Dr. Yili Zhao

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Experience

Facebook AI Research Menlo Park, CA
Senior Research Engineer, 2018 - present

- **Architected and led development of the open-sourced "Habitat-Sim"**, a photorealistic, high-performance 3D simulator, that enables researchers to train, develop, and evaluate embodied agents (virtual robots) performing a variety of tasks (navigation, manipulation etc.) in realistic 3D scenes. See Homepage. I was the *sole engineer who wrote the very 1st version of "Habitat-Sim" (internal prototype) from scratch.* In the final release, I developed many core modules, such as phsically based rendering, rendering acceleration, scene graph, asset management, visual sensors (pinhole, fisheye etc.). The research was published at **ICCV 2019**, and one of the **"Best Paper Award Nominees"**. (**7 out of 1,075**).

Facebook Menlo Park, CA
Senior Research Scientist, 2015 - 2018

- **Tech lead** in ads quality team. I devised, led, roadmapped, and developed projects on improving the post-click experience of Facebook ads. I designed metrics to measure the landing page quality, implemented reliable algorithms to improve the ranking precision, built data pipelines to collect realtime machine learning data, and also developed and optimized the deep learning models. My work significantly boosted the quality of the Facebook ads and company revenue.
- I worked in the ads ranking team, designed and developed real-time, ads backend infrastructure, data pipelines that could ingest billions of user events in real-time, and transform them into denormalized, flat data, ready for the Facebook machine-learning system.

Oculus, Facebook Menlo Park, CA
Research Scientist, 2014 - 2015

- I designed and developed a kinematics system to construct and optimize geometric models of human hands from the sampled data.

Nimble VR (acquired by Facebook), San Francisco, CA
Research Engineer, 2014

- I designed and developed visualization tools to analyze the recognition rates of the hand tracking system.

University of Southern California, Los Angeles, CA
Graduate Research Assistant, advisor: Jernej Barbič, August 2010 - August 2014

- Developed a biomechanical model to set the mass density, stiffness, and damping properties of branches and leaves in complex botanical systems. Published at **ACM SIGGRAPH 2017**.

- Presented a real-time dynamics system, as well as a comprehensive pipeline for simulation of anatomically realistic plants (trees, flowers, bushes, forests, etc.). Published at **ACM SIGGRAPH 2013**. I delivered the 20-minute SIGGRAPH presentation. Our video clip has been selected as part of the Technical Papers Video Trailer.
  Video 1: Oregon White Oak, realistic anatomy, adult tree, 120,000 leaves
  Video 2: Real-time physically-based simulation of plants

- Extended the well-known Featherstone's algorithm for linked rigid body systems to the deformable objects. Proposed a novel multi-domain dynamics method in reduced dimensional space for real-time simulation of flexible objects undergoing large-deformations. Published at **ACM SIGGRAPH 2011**. Our Oak tree video (HD) has been selected as part of the Technical Papers Video Trailer.
  See Figure 1.

- Developed an algorithm to simulate time-varying, geometrically complex, penalty-based distributed contact between many rigid objects and articulated objects.
  Published at IEEE Transactions on Visualization and Computer Graphics.
  Video: Implicit Multibody Penalty-based Distributed Contact

- **Code contributor to Vega FEM library**, a computationally efficient and stable C/C++ physics library for three-dimensional deformable object simulation.

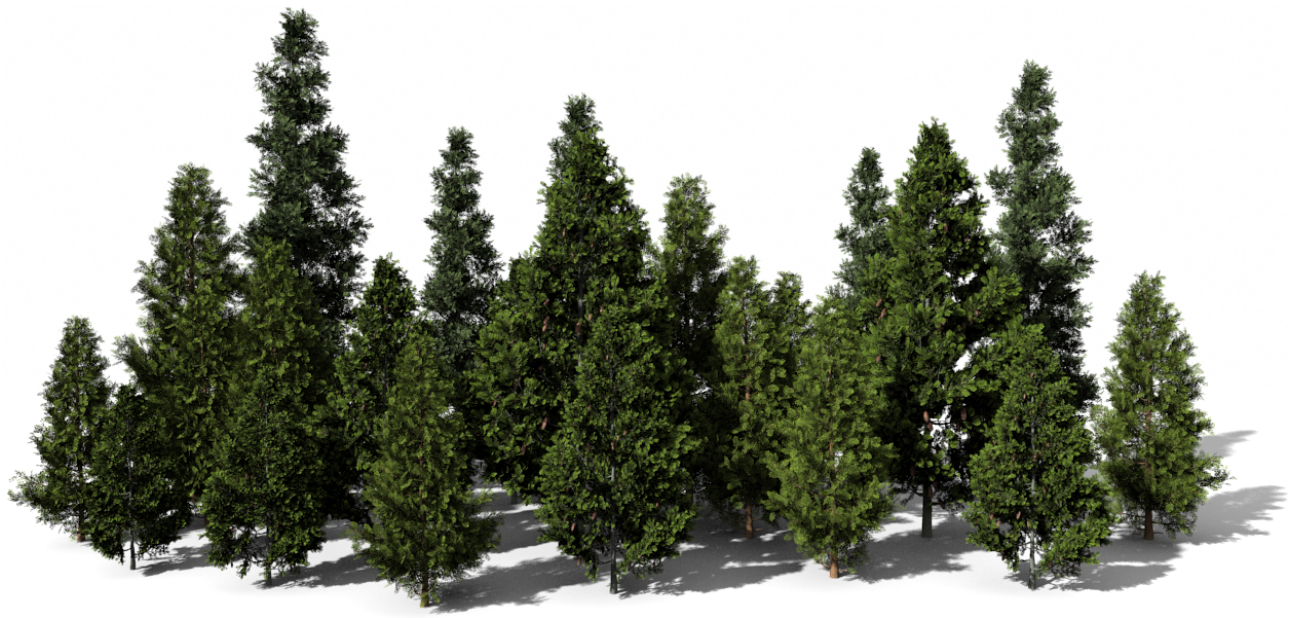

Figure 1: Simulating forest in randomized wind: **3** species, **24** trees, **1,920,525** triangles, **180,795** domains, **139,418** reduced DOFs, simulation fps: **3** Hz. **[video]**

University of Southern California, Los Angeles, CA
Graduate Research Assistant, advisor: Suya You, August 2009 - May 2010

- Developed a 3D simulator that allows the user to navigate in a virtual, **large-scale** and **complex scene** with many textured three-dimensional building models, and provides augmented reality experience to the user.

