

RV-VAE: Integrating Random Variable Algebra into Variational Autoencoders



UNIVERSITY OF CRETE

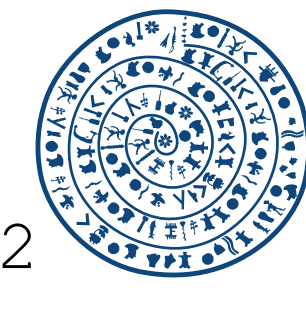
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SUMMARY

We incorporate continuous **distributions** into **VAE** architectures. We achieve this by **removing** the **stochastic** procedure of latent sampling (**reparameterization trick**) and adding **new modules** based on **RVs** to treat decoder node **activations as distributions**. This **improves** latent space utilization and therefore enhances:

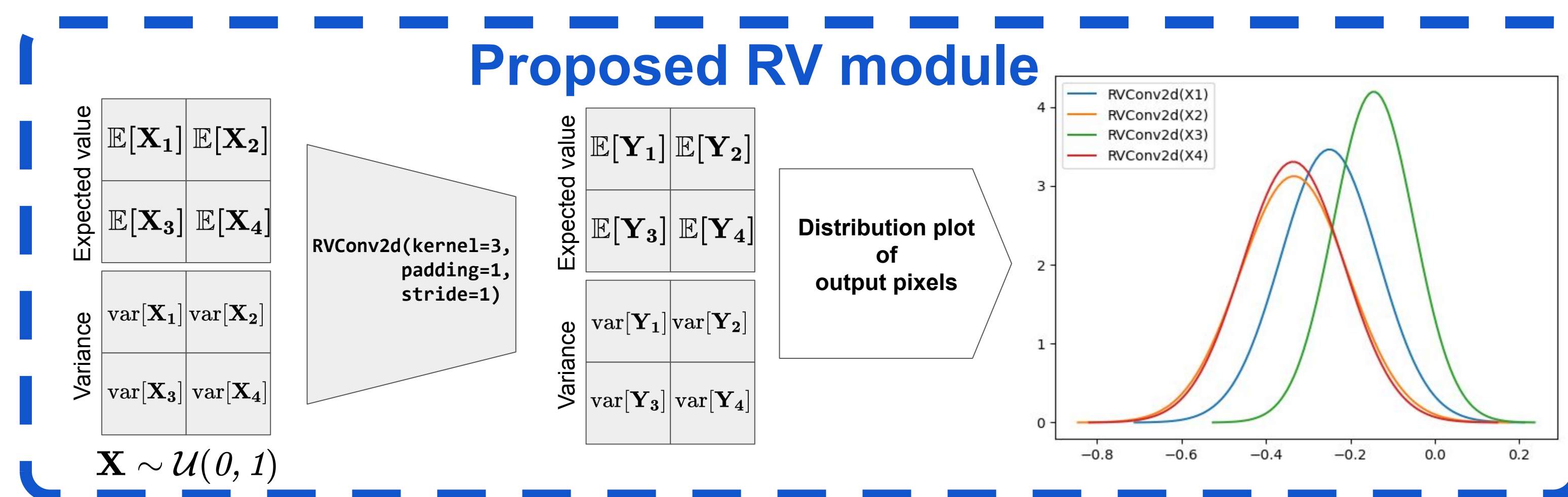
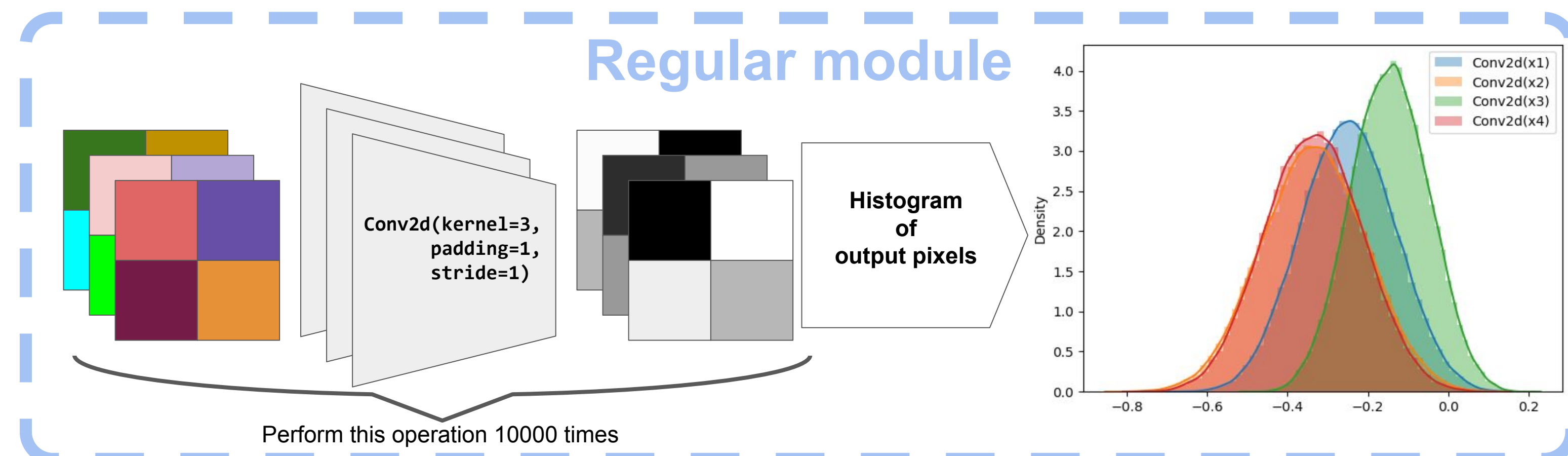
- **reconstruction** quality
- **generative** fidelity
- without hindering convergence rate

