# FreeDrag: Feature Dragging for Reliable Point-based Image Editing
## Supplementary Material

Pengyang Ling[1]*    Lin Chen[1,2]*    Pan Zhang[2]    Huaian Chen[1†]    Yi Jin[1†]    Jinjin Zheng [1]

[1]University of Science and Technology of China    [2]Shanghai AI Laboratory

{lpyang27, chlin}@mail.ustc.edu.cn  {anchen, jinyi08, jjzheng}@ustc.edu.cn  zhangpan@pjlab.org.cn

Figure 1. Visual demonstration of the effect of adaptive updating and backtracking mechanism.

## 1. Ablation Study

We further explore the effect of the adaptive updating in the template feature and the backtracking mechanism in line search. As shown in Fig. 1, it is observed that FreeDrag fails to accurately reach the assigned target points without adaptive updating, this is because the stationary template feature cannot provide strong motion guidance for continuous movement towards target points. Meanwhile, it can also be observed in Fig. 1 that unsatisfactory dragging editing appears without the aid of the backtracking mechanism, which can be attributed to the absence of prompt self-correcting under abnormal cases. Therefore, it is concluded that a better dragging editing necessitates both adaptive updating and the backtracking mechanism.

## 2. Limitation

Freedrag achieves image manipulation with a reliance on the 2D dragging instructions, which may be limited in certain 3D editing scenarios due to potential ambiguity. As can be observed in Fig. 2, an intention of "head up" might result in a "resized shape" instead.

## 3. Visual Comparison

We conduct more experiments to compare FreeDrag with DragGAN[2] and DragDiffusion[3] in StyleGAN2[1] models and Diffusion models, respectively. As shown in Fig. 3,
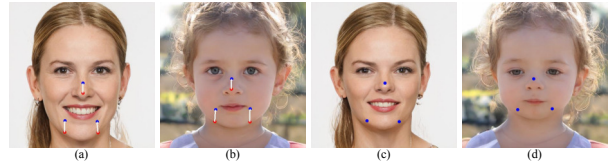


Figure 2. Limitations of 2D dragging instructions. (a)-(b): Dragging instructions. (c)-(d): Edited results.

FreeDrag attains the editing results with more precise dragging, and also gains high-quality structure preservation (see Fig. 4), indicating superior dragging editing. The same situation can also be observed in real image editing. As shown in Fig. 5, FreeDrag better achieves dragging editing with higher performance in preserving original structure, leading to reliable point-based image editing.

## References

[1] Tero Karras, Samuli Laine, Miika Aittala, Janne Hellsten, Jaakko Lehtinen, and Timo Aila. Analyzing and improving the image quality of stylegan. In *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*, pages 8110–8119, 2020. 1

[2] Xingang Pan, Ayush Tewari, Thomas Leimkühler, Lingjie Liu, Abhimitra Meka, and Christian Theobalt. Drag your GAN: Interactive point-based manipulation on the generative image manifold. *arXiv preprint arXiv:2305.10973*, 2023. 1

