Dimensionality Reduction

A Brief Introduction

What is Dimensionality Reduction?

Transformation of data from a high-dimensional space into a low-dimensional space so that the low-dimensional representation retains some meaningful properties of the original data, ideally close to its intrinsic dimension.

Taken from wikipedia

$$\mathbb{X}^{n \times d} \longrightarrow \mathbb{X}^{n \times k}$$

$$d < k$$

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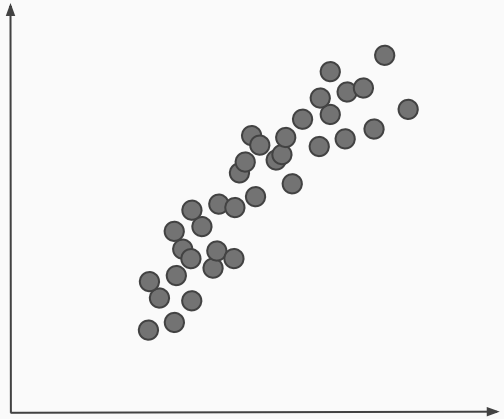

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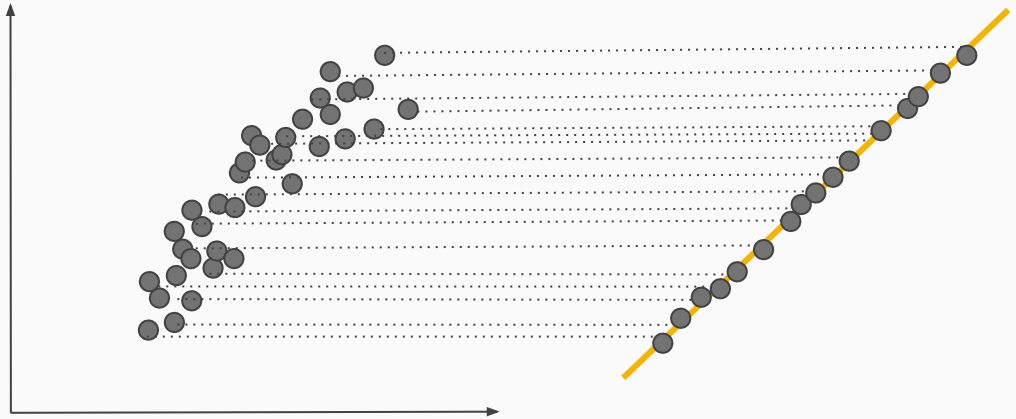

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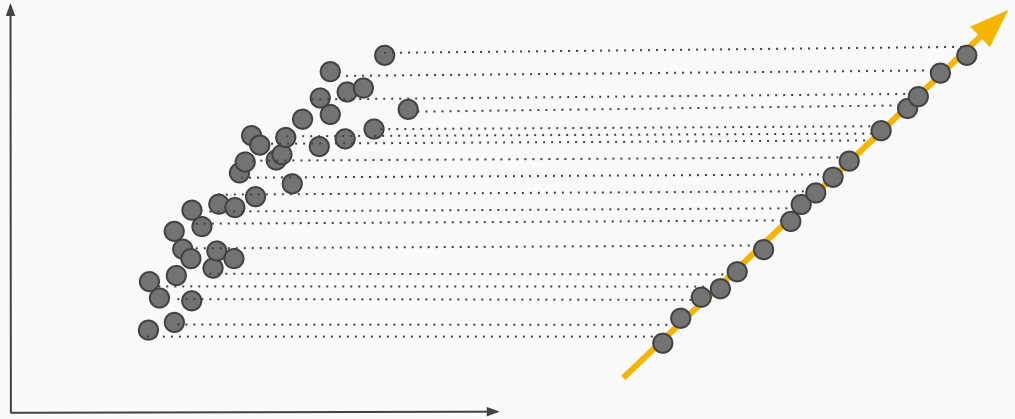

