



# Linear Algebra: Foundations to Frontiers

## You will learn to

### Slice and Dice

- ✧ Recognize, apply, verify, and make connections between properties of vectors and their operations including geometric interpretations, orthogonality, length, vector algebra, and representations as linear combinations of unit basis vector.
- ✧ Develop and evaluate algorithms for matrix and vector operations.
- ✧ Make use of decomposition and blocking methods as well as recognize, develop and apply special characteristics of matrix including whether a matrix is triangular, symmetric, diagonal, and invertible.

### Transform and Solve

- ✧ Recognize, apply, and verify properties of linear transformations, including their connection to matrices *and systems of linear equations*.
- ✧ Determine solutions for systems of equations by applying a variety of methods including Gaussian elimination as well as various LU and QR factorization methods, and compare and contrast the different approaches.
- ✧ Find eigenvalues and eigenvectors of a matrix.

### Abstract

- ✧ Develop and evaluate a variety of algorithms for determining the solutions of systems.
- ✧ *Understand and apply notions* such as range, null space, rank, and isomorphism in the context of vector spaces and subspaces.
- ✧ Recognize, develop, and apply various characterizations of linear independence.
- ✧ Create a small library of basic linear algebra subroutines.