

Linear Transformations

Mathematics

What makes a map linear, and the four subspaces every matrix carries.

A map that respects addition and scaling.

What makes a map linear

$$T(u + v) = T(u) + T(v)$$

$$T(\lambda v) = \lambda T(v)$$

$T(0) = 0$ then follows, always

Fix a basis and every linear map is a matrix

The four subspaces of A

Column space — the image of the map

Null space — vectors sent to zero

Row space — sits in the domain

Left null space — sits in the codomain

Column space and left null space are orthogonal complements in the codomain; row space and null space are complements in the domain.