TRAIL
TRUSTED AI LABS

Summer Workshop 25' London

Malleable Latent Space for Reliable Time Series Generation and OOD Detection

Project n° 4

Wallonie - Bruxelles International.be
Wallonie service public SPW
S3
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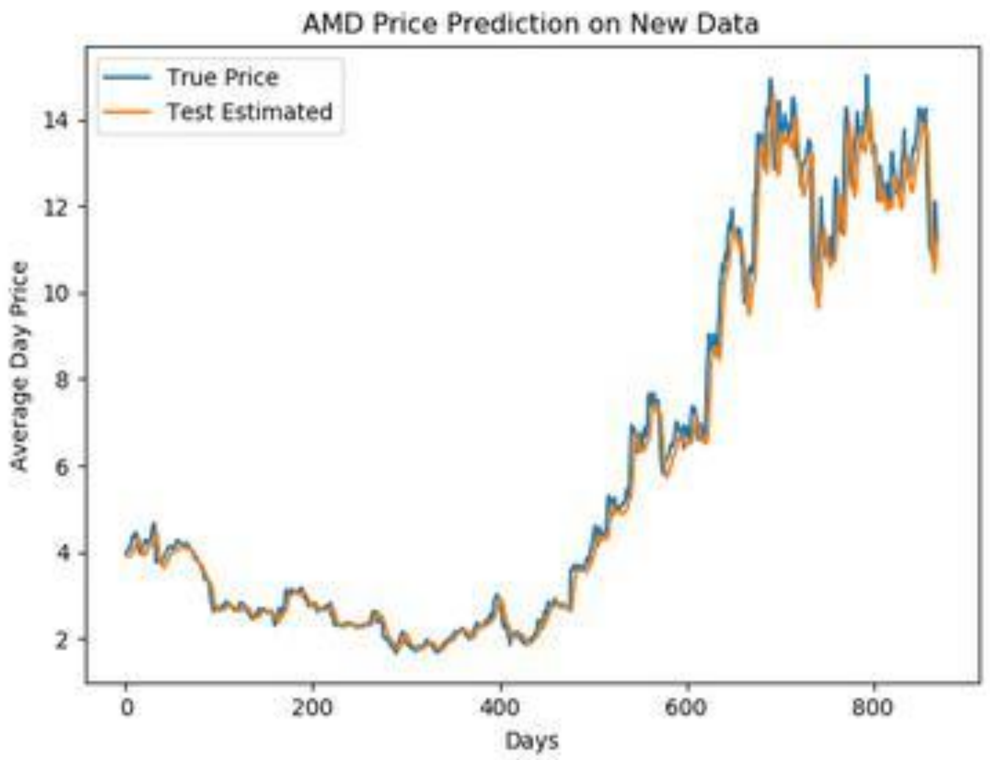
Time series Generation