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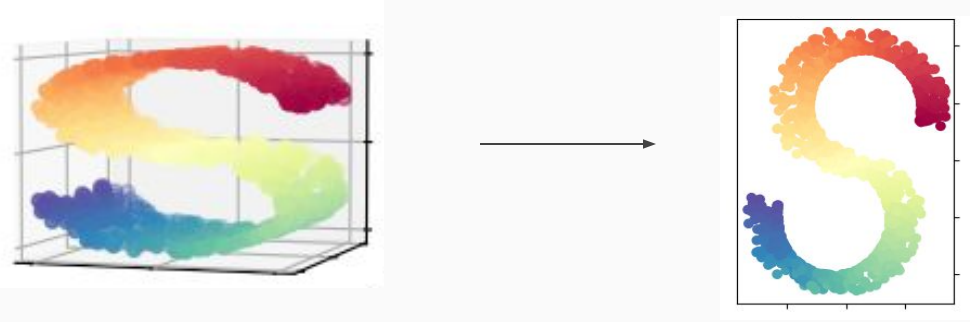

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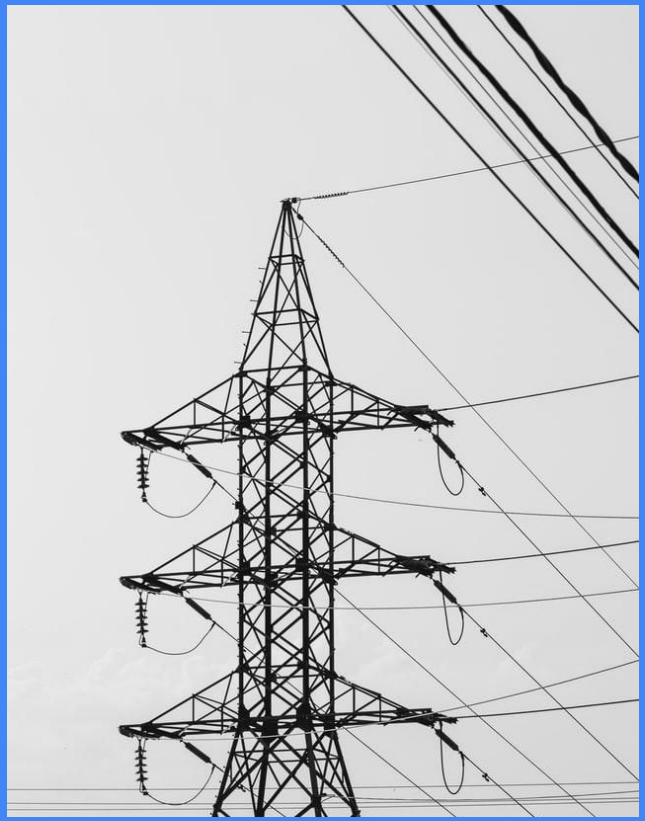
Applications

