# Ayush Tewari

*Postdoctoral Associate at MIT CSAIL*

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## Education

10/16 – 07/21 **Max Planck Institute for Informatics and Saarland University**, Saarbrücken, Germany
Doctor of Engineering (Dr.-Ing.), Grade: Summa Cum Laude
Thesis: "Self-Supervised Reconstruction and Synthesis of Faces"
Supervisor: Prof. Christian Theobalt

08/14 – 07/15 **INRIA and Grenoble Institute of Technology**, France
Master of Science in Computer Science, Thesis: "Image Blending using Local Phase"
Supervisors: Dr. George Drettakis and Dr. Adrien Bousseau

06/10 – 05/14 **International Institute of Information Techonology**, Hyderabad, India
Bachelor of Technology (Honours) in Computer Science

## Work

since 12/21 **Massachusetts Institute of Technology, Cambridge, MA**
Postdoc with Prof. William T. Freeman, Prof. Joshua B. Tenenbaum, and Prof. Vincent Sitzmann

08/21 – 11/21 **Max Planck Institute for Informatics, Saarbrücken, Germany**
Postdoc with Prof. Christian Theobalt

03/20 – 08/20 **Stanford University**
Research Intern with Prof. Maneesh Agrawala

## Honors and Awards

2023 NeurIPS Spotlight for "Diffusion with Forward Models: Solving Stochastic Inverse Problems without Direct Supervision", awarded to top ∼3% submissions.

2022 Otto Hahn Medal by the Max Planck Society, awarded for outstanding scientific achievement by junior scientists.

2022 ECCV Oral for "Neural Radiance Transfer Fields for Relightable Novel-view Synthesis with Global Illumination", awarded to top ∼3% submissions.

2022 BMVC Best Paper Honorable Mention for "VoRF: Volumetric Relightable Faces".

2021 CVPR Oral for "i3DMM: Deep Implicit 3D Morphable Model of Human Heads", awarded to top ∼6% submissions.

2020 CVPR Oral for "StyleRig: Rigging StyleGAN for 3D Control over Portrait Images", awarded to top ∼6% submissions.

2019 CVPR Oral for "FML: Face Model Learning from Videos", awarded to top ∼6% submissions.

2018 CVPR Oral for "Self-supervised Multi-level Face Model Learning for Monocular Reconstruction at over 250 Hz", awarded to top ∼2% submissions.

2018 Invited paper for TPAMI special issue on the best of ICCV 2017 "High-Fidelity Monocular Face Reconstruction Based on an Unsupervised Model-Based Face Autoencoder".

2017 ICCV Oral for "MoFA: Model-based Deep Convolutional Face Autoencoder for Unsupervised Monocular Reconstruction", awarded to top ∼2% submissions.

2014 Institute research award for undergraduate research, IIIT Hyderabad.

2014 Dean's merit list, IIIT Hyderabad.

## Conference Articles

* equal first authors † equal advising

[C1] A. Tewari*, T. Yin*, G. Cazenavette, S. Rezchikov, J. B. Tenenbaum, F. Durand, W. T. Freeman, and V. Sitzmann. Diffusion with Forward Models: Solving Stochastic Inverse Problems Without Direct Supervision. In *Neural Information Processing Systems (NeurIPS) (Spotlight Presentation)*, 2023.

[C2] Y. Du, C. Smith, A. Tewari†, and V. Sitzmann†. Learning to Render Novel Views from Wide-Baseline Stereo Pairs. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023.

[C3] K. Jatavallabhula, A. Kuwajerwala, Q. Gu, M. Omama, T. Chen, S. Li, G. Iyer, S. Saryazdi, N. Keetha, A. Tewari, J. Tenenbaum, C. de Melo, M. Krishna, L. Paull, F. Shkurti, and A. Torralba. ConceptFusion: Open-set Multimodal 3D Mapping. In *RSS*, 2023.

[C4] X. Pan, A. Tewari, T. Leimkühler, L. Liu, A. Meka, and C. Theobalt. Drag Your GAN: Interactive Point-based Manipulation on the Generative Image Manifold. In *ACM SIGGRAPH 2023 Conference Proceedings*, 2023.

[C5] C. Smith, Y. Du, A. Tewari, and V. Sitzmann. FlowCam: Training Generalizable 3D Radiance Fields without Camera Poses via Pixel-Aligned Scene Flow. In *Neural Information Processing Systems (NeurIPS)*, 2023.

[C6] M. B R, A. Tewari, X. Pan, M. Elgharib, and C. Theobalt. gCoRF: Generative Compositional Radiance Fields. In *International Conference on 3D Vision (3DV)*, 2022.

[C7] A. Tewari, M. B R, X. Pan, O. Fried, M. Agrawala, and C. Theobalt. Disentangled3D: Learning a 3D Generative Model with Disentangled Geometry and Appearance from Monocular Images. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*. IEEE, 2022.