[3] Yujun Shi, Chuhui Xue, Jiachun Pan, Wenqing Zhang, Vincent YF Tan, and Song Bai. Dragdiffusion: Harnessing diffusion models for interactive point-based image editing. *arXiv preprint arXiv:2306.14435*, 2023. 1
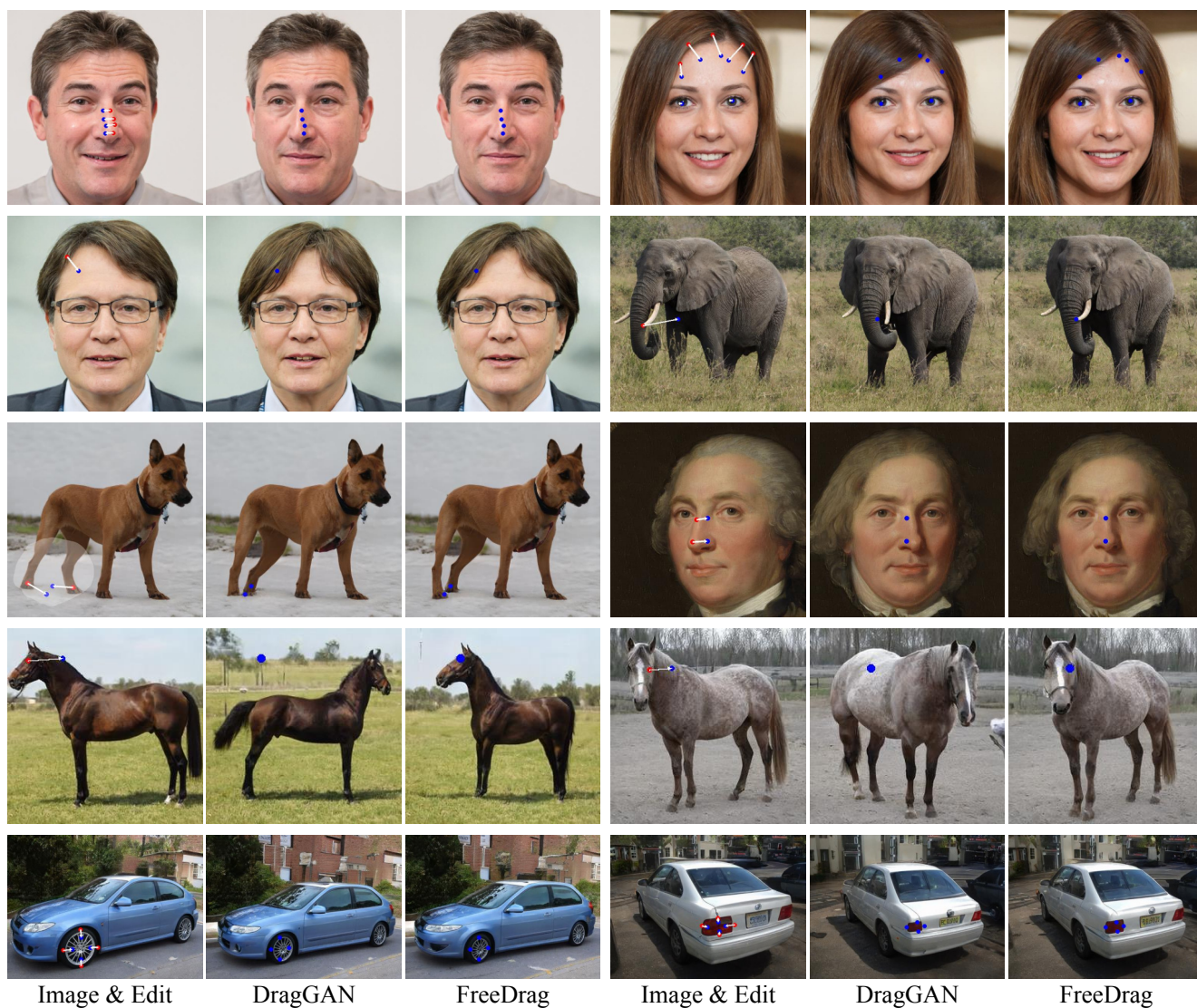
| Image & Edit | DragGAN | FreeDrag | Image & Edit | DragGAN | FreeDrag |

Figure 3. Visual comparison in GAN-based dragging results. FreeDrag achieves more precise point-based dragging editing.