Transmission

It is cheaper to send 1MB of data than to send 128MB

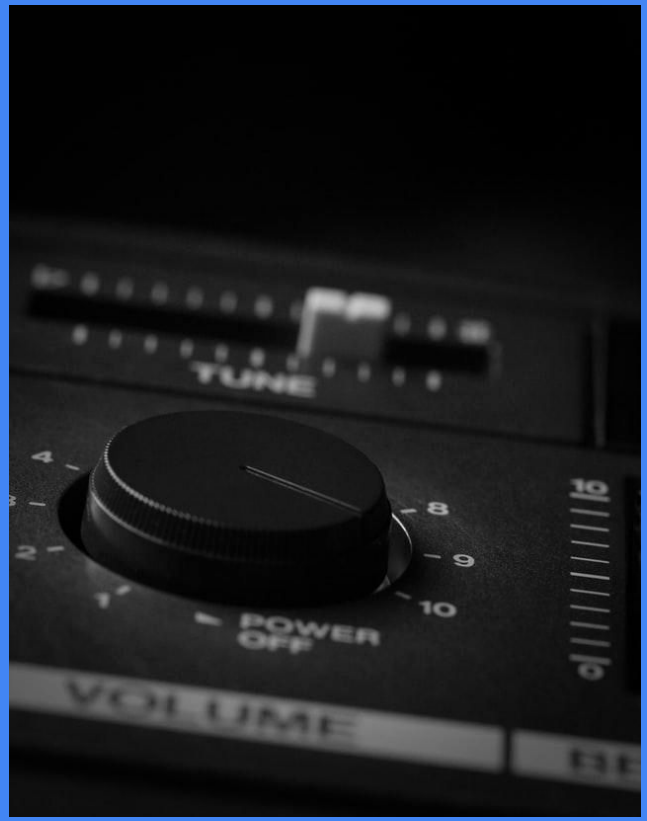


Visualization

It is hard to visualize more than 2 or 3 dimensions

Reduce noise

Sometimes extra dimensions
just add noise to another task



Feature extraction

Computed dimensions could improve performance in a supervised learning task

“The goal is never to apply dimensionality reduction, it is a tool that may help you achieve a more meaningful goal”

- God

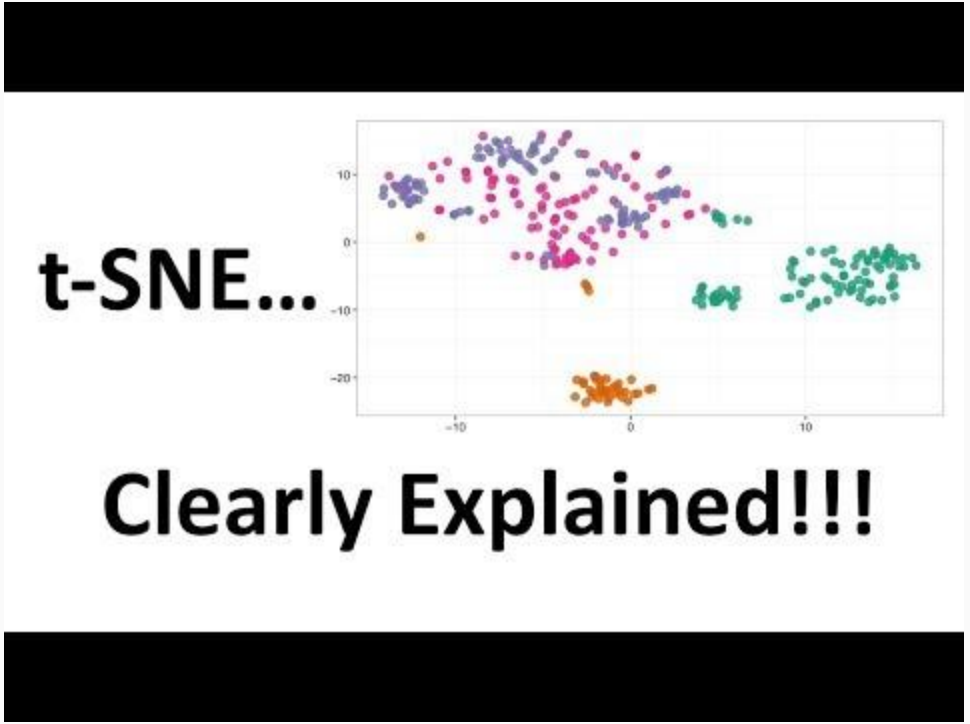
Algorithms

Algorithms

To visualize

To extract features

...