[C8] A. Harrington, V. DuTell, A. Tewari, M. Hamilton, S. Stent, R. Rosenholtz, and W. T. Freeman. Exploring perceptual straightness in learned visual representations. In *The Eleventh International Conference on Learning Representations (ICLR)*, 2022.

[C9] L. Lyu, A. Tewari, T. Leimkuehler, M. Habermann, and C. Theobalt. Neural Radiance Transfer Fields for Relightable Novel-view Synthesis with Global Illumination. In *European Conference on Computer Vision (ECCV) (Oral Presentation)*, 2022.

[C10] X. Pan, A. Tewari, L. Liu, and C. Theobalt. GAN2X: Non-Lambertian Inverse Rendering of Image GANs. In *International Conference on 3D Vision (3DV)*, 2022.

[C11] P. Rao, M. B R, G. Fox, T. Weyrich, B. Bickel, H.-P. Seidel, H. Pfister, W. Matusik, A. Tewari, C. Theobalt, and M. Elgharib. VoRF: Volumetric Relightable Faces. In *British Machine Vision Conference (BMVC) (Oral Presentation, Best Paper Honorable Mention)*, 2022.

[C12] P. Sharma, A. Tewari, Y. Du, S. Zakharov, R. A. Ambrus, A. Gaidon, W. T. Freeman, F. Durand, J. B. Tenenbaum, and V. Sitzmann. Neural Groundplans: Persistent Neural Scene Representations from a Single Image. In *The Eleventh International Conference on Learning Representations (ICLR)*, 2022.

[C13] M. B R, A. Tewari, T.-H. Oh, T. Weyrich, B. Bickel, H.-P. Seidel, H. Pfister, W. Matusik, M. Elgharib, and C. Theobalt. Monocular Reconstruction of Neural Face Reflectance Fields. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.

[C14] M. B R, A. Tewari, H.-P. Seidel, M. Elgharib, and C. Theobalt. Learning Complete 3D Morphable Face Models from Images and Videos. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.

[C15] G. Fox, A. Tewari, M. Elgharib, and C. Theobalt. StyleVideoGAN: A Temporal Generative Model using a Pretrained StyleGAN. In *British Machine Vision Conference (BMVC) (Oral Presentation)*, 2021.

[C16] L. Lyu, M. Habermann, L. Liu, M. B. R, A. Tewari, and C. Theobalt. Efficient and Differentiable Shadow Computation for Inverse Problems. In *IEEE International Conference on Computer Vision (ICCV)*, 2021.

[C17] E. Tretschk, A. Tewari, V. Golyanik, M. Zollhöfer, C. Lassner, and C. Theobalt. Non-Rigid Neural Radiance Fields: Reconstruction and Novel View Synthesis of a Dynamic Scene From Monocular Video. In *IEEE International Conference on Computer Vision (ICCV)*, 2021.

[C18] T. Yenamandra, A. Tewari, F. Bernard, H.-P. Seidel, M. Elgharib, D. Cremers, and C. Theobalt. i3DMM: Deep Implicit 3D Morphable Model of Human Heads. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (Oral Presentation)*, 2021.

[C19] Y. Zhou, M. Habermann, I. Habibie, A. Tewari, C. Theobalt, and F. Xu. Monocular Real-time Full Body Capture with Inter-part Correlations. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.

[C20] A. Tewari, M. Elgharib, G. Bharaj, F. Bernard, H.-P. Seidel, P. Pérez, M. Zollhöfer, and C. Theobalt. StyleRig: Rigging StyleGAN for 3D Control over Portrait Images. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (Oral Presentation)*, 2020.

[C21] J. Thies, M. Elgharib, A. Tewari, C. Theobalt, and M. Niessner. Neural Voice Puppetry: Audio-driven Facial Reenactment. In *European Conference on Computer Vision (ECCV)*, 2020.

[C22] E. Tretschk, A. Tewari, V. Golyanik, M. Zollhöfer, C. Stoll, and C. Theobalt. PatchNets: Patch-Based Generalizable Deep Implicit 3D Shape Representations. In *European Conference on Computer Vision (ECCV)*, 2020.

[C23] E. Tretschk, A. Tewari, M. Zollhöfer, V. Golyanik, and C. Theobalt. DEMEA: Deep Mesh Autoencoders for Non-Rigidly Deforming Objects. In *European Conference on Computer Vision (ECCV) (Oral Presentation)*, 2020.

[C24] A. Tewari, F. Bernard, P. Garrido, G. Bharaj, M. Elgharib, H.-P. Seidel, P. Pérez, M. Zollhöfer, and C. Theobalt. FML: Face Model Learning from Videos. In *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (Oral Presentation)*, 2019.

