Co-denoising from dummies!

Your noise, my noise; apo-noise!

Takes full responsibility for the bad memes!

!!! Disclaimer: This presentation contains memes. OMG!

Amazing idea in Marseille ;)

!!! Exact scene of us discussing the idea in Marseille!

And it seems people did it before!

Or did they?

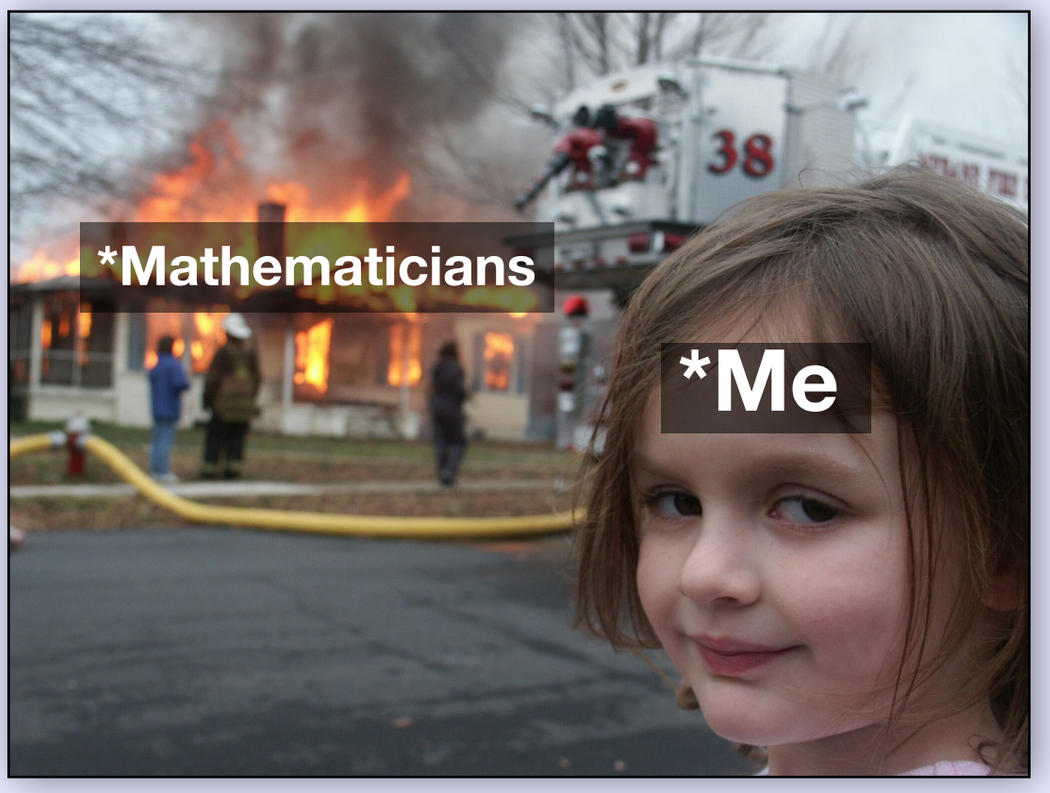
Recap: Flow Matching

Recap: Flow Matching

Flow Matching is interpolation!

Recap: Flow Matching

Flow Matching is interpolation!



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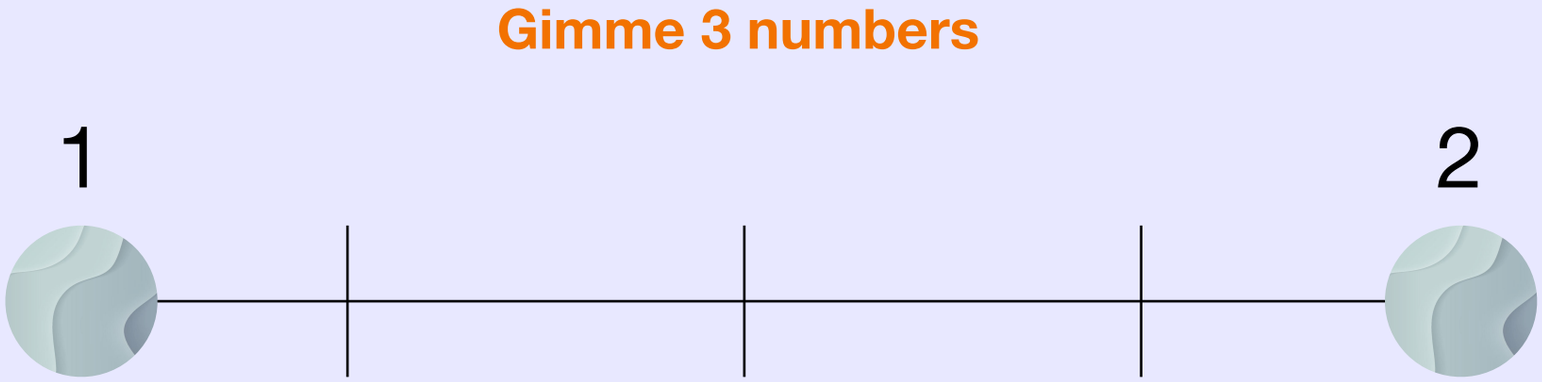

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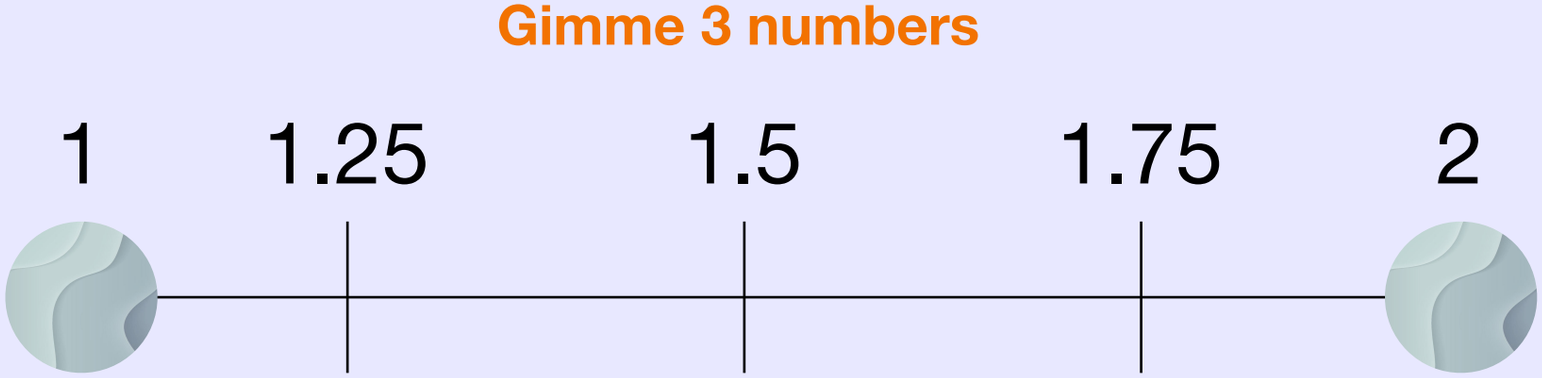

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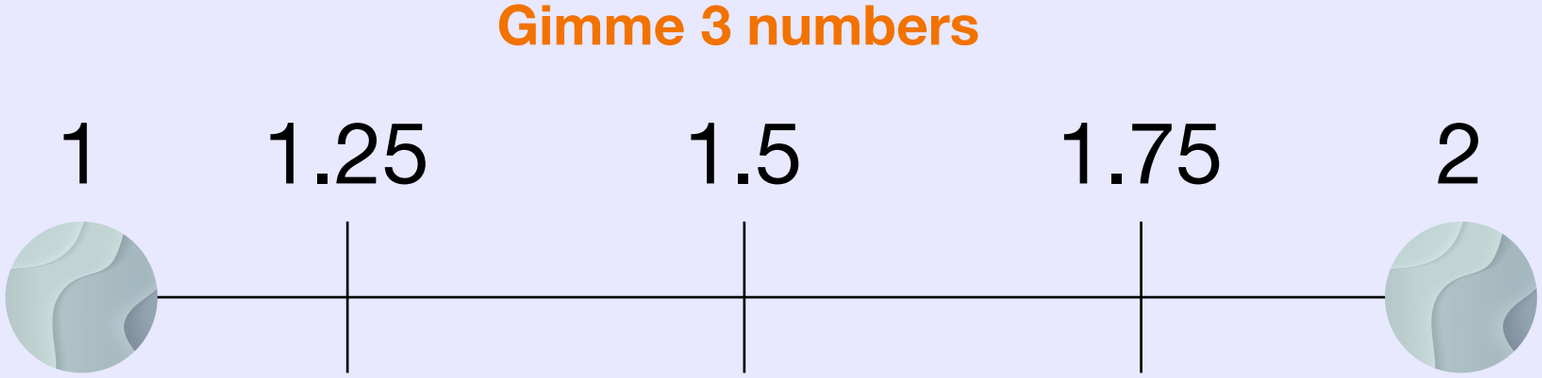

Unknowingly, we all did Flow Matching here!!

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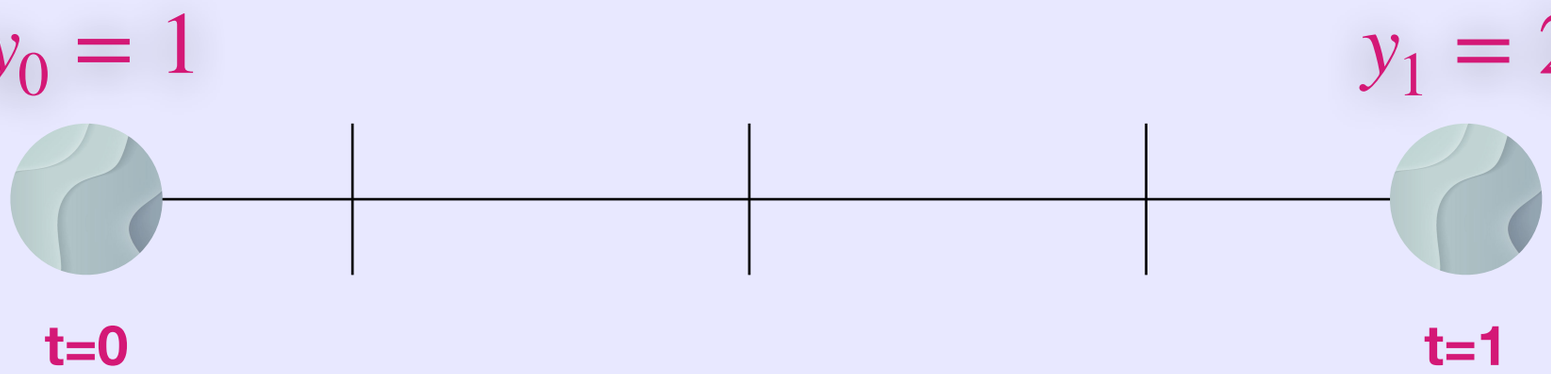

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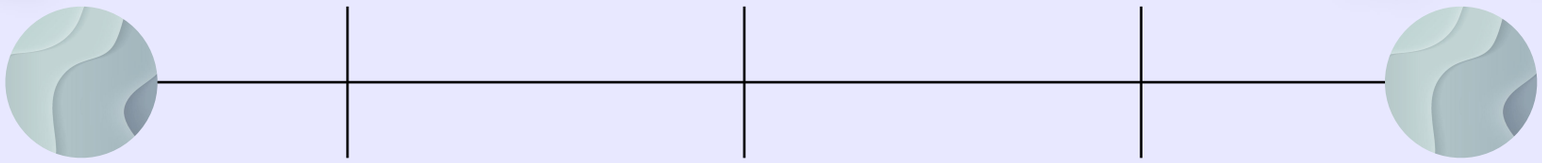
$y_0 = 1$

$y_1 = 2$



t=0

t=1

$$v = \frac{dy}{dt} = \frac{2-1}{1-0} = 1$$

Recap: Flow Matching

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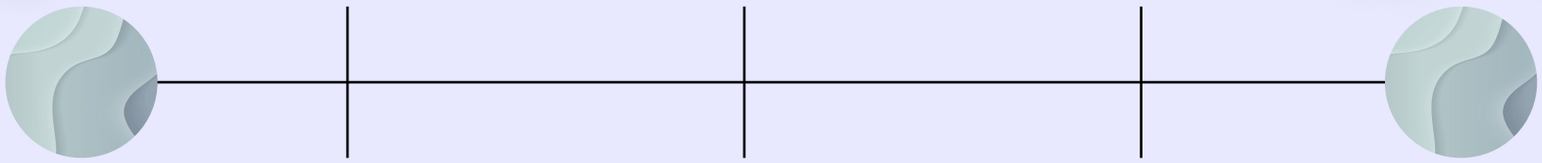

t=0

t=1

$$y_{new} = y_{old} + step \cdot v$$

$$v = \frac{dy}{dt} = 1$$

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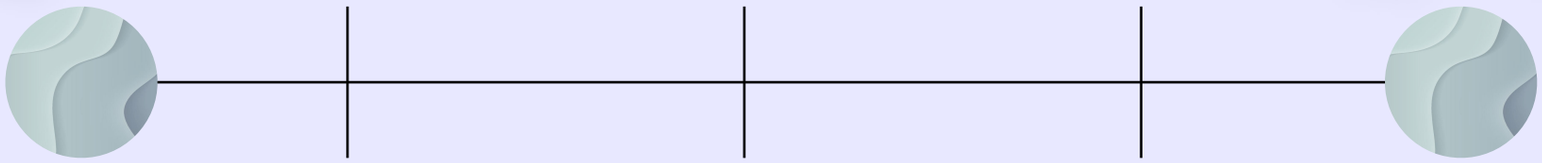

t=0

t=1

$$y_{new} = y_{old} + 0.25 \cdot v$$

$$v = \frac{dy}{dt} = 1$$

Recap: Flow Matching

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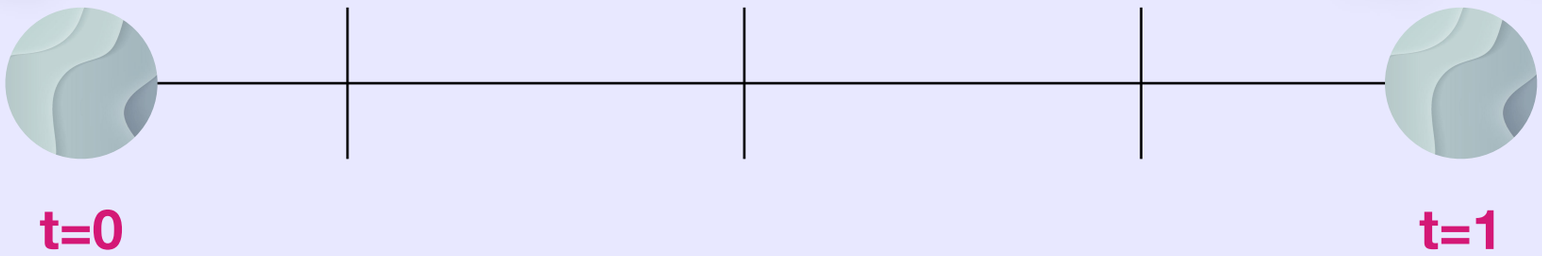

