Han(*Aurora*) Wang

Curriculum Vitae

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Bio and Research Interests

- Research Engineer at **Meta Reality Labs**, with over **Five** years industry experience at leading tech companies, including **Meta Reality Labs, Snap, Microsoft Research, and DiDi Research**
- Worked on: **Digital Avatars, Physics-based Simulation (cloth and hair)**, **AR engine** development, 3D Simulation for **Autonomous Driving** and Advanced Data Analysis.
- **World Finalist** of ACM International Collegiate Programming Contest (ICPC), 2016 and **gold medalist** at the ACM-ICPC Asia regional contests, which further shaped my technical proficiency and problem-solving capabilities.
- Skilled in both **engineering and research**, specializing in **computer graphics** (**simulation**, geometry) and computer vision with a focus on **AR/VR** and **robotics** (autonomous system).
- Research Interests: Highly motivated and enthusiastic about research in **Computer Graphics**, particularly in **(Differentiable) Physics-based Simulation/Animation, Geometric Learning, Data-driven Simulation, Simulation Applications in Robotics (autonomous systems)** and **Simulations in Molecular Dynamics**, with a strong desire to further my research through Ph.D. study at a esteemed institution.

Education

- **Northwestern University** - IL, US   *09/2017 - 06/2019*
    - *Master of Science* in Computer Science   GPA: 3.7/4.0   Academic advisor: **Prof. Jack Tumblin**
    - Thesis: Action recognition in compressive sensing   Thesis Advisor: **Prof. Aggelos K. Katsaggelos**
- **Northeastern University** - China   *09/2013 - 06/2017*
    - *Bachelor of Engineering* in Software Engineering (Digital Media Technology track)
    - GPA: 3.80   **Major Rank: Top 1**   Graduated with Honors (**top <1%**)
    - Principal Medal (7/39,766)   **National Scholarships (twice, top 1%)** First-prize Scholarship (**4 times**)

Professional Contests - Only highlighted awards are listed

- **World Finalist, *40th* ACM-ICPC International Contest**   *05/2016*
    - *ACM International Collegiate Programming Contest World Finals - Honorable Mention.*
- **Gold Medal, *40th* ACM International Collegiate Programming Contest, Asia Regional**   *10/2015*

Publications, Working Papers and Patents

- **Han Wang**, Yifei Li, Minchen Li. "DiffHair: Inverse Hair Optimization using Differentiable XPBD Simulation." **in submission** to ***ACM SIGGRAPH 2025***   Project **Page**

- Bowen You*, **Han Wang*** (equal contribution), Xiujin Liu, Xiaoyang Wang. "FlexiDiffusion: Enhancing User-Controlled Text-to-Image Generation with Layout-Aware Personalization." **submitted** to *IEEE/CVF Conference on Computer Vision and Pattern Recognition **(CVPR) 2025***   **Paper**

- Qinzheng Zhou, **Han Wang**. "HiSAM: Hierarchical State Space Alignment for Motion Generation." **submitted** to *IEEE/CVF Conference on Computer Vision and Pattern Recognition **(CVPR) 2025***   **Paper**

- Xiaogang Jia, Bo Li, **Han Wang**, Xi Huang, Gerhard Neumann. "Towards Effective Representations: Improving Imitation Learning with Object-Centric pretraining." in **submission** to ***Robotics: Science and Systems(RSS) 2025*** Project **Page**

○ Cheng Zhao, Haomei Jia, Ran Gao, Shiqi Zheng, Fengzhi Wu, **Han Wang**. "Safety Risk Management System in Electric Power Engineering Construction under the Background of Big Data" **published** in *IEEE International Conference on Artificial Intelligence, Big Data and Algorithms (CAIBDA)*, 2021 **Paper**

○ Qing Xie, Zhuo Su, **Han Wang**. 2016. Portable indoor positioning equipment. *China* **Patent** *205607404U Application number: 2016203717311, filed April 27, 2016, and* **issued** *September 28, 2016.*

Work Experience (with Research Experience)

○ **Meta (Facebook) Reality Labs**   *Burlingame, CA   03/2024 - Present*
Software Engineer/Research Engineer - *Codec Avatars Team*
- Working on research and development of **Codec Avatars** project **Pismo** integration into metaverse for Quest devices, Continuous Topology Architecture and full-body avatars (NDA).
- Designed and developed the first **universal prior model** that features a disentangled **representation** of face and hair for codec avatars, using **seperate branches for head and hair geometry/texture reconstruction** following uPiCA framework.
- Implemented telemetry and added unit test for Helios project, which is the initial version of codec avatar on device in Quest Pro, mostly using C++ and Python.

