






Wei Mao, Australian National University

✉ wei.mao@anu.edu.au ☎ (+61) 416 912 345
115 North Rd, Canberra, Australia, ACT 2601

Education

- 2018 – present  **Ph.D., Australian National University, Canberra, Australia.**
(Expected to graduate at Jul. 2023)
Research topic: *3D Human Understanding*
Supervisor: Miaomiao Liu.
Collaborator: Mathieu Salzmann
Thesis: Human Motion Prediction: From Deterministic to Stochastic
- 2016 – 2018  **Master of computing (advanced), Australian National University, Canberra, Australia.**
Specialisations: Artificial Intelligence
- 2009 – 2013  **B.S., East China University of Science and Technology, Shanghai, China.**
Major: Information Engineering

Employment History

- 2022 – present  **Post-doc, Australian National University, Canberra, Australia.**
(Expect to finish at Jan. 2024)
Supervisor: Richard Hartley, Miaomiao Liu
- 2013 – 2016  **Software Engineer.** Dongyuan Computer Automation Engineering Co.,Ltd., Shanghai, China

Publications

Journal Articles






- 1 **Mao, W.**, Liu, M., Salzmann, M., & Li, H. (2021). Multi-level motion attention for human motion prediction. *International Journal of Computer Vision*.
- 2 Yang, J., **Mao, W.**, Alvarez, J. M., & Liu, M. (2021). Cost volume pyramid based depth inference for multi-view stereo. *IEEE Transactions on Pattern Analysis and Machine Intelligence*.

Conference Proceedings


- 1 **Mao, W.**, Liu, M., Hartley, R., & Salzmann, M. (2022). Contact-aware human motion forecasting. In *Advances in neural information processing systems*.
- 2 **Mao, W.**, Liu, M., & Salzmann, M. (2022). Weakly-supervised action transition learning for stochastic human motion prediction. In *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*.
- 3 **Mao, W.**, Liu, M., & Salzmann, M. (2021). Generating smooth pose sequences for diverse human motion prediction. In *Proceedings of the IEEE/CVF international conference on computer vision* (pp. 13309–13318).
- 4 **Mao, W.**, Liu, M., & Salzmann, M. (2020). History repeats itself: human motion prediction via motion attention. In *European conference on computer vision*.

- 5 Yang, J., **Mao, W.**, Alvarez, J. M., & Liu, M. (2020). Cost volume pyramid based depth inference for multi-view stereo. In *Proceedings of the ieee/cvf conference on computer vision and pattern recognition*.
- 6 **Mao, W.**, Liu, M., Salzmann, M., & Li, H. (2019). Learning trajectory dependencies for human motion prediction. In *Proceedings of the ieee/cvf international conference on computer vision*.



Teaching

- 2022  **Guest Lecturer:** Advanced Computer Vision (ENGN8501), ANU.
- 2021  **Tutor:** Artificial Intelligence (COMP3620), Computer Vision (ENGN6528), ANU.
- 2019  **Tutor:** Computer Vision (ENGN6528), ANU.
- 2018  **Tutor:** Artificial Intelligence (COMP3620), Relational Database (COMP6240), ANU.
- 2017  **Tutor:** Relational Database (COMP6240), ANU.

Academic Service

- Reviewer  **CVPR:** 2021,2022,2023
ICCV: 2021,2023
IJCAI: 2022,2023
ICML: 2022,2023
NeurIPS: 2021,2022
RAL: 2021,2022,2023

Honour

- 2022  **CVPR Outstanding Reviewer**
- 2019  **ICCV Student Travel Award**

Research Statement

Wei Mao

March 10, 2023

1 Introduction

My name is Wei Mao, a PhD student from Australian National University (expecting to graduate in July 2023). This research statement summarizes my research focuses and research progresses. Apart from my PhD supervisor Dr. Miaomiao Liu, I also work closely with Dr. Mathieu Salzmann from EPFL. I currently hold a post-doc position advised by Prof. Richard Hartley and Dr. Miaomiao Liu, which is expected to finish earlier next year (Jan. 2024).

My research topics are mainly human-related e.g., human motion prediction, human motion generation, human shape recovery, and human-scene interaction. I am also interested in 3D such as 3D scene reconstruction, multi-view stereo.