$$y_{new} = 1 + 0.25 \cdot 1 = 1.25$$

$$v = \frac{dy}{dt} = 1$$

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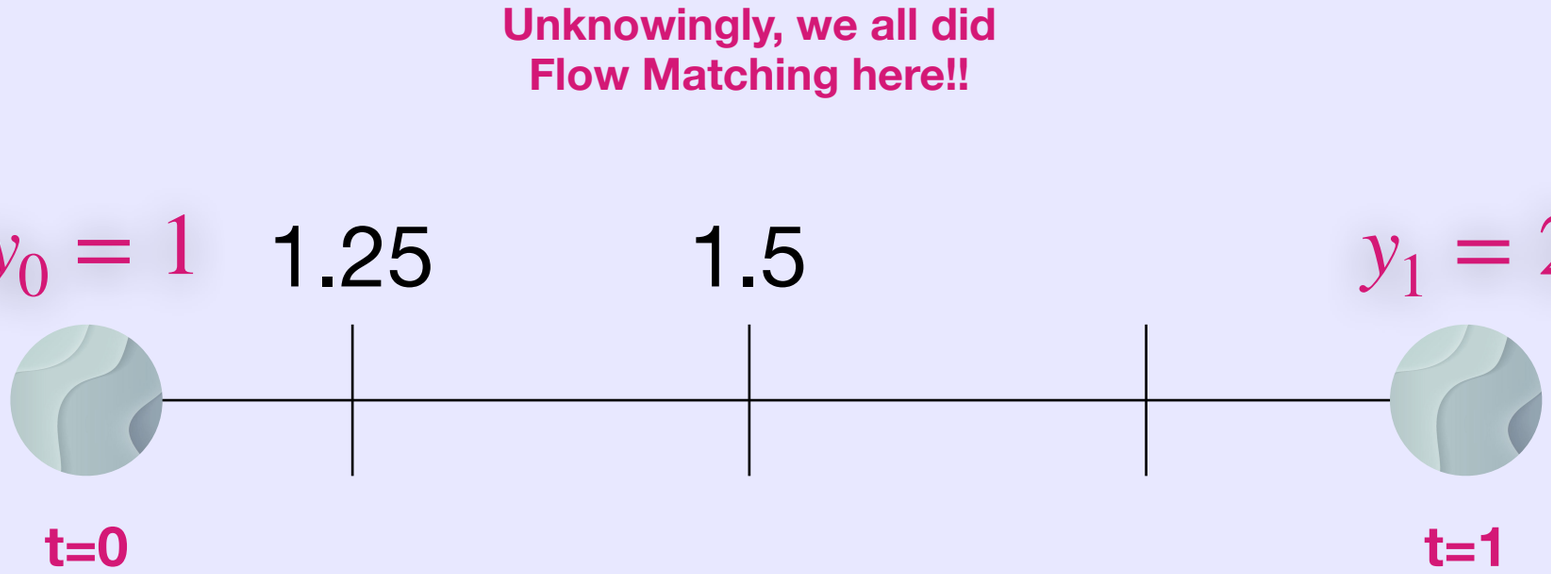

$$y_{new} = 1.25 + 0.25 \cdot 1 = 1.5$$

$$v = \frac{dy}{dt} = 1$$

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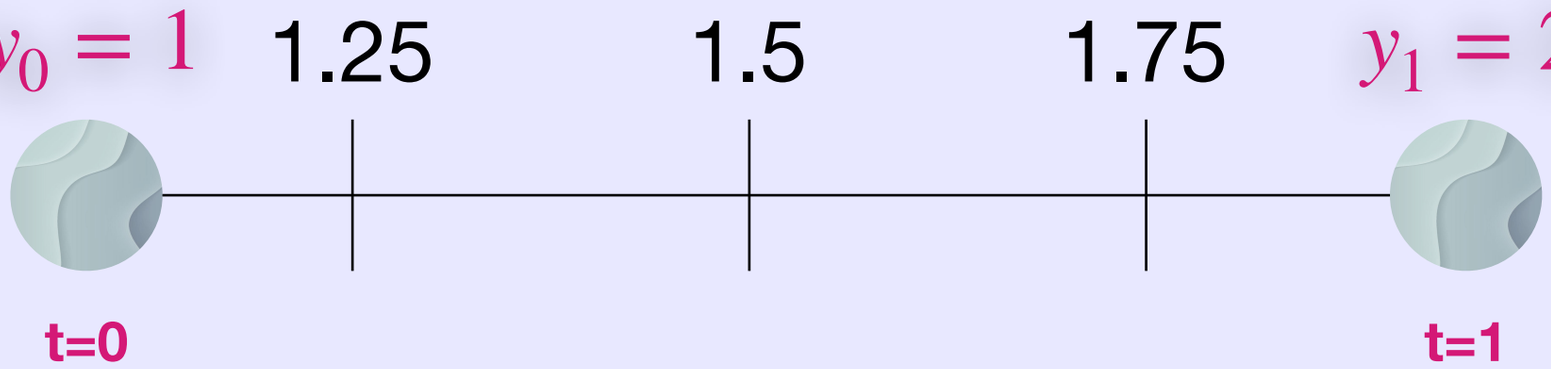

$$y_{new} = 1.5 + 0.25 \cdot 1 = 1.75$$

$$v = \frac{dy}{dt} = 1$$

Recap: Flow Matching

Flow Matching is interpolation!

Source Distribution

π_0

Target Distribution

π_1

Lipman, Yaron, et al. "Flow Matching for Generative Modeling.." ICLR 2023.
Liu, Xingchao, et al. "Flow Straight and Fast: Learning to Generate and Transfer Data with Rectified Flow." ICLR 2023.

Recap: Flow Matching

Flow Matching is interpolation!

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π_0

Target samples

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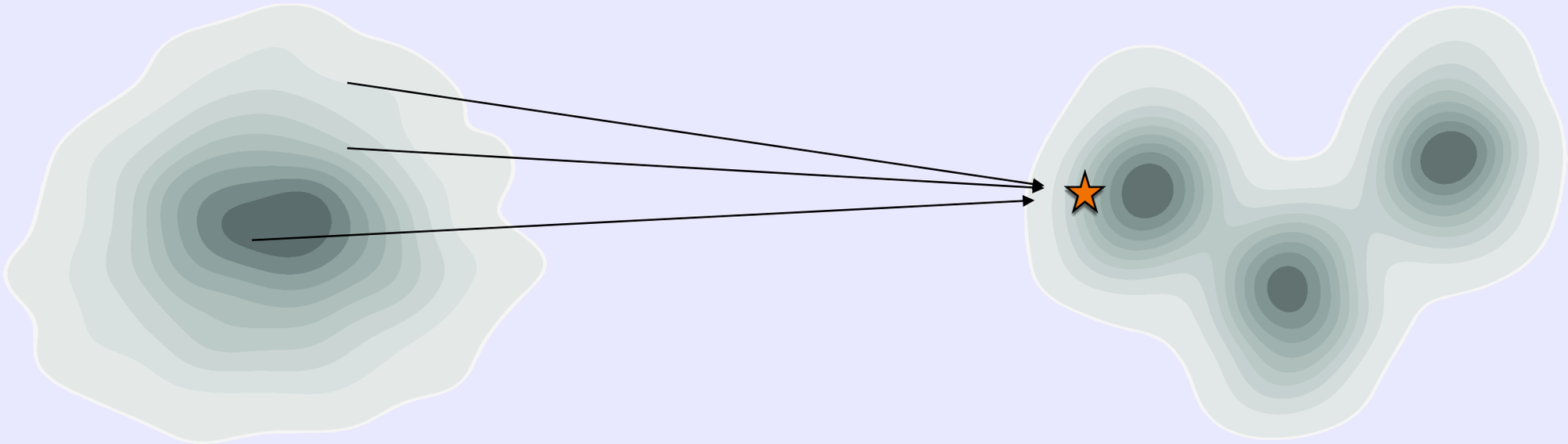

Source Distribution

π_0

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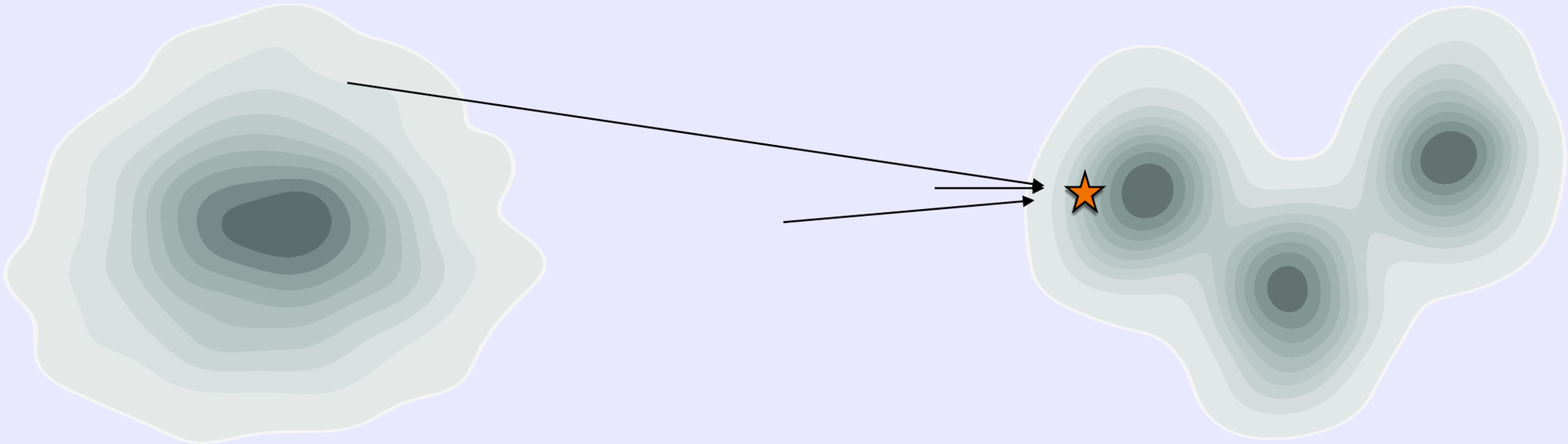

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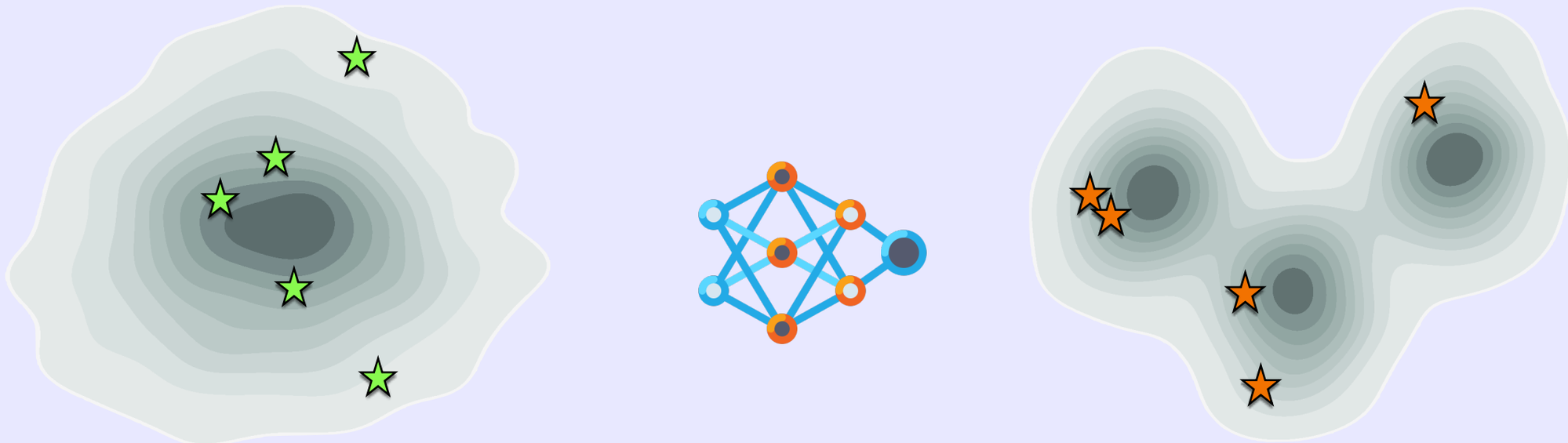

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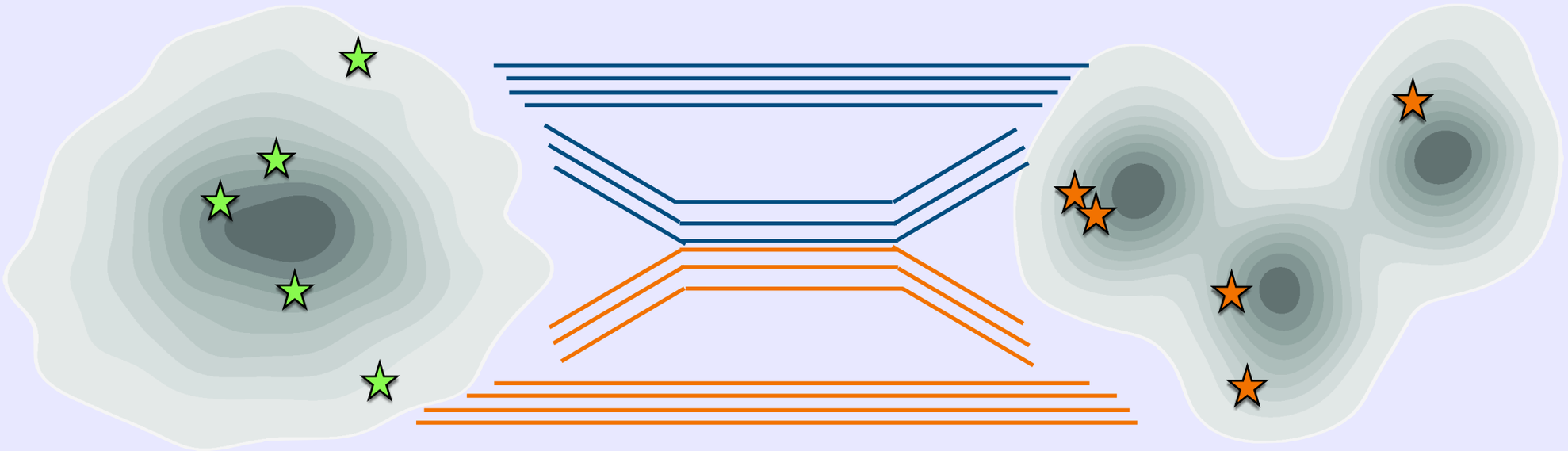

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π_0

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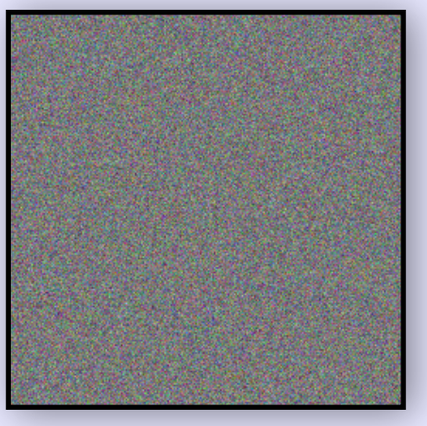
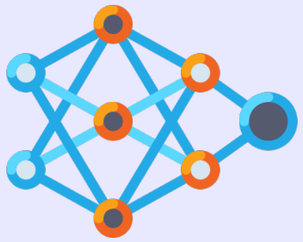
Flow Matching for Image Generation

Image, image and more image...





