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11.3.3 Orthogonal Bases

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11.3.3 Orthogonal Bases

Video 11.3.3 Part 1



Start of transcript. Skip to the end.

Dr. Robert van de Geijn: Now we arrive at the very important topic

of Gram-Schmidt orthogonalization.

This is also known as the Gram-Schmidt process.

It starts with a set of linearly independent vectors,

and it results in a set of mutually

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Video

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You MAY Want to download the PDF for the visualization.

Notice: to view you will want to download the file and view with acrobat reader.

Reading Assignment

0 points possible (ungraded) Read Unit 11.3.3 of the notes. [LINK]



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Video 11 2 2 Dart 2 outs off

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Video cuts off at 5:32. Complete video on youtube [here][1] [1]: https://www.youtube.com/watch?v=H7DGGzdqSBg

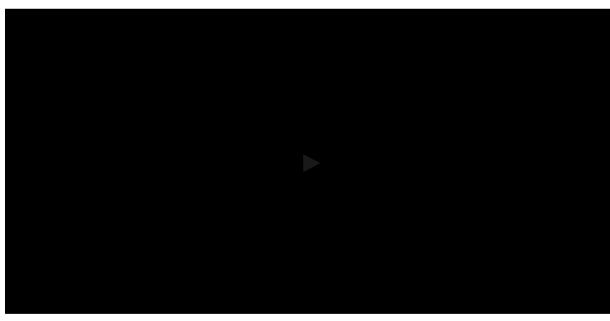
The final slide in this video has a few errors in it, involving the "perpendicular symbol" that is missing in one place, and shouldn't be there in another. Here is the corrected slide:

Gram-Schmidt process

- \triangleright Compute q_0 :
 - Normalize a₀:
 - $\rho_{0,0} = ||a_0||_2.$
 - $page q_0 = a_0/\rho_{0,0}$.
- ightharpoonup Compute q_1 :
 - Let a₁ equal the component of a₁ orthogonal to q₀:
 - $\rho_{0,1} = q_0^T a_1.$
 - $a_1^{\perp} = a_1 \rho_{0,1}q_0.$
 - Normalize a[⊥]₁:
 - $\rho_{1,1} = \|a_1^{\perp}\|_2.$
 - $q_1 = a_1^{\perp}/\rho_{1,1}$.
- \triangleright Compute q_2 :
 - Let a_2^{\perp} equal the component of a_2 orthogonal to q_0 and q_1 :
 - $\rho_{0,2} = q_0^T a_2.$
 - $\rho_{1,2} = q_1^T a_2.$
 - $a_2^{\perp} = a_2 \rho_{0,2}q_0 \rho_{1,2}q_1.$
 - Normalize a[⊥]₂:
 - $\rho_{2,2} = \|\mathbf{a}_2^{\perp}\|_2.$
 - $q_2 = a_2^{\perp}/\rho_{2,2}$.
- \triangleright Compute q_3 :



Video 11.3.3 Part 2



66

And then this was the formula for the projection

the vectors q 0 and q 1.

except up

onto the space spanned by these two orthonormal columns.

that they are mutually orthonormal.

If we now rotate this picture some more and rotate it into this position right

here, then what we see here is that a 2

We can compute the projection of a 2

and q 1 by creating a matrix, Q super 2

onto the space spanned by q 0

here, that has as its columns

is definitely not in the plane

spanned by q 0 and q 1.

If we take that dashed vector that we

Video

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