2 Human Motion Prediction

Given past human motion, the goal of this task is to predict the future movements of the human. We mainly focus on two sub-tasks of this topic, namely,

- Deterministic human motion prediction
- Stochastic human motion prediction

For the first sub-task, we proposed a novel spatial-temporal encoding strategy which takes account both temporal smoothness of joint trajectory and spatial dependencies among human joints. It is done by bringing the motion sequence to trajectory space and using a fully-connected graph structure to model the spatial relationships among different trajectories [MLSL19]. Moreover, we also introduced an attention-based approach that is able to make use of the past sub-motions from a long historical motion, that can better reflect the current context [MLS20].

For stochastic human motion prediction, We proposed an end-to-end trainable approach that is able to produce diverse future motions by predicting a sequence of valid human poses with smooth trajectories. Such approach relaxes the requirement of a large amount of diverse training motion data and also can be extended to new applications like controllable human motion prediction [MLS21]. Furthermore, we introduced the new task of action-driven stochastic human motion prediction that aims to predict a set of future motions given a sequence of action labels and past motion observations [MLS22]. We develop a weakly-supervised training strategy to learn various action transitions from data with few or even no transitions. We also propose an effective way to produce future motions of varying lengths.

3 Human-scene Interaction

In [MLHS22], we proposed a distance-based contact map to model human-scene interaction. Our contact map captures the contact relationships between every joint and every 3D scene point at each time instant. Such explicit contact constraints is helpful in predicting future human motion in a 3D scene.

4 Current Research Progresses

Recently, my main research focus is on dynamic scene reconstruction. Given a sequence of images capturing a scene with dynamic object(s) e.g., human, the goal is to reconstruct the 3D geometry of the scene.

I am also interested in physics-based human-scene interaction modeling and have started a project with a PhD student on physics-based hand object pose estimation.

References

- [MLHS22] Wei Mao, Miaomiao Liu, Richard Hartley, and Mathieu Salzmann. Contact-aware human motion forecasting. *NeurIPS*, 2022.
- [MLS20] Wei Mao, Miaomiao Liu, and Mathieu Salzmann. History repeats itself: Human motion prediction via motion attention. In *ECCV*, pages 474–489. Springer, 2020.
- [MLS21] Wei Mao, Miaomiao Liu, and Mathieu Salzmann. Generating smooth pose sequences for diverse human motion prediction. In *ICCV*, pages 13309–13318, 2021.
- [MLS22] Wei Mao, Miaomiao Liu, and Mathieu Salzmann. Weakly-supervised action transition learning for stochastic human motion prediction. In *CVPR*, 2022.
- [MLSL19] Wei Mao, Miaomiao Liu, Mathieu Salzmann, and Hongdong Li. Learning trajectory dependencies for human motion prediction. In *ICCV*, pages 9489–9497, 2019.

Paper to Present

Contact-aware Human Motion Forecasting

Wei Mao, Miaomiao Liu, Richard Hartley, Mathieu Salzmann

Paper: <https://arxiv.org/abs/2210.03954>

Code: <https://github.com/wei-mao-2019/ContAwareMotionPred>

Video: <https://neurips.cc/virtual/2022/poster/54945>

Bib:

```
@inproceedings{mao2022contact,  
  title={Contact-aware Human Motion Forecasting},  
  author={Mao, Wei and Hartley, Richard and Salzmann, Mathieu and others},  
  booktitle={Advances in Neural Information Processing Systems},  
  year={2022}  
}
```

To Whom It May Concern:

This is to confirm that my PhD student Wei Mao of Australian National University has successfully submitted his PhD thesis and is expected to graduate in July 2023.

Miaomiao Liu.
8 Mar. 2023

List of Potential Mentors

Name	Institute/Company	Email
Cristian Sminchisescu	Lund University	cristian.sminchisescu@math.lth.se
Michael Black	Max Planck Institute for Intelligent Systems	black@tuebingen.mpg.de
Richard Newcombe	Meta	newcombe@fb.com
Pascal Fua	EPFL	pascal.fua@epfl.ch
Noah Snavely	Cornell Tech	snavely@cs.cornell.edu
Cordelia Schmid	INRIA	Cordelia.Schmid@inria.fr
Yaser Sheikh	Facebook Reality Lab	yasers@fb.com