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Image, image and more image…

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Flow Matching for Image Generation

Image, image and more image…

t

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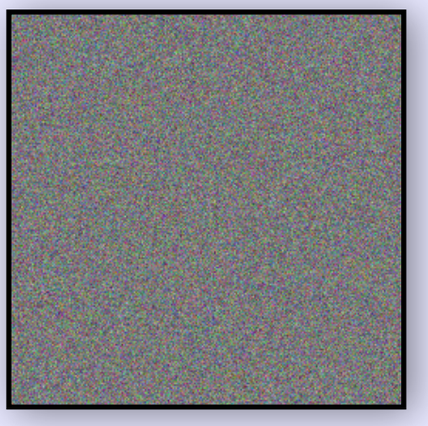
Flow Matching for Image Generation

Image, image and more image…

t

$$img_t = t \cdot img + (1 - t) \cdot noise$$



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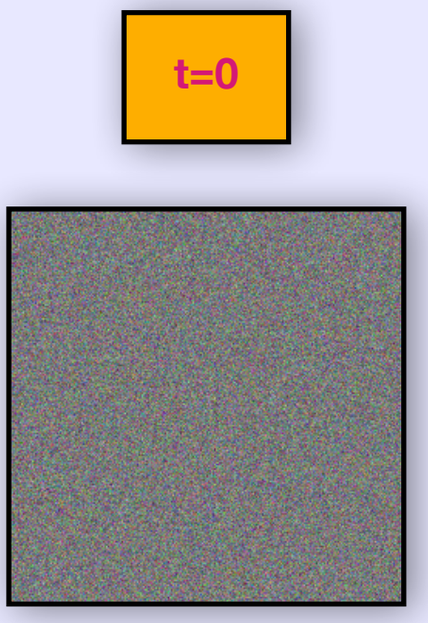
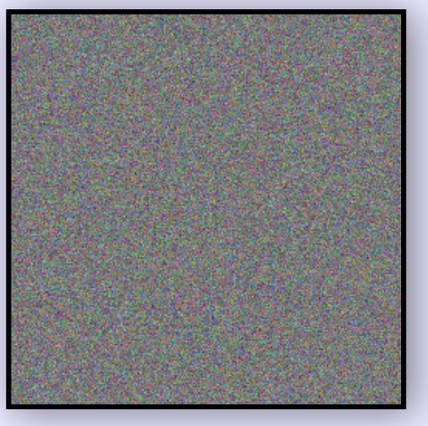
Image, image and more image…

t=0





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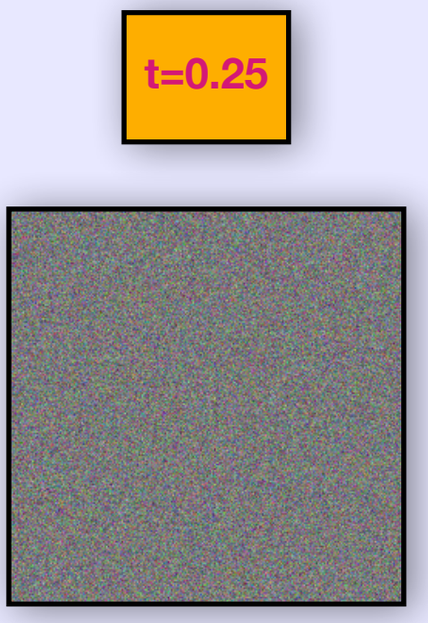
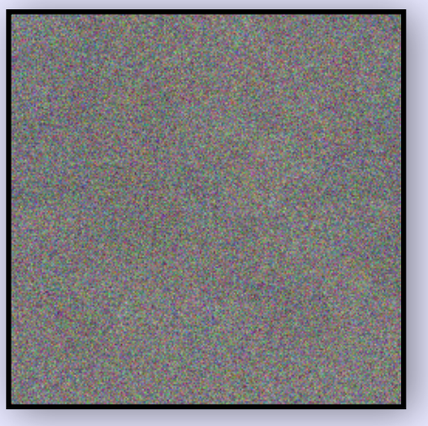
Flow Matching for Image Generation

Image, image and more image…

t=0.25





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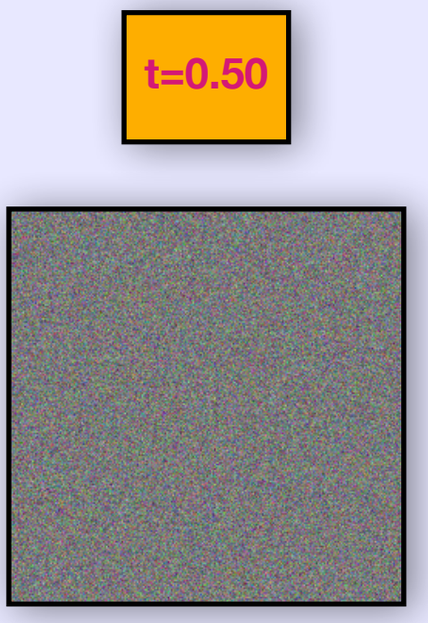
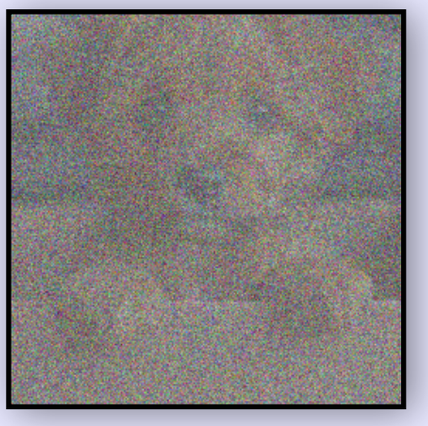
Flow Matching for Image Generation

Image, image and more image…

t=0.50





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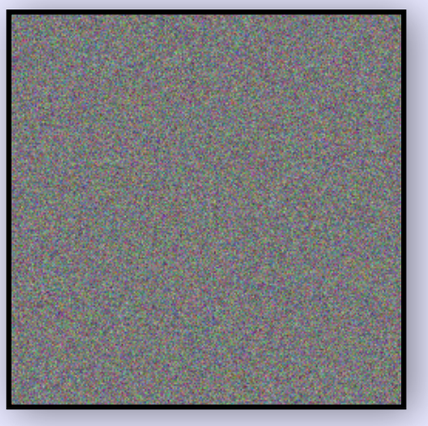
Flow Matching for Image Generation

Image, image and more image…

t=0.75



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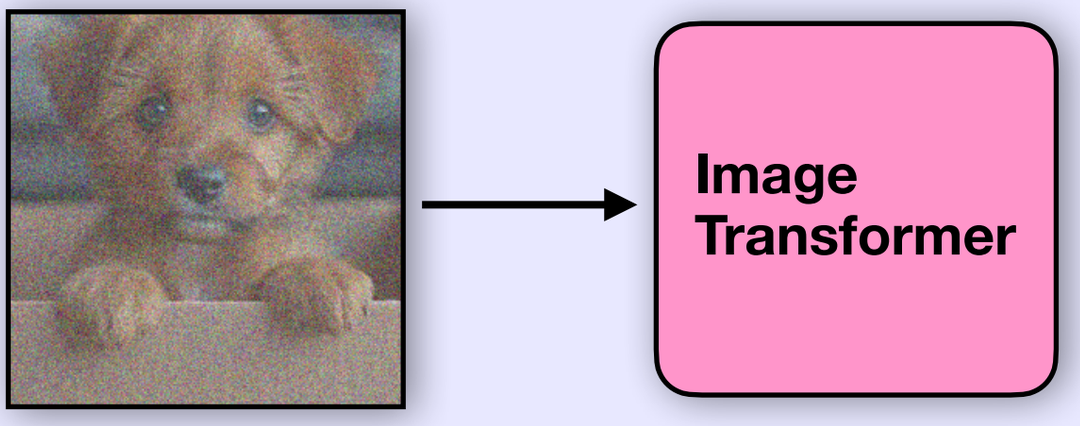
Flow Matching for Image Generation

Image, image and more image…



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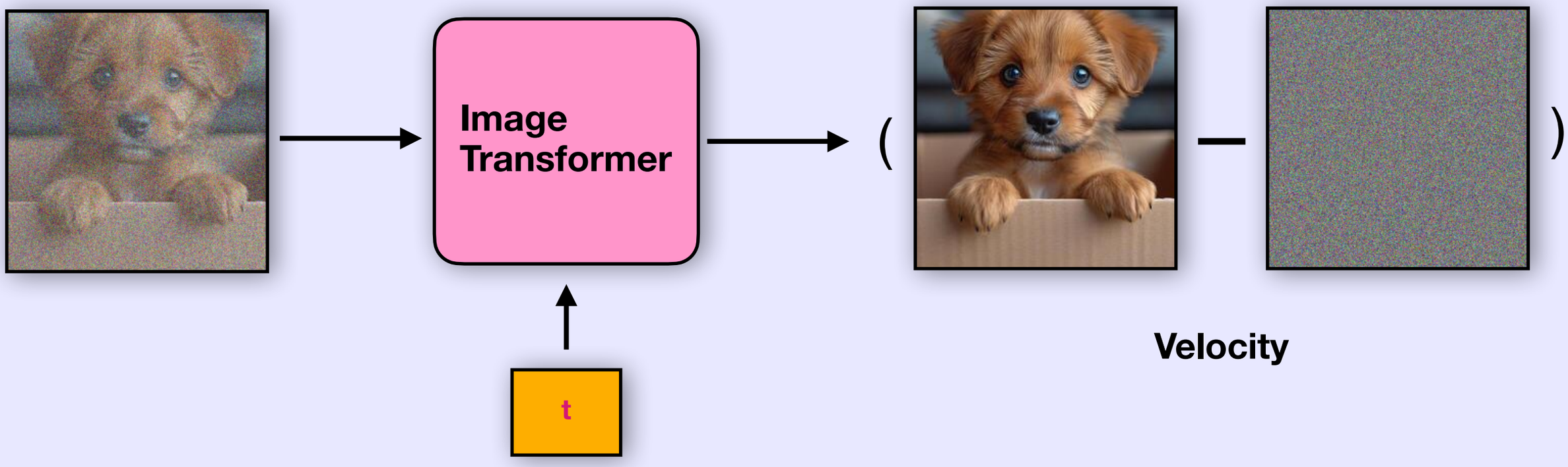
Flow Matching for Image Generation

Image, image and more image…

Training



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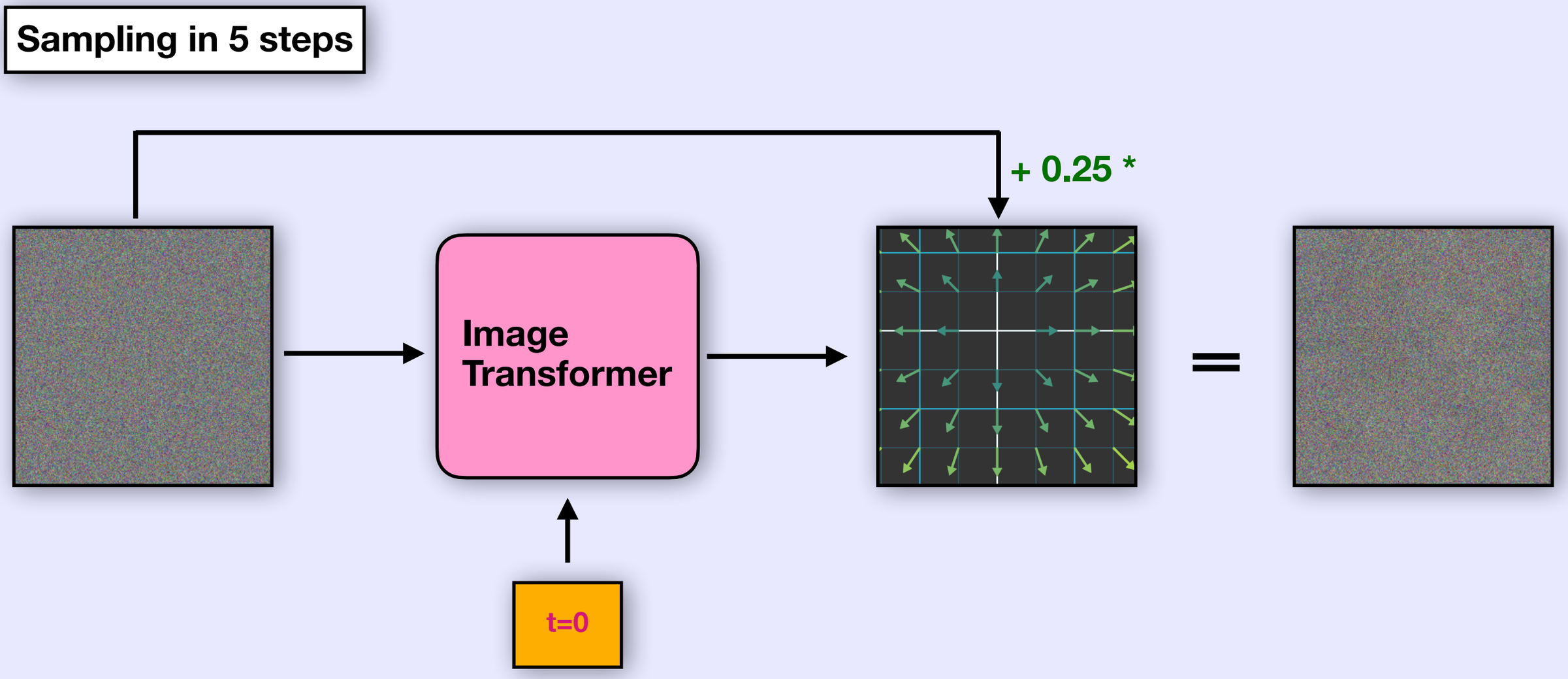
Image, image and more image…



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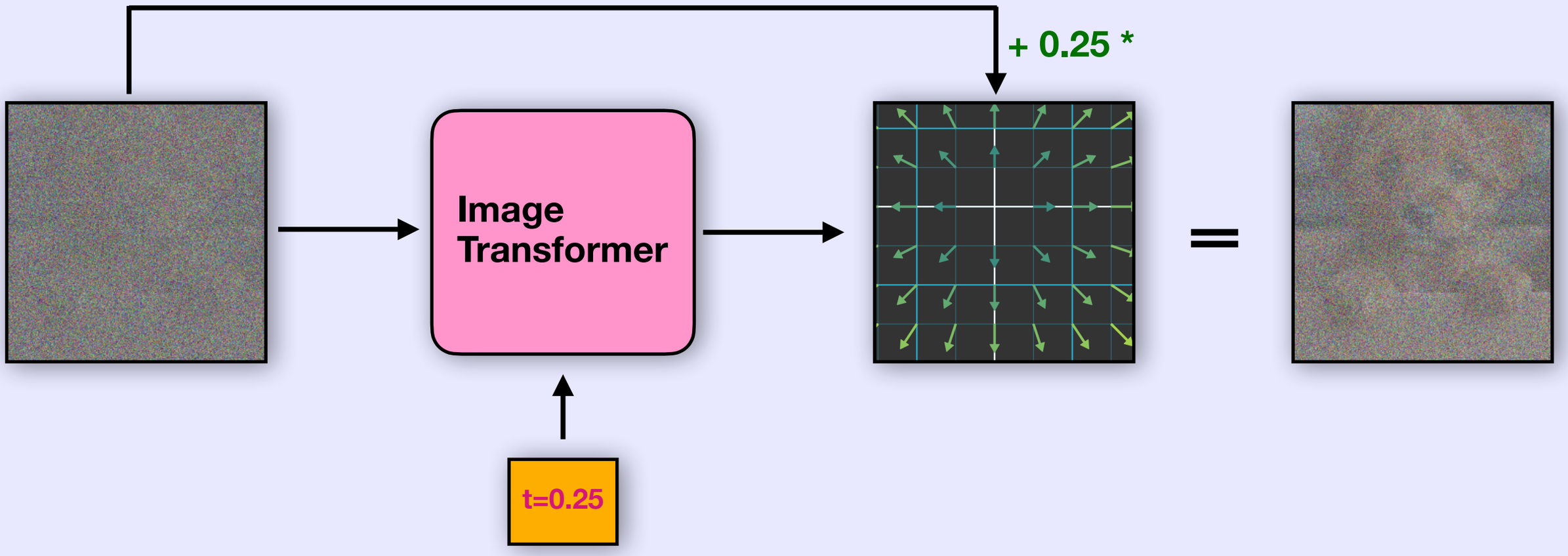
Flow Matching for Image Generation

