Week 2 Reading Reflection

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October 2023

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The reading material this week covers the first two sections of Tensor Methods in Computer Vision and Deep Learning. The first section mainly discusses the wide applications of tensors. Specifically, it focuses on tensor methods in representation learning and deep learning. Tensor methods have inherent advantages over traditional machine learning models because they can capture the natural topological structures and dependencies among different modes. In deep learning, tensor methods can noticeably reduce the number of unknown parameters and further speed up operations. After going through this portion, the following questions arose in my mind.

1. What is representation learning?

2. What is deep learning?

3. What is curse of dimensionality ? (I remember I learned this concept in machine learning class before, but have forgotten about it).

In the second section, the paper introduces basic definitions and operations related to tensors. This part is straightforward, but I am confused by some mathematical notations.

1. I am not clear about the concepts of tensor unfolding and contraction. Additionally, tensor unfolding seems to be tensor vectorization. What is the difference between these two ideas.

2. I don't understand the mathematical notation of $\{X^{(m)} \in \mathbb{R}^{I_m \times N}\}_{m=1}^{M}$. What does $I_m \times N$ means?

3. What is the inner product of the tensor? Is it a result generated by multiplying elements with the same indices in tensors and adding them up?

4. I don't understand the n-mode product and the Schatten-p norm?