[C25] A. Tewari, M. Zollhöfer, P. Garrido, F. Bernard, H. Kim, P. Pérez, and C. Theobalt. Self-supervised Multi-level Face Model Learning for Monocular Reconstruction at over 250 Hz. In *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (Oral Presentation)*, 2018.

[C26] H. Kim, M. Zollhöfer, A. Tewari, J. Thies, C. Richardt, and C. Theobalt. InverseFaceNet: Deep Single-Shot Inverse Face Rendering From A Single Image. In *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2018.

[C27] Q. Sun, A. Tewari, W. Xu, M. Fritz, C. Theobalt, and B. Schiele. A Hybrid Model for Identity Obfuscation by Face Replacement. In *European Conference on Computer Vision (ECCV)*, 2018.

[C28] A. Tewari, M. Zollhöfer, H. Kim, P. Garrido, F. Bernard, P. Perez, and T. Christian. MoFA: Model-based Deep Convolutional Face Autoencoder for Unsupervised Monocular Reconstruction. In *The IEEE International Conference on Computer Vision (ICCV) (Oral Presentation)*, 2017.

## Journal Articles

* equal first authors † equal advising

[J1] L. Lyu, A. Tewari, M. Habermann, S. Saito, M. Zollhöfer, T. Leimkühler, and C. Theobalt. Diffusion Posterior Illumination for Ambiguity-aware Inverse Rendering. *ACM Transactions on Graphics (Proceedings SIGGRAPH Asia)*, 2023.

[J2] M. Mendiratta, X. Pan, M. Elgharib, K. Teotia, M. B R, A. Tewari, V. Golyanik, A. Kortylewski, and C. Theobalt. AvatarStudio: Text-driven Editing of 3D Dynamic Human Head Avatars. *ACM Transactions on Graphics (Proceedings SIGGRAPH Asia)*, 2023.

[J3] A. Petitjean, Y. Poirier-Ginter, A. Tewari, G. Cordonnier, and G. Drettakis. ModalNeRF: Neural Modal Analysis and Synthesis for Free-Viewpoint Navigation in Dynamically Vibrating Scenes. *Computer Graphics Forum (EGSR)*, 2023.

[J4] A. Tewari*, J. Thies*, B. Mildenhall*, P. Srinivasan*, et al. Advances in Neural Rendering. *Computer Graphics Forum (EG STAR)*, 2022.

[J5] M. B R, A. Tewari, A. Dib, T. Weyrich, B. Bickel, H.-P. Seidel, H. Pfister, W. Matusik, L. Chevallier, M. Elgharib, and C. Theobalt. PhotoApp: Photorealistic Appearance Editing of Head Portraits. *ACM Transactions on Graphics (Proceedings SIGGRAPH)*, 2021.

[J6] A. Tewari, M. Elgharib, M. BR, F. Bernard, H.-P. Seidel, P. Pérez, M. Zöllhofer, and C. Theobalt. PIE: Portrait Image Embedding for Semantic Control. *ACM Transactions on Graphics (Proceedings SIGGRAPH Asia)*, 2020.

[J7] A. Tewari, M. Zollhöfer, F. Bernard, P. Garrido, H. Kim, P. Pérez, and C. Theobalt. High-Fidelity Monocular Face Reconstruction Based on an Unsupervised Model-Based Face Autoencoder. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2020.

[J8] A. Tewari*, O. Fried*, J. Thies*, et al. State of the Art on Neural Rendering. *Computer Graphics Forum (EG STAR 2020)*, 2020.

[J9] B. Egger, W. A. P. Smith, A. Tewari, et al. 3D Morphable Face Models - Past, Present and Future. *ACM Transactions on Graphics (Presented at SIGGRAPH)*, 2020.

[J10] M. Elgharib*, M. Mendiratta*, J. Thies, M. Niessner, H.-P. Seidel, A. Tewari, V. Golyanik, and C. Theobalt. Egocentric Videoconferencing. *ACM Transactions on Graphics (Proceedings SIGGRAPH Asia)*, 2020.

[J11] O. Fried, A. Tewari, M. Zollhöfer, A. Finkelstein, E. Shechtman, D. B. Goldman, K. Genova, Z. Jin, C. Theobalt, and M. Agrawala. Text-based Editing of Talking-head Video. *ACM Transactions on Graphics (Proceedings SIGGRAPH)*, 2019.

[J12] H. Kim, P. Garrido, A. Tewari, W. Xu, J. Thies, M. Niessner, P. Pérez, C. Richardt, M. Zollhöfer, and C. Theobalt. Deep Video Portraits. *ACM Transactions on Graphics (Proceedings SIGGRAPH)*, 2018.