MOTIVATION

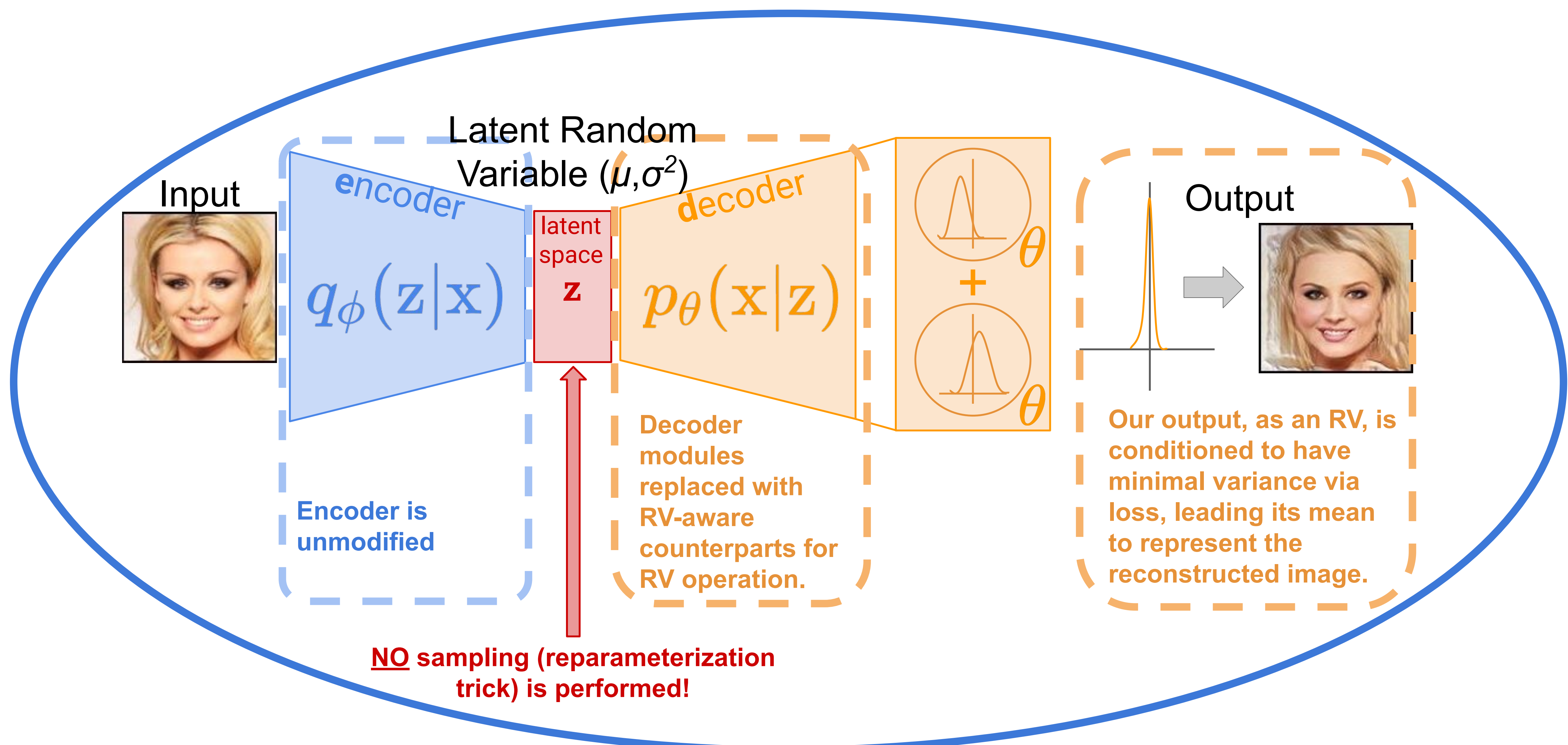
Alleviate the need for latent-space **sampling** in VAEs and **utilize** the **whole distribution**!