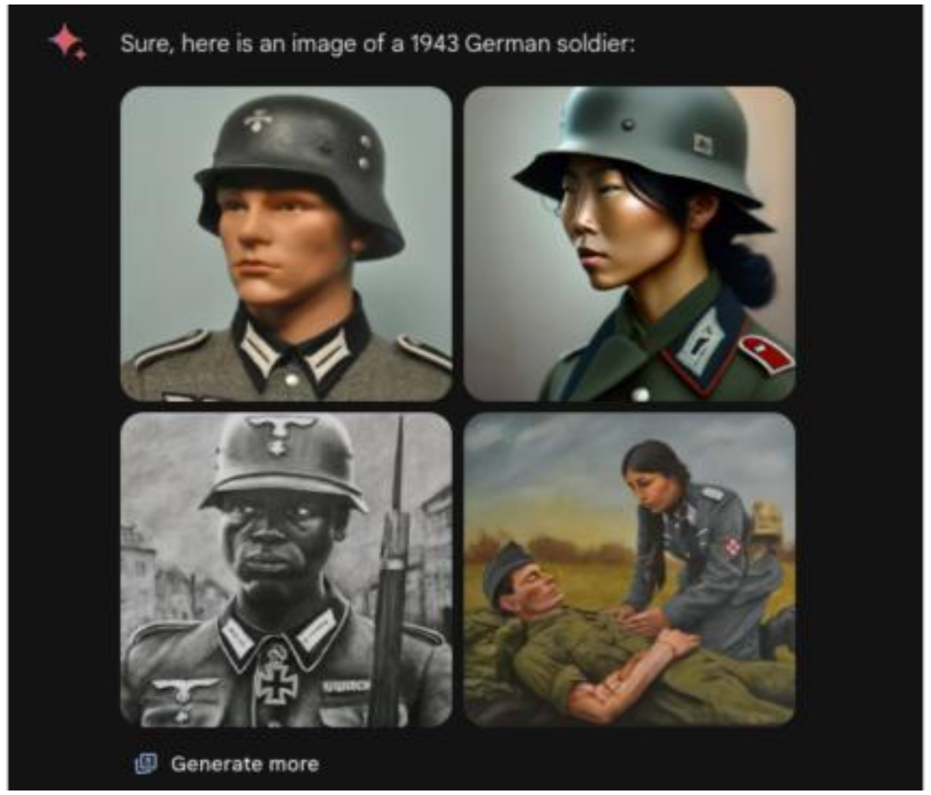
Ubiquitous

Time series Generation

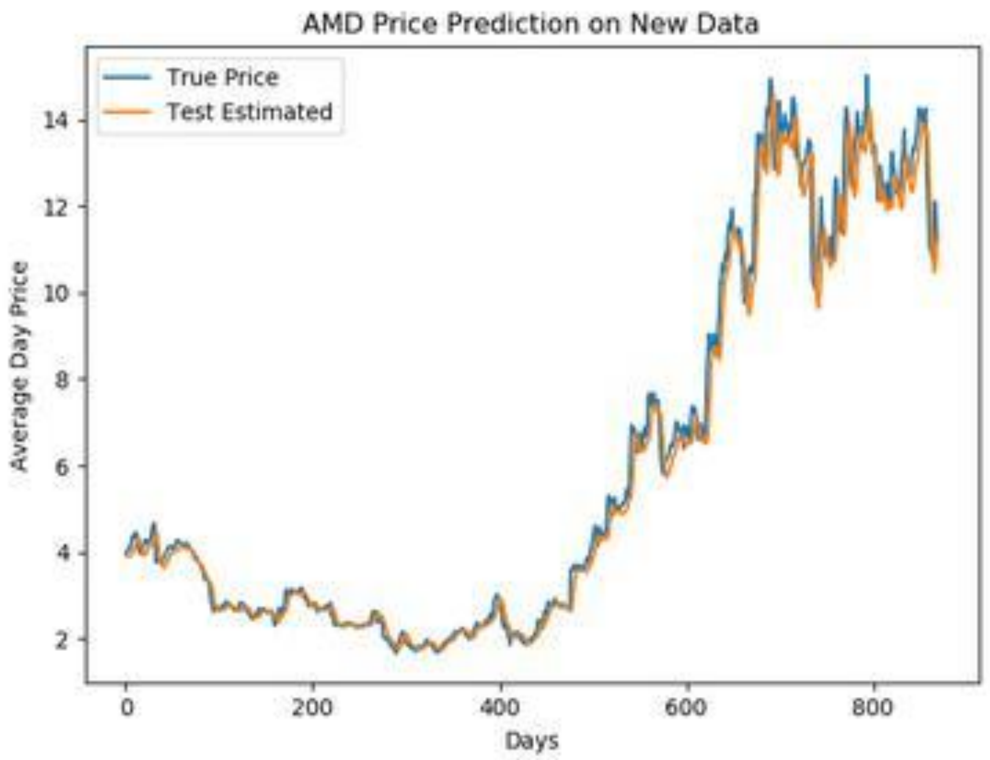
Ubiquitous



Non-intuitive



Time series Generation



Ubiquitous

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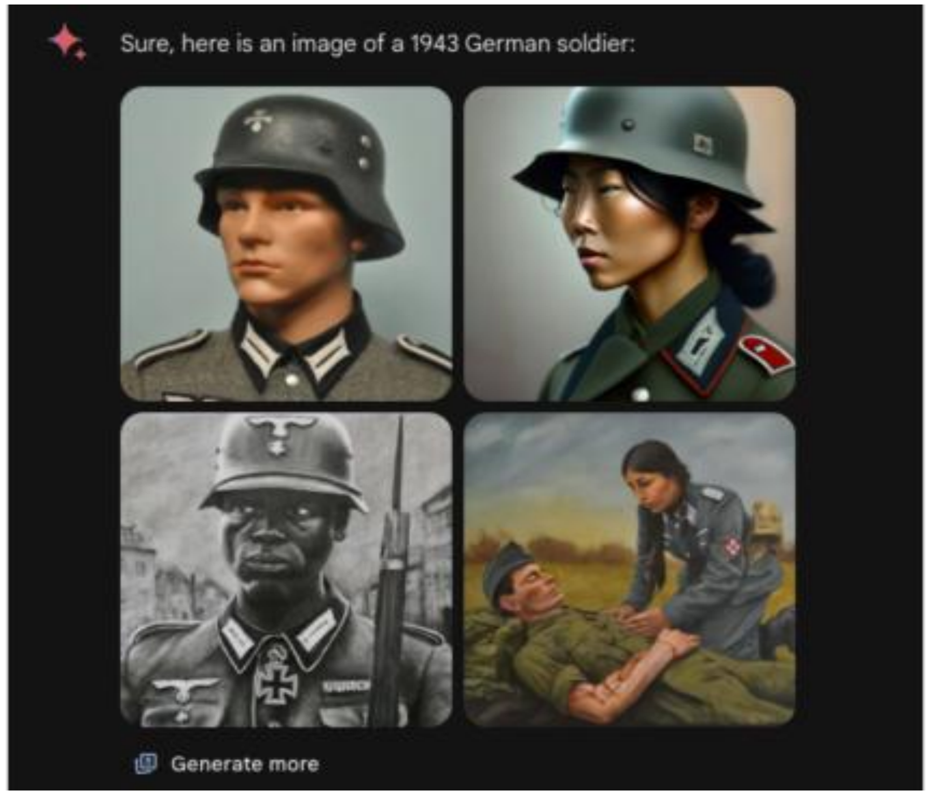
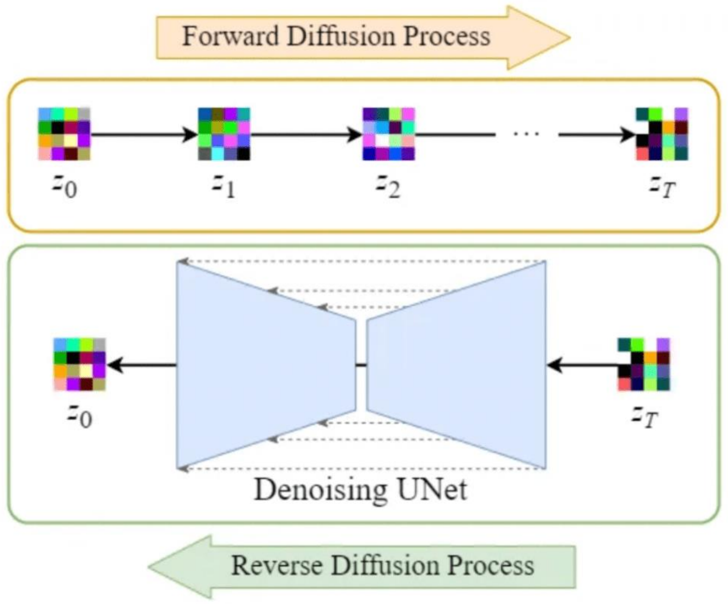


