Xi Wang

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Research interests

My research interest falls at the intersection of human perception, computer vision & graphics, and human-computer interaction. My goal is to bring human insights and behaviour patterns into learning, in particular through observations of eye movements. My PhD research focuses on understanding the nature of eye movements, in particular we studied how people perceive 3D shapes and what eye movements tell us about the minds.

Academic positions

2021- **Postdoctoral researcher**, *Advanced Interactive Technologies (AIT) Lab*, ETH Zurich, Switzerland.
Funded through personal ETH Zurich Postdoctoral Fellowship ($229,000$ for 2 years)

Education

2014-2020 **Doktor der Ingenieurwissenschaften (Dr.-Ing.)**, *Computer Graphics, Technische Universität Berlin*, Germany.
- Advisor: Prof. Dr. Marc Alexa
- PhD Thesis: *Exploring perception through the eyes: from eye tracking to visual saliency and mental imagery*
- Thesis committee: Prof. Marc Alexa, Prof. Gordon Wetzstein, Prof. Kenneth Holmqvist, Prof. Marianne Maertens
- Graduated with distinction (summa cum laude)

2012–2014 **Master of Engineering**, *at Shanghai Jiao Tong University*, Dual degree program.

2010—2012 **Master of Science**, *at Technische Universität Berlin*, Dual degree program.

2008—2010 **Bachelor of Computer Science and Engineering**, *Shanghai Jiao Tong University*.

Research stays

06-11/2020 Adobe internship with Zoya Bylinskii and Aaron Hertzmann.

02-05/2020 Visiting scholar in the Computational Perception & Cognition group at MIT led by Aude Oliva.

05/2018 Visiting student at University of Regensburg. Hosted by Kenneth Holmqvist

Publications

Journal publications

[J7] Toward Quantifying Ambiguities in Artistic Images.

X. Wang, Z. Bylinskii, A. Hertzmann, and R. Pepperell.

ACM Transactions on Applied Perception (TAP) 17(4), 1-10, 2020.

[J6] A consensus-based elastic matching algorithm for mapping recall fixations onto encoding fixations in the looking-at-nothing paradigm.

X. Wang, K. Holmquist, and M. Alexa.

Behavior Research Methods, pp. 1-20, 2021.

[J5] Computational discrimination between natural images based on gaze during mental imagery

X. Wang, A. Ley, S. Koch, J. Hays, K. Holmquist and M. Alexa.

Scientific Reports 10, 13035 (2020).

[J4] The Mean Point of Vergence Is Biased under Projection.

X. Wang, K. Holmquist, and M. Alexa.

Journal of Eye Movement Research 12(4), 2019

[J3] Keep it simple: Depth-based Dynamic Adjustment of Rendering for Head-mounted Displays Decreases Visual Comfort

J. Jacobs, **X. Wang**, and M. Alexa.

ACM Transactions on Applied Perception (TAP) (7% invited SAP submission), 2019

[J2] Tracking the Gaze on Objects in 3D. How do People Really Look at the Bunny?

X. Wang, S. Koch, K. Holmquist and M. Alexa.

ACM Transaction on Graphics (Proc. of SIGGRAPH ASIA) ACM, 2018.

[J1] Measuring Visual Salience of 3D Printed Objects.

X. Wang, D. Lindlbauer, C. Lessig, M. Maertens, and M. Alexa.

IEEE Computer Graphics and Applications. Special Issue on Quality Assessment and Perception in Computer Graphics, vol.36, no.4, pp.46-55, 2016.

Peer-reviewed full-length conference publications

[C4] The Mental Image Revealed by Gaze Tracking.

X. Wang, A. Ley, S. Koch, D. Lindlbauer, J. Hays, K. Holmquist and M. Alexa.

Proceedings of the 2019 *CHI Conference on Human Factors in Computing Systems*, Glasgow, UK, 2019.

[C3] Graph-Cut Segmentation of Polarimetric SAR Images.

R. Hänsch, O.Hellwich, and **X. Wang**.

Proceedings of the IGARSS 2014, pp. 1733-1736, Québec, Canada, 2014.

[C2] Comparison of Different Color Spaces for Image Segmentation using Graph-Cut.