Image, image and more image…

Sampling in 5 steps



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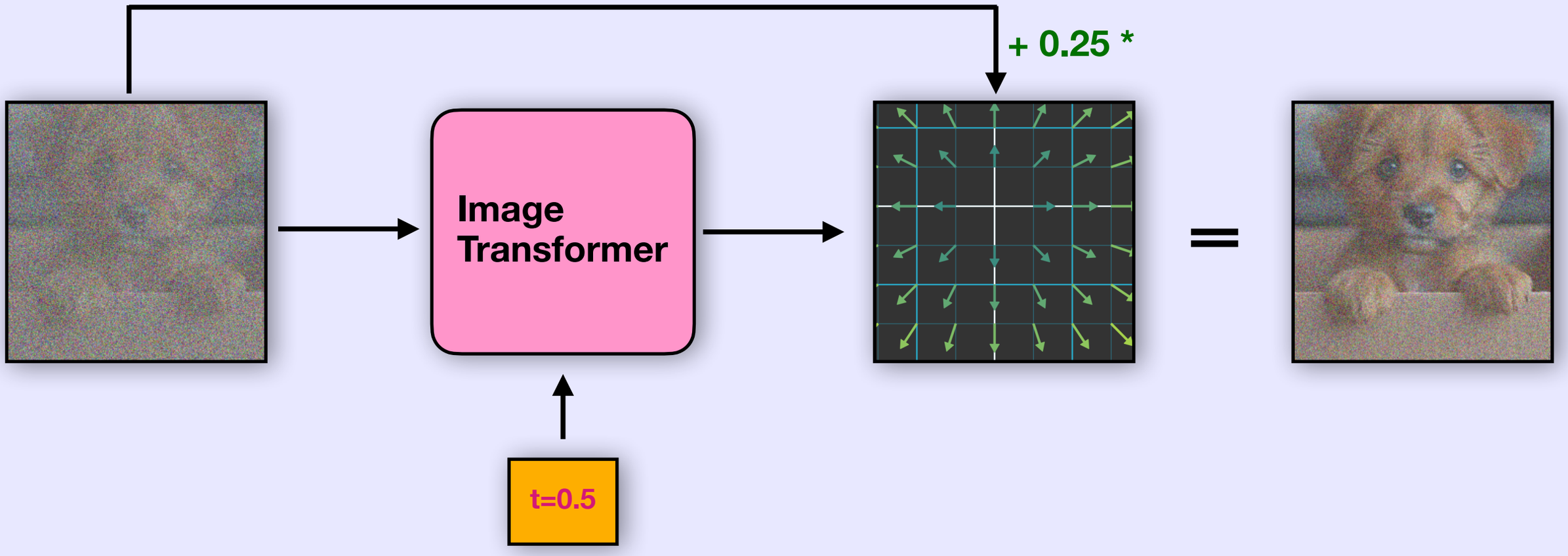

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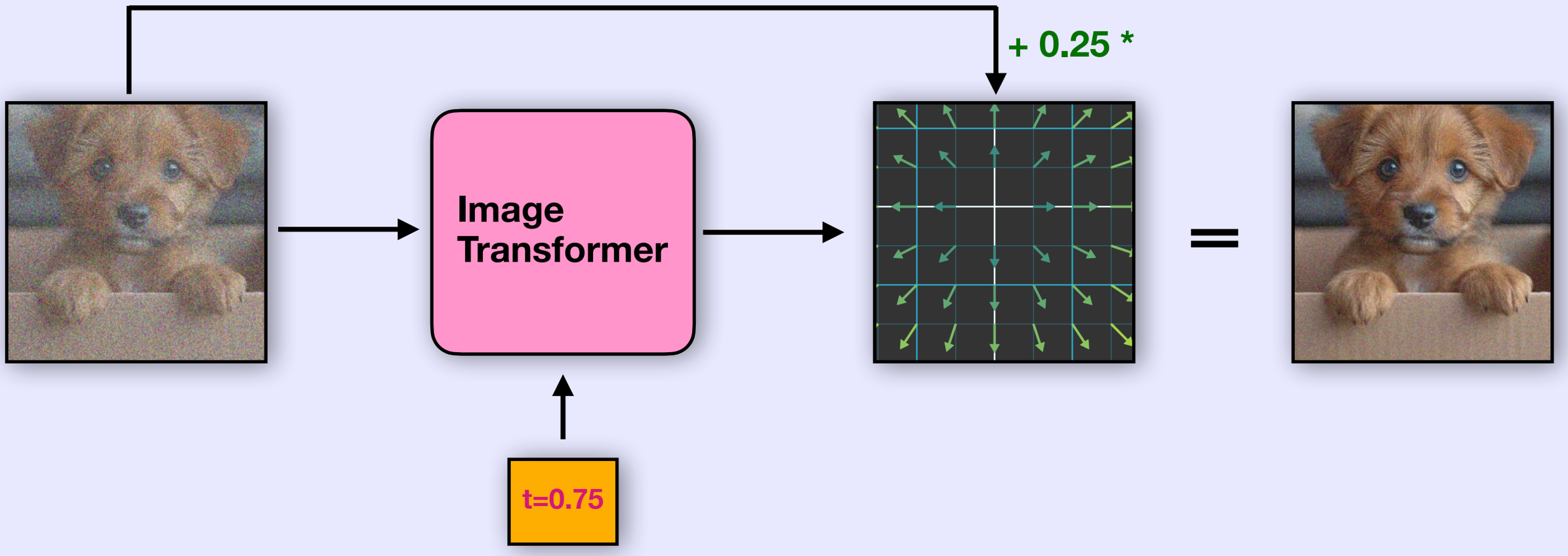

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Image, image and more image…

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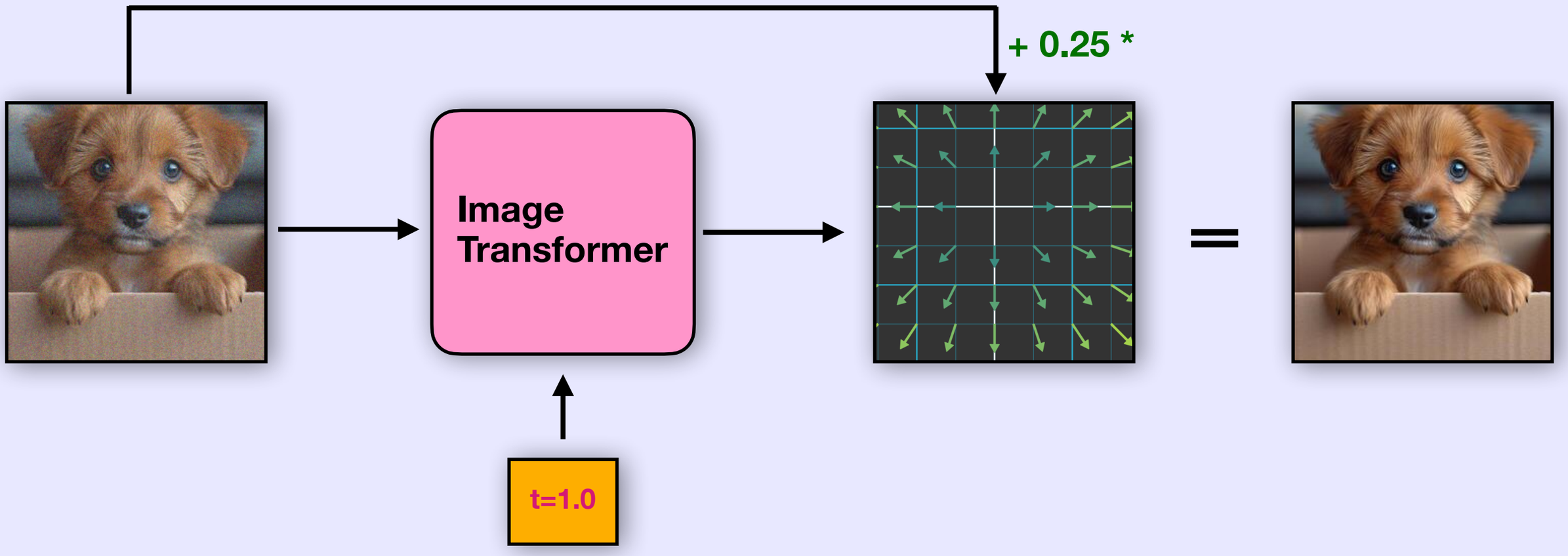

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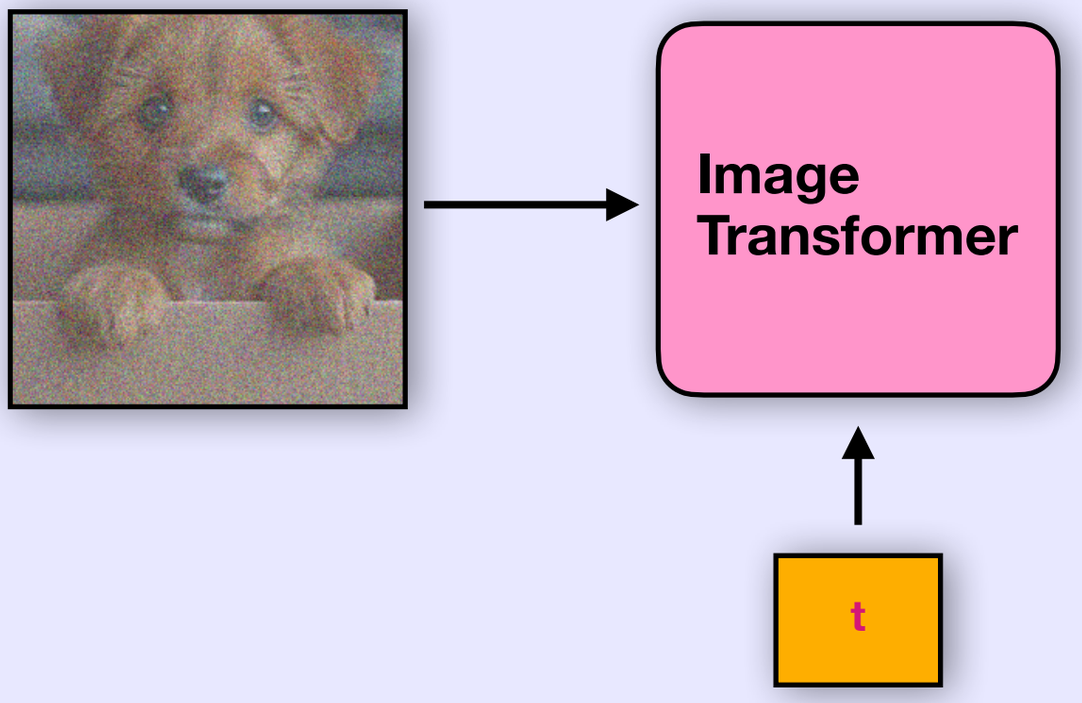
Co-denoising for Image Generation

Image, image and more image…

Can we denoise more things to improve image generation?

Co-denoising for Image Generation

I was kinda lying before!



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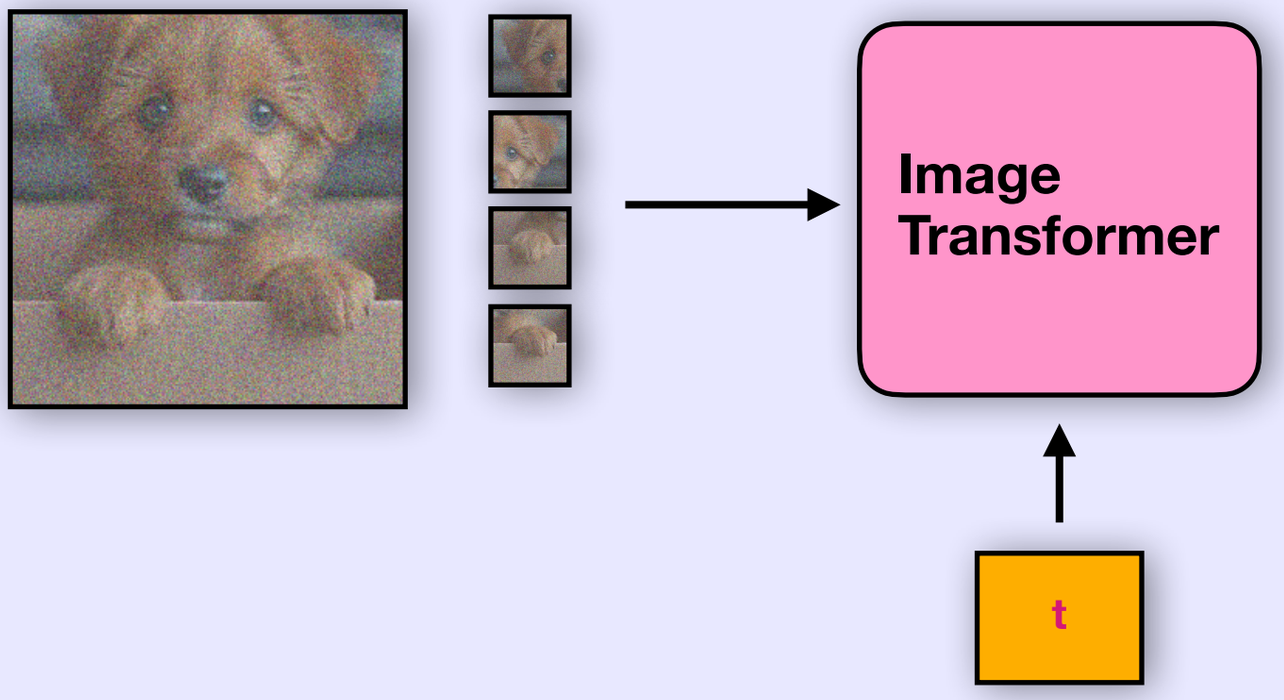
Co-denoising for Image Generation

There is more to it…



Li, Tianhong, et al. "Back to Basics: Let Denoising Generative Models Denoise." arXiV 2025.
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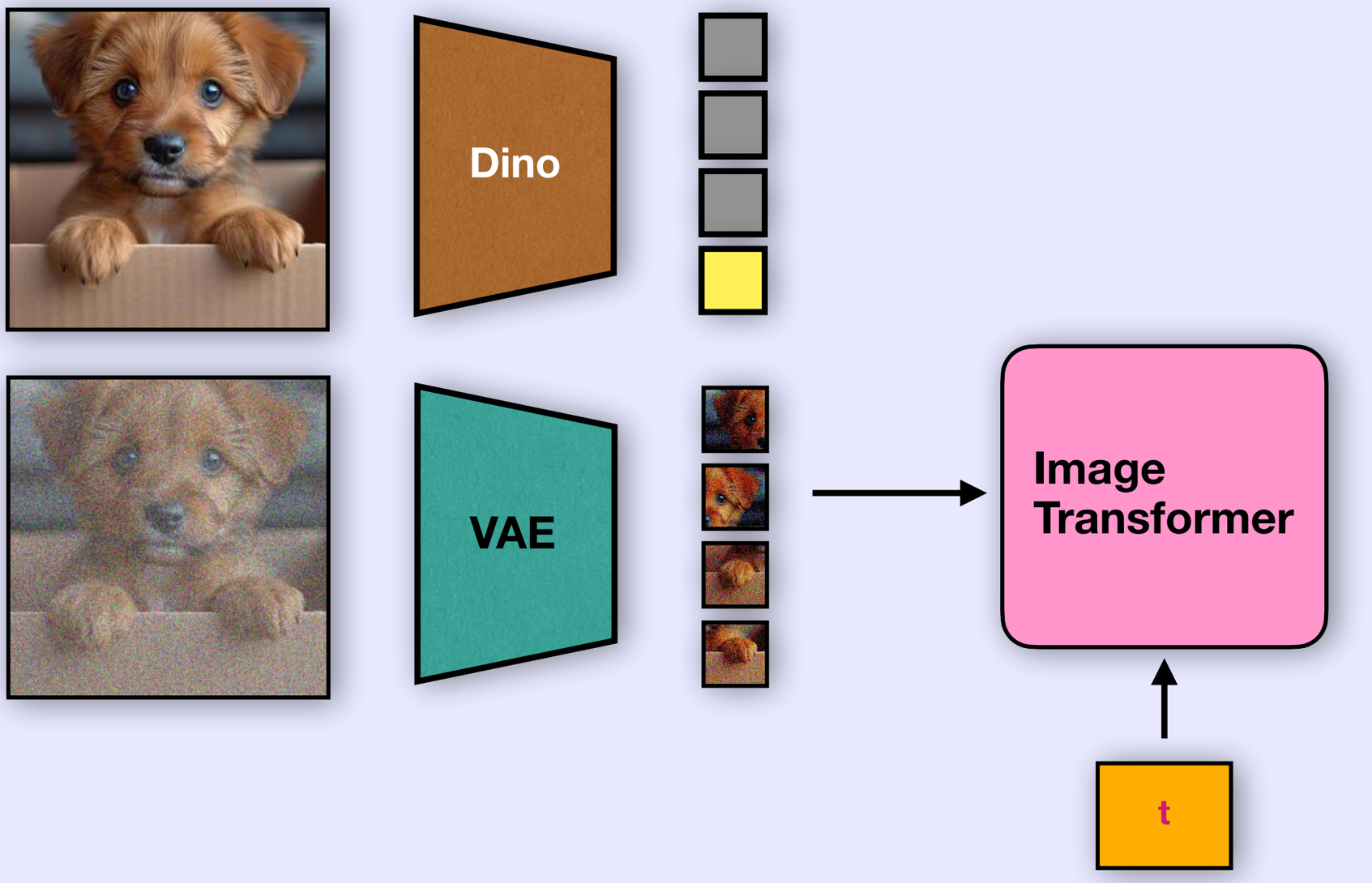
Co-denoising for Image Generation

Co-denoising with Dino class token!