RV MODULES

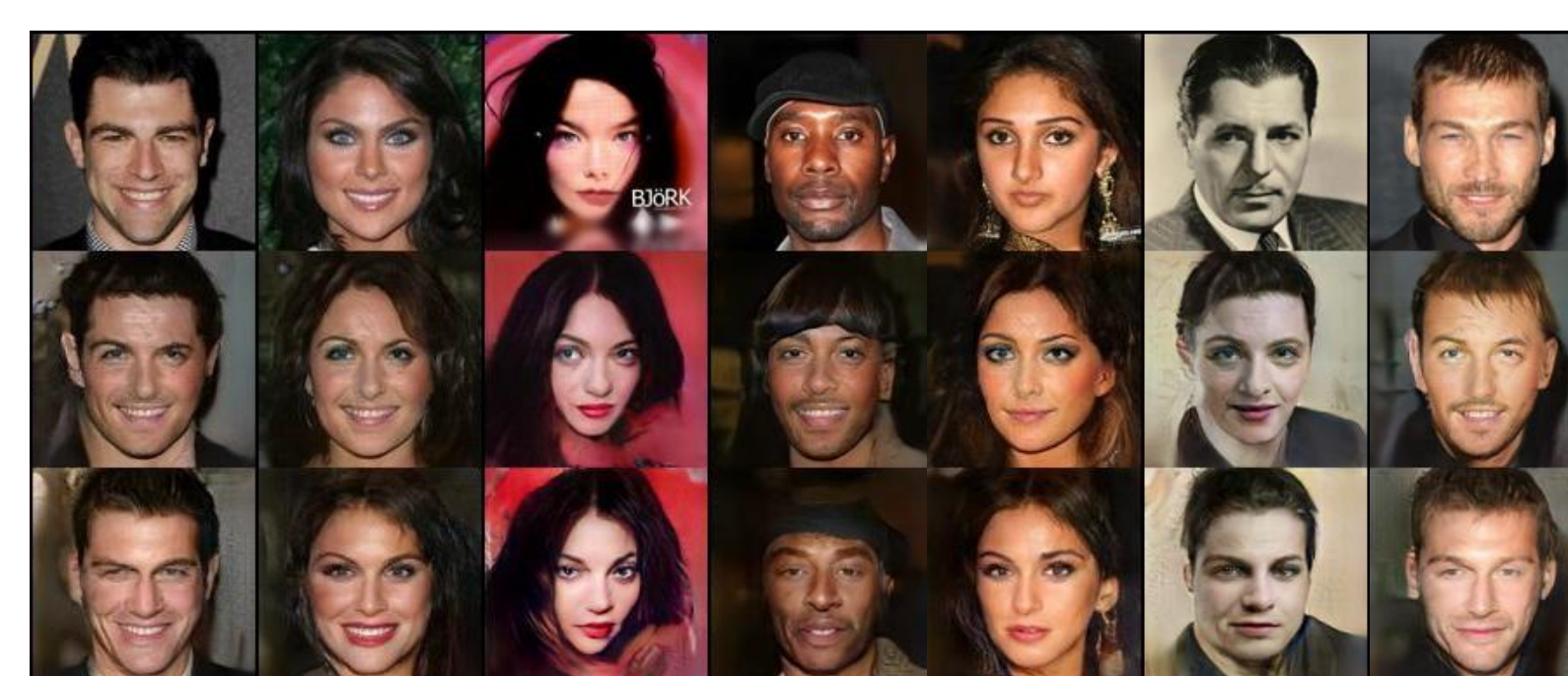
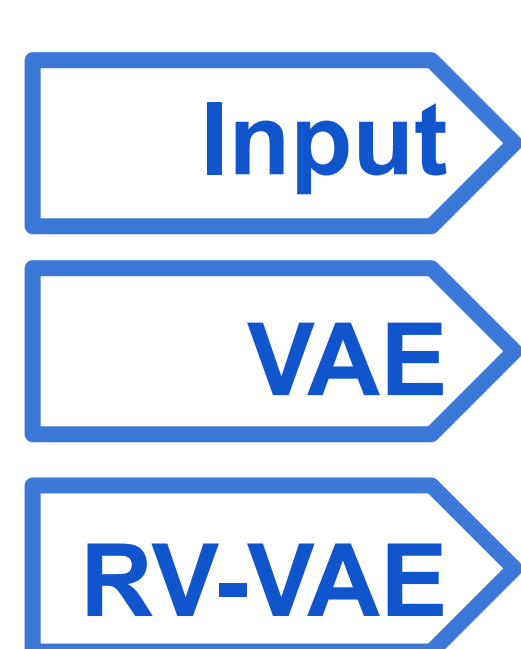
We propose **new modules** that utilize **RV Algebra** and perform **ANN operations with Random Variables** instead of constant samples.



