

Introduction to Vectors

ILC Notes

Introduction to Vectors

- Vectors form the foundation of linear algebra.

Characteristics of Vectors

- In linear algebra, vectors are an ordered list of numbers.
- Vectors have several properties, with dimensionality and orientation being key.
- Magnitude & Direction

Understanding Dimensionality and Orientation

- Dimensionality refers to the number of elements in the vector.
- Orientation refers to the layout of the vector (column or row).

Discrepancies between Mathematical and Python Terminologies

- The dimensionality of a vector in Python refers to the number of geometric dimensions used to print out a numerical object.
- The mathematical dimensionality, i.e., the number of elements in the vector, is termed the length or shape in Python.

Creation and Visualization of Vectors in NumPy

- Python lists seem simple for vector representation, but they do not support many linear algebra operations.
- Hence, NumPy arrays are preferred for creating vectors.
- The shape of vectors can help understand their orientation and size.

Geometry of Vectors

- Vectors have a geometric interpretation as straight lines with specific length (magnitude) and direction.
- Vectors and coordinates are different but can correspond when the vector starts at the origin.

Operations on Vectors

- Operations on vectors in linear algebra include addition, subtraction, etc.
- These operations are often straightforward but require the vectors to have the same dimensionality and orientation.
- Python handles vector operations differently depending on their orientation, an operation termed broadcasting.

Vector Geometry

- The geometric interpretation of vectors is important in physics and engineering to represent physical forces.
- The algebraic interpretation is useful in data science for storing temporal data.
- Understanding the geometry of vector subtraction is crucial for orthogonal vector decomposition, a key aspect of linear algebra applied in science and engineering.