

# SNS COLLEGE OF TECHNOLOGY

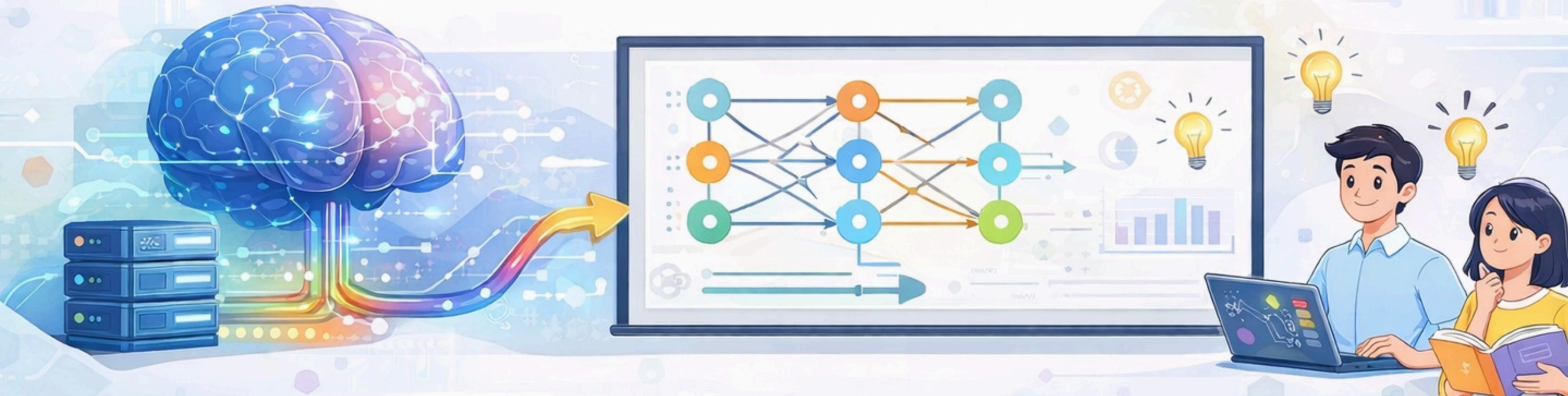
An Autonomous Institution

Coimbatore-35

## Autoencoders and Variational Autoencoders (VAEs)

A Design Thinking Approach

23ECE604-GENAI AND AGENTIC AI SYSTEMS FOR ELECTRONICS ENGINEER



# Empathize – Understanding the Problem



Interviews



Surveys



Empathy Maps

## Define – Clearly Articulating the Problem

### Problem Summary

*Students struggle to improve in math because they lack personalized feedback and find practice problems unengaging.*

- Who?** – Struggling Math Students
- What?** – Lack of personalized feedback
- Why?** – Unengaging Practice

