General Assembly

STUDY GUIDE

MATRIX OPERATIONS IN PYTHON

Key Terms & Definitions

- A **matrix** is a rectangular array of elements. A matrix is like a spreadsheet—it's a rectangular container of scalars made up of rows and columns. The plural of matrix is **matrices**. Matrices are always denoted by bold, capital letters, an example being **X**. When indexing matrices, we always write rows first, followed by columns.
- Suppose we have an m-by-n matrix. Then, a single data point would have dimensions 1-by-n: 1 row and _n_ columns. This is called a **row vector**.
- We can also take a column from a matrix. This is called a **column vector**. In the context of our data, this would be all of the values of a given feature.
- We can make any row vector a column vector by **transposing** it. The transpose is represented by a "T" symbol.
- To sum two matrices of equal dimension, sum each corresponding element. This is often called **element-wise addition**.
- If a matrix is multiplied by a scalar, then each element is multiplied by that scalar. This is often called **element-wise multiplication**. So, the final matrix will have the same dimensions as the original.
- **Dot product** is the result of multiplying two matrices together.
- **Residuals** represent the distance between actual values and predicted values.
- We know that there's a "multiplicative inverse" such that, for any real number x, `1x = x1 = x`. Perhaps with matrices, there exists a matrix, **I**, such that **IX** = **XI** = **X**. This matrix **I** does exist—it's called the **identity matrix**.
- The **diagonal** of a matrix is the set of all elements in which the row and column indices are equal.
- A **square matrix** is a matrix that has the same number of rows and columns.
- If `(ad - bc)` is zero, the inverse will be undefined. For this reason, this number is an important value in linear algebra—we call it the **determinant** of the matrix.

Guiding Questions

1. What are some situations in which the dot product would be useful?

2. Why is matrix multiplication more complex than simply multiplying each element by its corresponding element in the second matrix?
3. Why would we want to look at the inverse of a matrix?
4. Describe a situation in which you would want to transpose a matrix.

Additional Resources

1. Intro to Matrices
2. A Simple Overview of Matrices
3. Linear Algebra's Role in Data Science
4. An Introduction to Linear Algebra for Data Scientists