MA106

Shubh Kumar

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1 Lecture 1: Introduction

- Matrices are a new universe of Numbers
- Visualizing the matrices as a column vector of row vectors or a row vector of column vectors, is an important thing
- Outer Product is called so, as its sort of doing the inner product/scalar product(or dot product!), the other way round!
- Going over the various ways to write the Product of Two Matrices
- Exercise: Proving Trivial Results like $\left(\mathbf{AB}\right)^T = \mathbf{B^T}\ \mathbf{A^T}$
- The j^{th} row of $\mathbf{AB}$ is a linear combination of the j^{th} row of $\mathbf{A}$ with coefficient of some common, and analogically in case of k^{th} column of $\mathbf{AB}$ would be
- Really Nice Question: Justifying the different cases of solutions to system of linear equations using concepts from matrices

2 Lecture 2: Linear Systems

- General Linear system will include homogeneous as well as non-homogeneous.
- **Deducing Connections:** How to relate $\mathbf{Ax} = \mathbf{b}$ to $\mathbf{Ax} = \mathbf{0}$. If $\mathbf{Ax} = \mathbf{0}$ has non-trivial solutions, than that would mean infinitely many solutions if we know just one solution exists.
- Extending the past concepts to more general cases: Using the above thing to solve any general system of m equations in n variables.

3 Lecture 3: Gaussian Elimation

Nothing as such apart from Lecture Notes introduced, Just a very nice and thoughtful question: Let $\mathbf{A} \in \mathbb{R}^{9x4}$ and $\mathbf{B} \in \mathbb{R}^{7x3}$. Is there $\mathbf{X} \in \mathbb{R}^{4x7}$ such that $\mathbf{X} \neq \mathbf{O}$ but $\mathbf{AXB} = \mathbf{O}$