Cover Letter

Yuming Chen

1 Introduction

My research interests lie in **human-centric computer vision** and **reinforcement learning from human feedback (RLHF)**. I am particularly interested in generative models for human-centric problems, such as pose estimation, motion prediction, eye tracking, etc. Additionally, further applications in human-AI interaction and related topics also attract me.

1.1 Alignment with Your Lab

My experiences and research interests align well with your excellent work in gaze estimation, motion prediction, and hand-object interaction (HOI). Previously, I conducted published works on 3D hand reconstruction. I also have experience in physics-based simulation (including robotic arm, dexterous hand and UAV) and multi-agent reinforcement learning (MARL). It could contribute to contact-rich HOI research and potential RLHF applications in human-centric tasks.

2 Related Experience

2.1 Opponent Modelling

I have explored the problem of cooperating with an unseen partner in the setting of mixed cooperative-competitive games[2], from the perspective of multi-agent reinforcement learning and game theory. Technically, we leverage contrastive learning to learn a consistent representation of the opponent's policy. This approach can be introduced in other tasks to enhance the zero-shot ability.

2.2 3D Hand Reconstruction from Blurry Monocular Images

Most current approaches focus on the blurriness problem in video, where the temporal information helps to reconstruct human motion. We recover hand motion from a single blurry image to utilise temporal information inherent in a single blurry image [1]. To overcome the ambiguity, we make multiple estimations for one image in a generative manner, and select the plausible ones with a learned selection module.

3 Future Plan

My proposed research directions include:

- generative model in 3D estimation and motion prediction.
- physics-based HOI estimation.
- self/weak/semi-supervised learning in human 3D estimation.

These ideas are preliminary, and I am eager to refine them to better align with the team. I am also open to any other related topics.

References

[1] Yuming Chen, Rongyu Chen, Zhongqun Zhang, Yihua Cheng, and Hyung Jin Chang. Multi-hypothesis 3d hand mesh recovering from a single blurry image. In *International Conference on Multimedia and Expo (ICME)*, 2025.

[2] Yuming Chen and Yuanheng Zhu. Policy representation opponent shaping via contrastive learning. In *International Conference on Neural Information Processing (ICONIP)*, 2023.