Han*(Aurora)* Wang

Curriculum Vitae

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Bio and Research Interests

- With almost **five years of industry experience** at tech giants including **Microsoft Research, Snapchat, and DiDi Research**, I have honed my skills in both **engineering and research**, focusing mainly on **computer graphics** (simulation and rendering) and computer vision, especially in the fields of **AR/VR** and **autonomous driving**. Moreover, as an **ACM-ICPC World Finalist** in **2016** and a **gold medalist** at the ACM-ICPC Asia regional contests, these experiences have further shaped my technical proficiency and problem-solving capabilities.
- I've developed a strong motivation and enthusiasm in research on **Computer Graphics**, especially **physics-based simulation/animation, geometry, rendering and simulation applications**. I'd love to advance my understanding of this field further, through Ph.D. study with an expert at a remarkable 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) 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*

Work Experience (with Research Experience)

- **DiDi Research America** *Mountain View, CA 11/2022 - Present*
  Senior Software Engineer *- Simulator Core Team*
  - Researched and implemented algorithms on **simulation intelligence** and **3D sensor simulation** for **autonomous driving**, to make the simulation of ego car and surrounding agents more realistic and consistent with vehicle dynamics, utilizing **3D graphics** and **computer vision** techniques.
  - Led another two engineers developing **sensor simulation**, which generate synthetic scenarios' 3D point cloud data scanned by simulated LiDAR based on **physics-based ray casting** and **PBR**.
  - 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.
  - Sensor simulation led to a **38%** increase in mAP@iou_0.5 for our LiDAR detection model.
  - Researching on LiDAR simulation (synthesize point cloud) on **inclement weather** scenarios.
- **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 - *Software Analytics Group (Now under Data, Knowledge, and Intelligence (DKI) 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

◦ **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.

- **Knowledge Representation & Reasoning on Question Answering** *02/2018 - 03/2018*
  Supervised by Prof. Ken Forbus, Northwestern University, IL, US
  - 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 10 tasks with the Facebook bAbI dataset; COMMON LISP **code**.
- **Action Recognition in Compressive Sensing** *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.
- **Automatic 3D Animation Generation System** *05/2015 – 08/2016*
  Undergraduate Research Assistant, supervised by Prof. Ruiyun Yu, Northeastern University (CN)
  - Designed a smart and user-friendly **animation generation** system, providing management and visualization editing on the key resources of models, scenes and actions.
  - Developed the skeleton automatic **binding** algorithm based on skeleton distance factor, achieved better above-average binding effects by accurately computing the distance between skin and skeleton.

Publications and Patents

- 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
- 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.*

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** - Advisor: Prof. Aggelos K. Katsaggelos Northwestern University *2018 - 2019*
- **Grader & Peer Reviews** EECS351 - Computer Graphics Northwestern University *2018 - 2019*
- **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