 1st row and 4th column has a value of 0.68 and is bigger than 0.5.
  The 1st row and 7th column has a value of 0.65 and is bigger than 0.5.
  The 1st row and 8th column has a value of 0.83 and is bigger than 0.5.
  The 2nd row and 3rd column has a value of 0.50 and is bigger than 0.5.
  The 2nd row and 5th column has a value of 0.82 and is bigger than 0.5.
  The 2nd row and 6th column has a value of 0.66 and is bigger than 0.5.
  The 2nd row and 7th column has a value of 0.80 and is bigger than 0.5.
  The 3rd row and 5th column has a value of 0.82 and is bigger than 0.5.
  The 3rd row and 6th column has a value of 0.52 and is bigger than 0.5.
  The 4th row and 1st column has a value of 0.89 and is bigger than 0.5.
  The 4th row and 2nd column has a value of 0.98 and is bigger than 0.5.
  The 4th row and 4th column has a value of 0.52 and is bigger than 0.5.
  The 4th row and 5th column has a value of 0.72 and is bigger than 0.5.
  The 4th row and 6th column has a value of 0.97 and is bigger than 0.5.
fx >>
```

Question 5:

Put this code into a separate function that you can call from the command line with two inputs, corresponding to the number of rows and the number of columns of the matrix.

Answer 5:

```
% Define the function
function randomMatrixAnalysis(rows, columns)
    % Generate a matrix of random numbers
    randomMatrix = rand(rows, columns);

    % Print the original matrix with 2 decimals after the decimal point
    fprintf('Original Matrix:\n');
    disp(randomMatrix);

    % Loop through all rows and columns
    for i = 1:rows
        for j = 1:columns
            % Test whether each element is greater than 0.5
            if randomMatrix(i, j) > 0.5
                % Print values greater than 0.5
                fprintf('The %dth row and %dth column has a value of %.2f
and is bigger than 0.5.\n', i, j, randomMatrix(i, j));
            else
                % Print values not greater than 0.5
                fprintf('The %dth row and %dth column has a value of %.5f
and is not bigger than 0.5.\n', i, j, randomMatrix(i, j));
            end
        end
    end
end
```

```
Command Window
  >> q4(4,8);
  Original Matrix:
      0.1283    0.8576    0.2998    0.2292    0.5419    0.0095    0.6704    0.1016
      0.6105    0.1153    0.7529    0.0564    0.6247    0.7530    0.0910    0.0976
      0.6136    0.8825    0.2652    0.8278    0.0004    0.7037    0.8227    0.1064
      0.2349    0.3889    0.5255    0.1158    0.1636    0.3563    0.4232    0.6187