*How might we help them? !*



# 💡 IDEATE — Stage 3

## Ideate – Solutions with Autoencoders & VAEs



### Ideate – Solutions with Autoencoders & VAEs



Use Autoencoders



Encoder compresses data



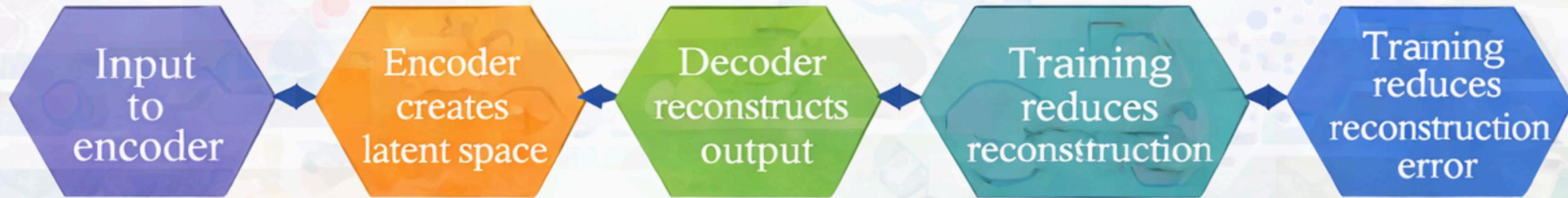
Decoder reconstructs data



VAE adds probability



# Prototype – Training with Autoencoders & VAEs



## Prototype – Training with Autoencoders & VAEs



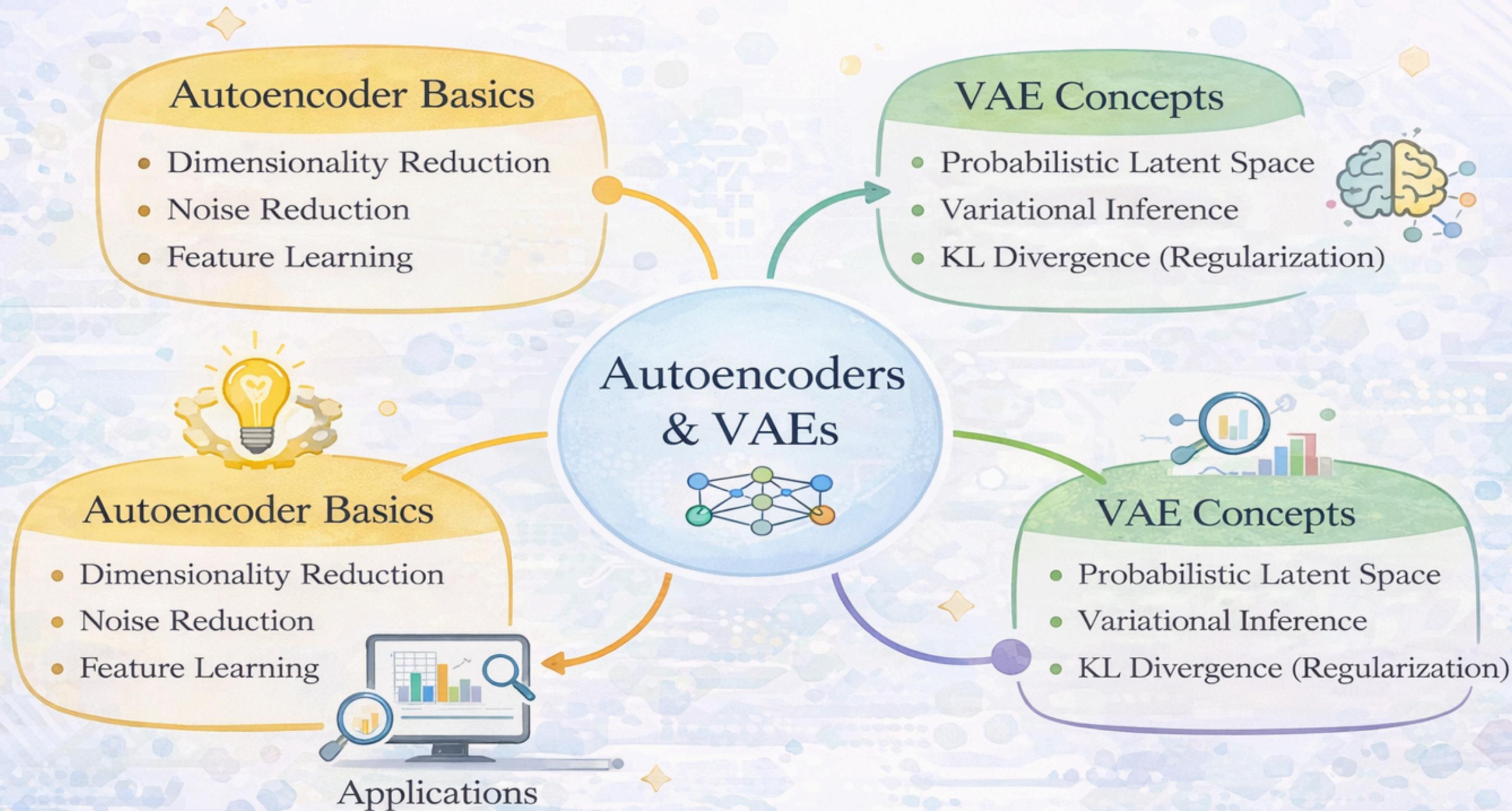
-  Use latent encoders
-  Encoder reconstructs data
-  Decoder reconstructs data
-  VAE adds probability



## Test – Evaluation with Autoencoders & VAEs



# MIND MAP



# CURIOSITY / DISCUSSION

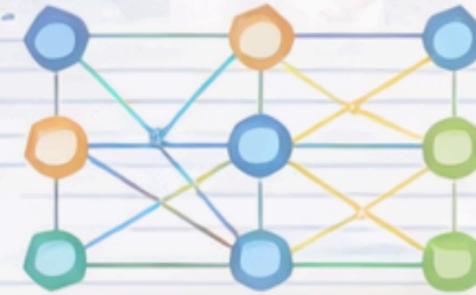


Why VAEs generate smoother outputs?