## Talks

09-11/23 **3D Structured Generative Models**
- John Hopkins University
- CMU
- Meta Reality Labs Research
- Princeton University
- MIT Graphics Seminar

06/23 **Teaching AI to See the 3D World**
CSAIL + Imagination in Action: AI Frontiers & Implications

08/22 **Finding 3D Structure in Unstructured 2D Data**
- Rank Prize Symposium on Neural Rendering, UK
- Adobe Research, UK
- Oxford University, UK
- Princeton University

03/22 **Learning 3D Generative Models from 2D Data**
- Dagstuhl Seminar on 3D Morphable Models and Beyond, Germany

08/21 **Synthesis of Portrait Images with 3D Control**
- ETH Zürich, Virtual
- Adobe Research, Virtual

08/21 **GANs with 3D Control**
- SIGGRAPH Course on Advances in Neural Rendering

07/21 **Self-Supervised Reconstruction and Synthesis of Faces**
- Max Planck Institute for Informatics, Germany

06/21 **Synthesis of Portrait Images with 3D Control**
- CVPR NTIRE Workshop, Virtual

03/21 **Self-Supervised 3D Digitization of Faces**
- MIT Vision and Graphics Seminar, Virtual

12/20 **PIE: Portrait Image Embedding for Semantic Control**
- SIGGRAPH Asia, Virtual

06/20 **StyleRig: Rigging StyleGAN for 3D Control over Portrait Images**
- CVPR, Virtual

06/20 **Neural Rendering Fundamentals**
- CVPR, Virtual

05/20 **Neural Rendering Fundamentals**
- Eurographics, Virtual

06/19 **FML: Face Model Learning from Videos**
- CVPR, Long Beach, USA

06/19 **Reconstructing and Editing Faces in the Wild**
- TU Münich, Germany

04/19 **Building 3D Morphable Face Models from 2D Data**
- Dagstuhl Semimar on 3D Morphable Models, Germany

03/19 **Reconstructing and Editing Faces in the Wild**
- Google, San Francisco, USA
- Adobe, San Francisco, USA

06/18 **Self-supervised Multi-level Face Model Learning for Monocular Reconstruction at over 250 Hz**
- CVPR, Salt Lake City, USA

10/17 **MoFA: Model-based Deep Convolutional Face Autoencoder for Unsupervised Monocular Reconstruction**
- ICCV, Venice, Italy
- Workshop on Image-based Modeling of Articulated and Deformable Objects, ICCV, Venice, Italy

## Teaching

Guest Lecture **MIT**, Cambridge, USA
Course: Machine Learning for Inverse Graphics, 2022, 2023

Guest Lecture **Princeton University**, Virtual
Course: Neural Rendering, 2022

Tutor **3DV**, Virtual
Course on Advances in Neural Rendering, 2021

Tutor **SIGGRAPH**, Virtual
Course on Advances in Neural Rendering, 2021

Tutor **CVPR**, Virtual
Tutorial on Neural Rendering, 2020

Tutor **Eurographics**, Virtual
Tutorial on Neural Rendering, 2020

Teaching Assistant **Max Planck Institute for Informatics**, Saarbrücken, Germany
Seminars:
- 3D Shape Analysis (Summer 2018)
- Computer Vision for Computer Graphics (Summer 2017, Summer 2019, Summer 2021)

Teaching Assistant **International Institute of Information Technology**, Hyderabad, India
Courses:
- Digital Signals Analysis and Applications (Spring 2013)
- Mathematics I (Discrete Mathematics) (Fall 2012, Fall 2013)

## Students Supervised

**MIT**

Yilun Du (2022), Prafull Sharma (2022), Cameron Smith (2023), Kairo Morton (2023), Tianwei Yin (2023), Amani Kiruga (2023)

**Max Planck Institute for Informatics**

Hoseein Hajipour (2018), Chitra Singh (2019), Mallikarjun B R (2019), Tarun Yenamandra (2020), Tianqi Fan (2020), Linjie Lyu (2021)

## Academic Services

**Area Chair**
- International Conference on 3D Vision (3DV), 2023

**Reviewer**
- The IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- ACM Transactions on Graphics (TOG)
- International Journal of Computer Vision (IJCV)
- The IEEE International Conference on Computer Vision (ICCV)
- IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
- SIGGRAPH, SIGGRAPH Asia
- Conference of the European Association for Computer Graphics (Eurographics)
- Conference on Neural Information Processing Systems (NeurIPS)
- International Conference on Machine Learning (ICML)
- European Conference on Computer Vision (ECCV)
- British Machine Vision Conference (BMVC)
- International Conference on Learning Representations (ICLR)

**Organizing**
- SIGGRAPH Course on Advances in Neural Rendering (2021)
- 3DV Tutorial on Advances in Neural Rendering (2021)
- Eurographics Course on Neural Rendering (2020)
- CVPR Tutorial on Neural Rendering (2020)