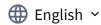
## Non-square matrix multiplication

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Practice Assignment • 20 min



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1. In the previous lecture we saw the Einstein summation convention, in which we sum over any indices which are repeated. In traditional notation we might write, for example,  $\sum_{j=1}^3 A_{ij} v_j = A_{i1} v_1 + A_{i2} v_2 + A_{i3} v_3$ . With the Einstein summation convention we can avoid the big sigma and write this as  $A_{ij} v_j$ . We know that we sum over j because it appears twice.

1/1 point

We saw that thinking about this type of notation helps us to multiply non-square matrices together. For example, consider the matrices

$$A=egin{bmatrix}1&2&3\4&0&1\end{bmatrix}$$
 and  $B=egin{bmatrix}1&1&0\0&1&1\1&0&1\end{bmatrix}$  ,

and remember that in the  $A_{ij}$  notation the first index i represents the row number and the second index j represents the column number. For example,  $A_{12}=2$ .

Let's define the matrix C=AB. Then in Einstein summation convention notation  $C_{mn}=A_{mj}B_{jn}$ .

Using the Einstein summation convention, calculate  $C_{21}=A_{2j}B_{j1}$ .

$$\bigcirc \ C_{21} = 3$$

$$\bigcirc \ \ C_{21}=4$$

$$\bigcirc$$
  $C_{21} = 5$ 

$$C_{21} = 6$$