Current QM for Gen AI in TS:

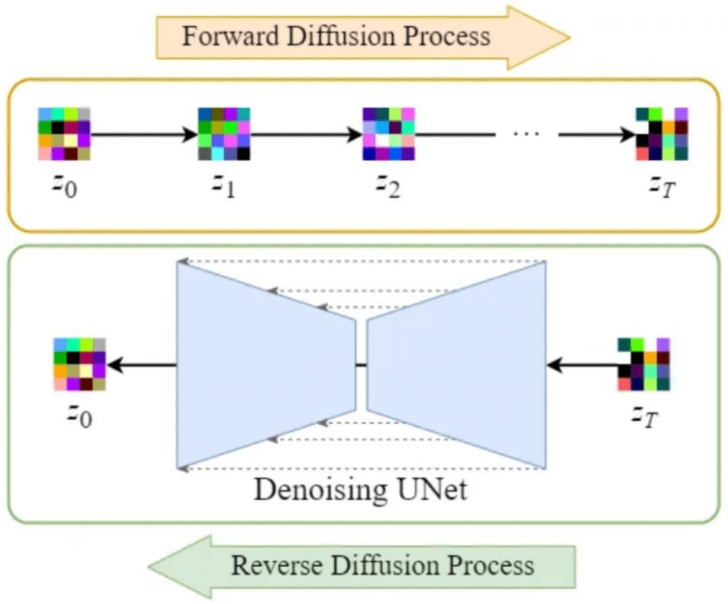
- Are not deep learning aware
- Are not temporality aware

Diffusion Models



- Modality agnostic
- Highly modifiable and tunable training process
- High quality samples
- Robust against common generative models' drawbacks