  The 1th row and 1th column has a value of 0.12831 and is not bigger than 0.5.
  The 1th row and 2th column has a value of 0.86 and is bigger than 0.5.
  The 1th row and 3th column has a value of 0.29982 and is not bigger than 0.5.
  The 1th row and 4th column has a value of 0.22923 and is not bigger than 0.5.
  The 1th row and 5th column has a value of 0.54 and is bigger than 0.5.
  The 1th row and 6th column has a value of 0.00952 and is not bigger than 0.5.
  The 1th row and 7th column has a value of 0.67 and is bigger than 0.5.
  The 1th row and 8th column has a value of 0.10159 and is not bigger than 0.5.
  The 2th row and 1th column has a value of 0.61 and is bigger than 0.5.
  The 2th row and 2th column has a value of 0.11530 and is not bigger than 0.5.
  The 2th row and 3th column has a value of 0.75 and is bigger than 0.5.
  The 2th row and 4th column has a value of 0.05639 and is not bigger than 0.5.
  The 2th row and 5th column has a value of 0.62 and is bigger than 0.5.
  The 2th row and 6th column has a value of 0.75 and is bigger than 0.5.
  The 2th row and 7th column has a value of 0.09100 and is not bigger than 0.5.
  The 2th row and 8th column has a value of 0.09759 and is not bigger than 0.5.
  The 3th row and 1th column has a value of 0.61 and is bigger than 0.5.
  The 3th row and 2th column has a value of 0.88 and is bigger than 0.5.
  The 3th row and 3th column has a value of 0.26517 and is not bigger than 0.5.
  The 3th row and 4th column has a value of 0.83 and is bigger than 0.5.
  The 3th row and 5th column has a value of 0.00038 and is not bigger than 0.5.
  The 3th row and 6th column has a value of 0.70 and is bigger than 0.5.
  The 3th row and 7th column has a value of 0.82 and is bigger than 0.5.
  The 3th row and 8th column has a value of 0.10636 and is not bigger than 0.5.
  The 4th row and 1th column has a value of 0.23493 and is not bigger than 0.5.
  The 4th row and 2th column has a value of 0.38891 and is not bigger than 0.5.
  The 4th row and 3th column has a value of 0.53 and is bigger than 0.5.
  The 4th row and 4th column has a value of 0.11581 and is not bigger than 0.5.
  The 4th row and 5th column has a value of 0.16362 and is not bigger than 0.5.
  The 4th row and 6th column has a value of 0.35634 and is not bigger than 0.5.
  The 4th row and 7th column has a value of 0.42322 and is not bigger than 0.5.
fx The 4th row and 8th column has a value of 0.62 and is bigger than 0.5.
```

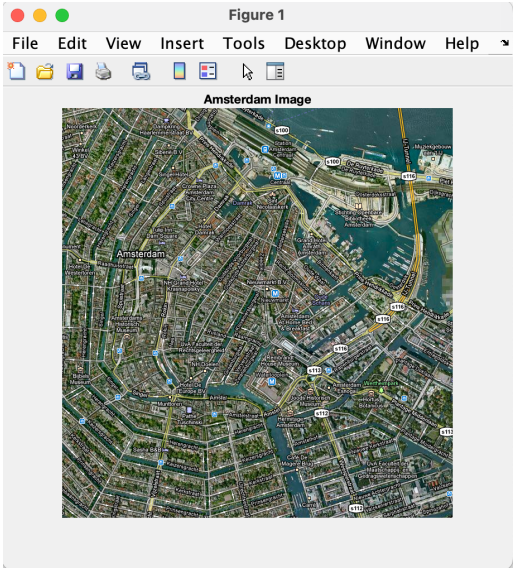
Exercises For Script B

Question 6:

Import and plot the picture of Amsterdam that comes with the online Matlab code.

Answer 6:

```
% The file path to the BMP image
imageFilePath = '/Users/tanisha/Desktop/IIITH COGSC/NEUROINFORMATICS/NEURO
LAB/amsterdam.bmp';

% Loading the image
amsterdamImage = imread(imageFilePath);

% Display the image
imshow(amsterdamImage);

% Title to the plot
title('Amsterdam Image');
```



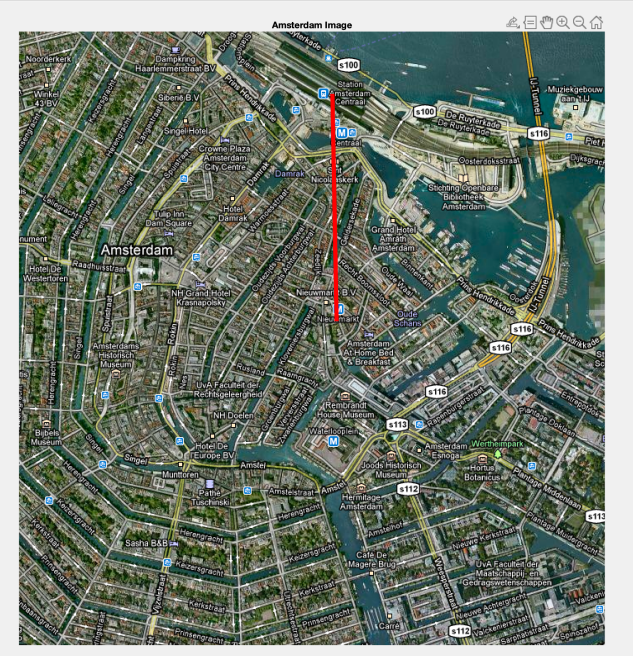
Question 7:

On top of the picture, plot a thick red line from “Nieuwmarkt” (near the center of the picture) to “Station Amsterdam Centraal” (near the top of the picture).

Answer 7:

