Linear Systems: Takeaways

Syntax

- Representing a matrix as an array:

```
import numpy as np

matrix_one = np.asarray([

[0, 0, 0],

[0, 0, 0]

], dtype=np.float32)
```

- Multiplying a row by a nonzero constant:

```
matrix[1] = 2*matrix[1]
```

- Adding one row to another row:

```
matrix[1] = matrix[1] + matrix[0]
```

- Combining and chaining row operations:

```
matrix[1] = 0.5*matrix[2] + matrix[1] + matrix[3]
```

Concepts

- Linear algebra provides a way to represent and understand the solutions to systems of linear equations. We represent linear equations in the general form of .
- A system of linear equations consists of multiple, related functions with a common set of variables. The point where the equations intersect is known as a solution to the system.
- The elimination method involves representing one of our variables in terms of a desired variable and substituting the equation that is in terms of the desired variable.
    - Suppose we have the equations and . Since both are equal to , we can substitute in the second function with the first function. The following are the steps to solve our example using the elimination method:
        - 1000 + 30x = 100 + 50x
        - 900 = 20x
        - 45 = x

- A matrix uses rows and columns to represent only the coefficients in a linear system, and it's similar to the way data is represented in a spreadsheet or a DataFrame.
- Gaussian elimination is used to solve systems of equation that are modeled by many variables and equations.
- In an augmented matrix, the coefficients from the left side of the function are on the left side of the bar (`|`), while the constants from the right sides of the function are on the right side.
- To preserve the relationships in the linear system, we can use the following row operations:
    - Any two rows can be swapped.
    - Any row can be multiplied by a nonzero constant.
    - Any row can be added to another row.
- To solve an augmented matrix, you'll have to rearrange the matrix into echelon form. In this form, the values on the diagonal are all equal to 1 and the values below the diagonal are equal to 0.

Resources

- [General form]
- [Elimination method]
- [Gaussian Elimination]
- [Linear algebra]