Linear Independence

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A set of vectors is linearly dependent if there exists a set of number $x_1 - x_n$ such that the sum of the product of $x_1 u_1$ all the way to $x_n u_n$ is 0.

A set of vectors is called linearly independent if it is not linearly dependent, meaning all of the coefficients must be 0 for the sum to be 0 (there exists no set such that the sum of 0 holds)

If vector u != 0, then the set {u} is linearly independent. For if $\alpha u = 0$ then since vector u != 0 we must have $\alpha = 0$

Any set containing the zero vector is linearly dependent (sum can equate to 0 without having all coefficients 0)

A set containing only two vectors is linearly dependent if and only if one is a multiple of the other

If there exists an alpha and beta such that $\alpha u + \beta v = 0$ then the vector set must be linearly dependent

Theorem

A set $\{u_1, u_2, \ldots, u_m\}$ of nonzero vectors is linearly dependent if and only if some u_r is a linear combination of its predecessors $u_1, \ldots, u_{r-1}$.

The proof is here: https://warwick.ac.uk/fac/sci/dcs/teaching/material/cs131/part2/note6.pdf