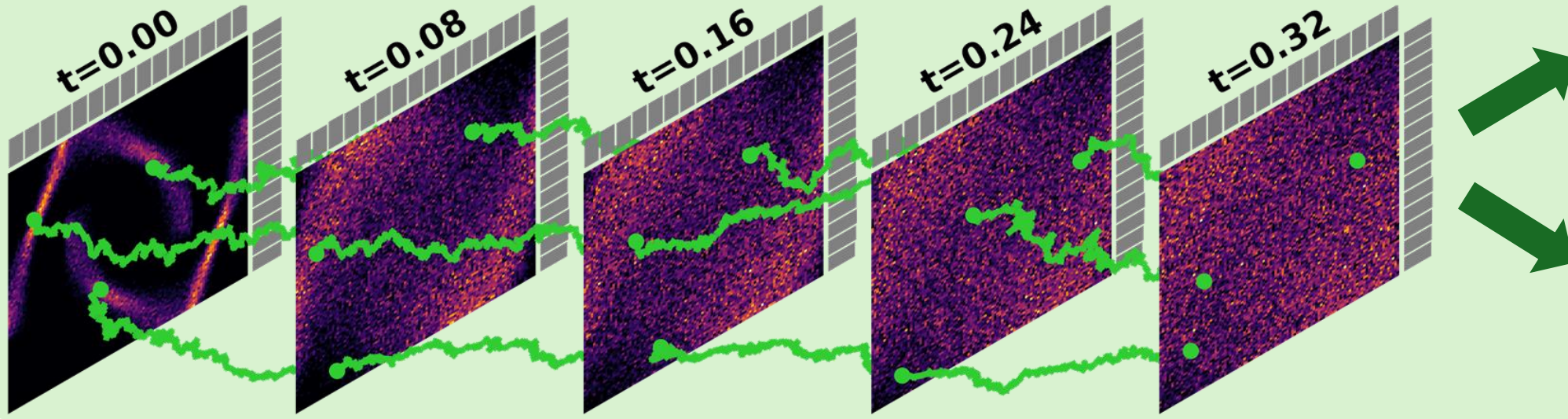


# Classification-Diffusion Copula

SDE-driven forward process



Density evaluation in one function call via class probabilities on dependence

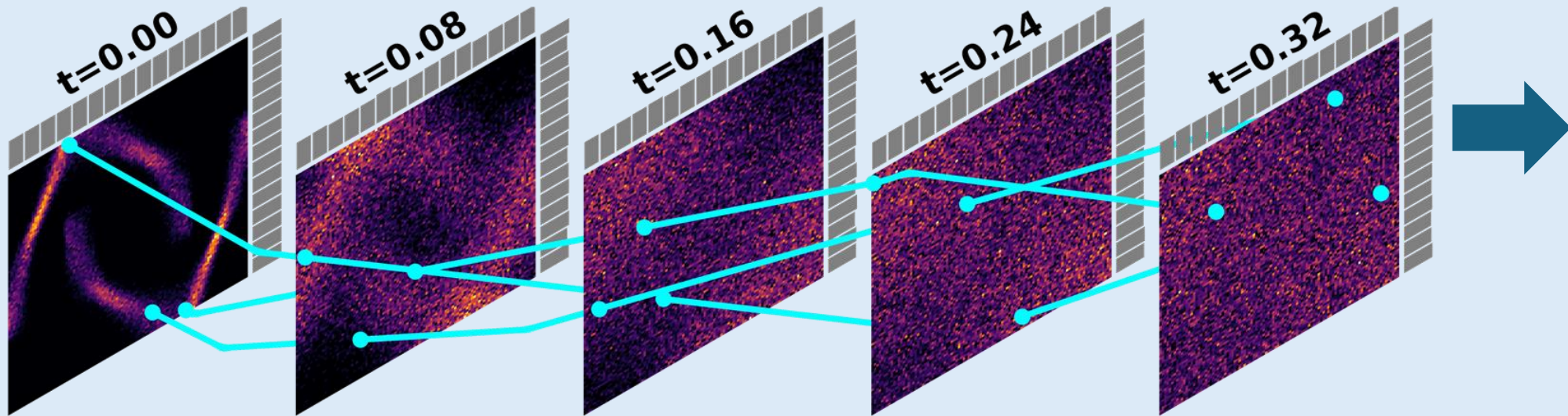
$$c(\mathbf{u}) = \frac{\mathbb{P}(\text{time} = 0 | \mathbf{u})}{\mathbb{P}(\text{time} = \infty | \mathbf{u})}$$

Scores-based sample generation

$$\nabla_{\mathbf{u}} \frac{\log \mathbb{P}(\text{time} = t | \mathbf{u})}{\log \mathbb{P}(\text{time} = \infty | \mathbf{u})}$$

Dependent copula → Only dependence is forgotten → Independent copula

Reflection process based on random initial velocity



## Reflection Copula

Predict velocity given location and time

$$v(\mathbf{u}, t) = \mathbb{E}[\text{blue arrow} \mid \mathbf{u}_t = \mathbf{u}]$$

Follow reversed velocity predictor from uniform to generate dependent samples

$$U \sim \text{Unif} \rightarrow -v(\mathbf{u}, t) \rightarrow \mathbf{u} \sim c(\mathbf{u})$$