LU Factorization writing component.

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When calculating the value of an x vector for an equation Ax = b, there are multiple ways to approach the answer to said problem. The most common way is just to solve x = . However solving for x using this method can be quite complicated especially when dealing with a large m x n matrix. As a result other methods exist. LU factorization or LU decomposition is one way to approach said answer. By making a lower triangular and upper triangular matrix and then using the formulas Ly = b, Ux = y one can solve for x in a faster and more effective way. This is due to the fact that when calculating one’s code would have to row reduce each element in A and save it to another matrix such that said matrix is and then multiply it by the scalar of 1 over the determinant. LU allows for a quicker and easier way to calculate x. both L and U can be created in a single nested for loop, where calculating the values for each one would take less time than finding . Not only that but the precision of it would be quiet more significant. As seen from the results of LU decomposition xlsx file the error for ||LU - A|| was zero meaning no precision was lost. Also ||Px - b|| although increasing exponentially per number of dimensions of the parsed Matrix had an error value that was negligible. This is in part due to the fact that doing Ly = b and Ux = y results in dealing with more accurate floating point values than that of and as a result the ||Px - b|| using LU factorization is much smaller, meaning the overall values for the x vector are much more accurate. As a result it is much better to use LU decomposition than finding as it is both faster and more accurate.