```
% The file path to the BMP image
imageFilePath = '/Users/tanisha/Desktop/IIITH COGSC/NEUROINFORMATICS/NEURO
LAB/amsterdam.bmp';

% Load the image
amsterdamImage = imread(imageFilePath);

% Display the image
```

```
imshow(amsterdamImage);

% Title to the plot
title('Amsterdam Image');

% Coordinates of "Nieuwmarkt" and "Station Amsterdam Centraal"
nieuwmarktCoord = [347, 380];
centraalStationCoord = [75, 375];

% Ploting a thick red line from "Nieuwmarkt" to "Station Amsterdam
Centraal"
line([nieuwmarktCoord(2), centraalStationCoord(2)], [nieuwmarktCoord(1),
centraalStationCoord(1)], 'Color', 'red', 'LineWidth', 5);
```



Question 8:

Plot a magenta star over the Waterlooplein metro station (a bit South of Nieuwmarkt).

Answer 8:

```
imageFilePath = '/Users/tanisha/Desktop/IIITH COGSC/NEUROINFORMATICS/NEURO
LAB/amsterdam.bmp';

% Load the image
amsterdamImage = imread(imageFilePath);

% Display the image
imshow(amsterdamImage);

% Title to the plot
title('Image with Magenta Star');

% Coordinates of Waterlooplein metro station
waterloopleinCoord = [492, 380];  % [row, column]

% Ploting a magenta star over the Waterlooplein metro station
```

```
starSize = 20;
x = waterloopleinCoord(2);
y = waterloopleinCoord(1);

% Star on the image
hold on;
plot(x, y, 'p', 'MarkerSize', starSize, 'MarkerEdgeColor', 'm',
'MarkerFaceColor', 'm');
hold off;
```

Question 9:

Find the maximum value on each color dimension (red, green, or blue) and plot a circle using that color. There may be more than one pixel with a maximum value; if so, pick one pixel at random.

Answer 9:

Exercises For Script C

Question 10:

From the function you wrote for exercise 5, generate a 32 × 3 number matrix in which the three numbers in each row correspond to the row, column, and result of the test (1 for bigger than 0.5; 0 for smaller than 0.5).

Answer 10:

```
% The function
function resultMatrix = randomMatrixAnalysis(rows, columns)
    % Generate a matrix of random numbers
    randomMatrix = rand(rows, columns);
```

```
    % Print the original matrix with 2 decimals after the decimal point
    fprintf('Original Matrix:\n');
    disp(randomMatrix);

    % Initialize resultMatrix to store information about the test results
    resultMatrix = zeros(rows, 3);

    % Loop through all rows and columns
    for i = 1:rows
        for j = 1:columns
            % Test element is greater than 0.5
            if randomMatrix(i, j) > 0.5
                % Store information in resultMatrix
                resultMatrix(i, :) = [i, j, 1];
            else
                % Store information in resultMatrix
                resultMatrix(i, :) = [i, j, 0];
            end
        end
    end

    % Print resultant matrix
    fprintf('Result Matrix (Row, Column, Result):\n');
    disp(resultMatrix);
end
```

Command Window

