CSC 340 Programming Assignment 2 Report
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Summary of the assignment goals

1. Implement Gauss-Jordan Elimination
    - Matrix is N x N w/ a result matrix that is N x 1
2. Calculating inverse matrices using Gauss-Jordan elimination
    - Matrix is N x N
3. Implement Gaussian Elimination
    - Matrix is N x N w/ a result matrix that is N x 1
4. Calculate determinants using Gaussian Elimination
    - Matrix is N x N

Description of algorithms

1. Gauss-Jordan Elimination
    - Input is a square matrix concatenated with 1 column result matrix
    - For each non result column it searches down the rows to find the max magnitude value in the column
    - Keeps a row swap index that increments every time a column is in the correct format
    - Swaps the max magnitude row to the row swap index row
    - For all rows other than the row swap index row it subtracts (value from current row and column) * (row swap index row)
    - This leads to an identity matrix with the solutions in the result column

2. Calculating inverse matrices using Gauss-Jordan elimination
    - Input is a square matrix
    - Adds an identity matrix to the right of the square matrix
    - Completes Gauss-Jordan row operations using the original columns
    - The original matrix turns into the identity matrix
    - The identity matrix turns into the inverse matrix
    - Cut off the inverse matrix and that is the result

3. Implement Gaussian Elimination
    - Input is a square matrix concatenated with 1 column result matrix
    - For each non result column it searches down the rows to find the max magnitude value in the column
    - Keeps a row swap index that increments every time a column is in the correct format
    - Swaps the max magnitude row to the row swap index row
    - For the rows below the row swap index it subtracts (value from current row & column / max magnitude) * (row swap index row)
    - This leads to the lower triangle in the array all becoming zeros
    - Uses substitution going from the bottom of the matrix to calculate the solutions

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4. Calculate determinants using Gaussian Elimination
    - Input is a square matrix
    - Completes Gaussian Elimination row operations
    - Keeps track of how many row swaps are made
    - Calculates determinant by multiplying all of the diagonal values in the matrix (A11, A22, A33, … Ann)
    - Multiplies that value by (-1 to the power of number of row swaps)

Discussion of issues encountered

- Major rounding errors when I was using numpy.arange because it was filling the array with integers and I was doing division on them
- Error swapping rows because I was using a shallow copies and I needed to use deep copies because the temporary rows were unintentionally getting changed
- Could not find a reasonable algorithm for scaling the algebra for the Gaussian Elimination