Guide-and-Rescale

Self-guidance Mechanism for Effective Tunning-Free Real Image Editing

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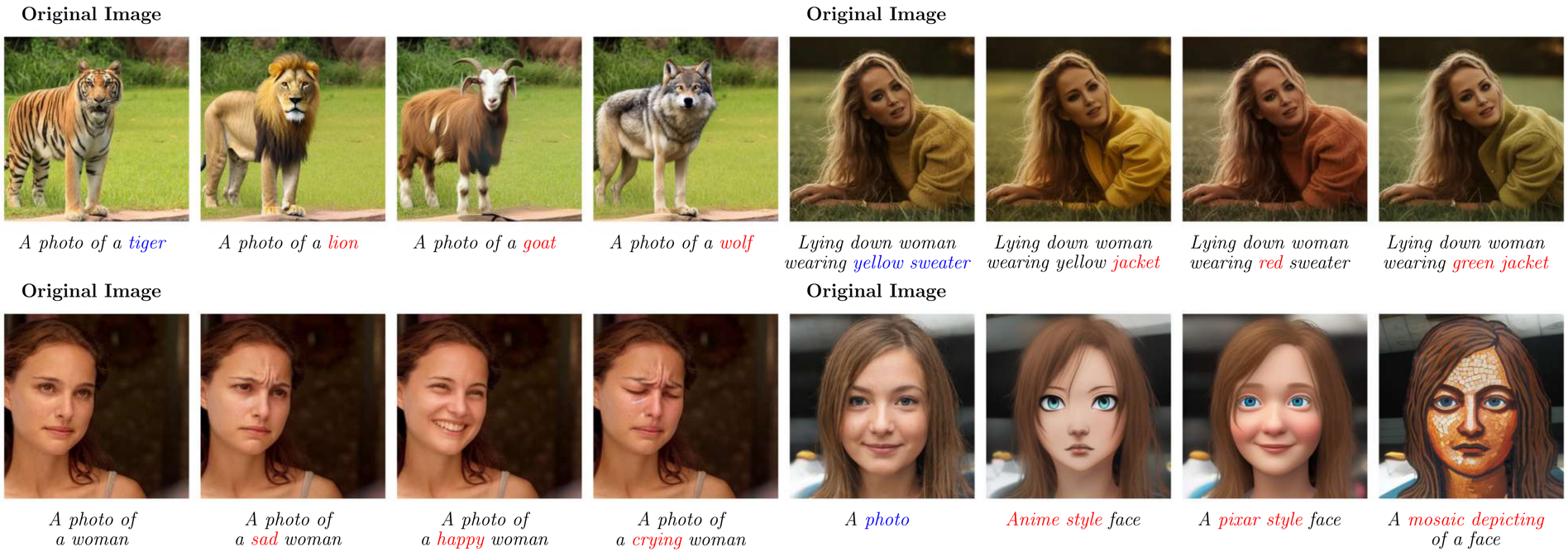
Paper summary

Introduction, Problem Statement

- Challenge
  - Manipulating real images with t2im models while preserving original structure



Paper summary
Introduction, Baselines

- Existing approaches
  - Fine-tuning (Memory Intensive + Time Consuming)
  - Internal representation exchange (Limited versatility)
  - High-quality reconstruction (Time consuming)

Paper summary

Introduction, Key contributions

- Proposed Framework: Guide-and-Rescale
  - Guidance technique to preserve original structure
  - No-fine tuning or exact inversion required
- Key benefits:
  - Controllable structure preservation via special guidance
  - Automative Noise Rescaling technique
  - Best balance between edit quality and original image preservation

Technical Details

Guidance recap

- Classifier guidance & classifier-free guidance

$$\hat{\epsilon}_t = \epsilon_\theta(z_t; t, y) - s\sigma_t \nabla_{z_t} \log p(y|z_t)$$

$$\hat{\epsilon}_t = (1+s)\epsilon_\theta(z_t; t, y) - s\epsilon_\theta(z_t; t, \emptyset)$$

- Combined guidance approach

$$\hat{\epsilon}_t = (1+s)\epsilon_\theta(z_t; t, y) - s\epsilon_\theta(z_t; t, \emptyset) + v\sigma_t \nabla_{z_t} g(z_t; t, y)$$

Technical Details

Proposed guidance scheme

$$\hat{\varepsilon}_\theta(z_t, t, y) = \mathrm{CFG}(z_t, t, y_{\mathrm{trg}}, 7.5) + v \cdot \nabla_{z_t} g(z_t, z_t^*, t, y_{\mathrm{src}}, \mathcal{I}^*, \bar{\mathcal{I}})$$