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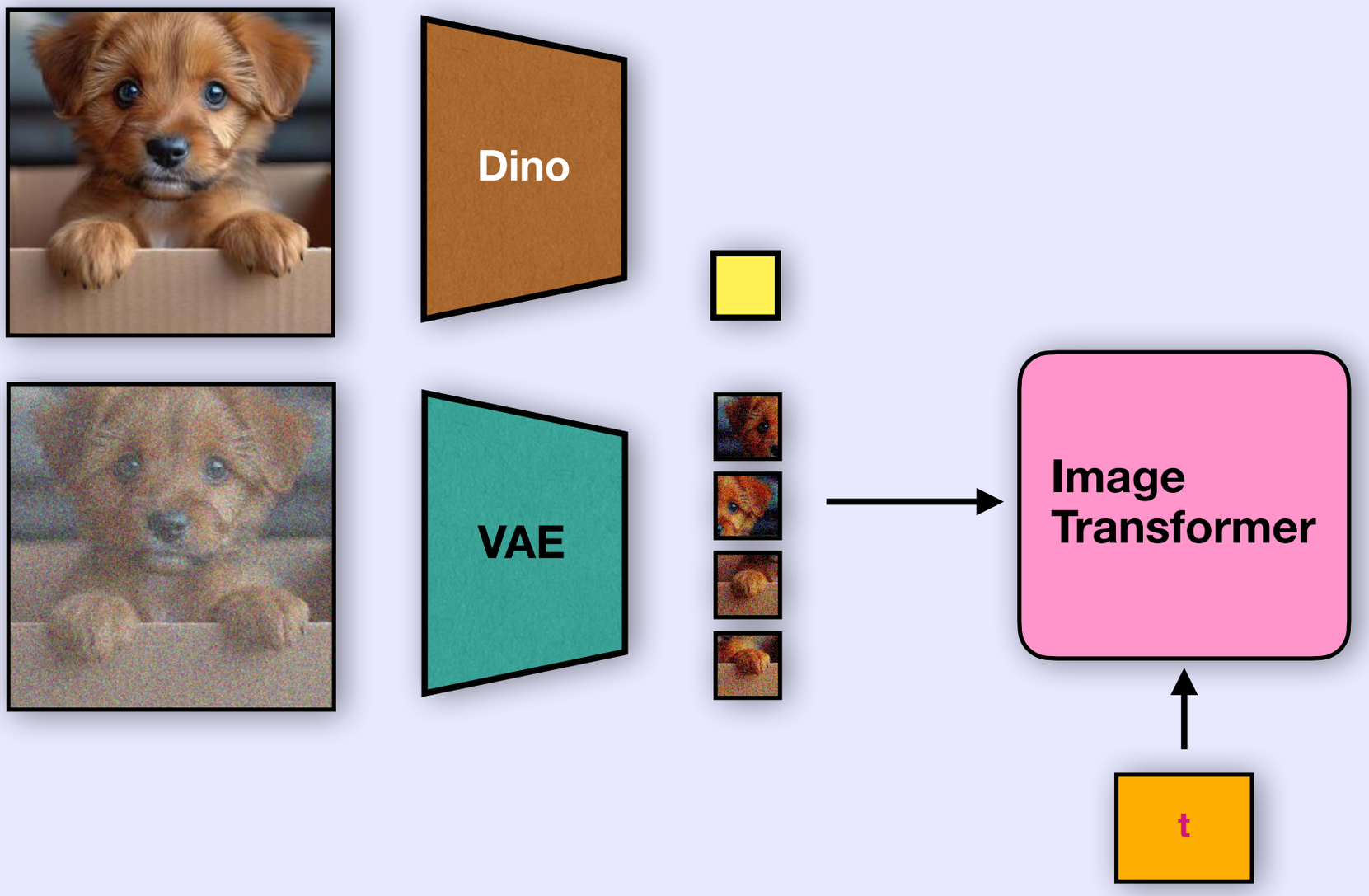

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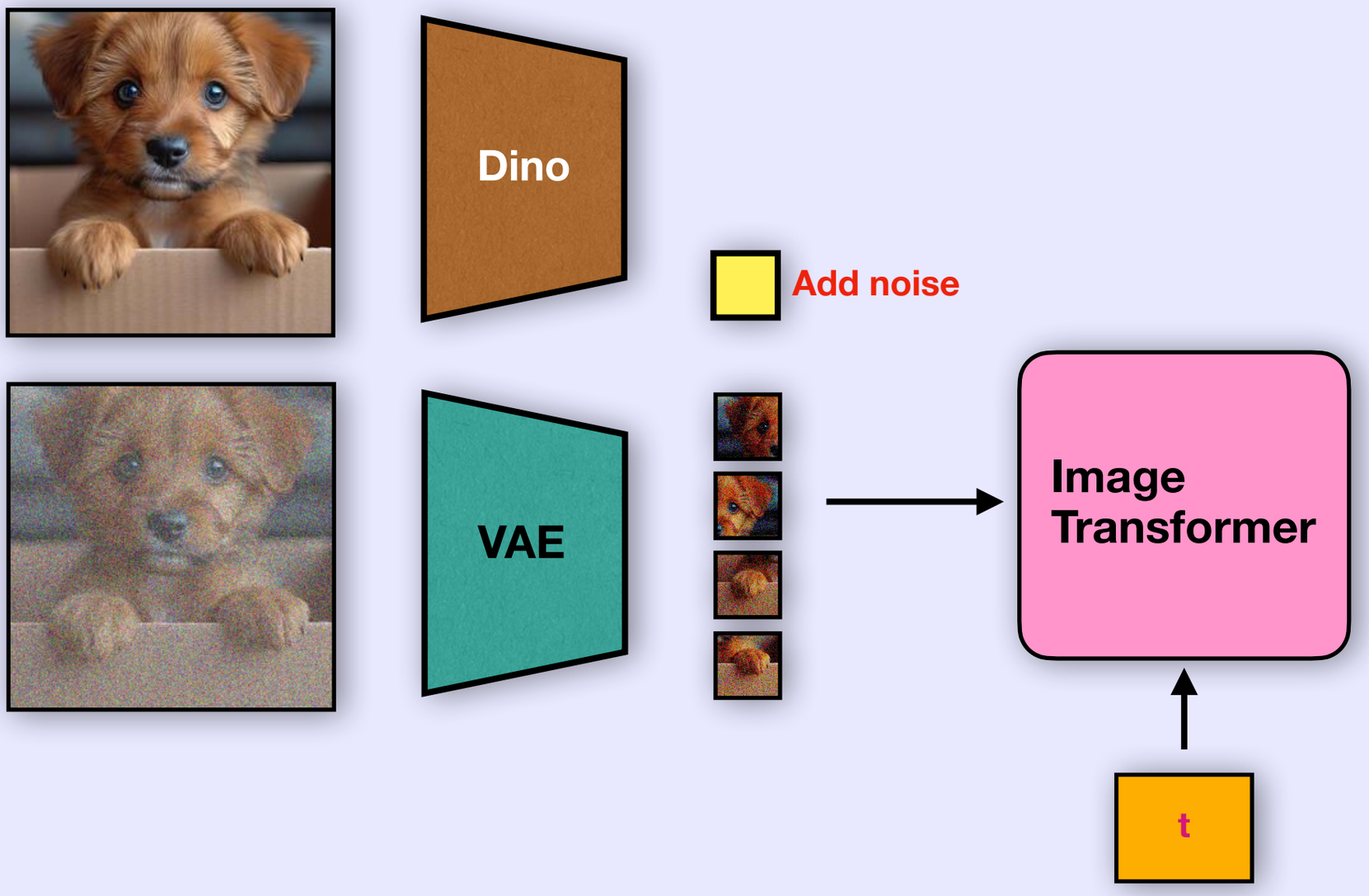

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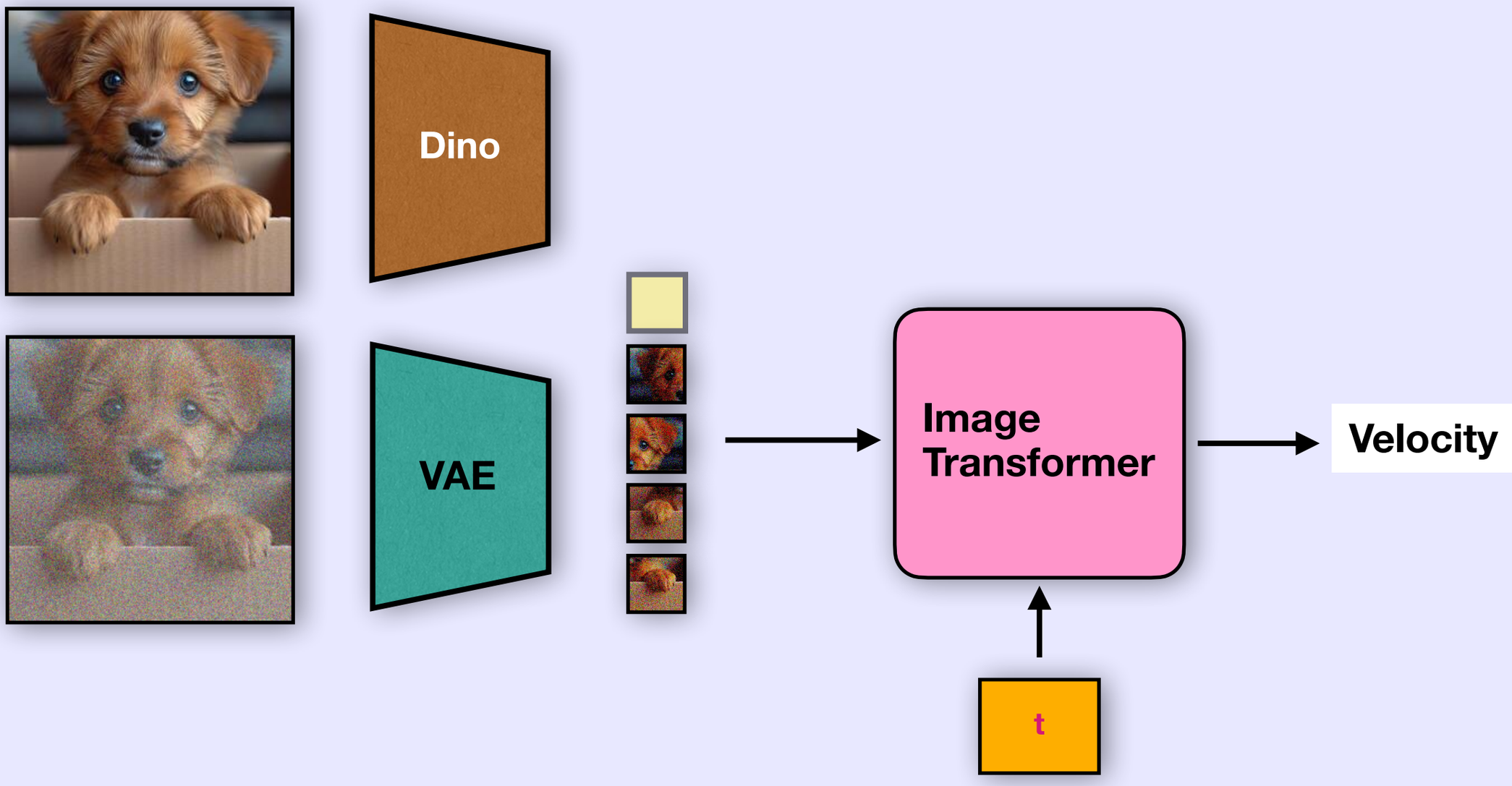

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Co-denoising for Image Generation

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Faster Convergence

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Co-denoising for Image Generation

Co-denoising with Dino class token!

Faster Convergence

Forced to decode and understand rich representation!!!!

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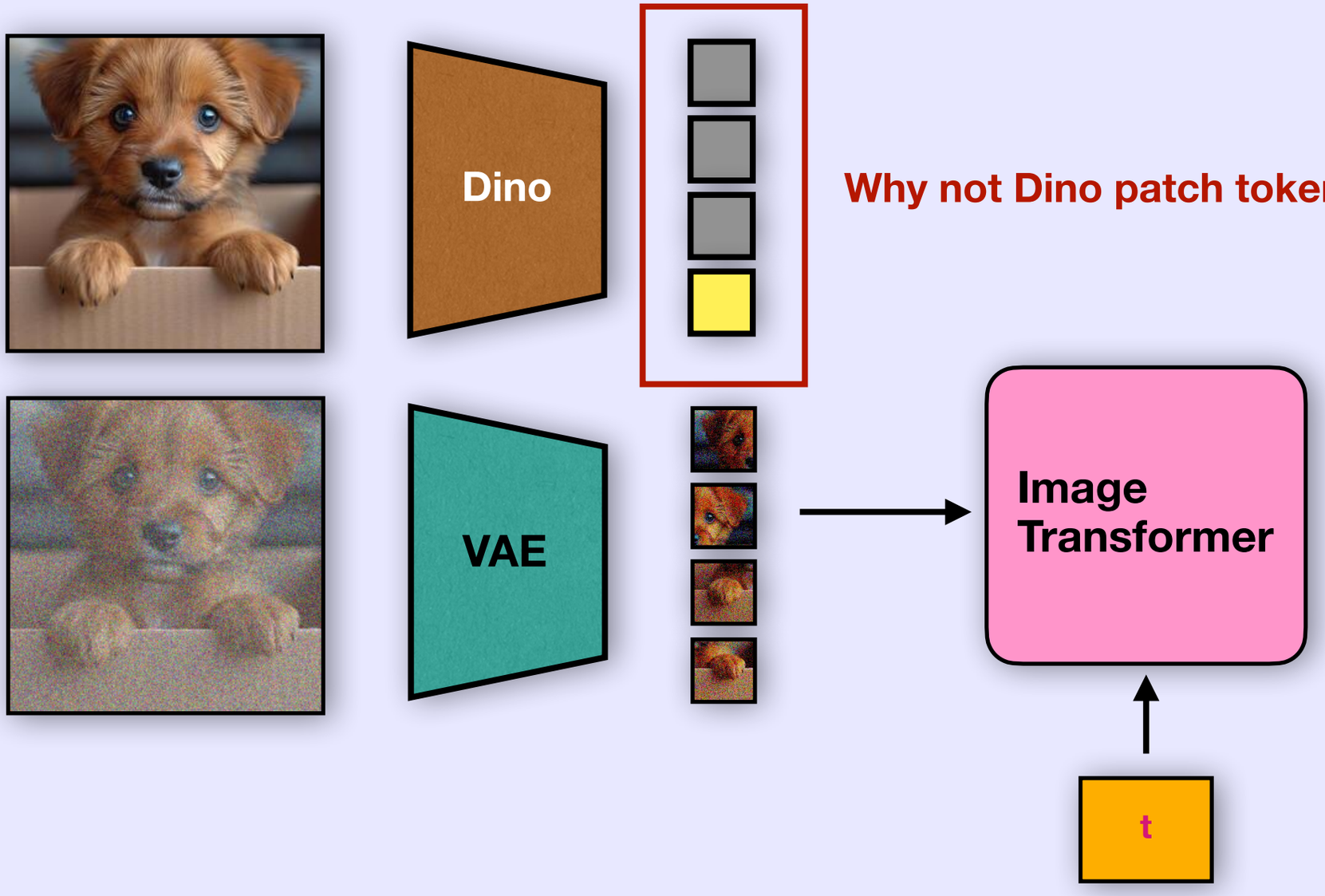
Co-denoising for Image Generation

Co-denoising with Dino class token!