RV VAEs & EXPERIMENTAL RESULTS



Reconstructions

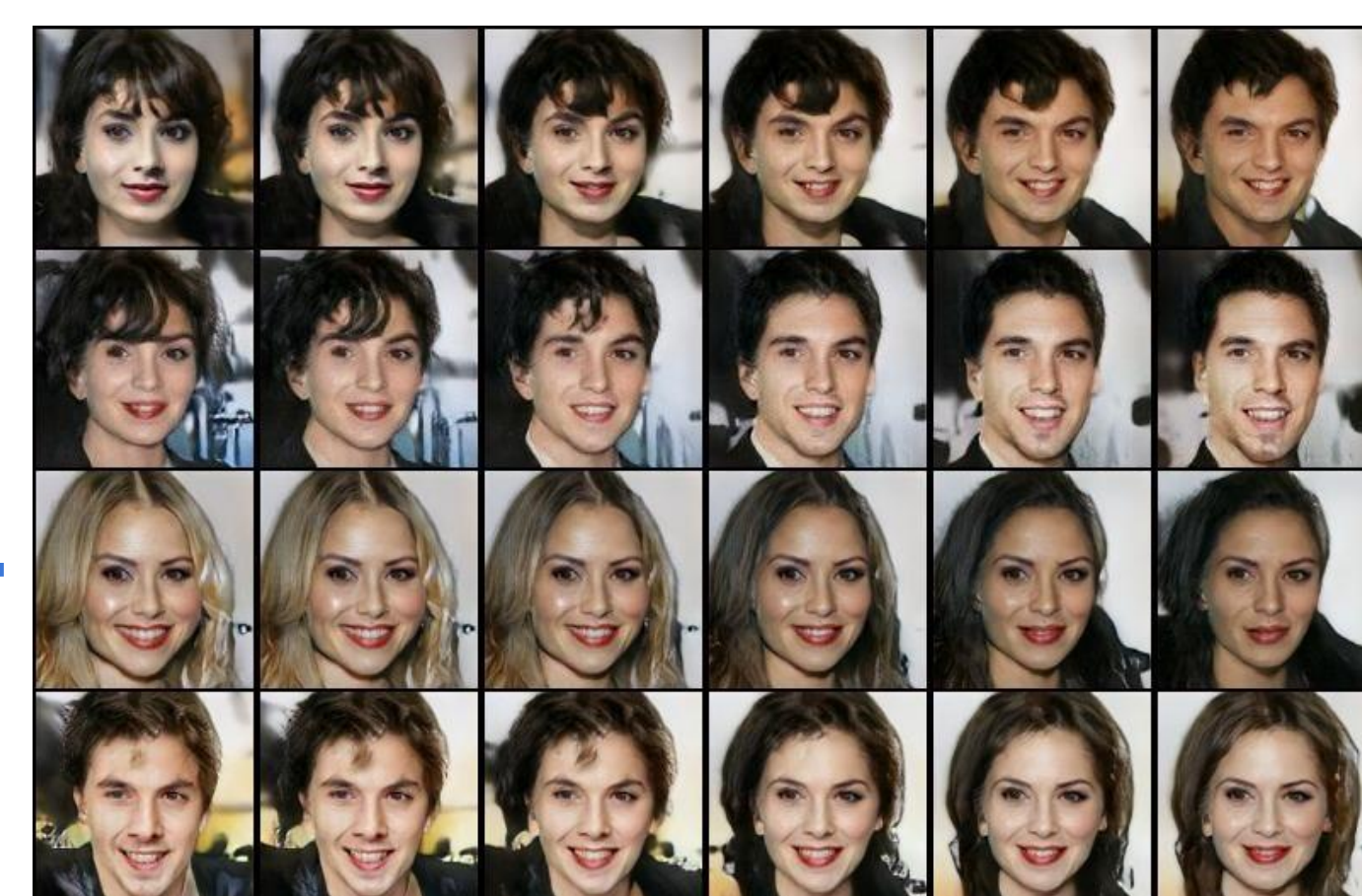


	Reconstruction MSE ↓	Generation FID ↓
SI-VAE	0.0247	2.85
RV SI-VAE	0.0151	2.82

Image
Generations



Sample
Interpolations



Code available
here