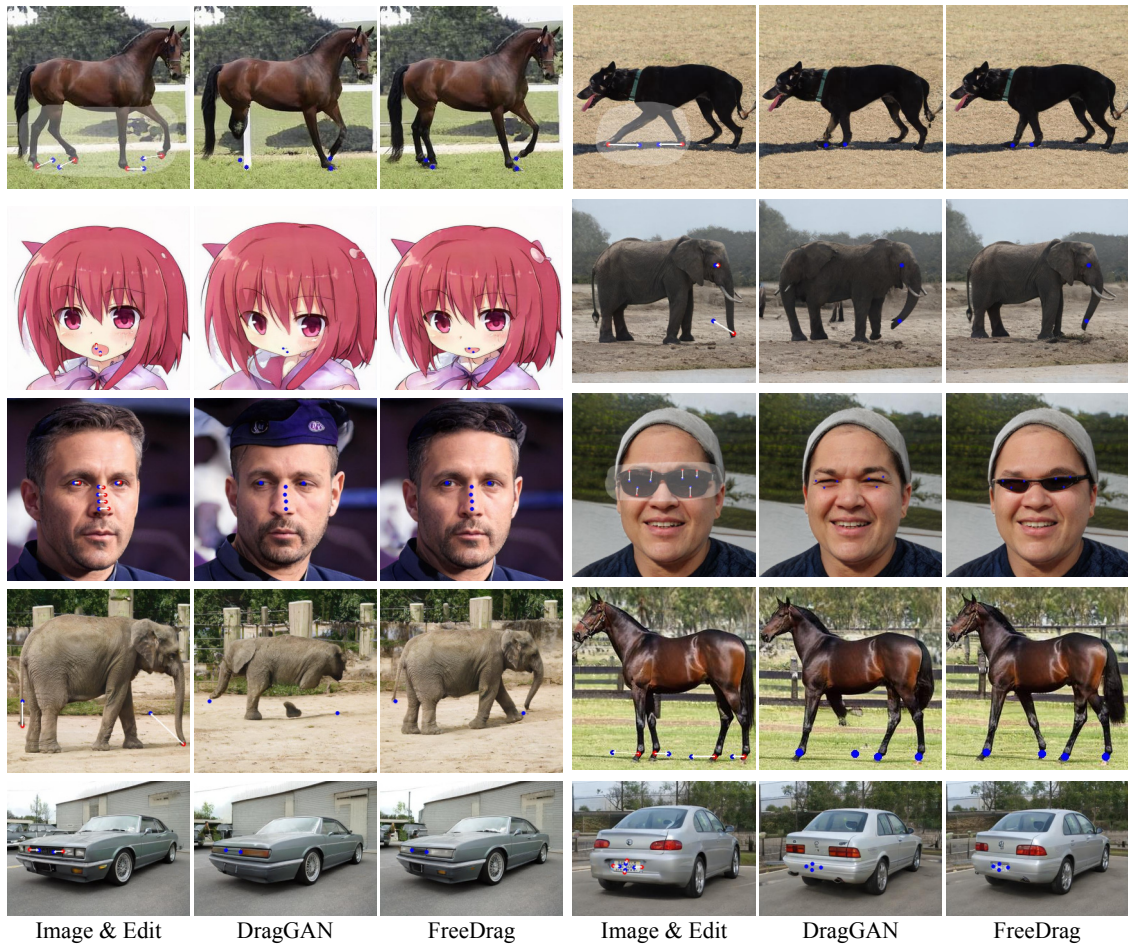| Image & Edit | DragGAN | FreeDrag | Image & Edit | DragGAN | FreeDrag |

Figure 4. Visual comparison in GAN-based dragging results. FreeDrag achieves superior preservation of original structure.
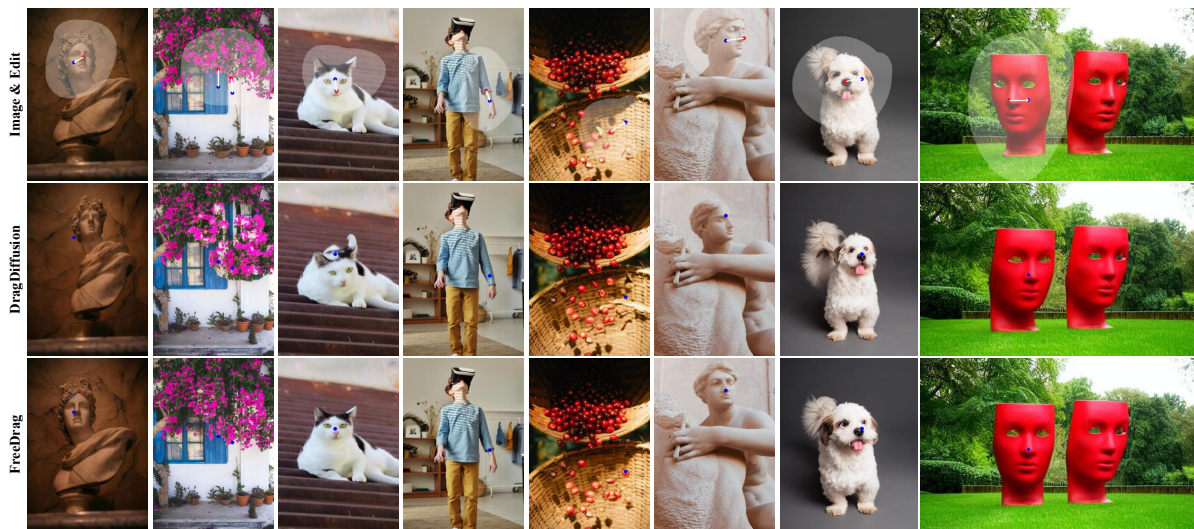


Figure 5. Visual comparison in real image editing. FreeDrag outperforms DragDiffusion in precise dragging and structure preservation.