X. Wang, R. Hänsch, L.Z. Ma and O. Hellwich.

Computer Vision Theory and Application (VISAPP), Lisbon, Portugal, 2014.

[C1] Depth Image- based Rendering with Spatio-temporally Consistent Texture Synthesis for 3D Video with Global Motion.

M. Köppel, **X. Wang**, D. Doshkov, T. Wiegand and P. Ndjiki-Nya.

IEEE International Conference on Image Processing (ICIP), Orlando, FL, USA, 2012.

Book contributions

[BC1] Accuracy of Monocular Gaze Tracking on 3D Geometry.

X. Wang, D. Lindlbauer, C. Lessig, and M. Alexa.

Burch, Michael; Chuang, Lewis; Fisher, Brian; Schmidt, Albrecht; Weiskopf, Daniel (Ed.): *Eye Tracking and Visualization*, Chapter 10, Springer, 2017.

Workshop papers and abstracts

[A9] Toward Quantifying Ambiguities in Artistic Images.

X. Wang and Z. Bylinskii, A. Hertzmann, and R. Pepperell

Abstracts of the 2021 *VSS meeting*, 2021

[A8] EMICS'21: Eye Movements as an Interface to Cognitive State

X. Wang and Z. Bylinskii, M. Castelhano, J. Hillis, and A. Duchowski

Extended Abstracts of the 2021 *CHI Conference on Human Factors in Computing Systems*, 2021

[A7] EMICS'20: Eye Movements as an Interface to Cognitive State

X. Wang and Z. Bylinskii, M. Castelhano, J. Hillis, and A. Duchowski

Extended Abstracts of the 2020 *CHI Conference on Human Factors in Computing Systems*, 2020

[A6] Saccadic eye movements displace visual working memory representations (poster)

X. Wang and Benjamin van Buren

The 27th *Object Perception, visual Attention, and visual Memory (OPAM) workshop*, Montréal, 2019.

[A5] Computational discrimination between natural images based on gaze during mental imagery (talk).

X. Wang, K. Holmquist and M. Alexa.

20st *European Conference on Eye Movements (ECEM)*, Alicante, Spain, 2019.

[A4] Maps of Visual Importance (talk).

X. Wang, K. Holmquist and M. Alexa.

41st *European Conference on Visual Perception (ECVP)*, Trieste, Italy, 2018.

[A3] 3D Eye Tracking in Monocular and Binocular Conditions (talk).

X. Wang, M. Maertens, and M. Alexa.

19th *European Conference on Eye Movements (ECEM)*, Wurpertal, Germany, 2017.

[A2] Accuracy of Monocular Gaze Tracking on 3D Geometry.

X. Wang, D. Lindlbauer, C. Lessig, and M. Alexa.

Workshop on Eye Tracking and Visualization (ETVIS) co-located with IEEE VIS, Washington, DC, USA, 2015.

[A1] Spatio-temporal Consistent Filling of disocclusions in the Multiview-video-plus-depth Format.

M. Köppel, **X. Wang**, D. Doshkov, T. Wiegand and P. Ndjiki-Nya.

IEEE 14th *International Workshop on Multimedia Signal Processing (MMSP)*, Banff, Canada, 2012. **(Top 10% paper award)**

Arxiv papers

[AX2] *Center of Circle after Perspective Transformation.*

X. Wang, A. Chern and M. Alexa.

arXiv preprint arXiv:1902.04541, 2019

[AX1] *Maps of Visual Importance.*

X. Wang, and M. Alexa.

arXiv preprint arXiv:1712.02142, 2017

Thesis

PhD Thesis Exploring perception through the eyes: from eye tracking to visual saliency and mental imagery, Technical University of Berlin, 06/2020.

Master Thesis Video cutout using illumination properties and texture information, Shanghai Jiao Tong University, 02/2014.

Bachelor Thesis Temporally consistent depth image-based rendering, Technical University of Berlin in cooperation with Fraunhofer Institute HHI, 08/2012.