Why not Dino patch tokens?

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Co-denoising for Image Generation

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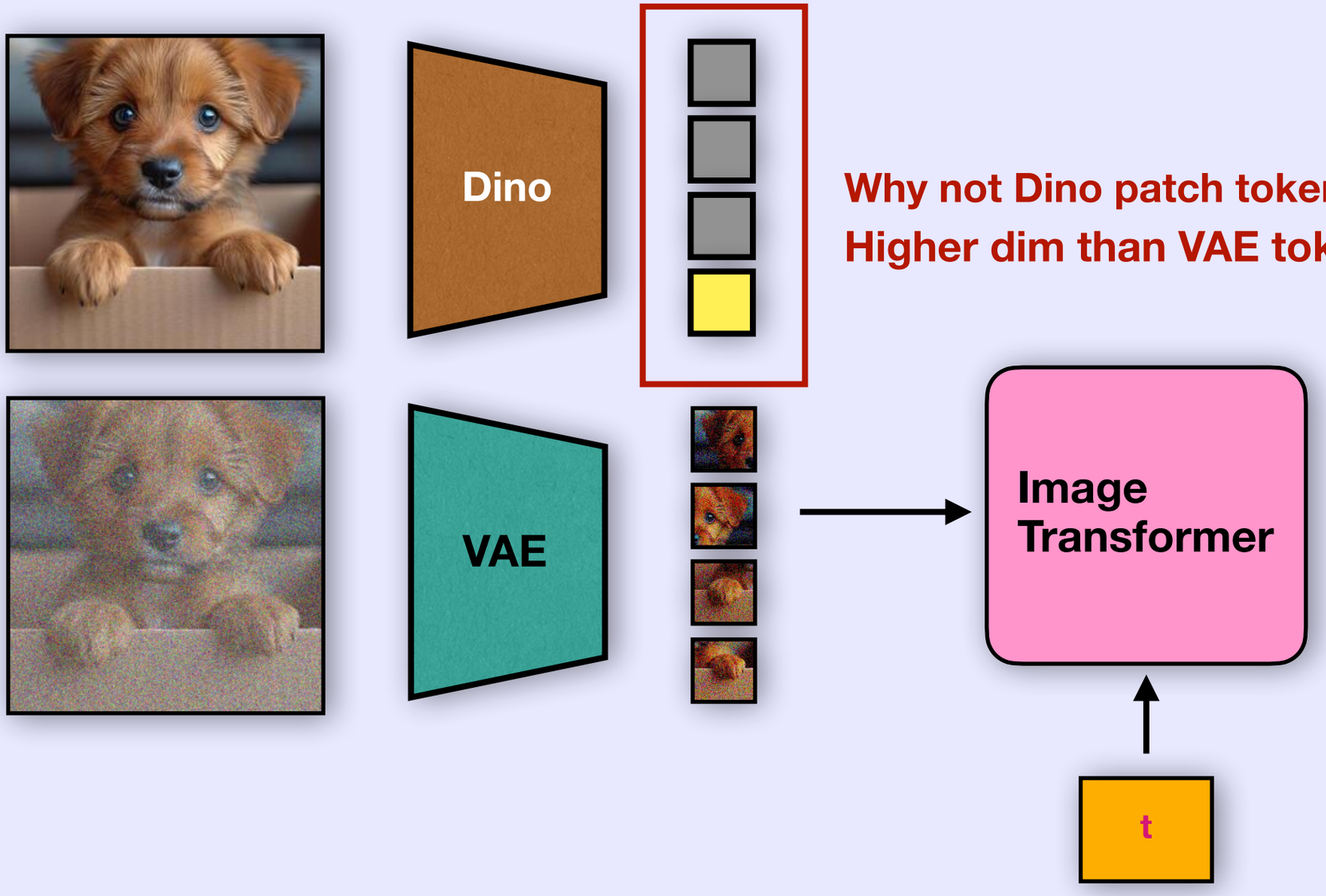


Why not Dino patch tokens?

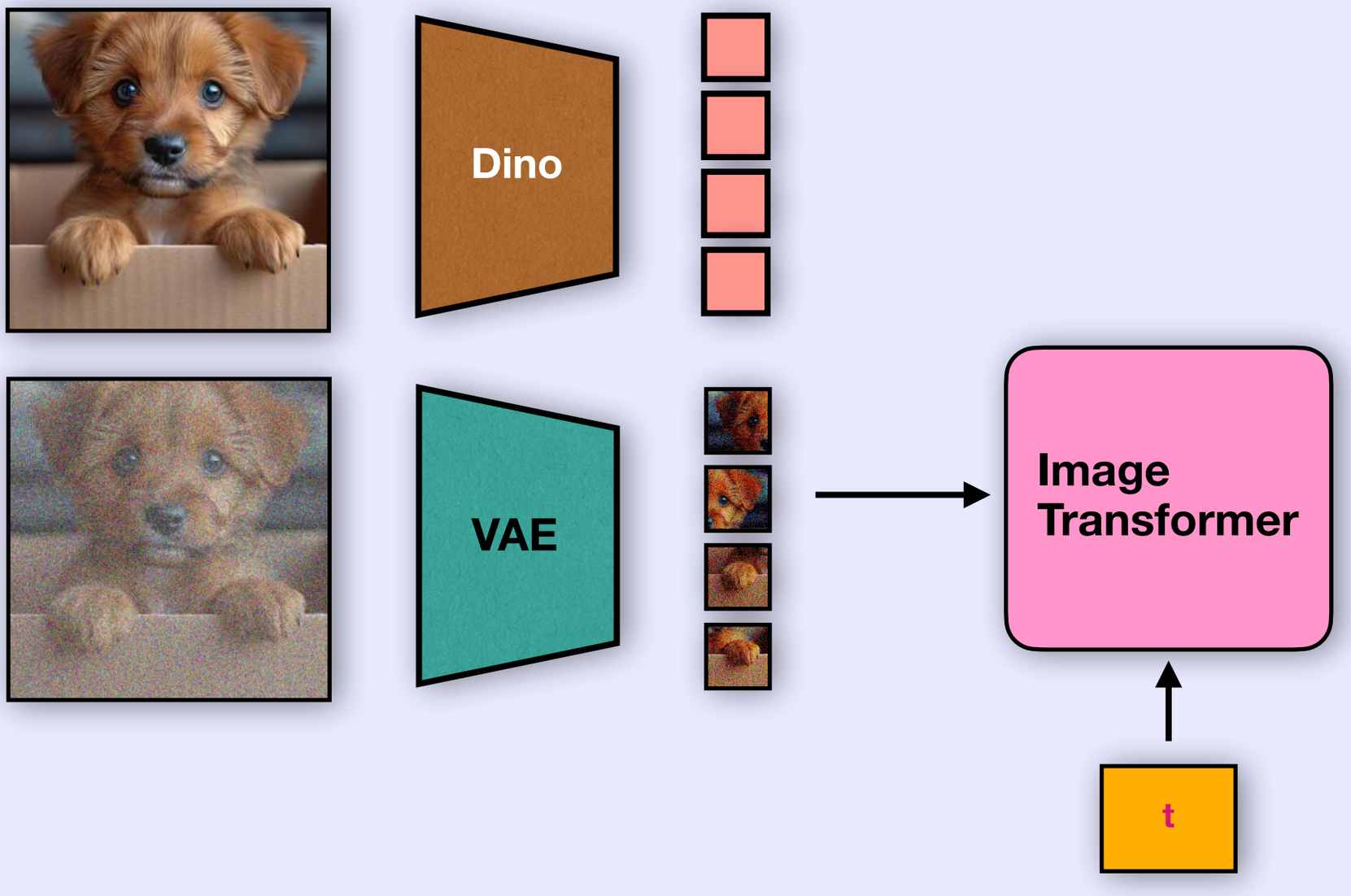
Higher dim than VAE tokens → Learns Shortcut!

Kouzelis, Theodoros, et al. "Boosting Generative Image Modeling via Joint Image-Feature Synthesis." ICLR 2025.

Co-denoising for Image Generation

Co-denoising with Dino patch tokens!

Dim. Reduction w/ PCA



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Co-denoising for Image Generation

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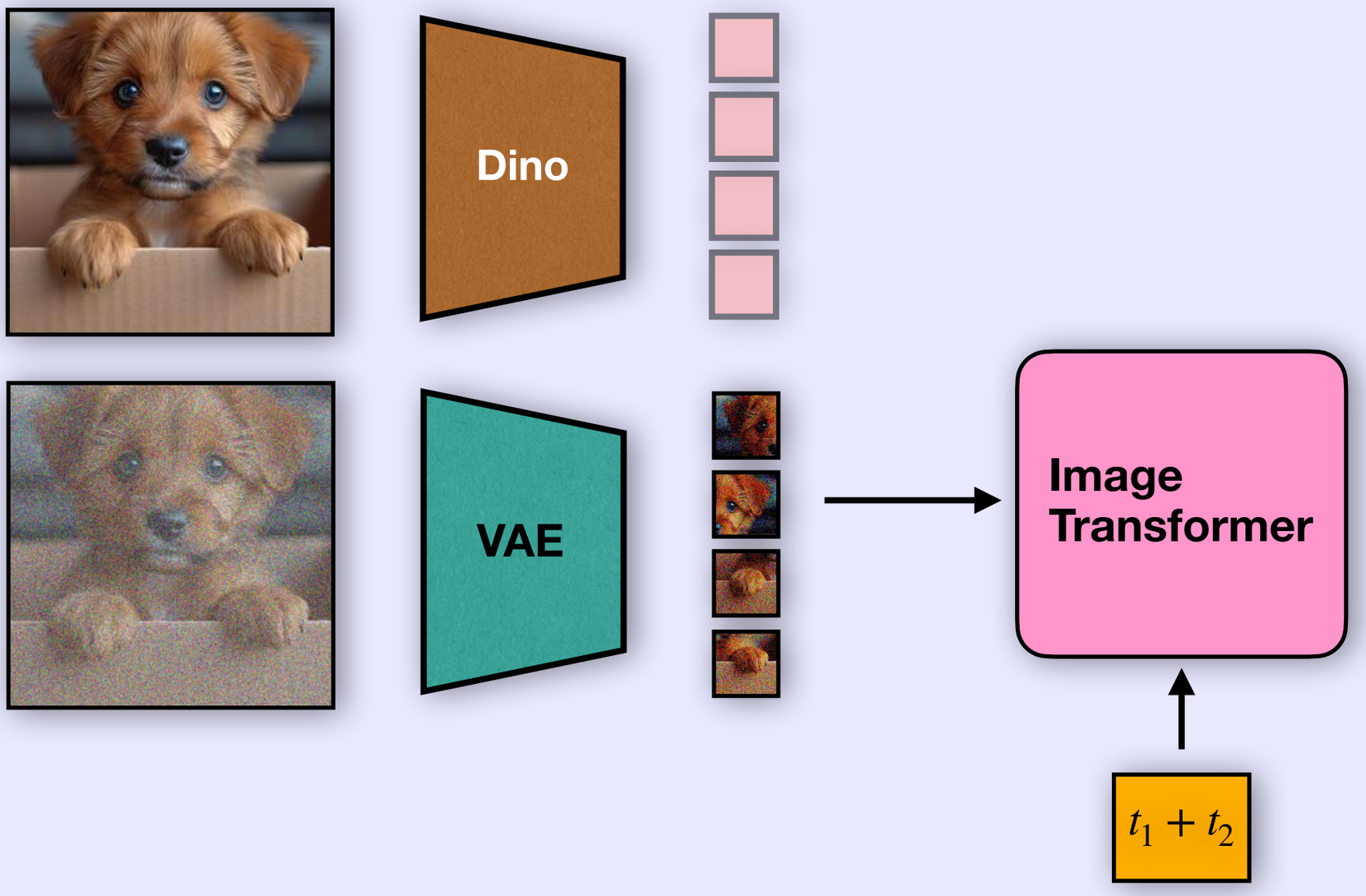

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Co-denoising for Image Generation

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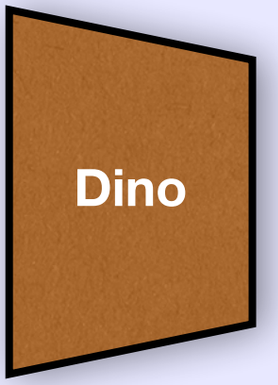

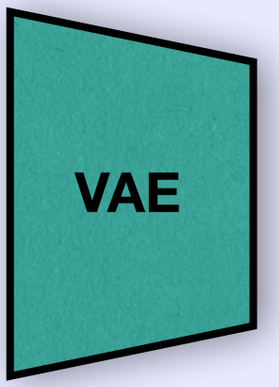

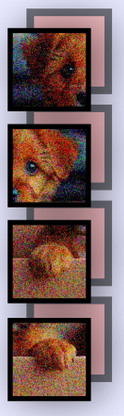

$t_1 + t_2$

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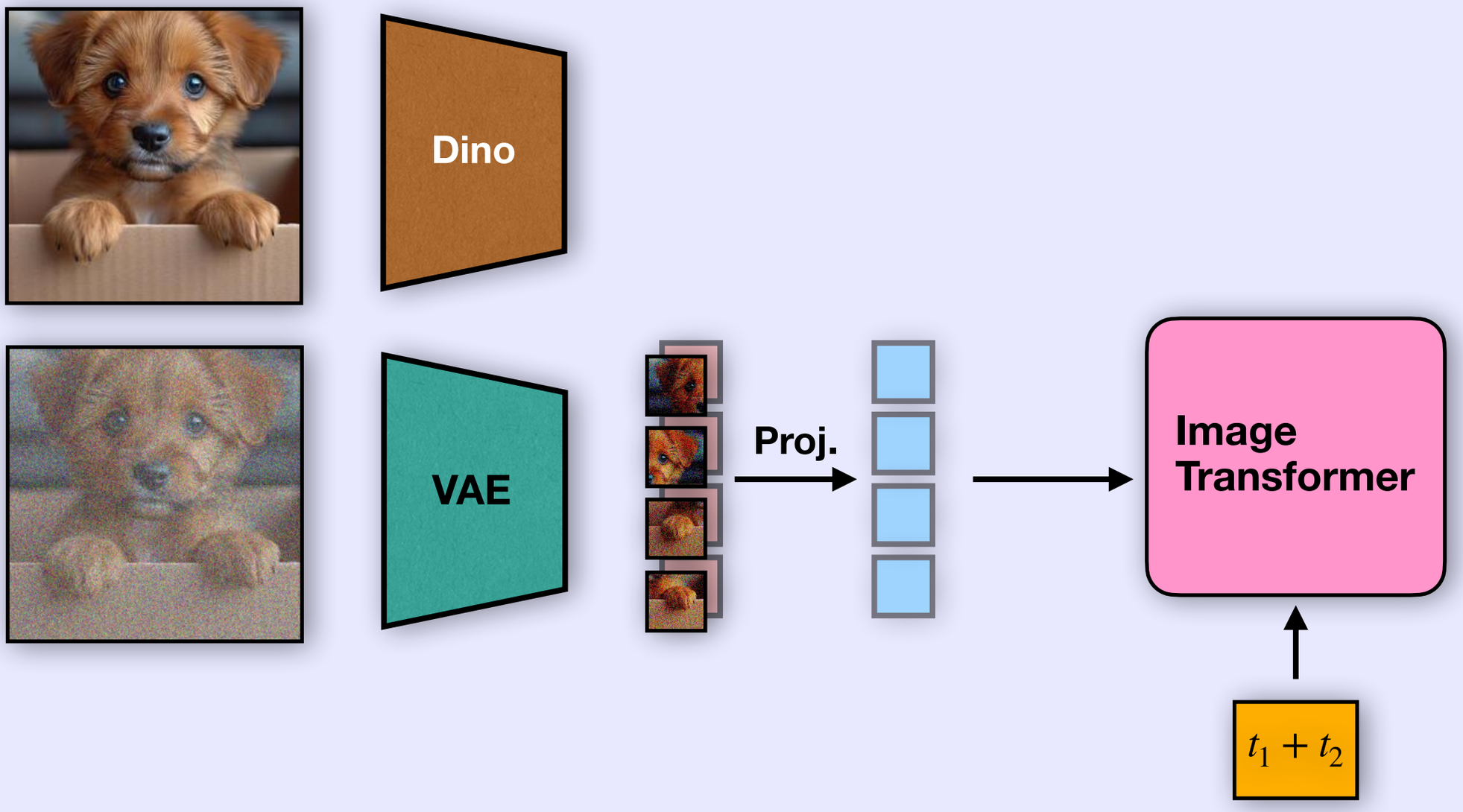
Co-denoising for Image Generation

Co-denoising with Dino patch tokens!