How latent space helps learning?



Where are VAEs used?



# APPLICATIONS



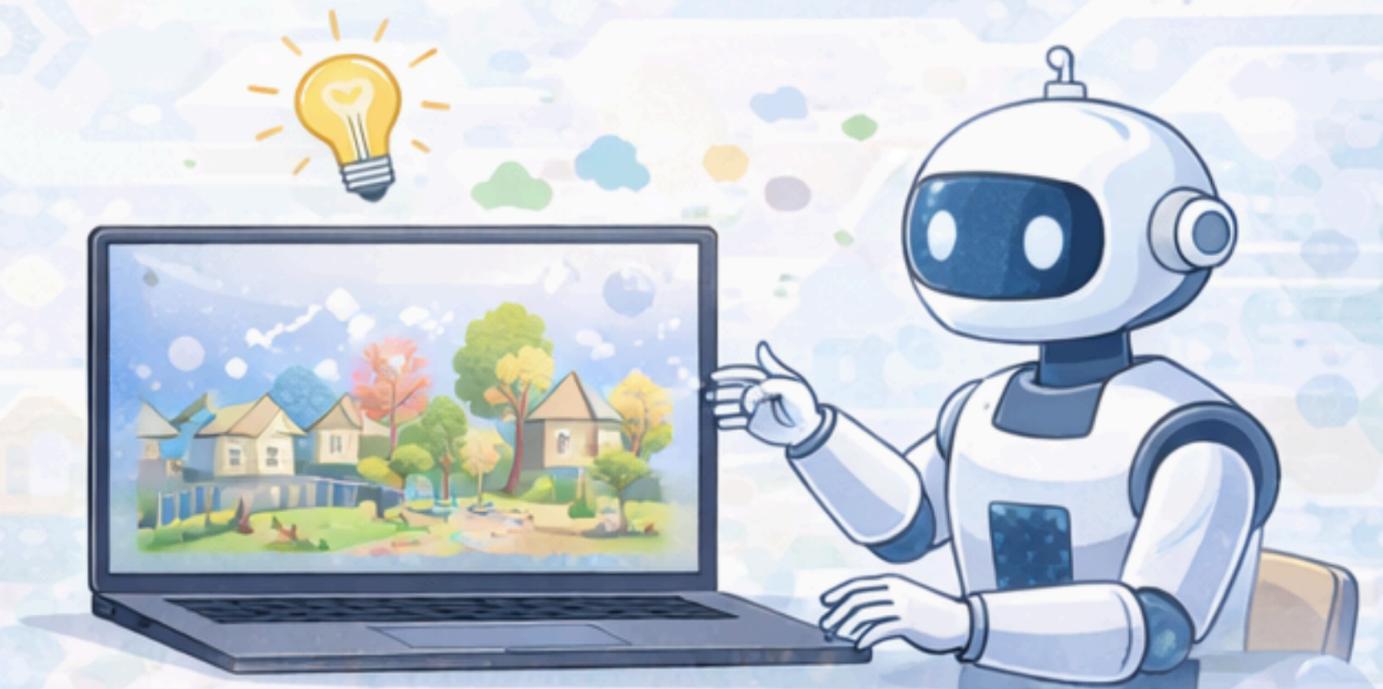
Image Enhancement



Anomaly Detection



Data Compression



Generation

# ADVANTAGES & LIMITATIONS

## Advantages

- ✓ Efficient Data Representation
- ✓ Noise Reduction
- ✓ Feature Extraction
- ✓ Data Generation

## Limitations

- ✗ Training Challenges
- ✗ Overfitting Risk
- ✗ Limited Interpretability
- ✗ Computational Cost



# CONCLUSION

- ✓ Autoencoders efficiently learn data representations
- ✓ VAEs add a probabilistic layer, enabling new applications
- ✓ Many real-world uses from denoising to creative generation
- ✓ Ongoing research seeks to improve, like multimodal & ethical AI

*Keep exploring and applying these techniques to discover new possibilities!*



# REFERENCES

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