Exploring Semantic Consistency in Image Super-Resolution

<u>Introduction:</u>

Image super-resolution (SR) reconstructs high-resolution images from degraded low-resolution images. Although current SR techniques are producing satisfying results, some of the results can be hallucinated, leading to semantic drift with the expected outcomes, as shown in Fig. 1.
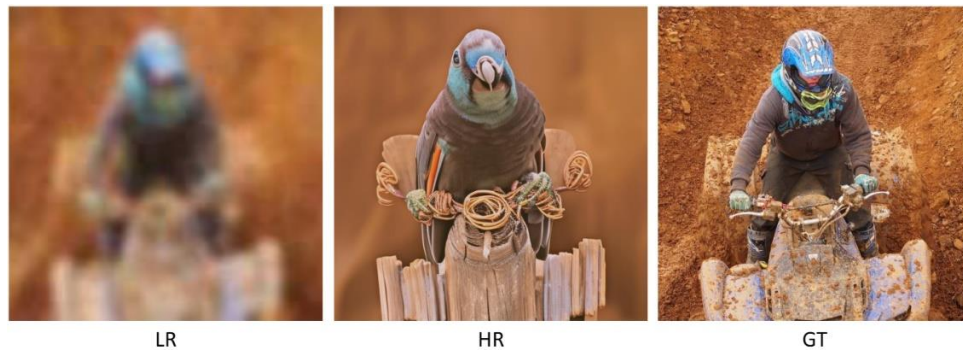

Fig. 1. Given a low-resolution (LR) input, current SR method [1] can generate result (HR) that have good visual quality but semantically incorrect from the ground-truth (GT) image.

In this project, you will explore different types of semantic drifts produced by advanced SR models, you will then design and develop models to measure the semantic consistency between images, finally, you will curate existing SR models guided by the semantic consistency measurement, pushing forward the accuracy of state-of-the-art SR models.

<u>What you will do:</u>

- Become familiar with state-of-the-art SR models and test them on various images to produce semantically consistent/inconsistent results.
- Develop computational models to accurately measure the semantic consistency of SR results.
- Further tuning existing SR models with the semantic constraint to produce more faithful SR results.

<u>What you will learn:</u>

- Cutting-edge technologies in diffusion models, SR methods, etc.
- Image evaluation metrics that quantify the output quality of SR models.

[1] Rongyuan Wu, Tao Yang, Lingchen Sun, Zhengqiang Zhang, Shuai Li, and Lei Zhang. "Seesr: Towards semantics-aware real-world image super-resolution." In Proceedings of the IEEE/CVF conference on computer vision and pattern recognition, pp. 25456-25467. 2024.