Fellowships & Awards

2020 ETH postdoctoral fellowship awards

2019 MIT & CBMM Brains, Minds, and Machines Summer Course Fellowship

2016 Shapeways Educational Grant

2013 Shanghai Jiao Tong University Hangtian Kegong Scholarship

2012 Signal Processing Society Travel Grant for IEEE International Conference on Image Processing

2011 Finalist of the Google Anita Borg Scholarship

2007–2009 Outstanding Student Scholarship, Shanghai Jiao Tong University

Invited talks

2020/11 Queen's University. Hosted by Monica Castelhano

2020/10 Facebook reality lab. Hosted by Tanya Jonker

2020/10 FAIR. Hosted by Dhruv Batra

2020/10 University of Stuttgart. Hosted by Andreas Bulling

2020/10 MIT. Hosted by Stefanie Mueller

2020/08 The University of Melbourne. Hosted by Tilman Dingler

2020/07	University of Tübingen. Hosted by Enkelejda Kasneci
2020/06	ETH. Hosted by Otmar Hilliges
2019/08	New York University. Hosted by Daniele Panozzo
2019/06	University of Cambridge. Hosted by Rafeł Mantiuk and Minjung Kim
2019/06	University College London. Hosted by Tim Weyrich and Niloy Mitra
2018/05	University of Regensburg. Hosted by Mark Greenlee and Kenneth Holmqvist

Service

Organising EMICS "Eye Movements as an Interface to Cognitive State" workshop at CHI'21 and SIG meeting at CHI'20

Reviewing IJCV, The Visual Computer, Cognitive Systems Research, Scientific reports, JEMR, PLOS One, CHI, UIST, 3DV, MVA, CVM

Student volunteering International Geometry Summit 2016

Teaching

2014-2020 **Computer Graphics I and II** , *Teaching Assistant*, TU Berlin.

Includes organization of courses, teaching and presentation of exercises, and correction of homework and exams.

2018-2020 **Bachelor and Master thesis supervision**, TU Berlin.
- J. Jacobs: Dynamic Control of Interocular Distance and Vergence Angle in Rendering for Head-Mounted Stereo Displays, 2019
- P. Wei: Learning to predict where people look at 3D printed objects using human fixations, 2019
- S. Zhang: Video-based Analysis of Eye Movement behind Closed Eyelids, 2019
- M. Funk: 3D reconstruction of hand-held objects using structure-from-motion and gaze data, 2020
- H. Zhou: Visual Saliency Based Adaptive Sampling for Objects Rendering, 2019
- M. Wanner: Image-based weight scale estimator: weight revealed by deviation signal, 2020
- T. Trifonova: Depth Encoding While Looking-at-nothing in Head Mounted Stereo Displays, 2020

2015-2020 **Computer Graphics Seminar and Project**, *Teaching Assistant*, TU Berlin.
- ○ *Projects:*
  - – F. Meckel and J. Eichelbaum (Winter 2015), Camouflage
  - – D. Neumann and L. Rögner (Summer 2018), Mental Imagery
  - – D. Dreyer (Winter 2018), Deviation Magnification
  - – K. Heuermann (Summer 2019), Sketch aggregator
  - – K. Pirschel (Summer 2019), Camera pose estimation
  - – S. Biebler (Summer 2019), As-projective-as-possible
  - – M. Wassmann and M. Vats (Winter 2019), Image generation from scene graphs
- ○ *Seminars:*
  - – F. Meckel (Summer 2016), Relief from 3D model
  - – K. Skutta (Winter 2016), Suggestive Contours for Conveying Shape,
  - – A. Czwink (Summer 2017), Stylization and Abstraction of Photographs
  - – M. Kürbis (Summer 2017), Palette-based Photo Recoloring
  - – R. Verheggen (Summer 2018), 3D display
  - – R. Butter (Summer 2019), Looking at nothing in VR
  - – M. Pahlitzsch (Winter 2019), Refraction Wiggles
  - – J. Strömsdörfer (Winter 2019), Structure from motion in the cloud

Professional experience

2013 **Summer Intern**, *Autodesk*, Shanghai.
Developed a browser plug-in used to simplify the hardware certification procedure

2012—2013 **Intern**, *Intel*, Shanghai.
Testing and debugging of programs developed with the Intel Media SDK.

2011—2012 **Student Research Assistant**, *Fraunhofer Institute HHI*, Berlin.
Developed a novel approach to solve the main problem of disocclusion in view synthesis.