Linear Systems: Takeaways ↗

Syntax

- Representing a matrix as an array:

```python
import numpy as np
matrix_one = np.asarray([
[0, 0, 0],
[0, 0, 0]
], dtype=np.float32)
```

- Multiplying a row by a nonzero constant:

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

- Adding one row to another row:

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

- Combining and chaining row operations:

```python
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 $Ax + By = c$.

- 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 $y = 1000 + 30x$ and $y = 100 + 50x$. Since both are equal to y, 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](#)