- Self-attention guider

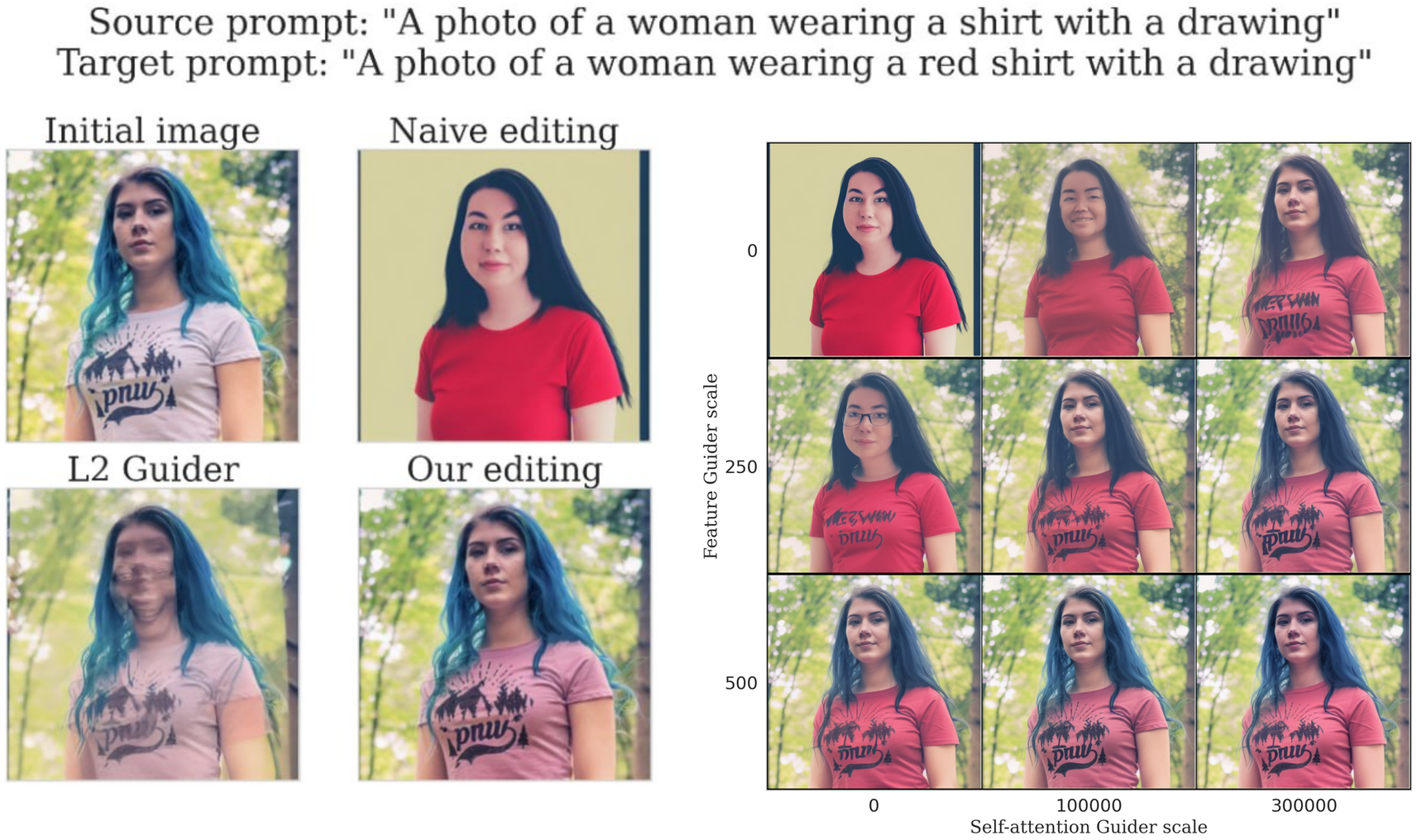
$$g(z_t, z_t^*, t, y_{\mathrm{src}}, \{\mathcal{A}_i^{*\mathrm{self}}\}, \{\bar{\mathcal{A}}_i^{\mathrm{self}}\}) = \sum_{i=1}^{L} \mathrm{mean} \|\mathcal{A}_i^{*\mathrm{self}} - \bar{\mathcal{A}}_i^{\mathrm{self}}\|_2^2$$

- Feature guider

$$g(z_t, z_t^*, t, y_{\mathrm{src}}, \Phi^*, \bar{\Phi}) = \mathrm{mean} \|\Phi^* - \bar{\Phi}\|_2^2$$

Technical Details

Proposed guidance scheme, motivation



Technical Details

Rescaling technique

- Overall guidance scheme

$$\epsilon_t = \varepsilon_\theta(z_t, t, \varnothing) + w\big(\varepsilon_\theta(z_t, t, y) - \varepsilon_\theta(z_t, t, \varnothing)\big) + \\ + \gamma \sum_i v_i \cdot \nabla_{z_t} g_i(z_t, z_t^*, t, y_{\text{src}}, \mathcal{I}^*, \overline{\mathcal{I}}),$$