Diffusion Models



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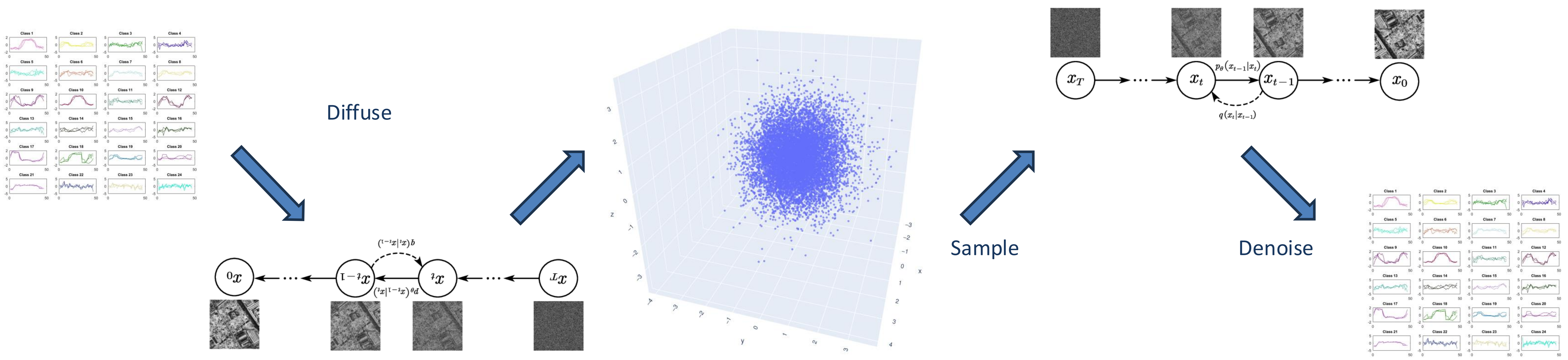

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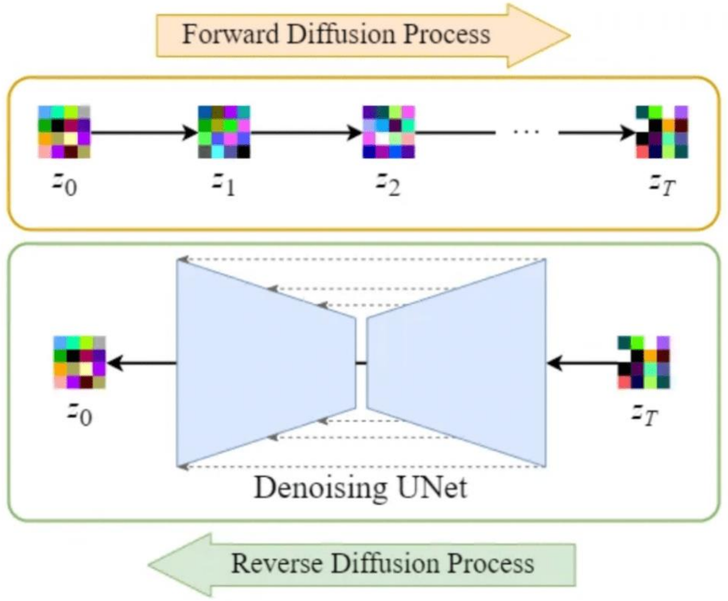

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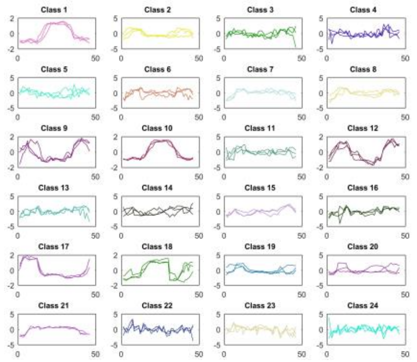
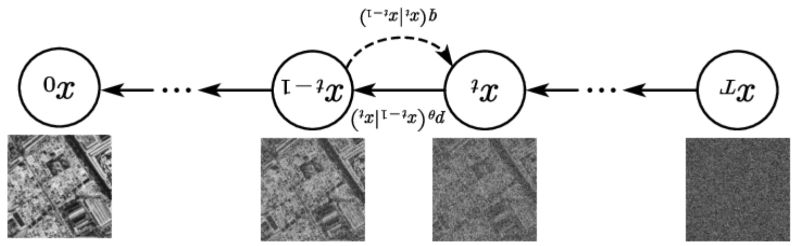
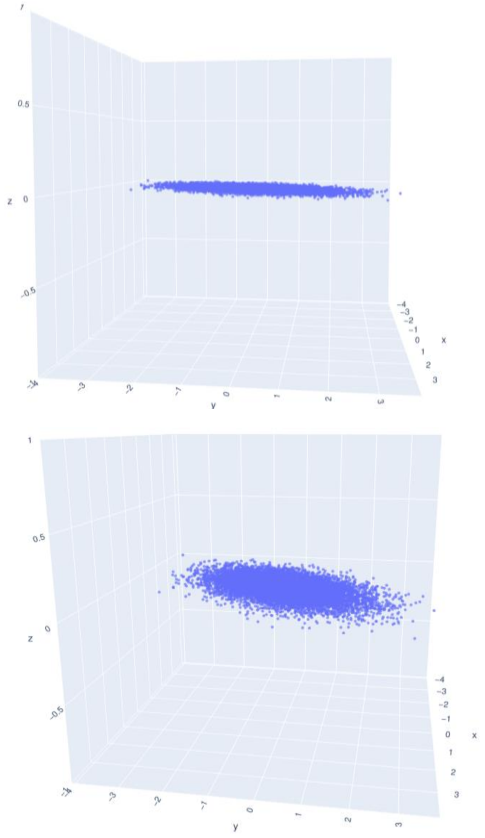
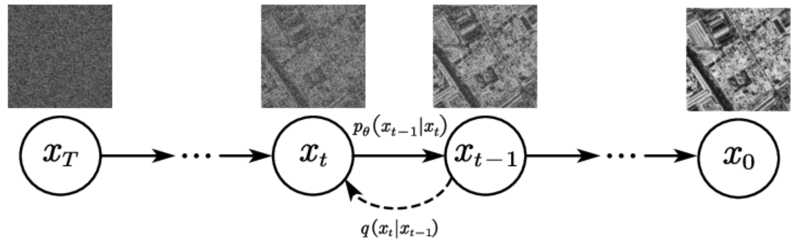


