Marilyn **Keller**

PhD Student · Computer Vision, Computer Graphics, Virtual Humans

Tübingen, Germany

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Summary

I am a PhD student specialized in Computer Vision, Computer Graphics, and Virtual Humans at the **Max Planck Institute for Intelligent Systems in Tübingen**, Germany. Currently, my research focuses on **learning and relating graphical models from multi-modal data** using advanced machine learning, deep learning and optimization techniques. Beside, I am interested in creating realistic renderings from sparse 3D data, including point clouds, optical scans, and medical imaging. My expertise spans virtual reality, statistical shape models, rendering, deep learning, and image processing, all of which are integral to advancing the field of **digital human modeling and visualizations**.

Academic Path

Tübingen, Germany

2019 - now

Max Planck Institute for Intelligent Systems, Perceiving Systems

PhD Student

- Advisors: Sergi Pujades and Michael J. Black
- My thesis aims to answer the question: ***Can we predict the internal anatomy of a person given their external body shape?*** This brings the following challenges:
- Capturing the body shape and the anatomy of subjects from medical scans
- Modelling the variability of the human skeleton shape and soft tissues distribution in a population
- Leveraging machine learning and deep learning to learn the correlation between external body shape and internal anatomy

Palo Alto, CA, USA

Jun. - Dec. 2022

Stanford – The Movement Lab

Visiting Researcher

- Advisors: Karen Liu and Scott Delp
- Learning to constrain the motions of a graphical body model by using biomechanical priors

London, United Kingdom

Apr. - Sep. 2016

BBC R&D, Interactive and immersive Content team

Master thesis

- Advisors: Florian Schweiger and Graham Thomas
- Set up a capture system consisting of multiple RGB and depth cameras (Kinect)
- Kinects and cameras joint calibration on Matlab
- Real-time 3D rendering of the final point cloud from video streams in Unreal Engine 4
- Test of several rendering algorithms (Image warping, Plenoptic sampling)

Grenoble, France

May - Aug. 2015

Inria Rhône-Alpes, MORPHEO team

Bachelor thesis

- Advisors: Julien Pansiot and Edmond Boyer
- Joint calibration of a motion capture system and a multi-camera system
- Implementation and comparison of several algorithms for the joint calibration of both systems

Karlsruhe, Germany

2015 - 2016

Karlsruhe Institute of Technology

Master of Science

- Master in Electronics and Information Technology with honours (grade 1.1)
- Computer vision, Computer graphics, Image processing

Grenoble, France

2013 - 2016

Grenoble INP Phelma

Bachelor and Master of Science

- Engineering school in Physics, Electronics and Materials
- Signal and image processing, Computer Science, probability and statistics.

Work Experience

Paris, France

2016 - 2019

Inetum Fablab

Research Engineer

- Development of a fall detection algorithm on RGB cameras (Python)
- Initiation and management of a research project on navigation in virtual reality (Unity, Google Tango)
- Methods based on point clouds capture to enable physical obstacle awareness in VR (demonstration at IEEE VR 18)
- Evaluation of the visualisation modes with a user study (Poster IEEE VR 19)

Publications

2024 A. Dakri, V. Arora, L. Challier, **M. Keller**, M. J. Black and S. Pujades, **On predicting 3D bone locations inside the human body**. 26th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024.

2024 **M. Keller**, V. Arora, A. Dakri, S. Chandhok, J. Machann, A. Fritsche, M. J. Black and S. Pujades, **HIT: Estimating Internal Human Implicit Tissues from the Body Surface**. In Proceedings IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR), 2024.

2023 **M. Keller**, K. Werling, S. Shin, S. Delp, S. Pujades, C. K. Liu and M. J. Black, **From Skin to Skeleton: Towards Biomechanically Accurate 3D Digital Humans**. In ACM ToG, Proc. SIGGRAPH Asia, 2023.

2022 **M. Keller**, S. Zuffi, M. J. Black and S. Pujades, **OSSO: Obtaining Skeletal Shape from Outside**. In Proceedings IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR) (pp. 20492-20501), 2022.

2020 D. Meng, **M. Keller**, E. Boyer, M. Black, S. Pujades, **Learning a Statistical Full Spine Model from Partial Observations**. In International Workshop on Shape in Medical Imaging (MICCAI) (pp. 122-133), 2020.

2019 **M. Keller** and T. Tchilinguirian, **Obstacles Awareness Methods from Occupancy Map for Free Walking in VR**. In IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR) (pp. 1012-1013), 2019.

2018 **M. Keller** and F. Exposito, **Game Room Map Integration in Virtual Environments for Free Walking**. In IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR) (pp. 763-764), 2018.

Honors & Awards

2024 **Outstanding Female Doctoral Student Prize - Honorable Mention**, MPI-IS Summer Colloquium — *Tuebingen, Germany*

2023 **Best Paper Award - Honorable Mention**, Siggraph Asia — *Sydney, Australia*

2016 **Master degree with honours (grade 1.1)**, Karlsruhe Institute of Technology — *Karlsruhe, Germany*

Invited Talks & Presentations

Sep. 2024 **Talk at ETH - Computer Graphics Lab**, Beyond the Surface: A Statistical Approach to Internal Anatomy Prediction — *Zürich, Switzerland*

Jun. 2024 **Talk at MPI Informatik - Visual Computing and AI Department**, Beyond the Surface: A Statistical Approach to Internal Anatomy Prediction — *Saarbrücken, Germany*

Jun. 2024 **Talk at Johns Hopkins University**, Inferring the internal anatomy from a 3D body shape: fat, muscles, and bones — *Baltimore, Maryland, USA (virtual)*

Feb. 2024 **Talk at the Shirley Ryan AbilityLab**, Towards Biomechanically Accurate 3D Digital Humans — *Chicago, USA (virtual)*

Dec. 2023 **Siggraph Asia 2024**, From Skin to Skeleton: Towards Biomechanically Accurate 3D Digital Humans — *Sydney, Australia*

Oct. 2023 **Talk at the Graphics and Imaging Lab at Universidad Zaragoza**, 3D human reconstruction beyond appearance — *Zaragoza, Spain (virtual)*

Jun. 2022 **CVPR 2022**, OSSO: Obtaining Skeletal Shape from Outside — *New Orleans, LA, USA*

Mar. 2022 **Dagstuhl-Seminar : 3D Morphable Models and Beyond**, Inferring people's skeleton from their external appearance — *Wadern, Germany*

May 2022 **EmpkinS Invited Talks, Friedrich-Alexander-Universität Erlangen-Nürnberg**, Inferring people's skeleton from their external appearance — *Erlangen, Germany*

Nov. 2020 **EECS Berkley Rising Star**, A population-based implant shapes set for fracture surgery — *Virtual*

Skills

Computer Vision 2D and 3D alignment, Parametric models, SMPL body model

Programming Python, Pytorch, C++, OpenCV, Matlab, Latex

Graphics Blender, Unity

Language French (native), English (C2), German (C1), Japanese (JLPT N4)