○ **DiDi Research America**   *Mountain View, CA   11/2022 - 03/2024*
Senior Software Engineer - *Simulator Core Team*
- Developed and implemented advanced algorithms in **simulation intelligence** and **3D sensor simulation** to enhance realism and consistency of ego car and surrounding agents' behaviors for **autonomous driving**, leveraging **3D graphics** and **computer vision** techniques.
- Led another two engineers to develop **sensor simulation** pipelines, generating 3D point cloud data from synthetic scenarios using **physics-based ray casting** and **PBR** techniques.
- Built and maintained 3D assets library with both hand-crafted large vehicle models and 3D generated small vehicles models using **3D reconstruction** techniques based on **NeRF and SDF**.
- Improved LiDAR detection model performance by **38% mAP@iou_0.5** through advancements in sensor simulation.
- Conducted research on **LiDAR simulation** under **inclement weather** scenarios to enhance robustness in adverse conditions.

○ **Snap Inc.**   *Santa Monica, CA   07/2019 - 11/2022*
Software Engineer - *Camera Platform Team (Snap AR)*
- Mainly contributed to **graphics**, **shader**-related features and internal tools **with C++ and Qt** for **Lens Studio**, one of Snap's three pillars, **SnapAR** - 3D AR engine for building augmented reality experiences for Snapchat.
- Tech and engineering owner of **Cloth Simulation** with 3D body mesh in Lens Studio 4.0 supported for AR effects with dynamic cloth physics on any mesh like real-world physics. Designed and implemented the pipelines of integration (cloth collision, stretching, bending, friction, vertex binding etc.) and **APIs** for points-based algorithms collaborated with **Snap Research**. This feature was released with Disney movie *Cruella* in **Snap Partner Summit 2021.**
- **Collider System** for AR, implemented an integration and APIs design of collider system in both Lens Core (the core rendering engine for Snapchat) and Lens Studio to support collision in AR lens creation, later combined in the **Physics system** released in Lens Studio 4.10.
- Engineering owner of **Shader Analyzer**, an internal tool for users to get **real-time analytics and compilation** info of shaders user created in Lens Studio. Designed and implemented **OpenGL shader** assembly, compilation tracking, complexity analysis, and rendering across **4** repositories.

- Developed **Texture Analyzer**, another internal tool enabling users to get visualized analytics of the texture, like mipmap mode etc.
- **Got Promoted** after the first half year. Besides above, also worked on small features like adding new blend modes, draco compression supports for **glTF**. Fixed bugs for Lens Core **rendering**, Lens Studio releases, lens templates, OpenGL shaders and optimized rendering performance.

○ **Snap Inc.** *Venice, CA   06/2018 - 09/2018*
Software Engineer Intern *- Camera Platform Team (Snap AR)*

- Implemented the pipeline integration of **hand-tracking** feature in Lens Studio to support hand tracking AR lenses creation.
- Developed AR lens templates featuring interactive hand and 3D virtual object dynamics using **Javascript** and **GLSL** (OpenGL shaders) in Lens Studio, released in late 2018.

○ **Microsoft Research** *Beijing, China   12/2016 - 06/2017*
Research Intern *- DKI Group (Data, Knowledge, and Intelligence)* re-org from Software Analytics Group

- Built a stand-alone system Insight Evolution for **insights** with explanations on **streaming data**, which can mining multiple types of insights with explanation on streaming data such as business data, collaborated with the Power BI team.
- Contributed to designing and implementing the whole pipeline with **C#**, which included raw streaming data pre-processing, **insights mining**, insights explanation and analysis and visualization of results with auto-insight(our visualization system).
- Implemented a mining algorithm for insight evolution based on **DBSCAN**. Proposed and completed benchmark test and comparison between our algorithm and others.

Skills

Programming	C++, C, Python, Rust, Java, C#, JavaScript, GLSL, Common Lisp, MATLAB
Frameworks	Qt, PyTorch, OpenGL, Open3D, OpenCV, Django, Flask, TensorFlow
Additional	LaTeX, Git, Blender, MySQL, PostgreSQL, Houdini, Maya, 3Ds Max, HTML, CSS

Research and Projects (Selected) Experience

○ **DiffHair: Inverse Hair Optimization using Differentiable XPBD Simulation** *07/2024 - Present*
Supervised by: Prof. Minchen Li (Carnegie Mellon University),   Collaborated with: Yifei Li (MIT)   Project **Page**

- Implemented a GPU-parallelized differentiable hair simulator using **Extended Position-Based Dynamics (XPBD)**, enabling accurate reconstruction of hair geometry and material properties from multiview images.
- Integrated differentiable rendering with XPBD to jointly optimize rest shapes and stiffness properties.
- Working Paper: in preparation to submission to **ACM SIGGRAPH 2025**.

○ **FlexiDiffusion: Layout-Aware Personalization in Text-to-Image Generation** *05/2024 - 10/2024*
submitted to IEEE/CVF Conference on Computer Vision and Pattern Recognition **(CVPR) 2025**   **Paper**

- Proposed a layout-controllable diffusion model enabling state-of-the-art text-to-image generation with enhanced fidelity and spatial personalization.