Diffuse "smartly"

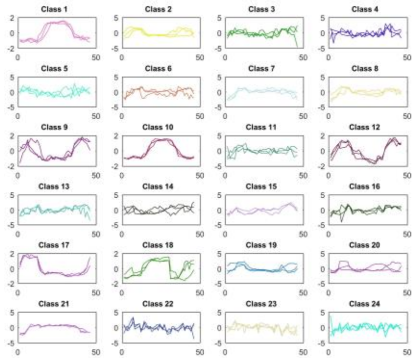




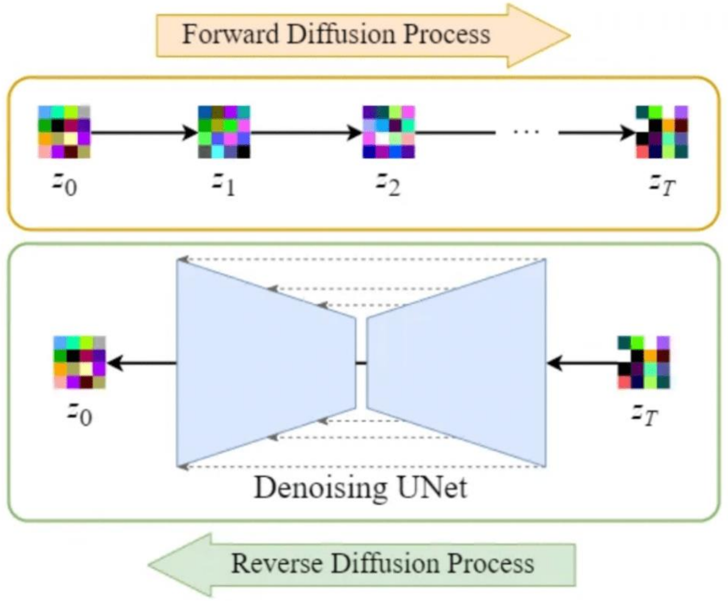


"Smart" Sampling

Denoise



Diffusion Models



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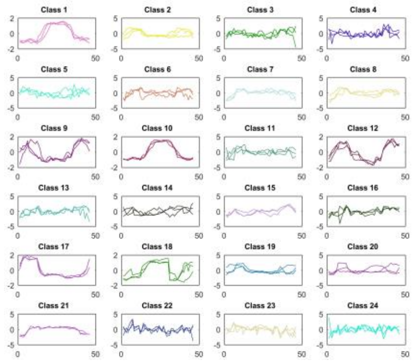

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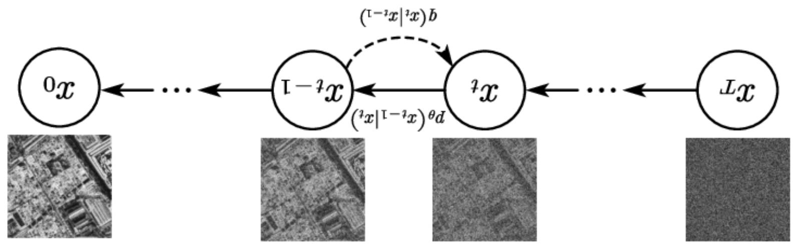

