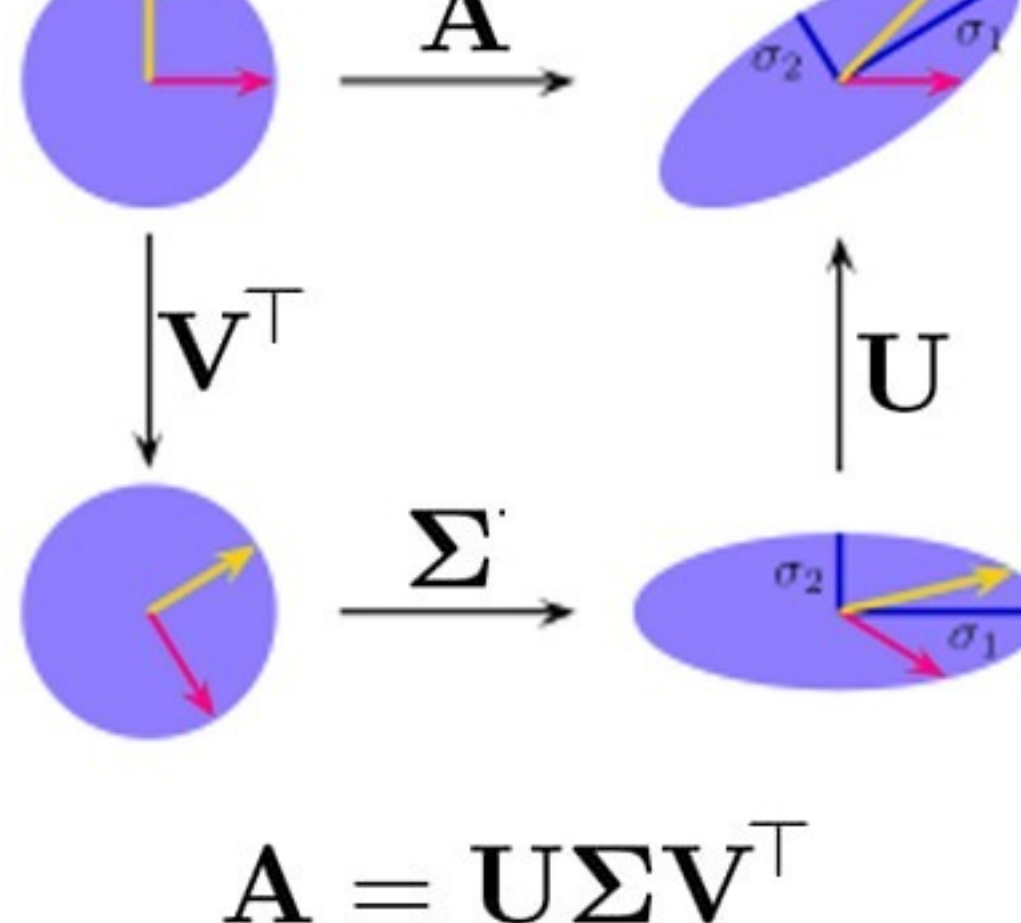
 Rupika Nimbalkar
Jul 9, 2021 · 3 min read

Singular Value Decomposition and its Application in AI

The use of Singular Value Decomposition in AI is very beneficial.



The Singular-Value Decomposition, also known as SVD is a very well-known matrix decomposition method used in reducing a matrix in fragments to have simpler calculations for certain following matrix.

Its application in many fields is quite commendable special in the areas related to science and technology.

Singular Value Decomposition

One of the widely applicable tools in linear algebra is Singular Value Decomposition. Its strength stems relatively from the fact that every matrix A belongs to \mathbb{R} has an SVD. Its decomposition is,

$$A = U \Sigma V^T$$

Here, A is a $m \times n$ matrix

U is an $m \times m$ orthogonal matrix

V is a $n \times n$ orthogonal matrix

We can also represent singular value decomposition as,

$$A = \sum_{i=1}^r \sigma_i \mathbf{u}_i \mathbf{v}_i^T$$

As we know the SVD factors provide eigendecomposition for,

$$A^T A = (U \Sigma V^T)^T U \Sigma V^T = V \Sigma^T U^T U \Sigma V^T = V \Sigma^T \Sigma V^T$$

$$A A^T = U \Sigma V^T (U \Sigma V^T)^T = U \Sigma V^T V \Sigma^T U^T = U \Sigma \Sigma^T U^T$$

Application of Singular Value Decomposition,

- In signal processing, singular value decomposition and pseudoinverse have been efficiently applicable in analyzing modifying, and synthesizing signals and sounds.
- Its application in image processing where the digital computer is used to process images with algorithms.
- It is quite helpful in face recognition, widely known as model analysis, where non-scaled mode shapes can be determined with non-scaled mode shapes.
- It uses in Numerical weather prediction is helpful where mathematical modes of the atmosphere are used weather prediction based on present weather condition.
- Its contribution in the field of quantum information where it is referred to as Schmidt decomposition cannot be ignored.



Before Processing



AfterProcessing

As SVD helps in the perfect representation of any matrix and it's quite easy to eliminate data that is not that important in a matrix for the production of low-dimensional approximation. That's why its role becomes important in the application of image compression and recommendation system. With this kind of amazing and helpful application, its role in artificial intelligence and its algorithms is cannot be ignored. Hence it becomes important for [AI startups](#) to understand this concept so that they can enjoy its benefit and deliver better AI products.


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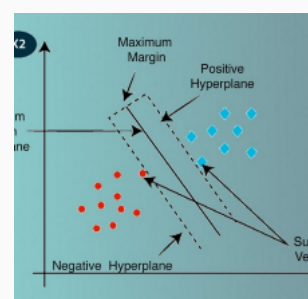
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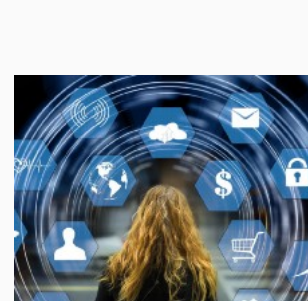
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
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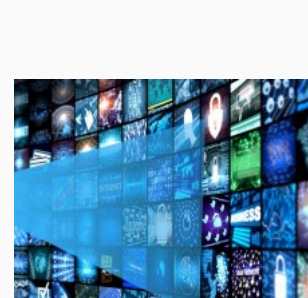
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
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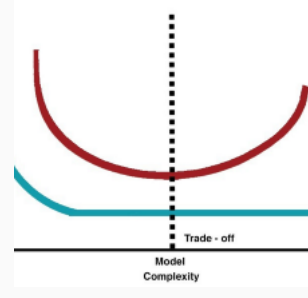
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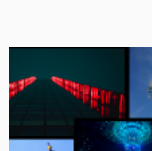
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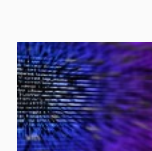



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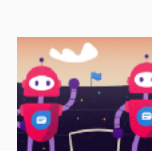
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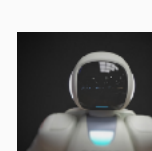
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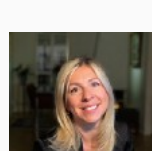
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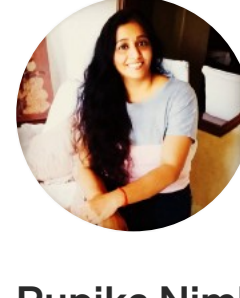
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