Gram-Schmidt orthogonalization

Gram-Schmidt orthogonalization is a mathematical process used to convert a set of linearly independent vectors into an orthogonal (or orthonormal) set of vectors in an inner product space. The procedure involves taking a given set of vectors and iteratively constructing orthogonal vectors by subtracting from each vector its projections onto the previously obtained orthogonal vectors. The first vector remains unchanged, while subsequent vectors are adjusted to ensure orthogonality. If desired, the process can be modified to produce an orthonormal set by normalizing each orthogonal vector. This method is particularly useful in various applications, including numerical methods, computer graphics, and solving systems of equations, as it simplifies calculations and improves numerical stability.