```
>> q11(32,3);
Original Matrix:
    0.1434    0.9532    0.5431
    0.2585    0.0044    0.9567
    0.7913    0.6014    0.3675
    0.7274    0.7856    0.0265
    0.8231    0.6385    0.7395
    0.9363    0.1170    0.3249
    0.1912    0.7105    0.6653
    0.5269    0.0977    0.4978
    0.2806    0.5848    0.8577
    0.4084    0.8476    0.7486
    0.2399    0.2307    0.3979
    0.3576    0.1960    0.5141
    0.1643    0.0378    0.5838
    0.0025    0.8275    0.5082
    0.4067    0.0283    0.7339
    0.2796    0.3672    0.7286
    0.1773    0.1748    0.1941
    0.5857    0.5041    0.4549
    0.7215    0.4960    0.5186
    0.7213    0.8649    0.1491
    0.5086    0.5711    0.7819
    0.3259    0.1710    0.1654
    0.4548    0.9084    0.4952
    0.2969    0.6636    0.2592
    0.6830    0.5027    0.6218
    0.9247    0.8221    0.4571
    0.2917    0.2877    0.2555
    0.4760    0.8810    0.5344
    0.3915    0.5314    0.0916
    0.3189    0.0926    0.5615
    0.4002    0.4835    0.8522
    0.8776    0.3218    0.7275
```

Command Window

```
Result Matrix (Row, Column, Result):
     1     3     1
     2     3     1
     3     3     0
     4     3     0
     5     3     1
     6     3     0
     7     3     1
     8     3     0
     9     3     1
    10     3     1
    11     3     0
    12     3     1
    13     3     1
    14     3     1
    15     3     1
    16     3     1
    17     3     0
    18     3     0
    19     3     1
    20     3     0
    21     3     1
    22     3     0
    23     3     0
    24     3     0
    25     3     1
    26     3     0
    27     3     0
    28     3     1
    29     3     0
    30     3     1
    31     3     1
    32     3     1
```

Question 11:

Write this 32 × 3 matrix to a text file that contains this matrix along with appropriate variable labels in the first row. Make sure this file is tab-delimited and readable by a spread- sheet software such as Microsoft Excel or Open Office Calc.

Answer 11:

```
% Define the function
function resultMatrix = randomMatrixAnalysis(rows, columns, filename)
    % Generate a matrix of random numbers
    randomMatrix = rand(rows, columns);

    % Initialize resultMatrix to store information about the test results
    resultMatrix = zeros(rows, 3);

    % Loop through all rows and columns
    for i = 1:rows
        for j = 1:columns
            % Test element is greater than 0.5
            if randomMatrix(i, j) > 0.5
                % Store information in resultMatrix
                resultMatrix(i, :) = [i, j, 1];
            else
                % Store information in resultMatrix
```

```
                resultMatrix(i, :) = [i, j, 0];
            end
        end
    end

    % Print the original matrix with 2 decimals after the decimal point
    fprintf('Original Matrix:\n');
    disp(randomMatrix);

    % Print test results
    fprintf('Result Matrix (Row, Column, Result):\n');
    disp(resultMatrix);

    % Creating a table with variable labels
    variableLabels = {'Row_Index', 'Column_Index', 'Test_Result'};
    resultTable = array2table(resultMatrix, 'VariableNames',
variableLabels);

    % The table to a tab-delimited text file
    writetable(resultTable, filename, 'Delimiter', '\t');
end
```

q11.m | result_matrix.txt

```
Row_Index   Column_Index    Test_Result
1   3   1
2   3   1
3   3   0
4   3   0
5   3   1
6   3   1
7   3   0
8   3   1
9   3   0
10  3   0
11  3   0
12  3   0
13  3   1
14  3   1
15  3   0
16  3   1
17  3   0
18  3   1
19  3   0
20  3   1
21  3   1
22  3   1
23  3   0
24  3   1
25  3   0
26  3   1
27  3   0
28  3   1
29  3   0
30  3   1
31  3   0
32  3   1
```