Peking University, Beijing, China
Graduate Research Assistant, advisor: Guoping Wang, September 2006 - July 2009

- Developed novel algorithms to accelerate rendering of a **large-scale, complex** scene with many three-dimensional massive models (funded by China National High-tech Research and Development Program).
- Developed algorithms to detect and repair the irregularities on three-dimensional triangle meshes (funded by National Grand Fundamental Research Program of China).

Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu, China
Undergraduate Research Assistant, advisor: Songcan Chen, Liyan Zhang, September 2005 - June 2006

- Developed an algorithm based on quadric error metrics to segment three-dimensional triangle meshes with color and texture properties.

Education

Ph.D., Computer Science
University of Southern California, Los Angeles, CA, United States (2009 - 2014)
Advisor: Jernej Barbič
Thesis: *Plant Substructuring and Real-time Simulation Using Model Reduction*

M.S., Computer Science
Peking University, Beijing, China (2006 - 2009)
Adivisor: Guoping Wang
Thesis: *Acceleration Techniques in Rendering Large-scale and Complex Scenes*

B.S., Computer Science
Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu, China (2002 - 2006)
Ranked $\mathbf{2^{nd}}$ **out of 268**
Advisor: Songcan Chen, Liyan Zhang
Thesis: *Research on Segmentation of three-dimensional Meshes with Color and Texture*

Publications

Manolis Savva, Abhishek Kadian, Oleksandr Maksymets, **Yili Zhao**, Erik Wijmans, Bhavana Jain, Julian Straub, Jia Liu, Vladlen Koltun, Jitendra Malik, Devi Parikh, Dhruv Batra: "**Habitat: A Platform for Embodied AI Research**" *Proceedings of the IEEE International Conference on Computer Vision* (ICCV 2019), **Best Paper Award Nominee**

Bohan Wang, **Yili Zhao**, Jernej Barbič: "**Botanical Materials Based on Biomechanics.**" *ACM Transactions on Graphics*, Vol. 36, No. 4, (SIGGRAPH 2017) (July 2017)

Hongyi Xu*, **Yili Zhao***, Jernej Barbič: "**Implicit Multibody Penalty-based Distributed Contact.**" IEEE Transactions on Visualization and Computer Graphics (TVCG), Vol. 20(9), 2014 (*** joint first authors**)

Yili Zhao and Jernej Barbič: "**Interactive authoring of simulation-ready plants.**" *ACM Transactions on Graphics*, Vol. 32, No. 4, (SIGGRAPH 2013) (July 2013)

Jernej Barbič and **Yili Zhao**: "**Real-time large-deformation substructuring.**" *ACM Transactions on Graphics*, Vol. 30, No. 4, (SIGGRAPH 2011) (July 2011)

Skills

Strong research & programming experience in physically-based simulation, robotics, computer graphics, animation, numerical optimization, machine learning.

Solid experience in designing, developing, and debugging software, written mostly in C++, using state-of-the-art algorithms and procedures.

Solid knowledge of calculus, advanced linear algebra, classical mechanics (forward/inverse kinematics/dynamics, etc.), robotics (PD, PID controller, Featherstone's algorithm etc.), Finite Element Method, numerical methods (optimization, Lagrange multiplier method, implicit numerical integration, etc.), physically based rendering, Object Oriented Programming, C/C++, computer architecture, parallel programming.

Languages: C/C++ (since 2002), Python, Objective-C, Presto, HiveQL, LaTeX, HTML;

Tools: vi, clang, gcc, Makefiles (Linux), CMake, OpenMP, OpenGL, Intel MKL, Intel TBB, GLUI, gnuplot, git, Mercurial

Platforms: Mac OS X, Linux, Windows. All three used on a regular basis.

Paper Reviews

- SIGGRAPH 2016, 2017, 2021
- SIGGRAPH Asia 2015, 2016, 2017, 2020
- Eurographics 2017
- Pacific Graphics 2014, 2015, 2016
- Graphical Models 2016, 2017
- Neurocomputing 2016
- Computers & Graphics 2013
- CASA 2017

Honors and Awards

Best Poster for Visual Presentation, Department of Computer Science, USC, 2012, 2013

Chiang Chen Scholarship, Peking University, 2006 (**1 of 20** winners, university-wide)

Excellent Graduate 2006, NUAA, June 2006 (**top 1%**)

Bronze medal, the 29^{th} ACM International Collegiate Programming Contest (Hangzhou site, 2005)

Member of Outstanding Student Program, NUAA, An elite subset of University Undergraduate Program, 2003 - 2004 (Ranked $\mathbf{2^{nd}}$ **out of 32**)

Excellent Student Scholarship, $\mathbf{1^{st}}$ **Prize** , NUAA, 2003 - 2006 (Consecutive **4** years, **top 2%**)

Personal

I like swimming, free style. I swim 1 mile (nonstop) every day in USC Daland's Swim Stadium. Now I usually do $2 \sim 2.5$ km per day.

References

Dr. Jernej Barbič, Associate Professor,
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