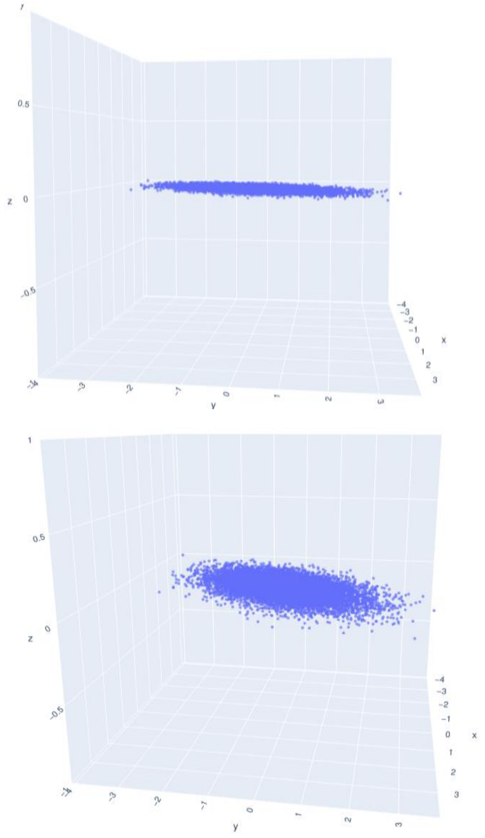

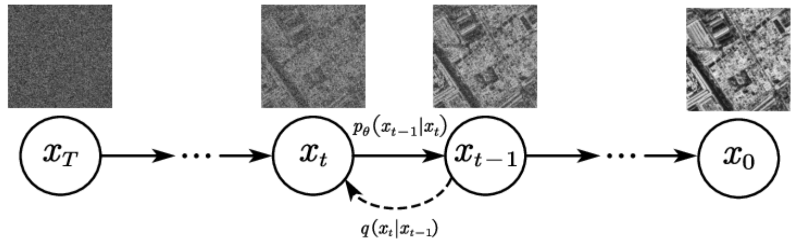

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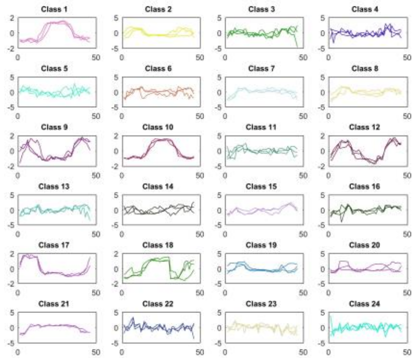
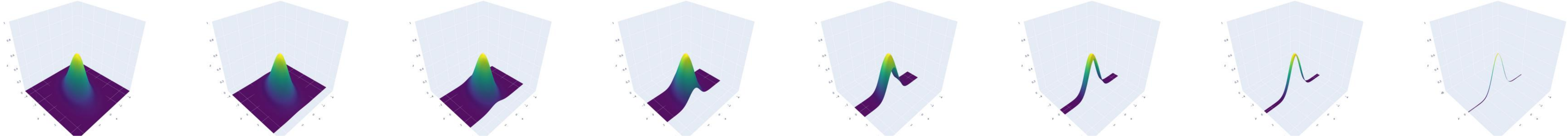
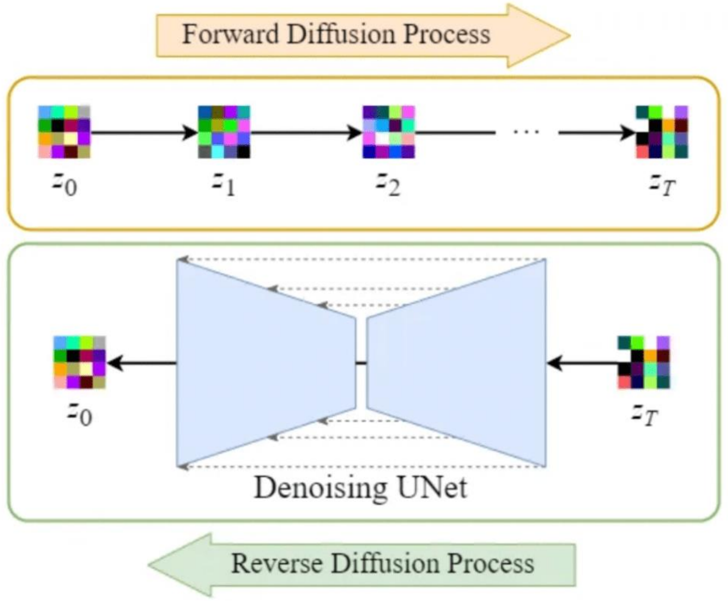