Dim. Reduction w/ PCA



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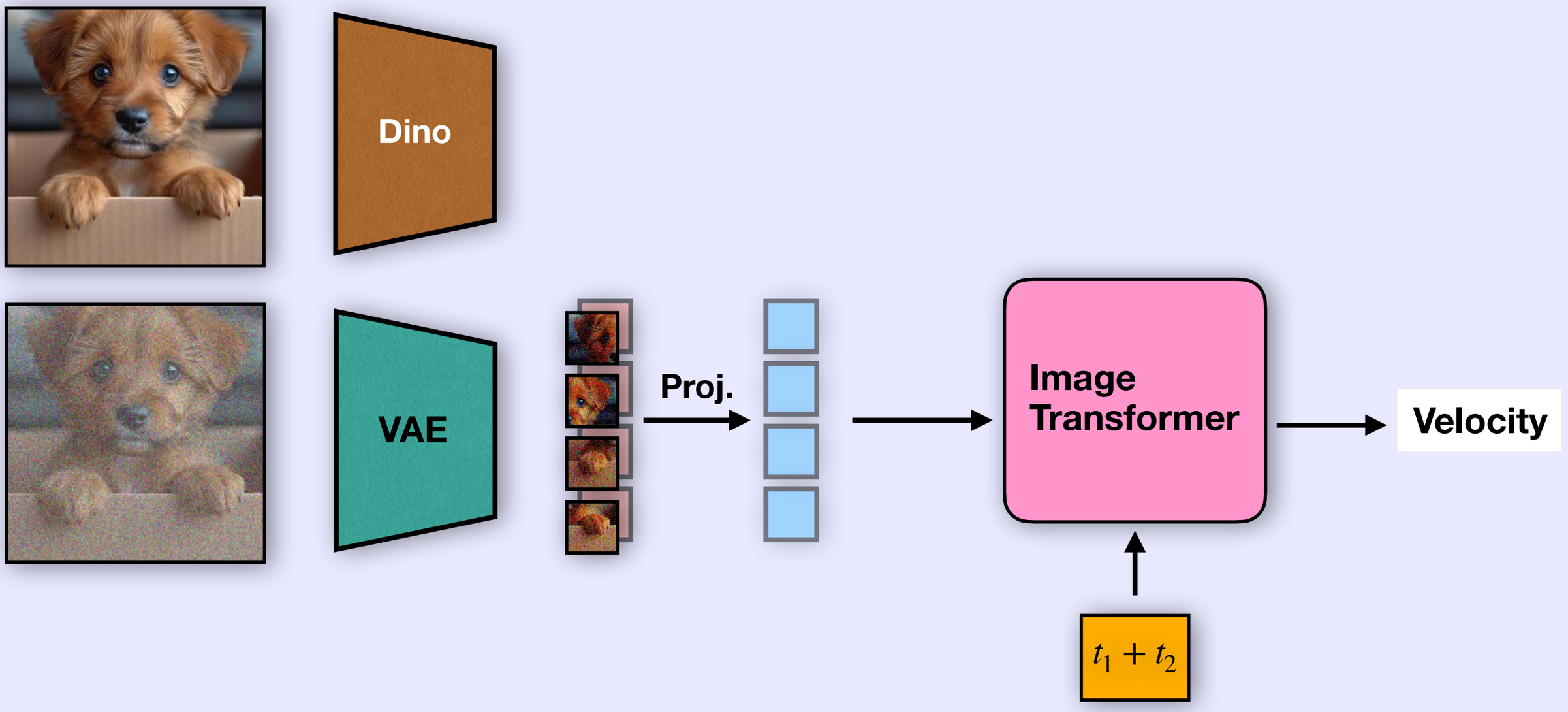

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Co-denoising for Image Generation

Co-denoising with Dino patch tokens!

Faster Convergence

Forced to decode even better representation!!!!

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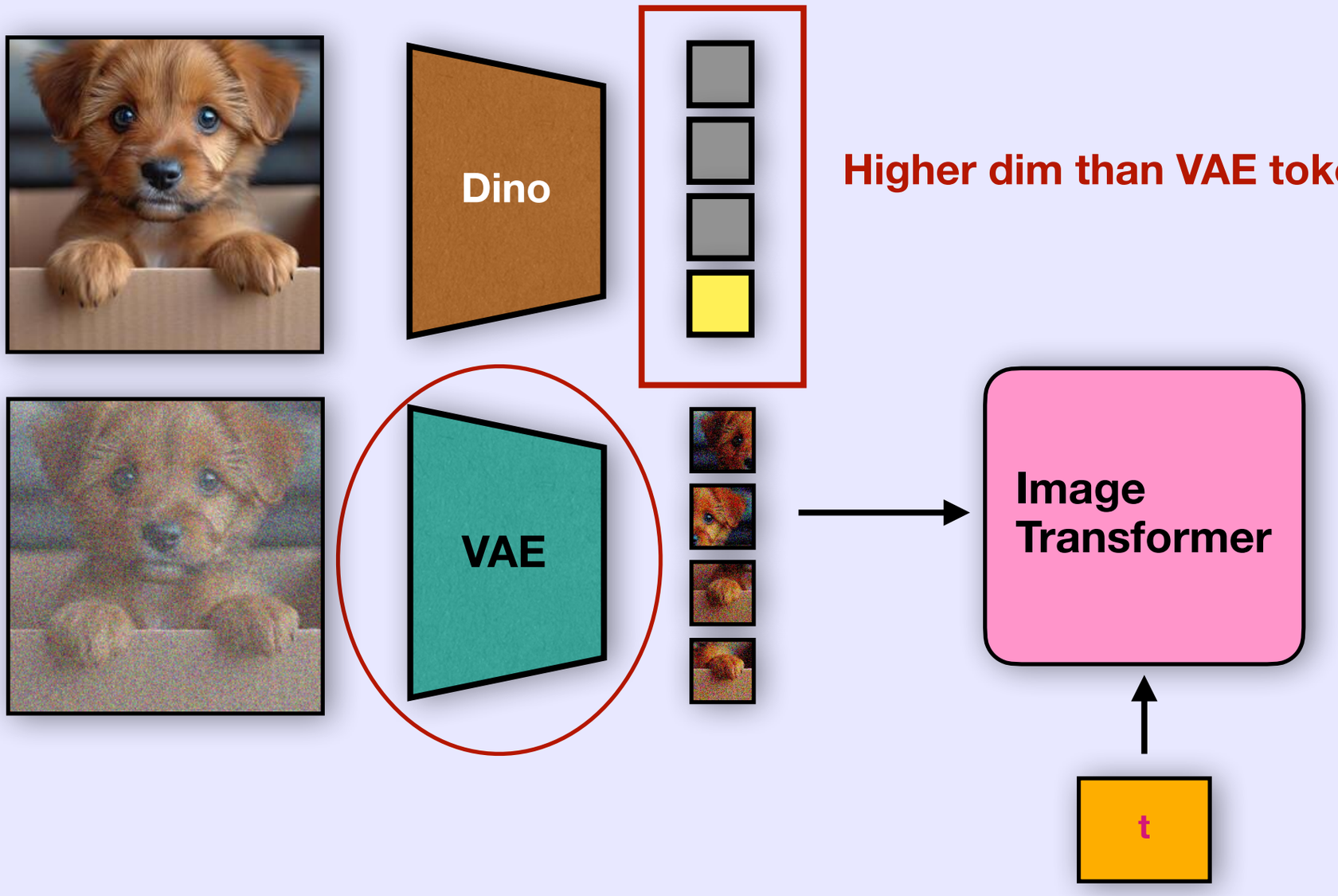
Co-denoising for Image Generation

Co-denoising with Dino patch tokens!

Why PCA?



Higher dim than VAE tokens → Learns Shortcut!

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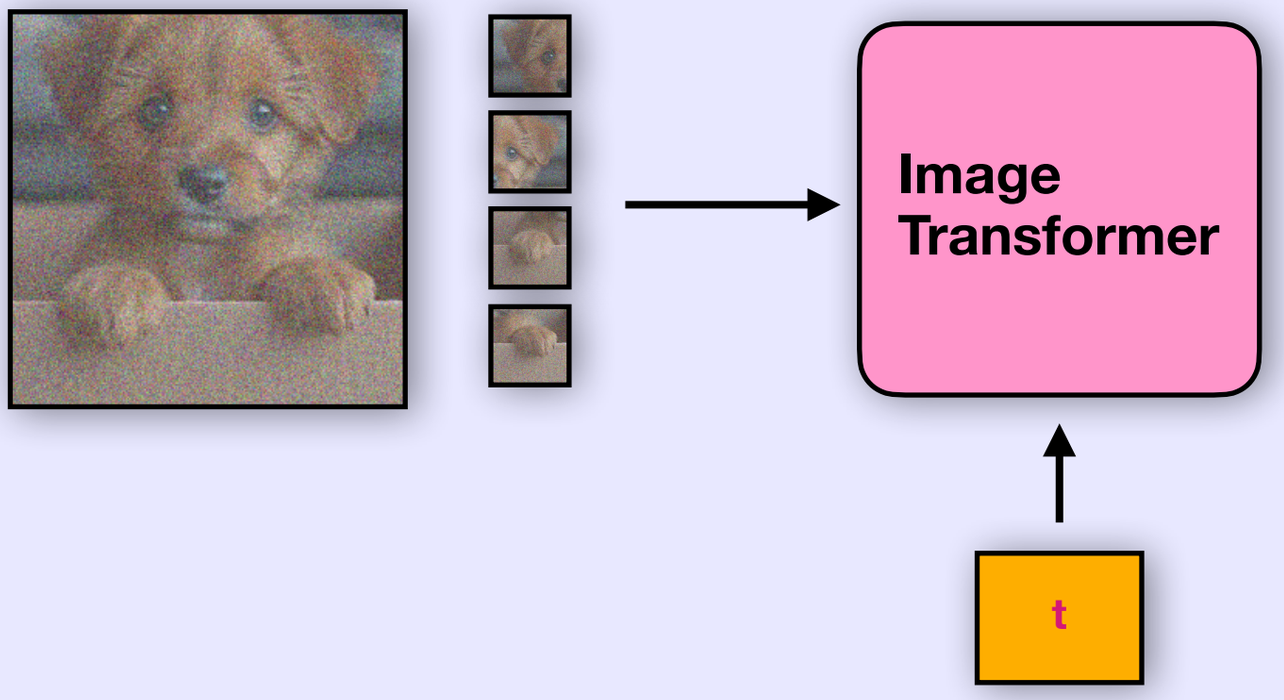
Co-denoising for Image Generation

Pixel Models are a thing!!! So no more VAE!



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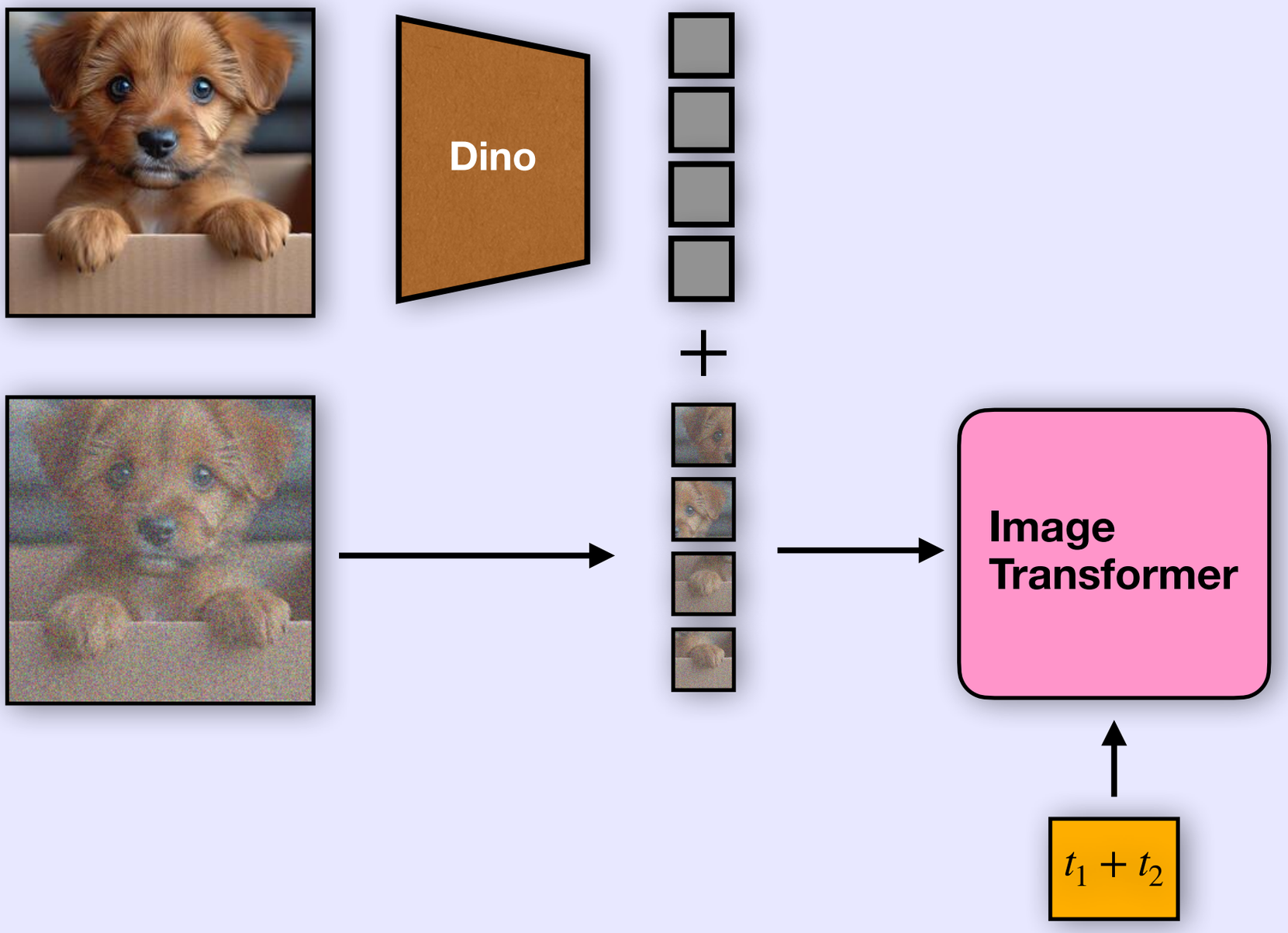
Co-denoising for Image Generation

Pixel Models + Raw Dino!!