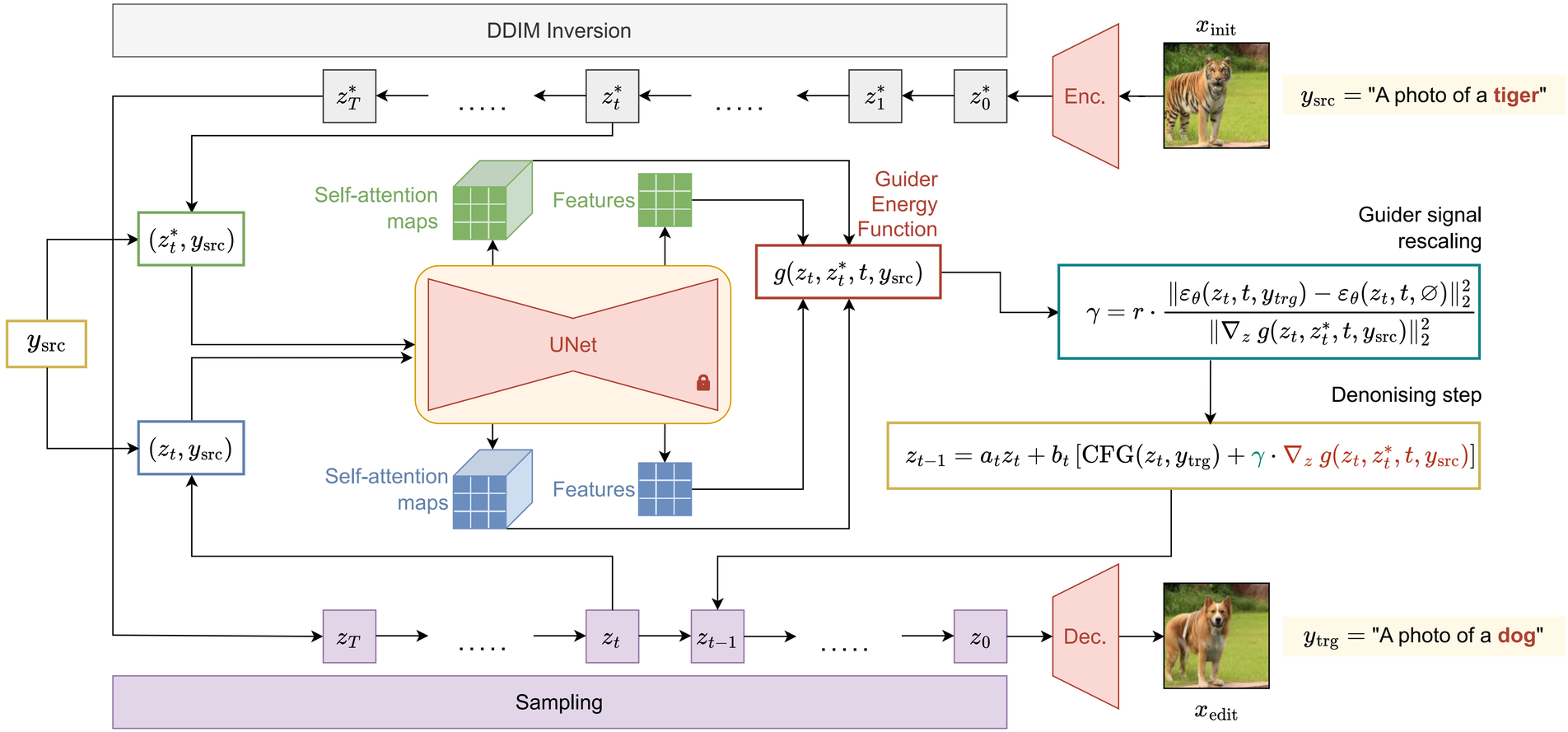
- Automative rescaling scheduling

$$r_{\text{cur}}(t) = \frac{\| w\big(\varepsilon_\theta(z_t, t, y) - \varepsilon_\theta(z_t, t, \varnothing)\big) \|_2^2}{\| \sum_i v_i \cdot \nabla_{z_t} g_i(z_t, z_t^*, t, y_{\text{src}}) \|_2^2},$$

$$\gamma = r \cdot r_{\text{cur}}(t).$$

Technical Details

Overall pipeline



Results

Qualitative

Results

Quantitative

Method	LPIPS ↓	CLIP ↑	FID ↓	Time (s) ↓
ProxMasaCtrl [5]	0.267	0.215	94.53	12.94
MasaCtrl [2]	0.306	0.223	100.62	13.73
EDICT [27]	<u>0.221</u>	0.229	47.13	68.13
P2P [6] + NTI [15]	0.279	0.233	42.46	66.77
P2P [6] + NPI [14] Prox [5]	**0.170**	0.233	43.16	8.59
P2P [6] + NPI [14]	0.251	0.234	44.05	8.54
PnP [24]	0.366	**0.256**	<u>39.55</u>	197.0
Guide-and-Rescale (ours)	0.228	<u>0.243</u>	**39.07**	24.26

Contacts

HF Demo:

Code:

Project page:

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