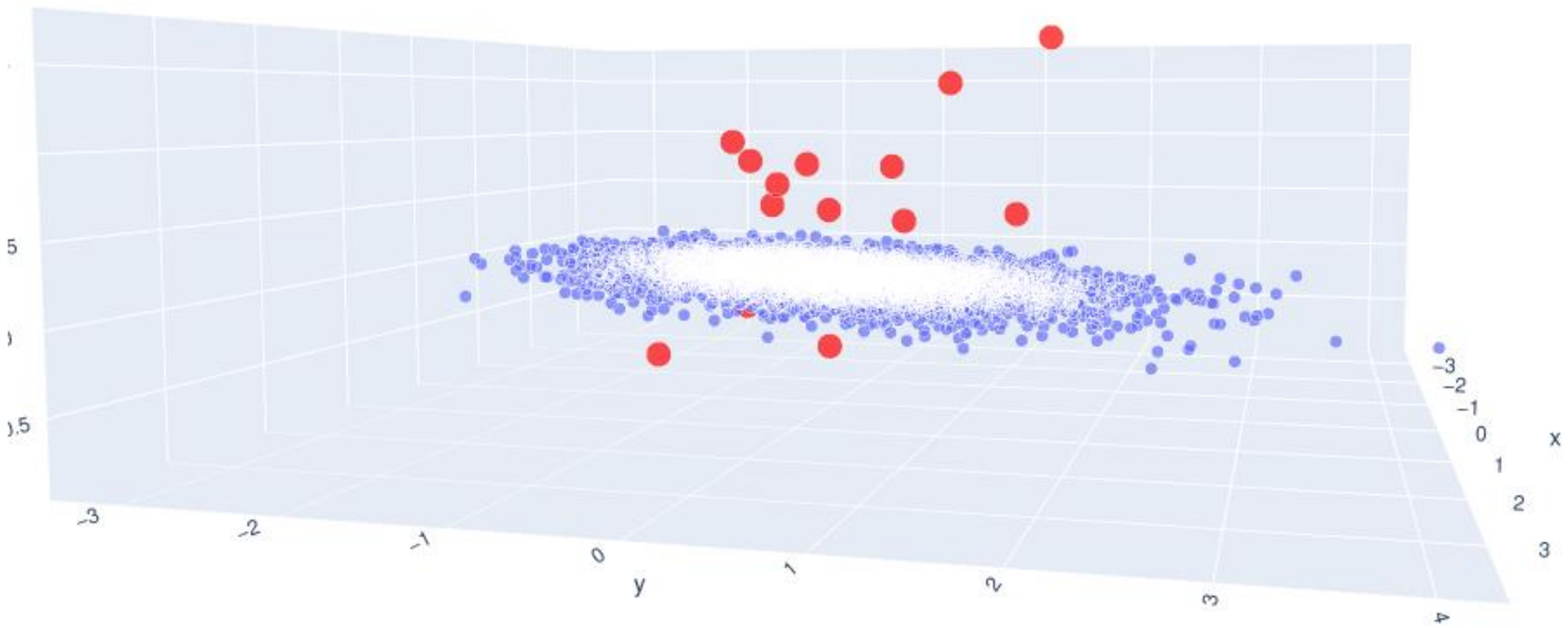
QM Gen AI and OOD

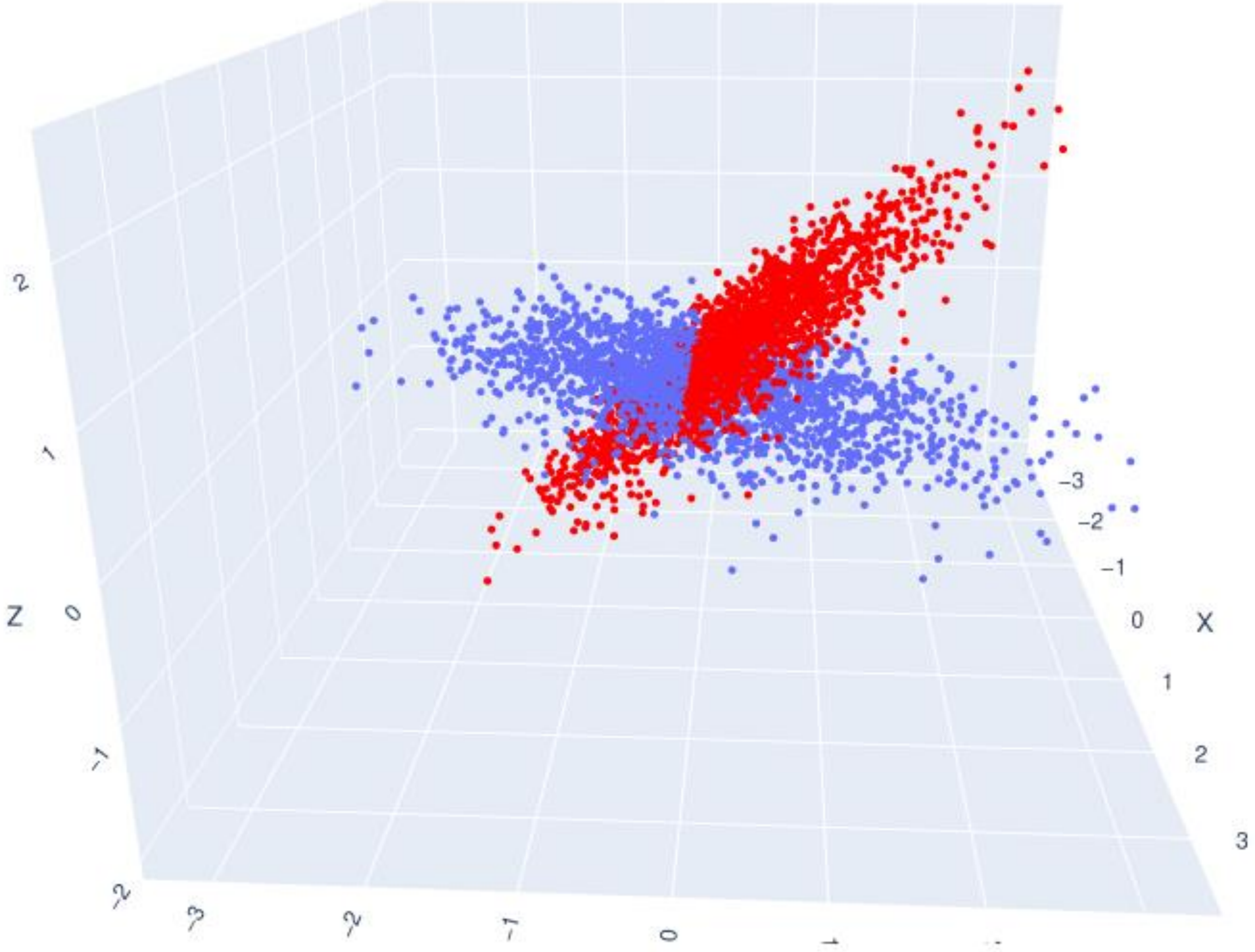


- Modality agnostic
- Highly modifiable and tunable training process
- High quality samples
- Robust against common generative models' drawbacks
- High reliability and guarantees during generation

Noise attenuated in selected dimensions → Low-dimensional subspace

Mahalanobis distance, KDE, Laplacian eigenmaps, AUROC, F1, FID, IS, KID, MSE, MAE, CRPS

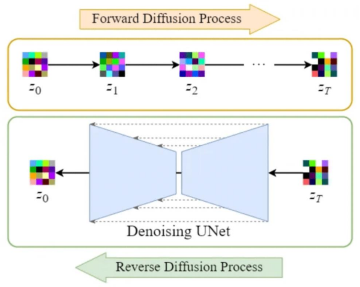




Work Plan

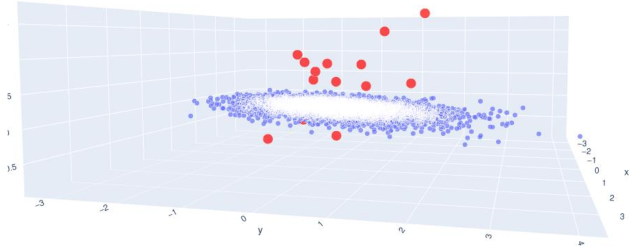
WP1 – Mapping Time:

- **Prepare the data** (“NASA Anomaly Detection Dataset SMAP & MSL”)
- **Prepare the noise sampling recipe**
- **Train the model**



WP2 - Experimentation Time:

- **Test and select metrics** (both outliers aware metrics and distribution metrics)
- **Prove that the methodology works**



WP3 – Paper time:

- **Publish and gain eternal glory** (only if it works)

Expertise Sought

Research Axis 1:

- Data cruncher
- Python
- Docker + git

Research Axis 2:

- Time series and temporal data
- Diffusion Models
- Math background

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Thank you for your attention !

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Full Proposal

Contact: tellez@multitel.be

PS: part of GD5

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Wallonie service public SPW