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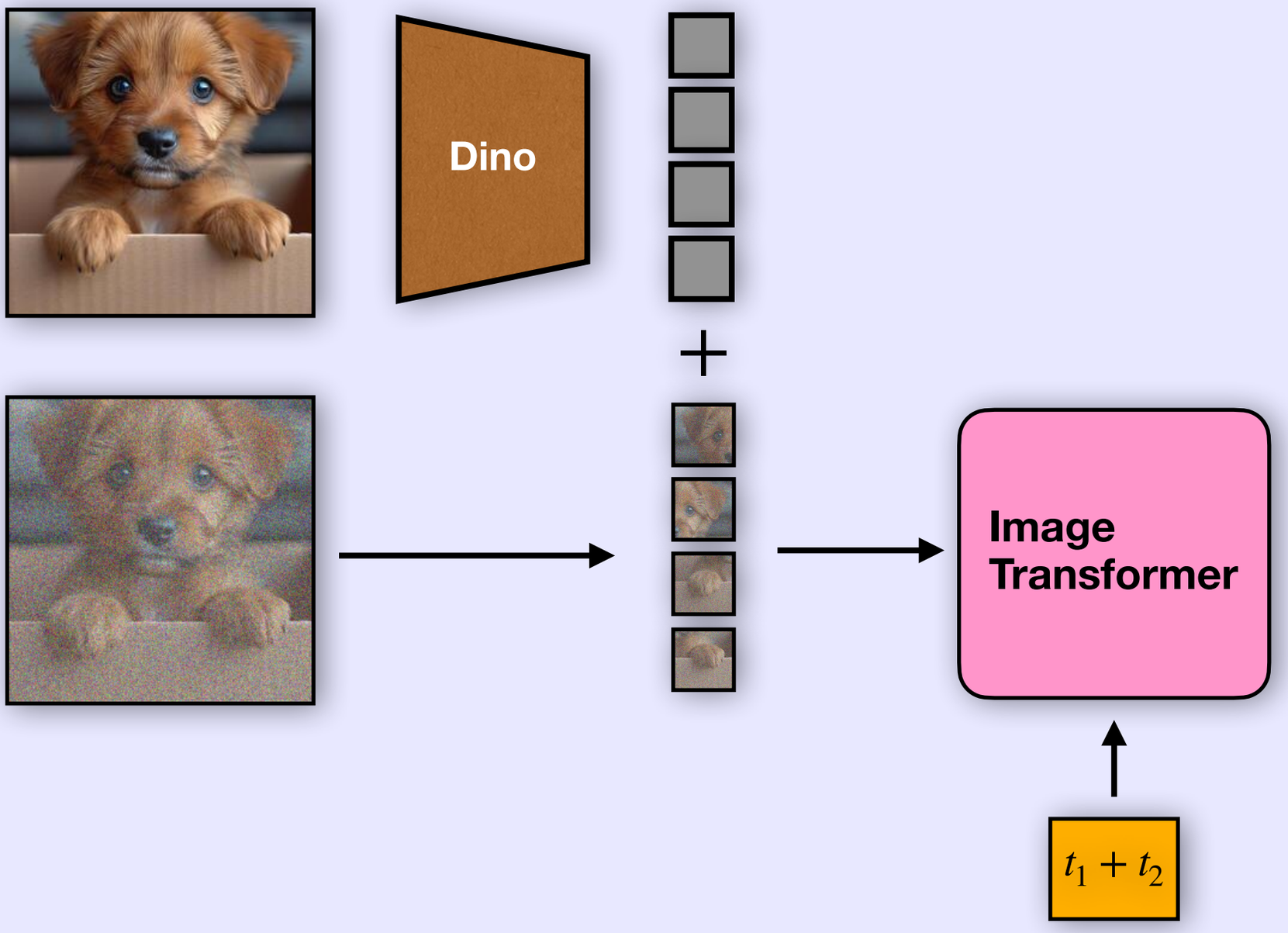
Co-denoising for Image Generation

Pixel Models + Raw Dino!!

How to get 2 velocities?



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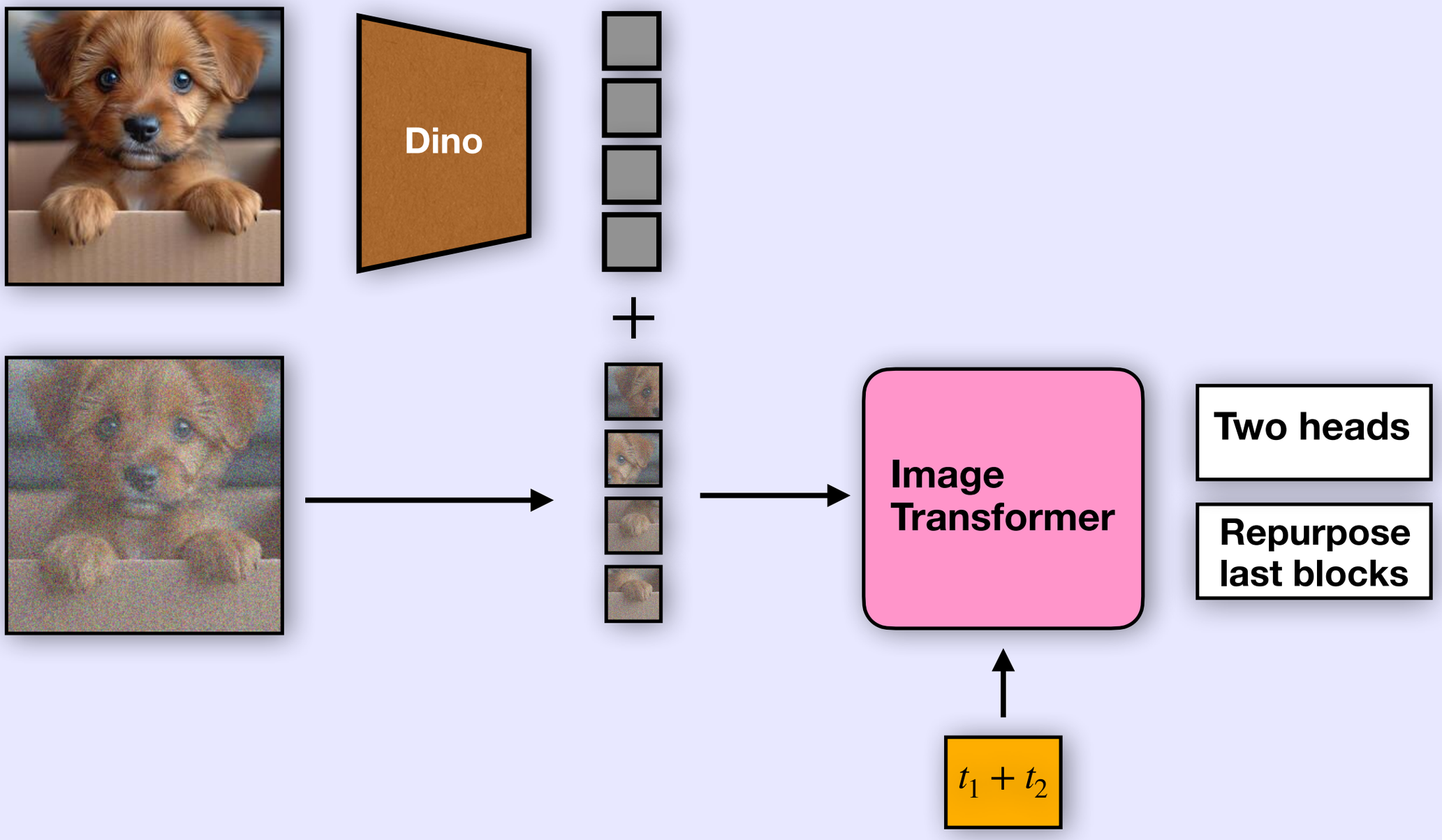

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Co-denoising for Image Generation

Pixel Models + Raw Dino!!

Cool Insight: Denoise Dino features faster than Image features!

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Co-denoising for Image Generation

All previous models!

Cool Insight: An intristic guidance to image generation!

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Co-denoising for Image Generation

All previous models!

RANT: Does **denoising DINO features** make any sense?

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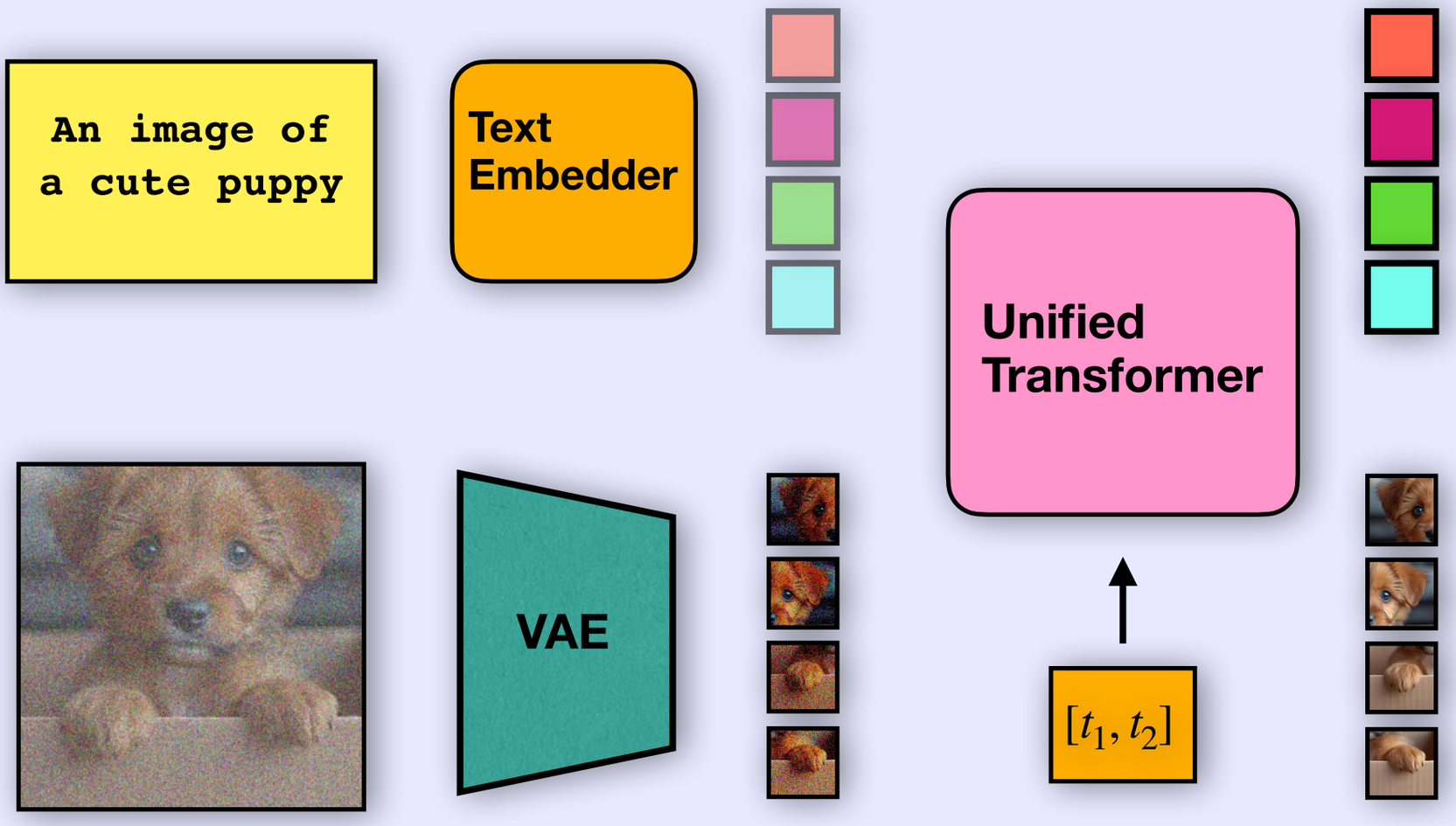
Co-denoising!

Denoise something meaningful!

Bao, Fan, et al. "One Transformer Fits All Distributions in Multi-Modal Diffusion at Scale." CVPR 2023.

Co-denoising!

Denoise text and image together!!!!



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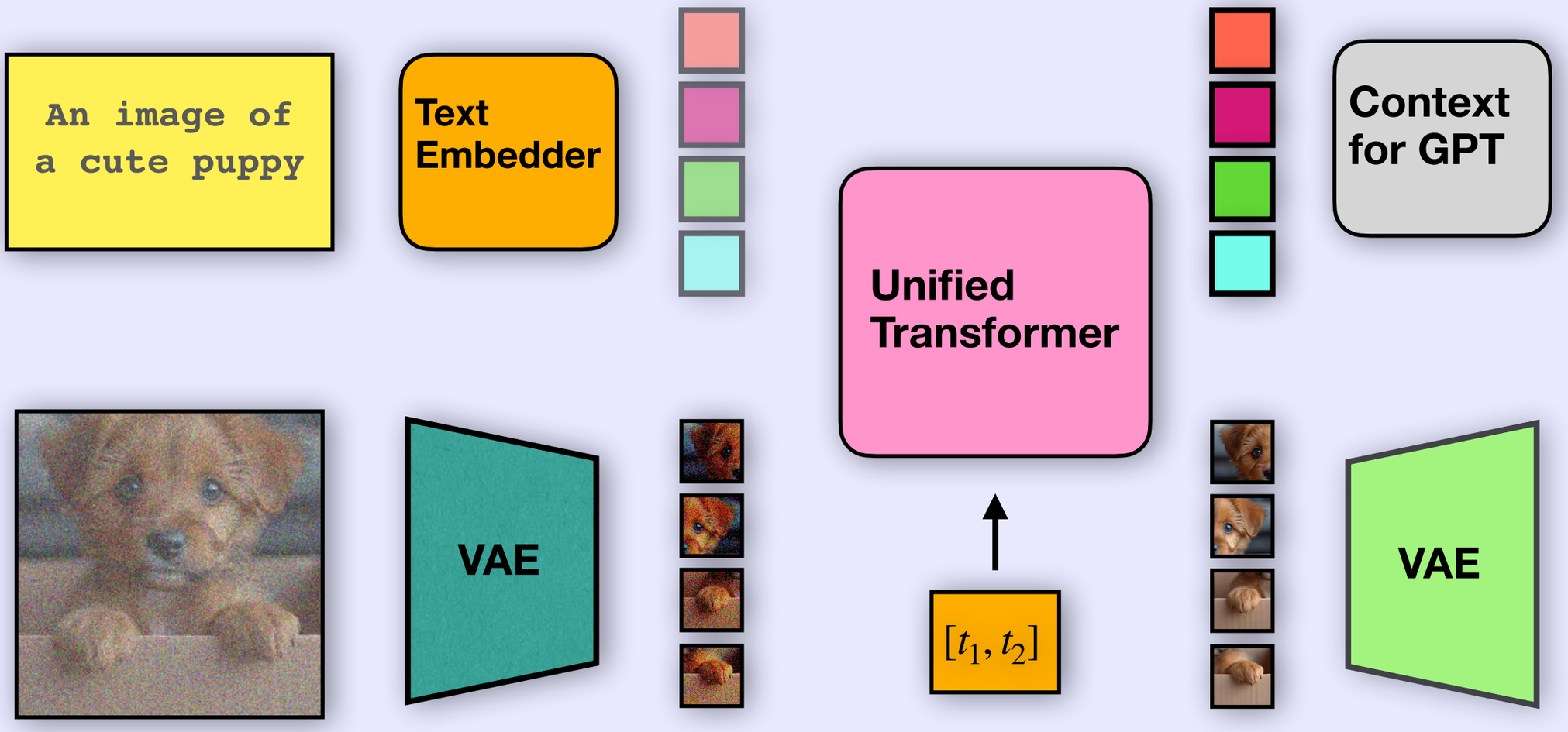

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Co-denoising!

Denoise text and image together!!!!

Cool thing: Learn **conditional and marginal** in one framework!

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Co-denoising!

Denoise text and image together!!!!

A guess: Two **t** with two different modalities; slower convergence!

Bao, Fan, et al. "One Transformer Fits All Distributions in Multi-Modal Diffusion at Scale." CVPR 2023.

This was the amazing idea in Marseille ;)

But with something else as an application ;)

Thank you!