○ **HiSAM: Hierarchical State Space Alignment for Motion Generation** *04/2024 - 11/2024*
submitted to IEEE/CVF Conference on Computer Vision and Pattern Recognition **(CVPR) 2025**   **Paper**

- Developed a state-space model for motion generation, achieving improved temporal coherence and spatial fidelity on standard benchmarks.

○ **Improving Imitation Learning with Object-Centric Representations** *09/2024 - Present*
Collaborated with: Prof. Gerhard Neumann   Working Paper: in submission to **RSS 2025**   **Project Page**

- Developed a pretraining pipeline with contrastive learning to extract object-centric features, enhancing task-relevant object detection and enabling robust video-based imitation learning with fewer demonstrations.
- **Knowledge Representation & Reasoning on Question Answering** *02/2018 - 03/2018*
  Supervised by Prof. Ken Forbus, Northwestern University, IL, US   Common Lisp **code**   Project **Report**
  - Implemented a knowledge representation & reasoning project addressing the prerequisite toy tasks outlined in 'Towards AI-Complete Question Answering' by Jason et al. from **Facebook AI Research**.
  - Implemented task text parsing to facts in KB, deployed the reasoning logic and relationship based on **Horn Clause** on five tasks, utilizing Companions reasoning system to answer queries. Achieved **100%** accuracy on bAbI dataset.
- **Action Recognition in Compressive Sensing**   Thesis Project **Report**   *09/2018 - 06/2019*
  ***Master Thesis**, supervised by Prof. Aggelos K. Katsaggelos, Northwestern University, IL, US*
  - Conducted in-depth research on Video Compressive Sensing and Action Recognition, optimizing **Temporal Segment Network (TSN)** to gauge video compression's impact on accuracy.
  - Identified a pivotal 1/16 compression threshold impacting action recognition, proposed experiments for optimizing compression standards via advanced algorithms, aiming for uncompressed video performance.
- **Fraudulent Click Detection.**   **Result website (Kaggle Link)**   *03/2018 - 06/2018*
  - Built high-performance prediction model using **Panda** and **Sklearn** to predict whether a user will download an app after clicking a mobile app advertisement, based on users' clicking records.
  - Designed an effective algorithm based on both **Multilayer Perceptron (MLP)** regression and classification, which results in **95%** accuracy. Visualized the prediction result by using JavaScript.
- **Automatic 3D Animation Generation System** *05/2015 – 08/2016*
  Undergraduate Research Assistant, supervised by Prof. Ruiyun Yu, Northeastern University (CN)
  - Designed a smart animation generation system with key resource management and editing, and developed a skeleton binding algorithm based on distance factors, improving accuracy and achieving above-average binding effects.

Honors and Awards (Selected)

- **Microsoft Star of Tomorrow,** top-performing interns at Microsoft Research Asia. *2017*
- **National Scholarship for Undergraduates** (<**Top 1%, twice**) *2014, 2015*
- **Top Ten College Students** Nomination Award of Liaoning Province *11/2016*
  - **Top 0.0015%** in **0.7M students** from whole province
  - **only one** candidate award-winning in Northeastern University (CN) (among all 39,766 students)
- **Principal Medal** in NEU(CN) - **only 7/39,766** (including PhDs, masters and undergraduates) *12/2015*
- **Top Ten Undergraduate Students Award** (**Top 10/29,248**) Northeastern University (CN) *05/2016*
- **Excellent Student of Shenyang City** (**Top 0.2%**), Shenyang Municipal Government *10/2014*
- **Model of Excellent Student Cadre** (**Top 0.9%, three times**) *2014, 2015, 2016*
- **First-prize Scholarship** - **4 times**, each per school year (**Top 1%**), NEU(CN) *2014, 2015, 2016, 2017*

MISC

- **GRE: 336** (V **167**, Q **169**, AW **4.5**)   **TOEFL: 116** (R **30**, L **30**, S **26**, W **30**)
- **Research Assistant** *2018 - 2019*
  - Advisor: Prof. Aggelos K. Katsaggelos   Northwestern University
- **Grader & Teaching Assistant** *2018 - 2019*
  - EECS351 - Computer Graphics   Instructor: Prof. Jack Tumblin   Northwestern University
- **Team lead** - ACM-ICPC Training Team, Northeastern University (CN) *2014 - 2016*
  - Led the ACM training team (16 teams, 50-people scale) to help improve team members' **C++ coding and algorithms** skills. Hosted multiple technical seminars and organized online programming competitions.
  - Led another 2 teammates to make a **historic breakthrough** by winning the **first** Gold Medal of ACM-ICPC (Asia Regional Contest) in Northeastern University history.
  - **Only female** contestant from Chinese universities who competed in the **ACM-ICPC World Finals** 2016