https://www.youtube.com/watch?v=NEaUSP4YerM&feature=emb_logo

Algorithms

To visualize

To extract features

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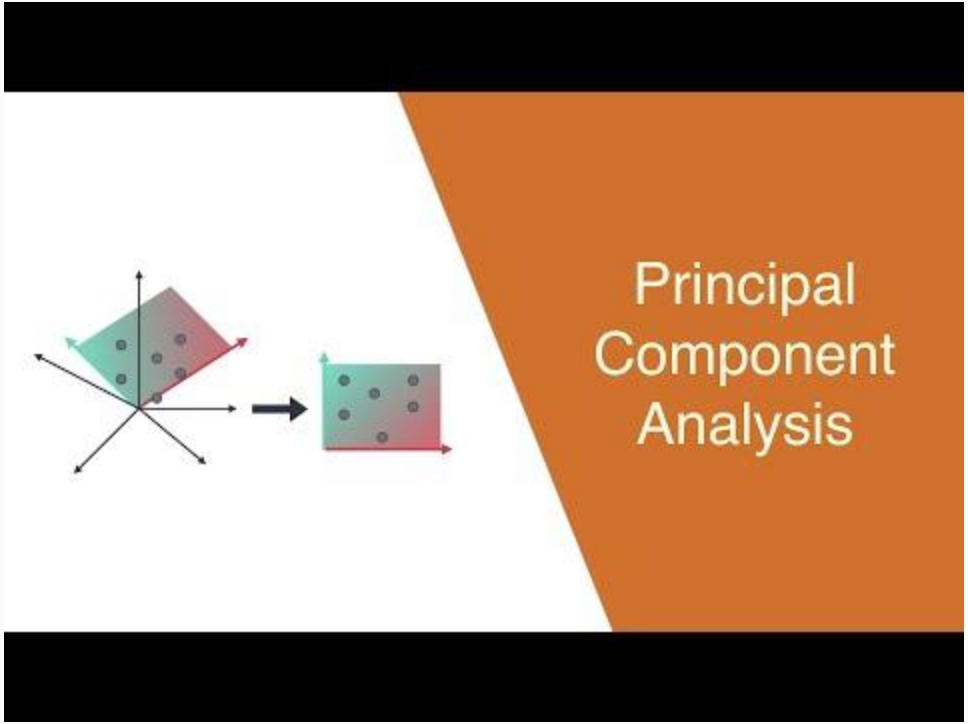

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Algorithms

To visualize

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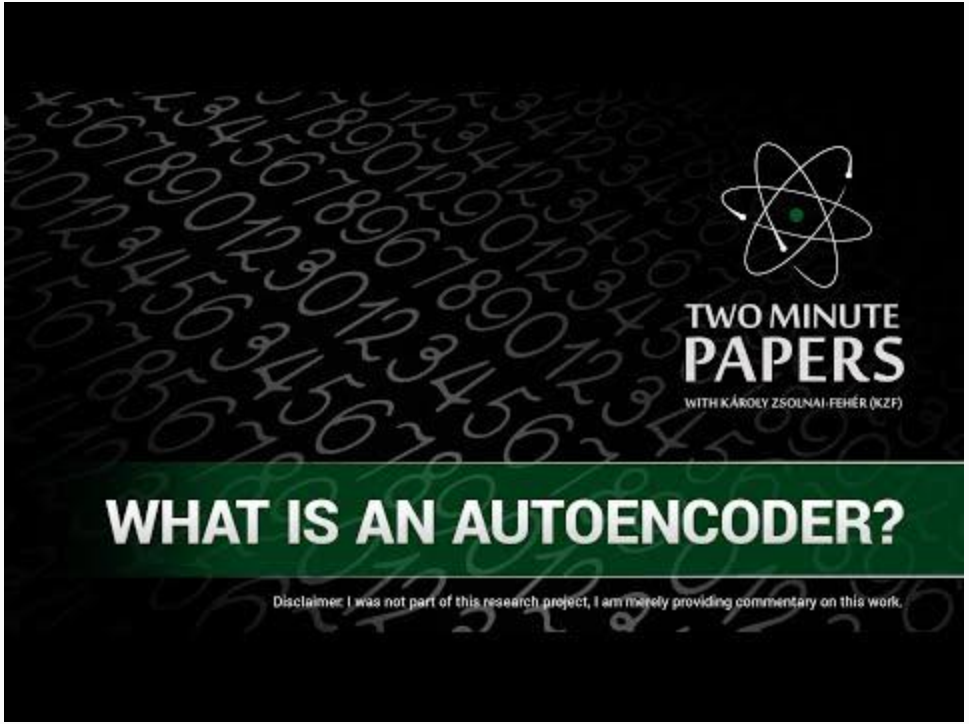

https://www.youtube.com/watch?v=Rdpbnd0pCiI&feature=emb_logo

Algorithms

To visualize

To extract features

...

Human creativity can go amazingly far, keep learning!

Think about why you use it, then check if the algorithm makes sense for your application.