Ryusuke Sugimoto

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PROFILE

PhD candidate in Computer Science at the University of Waterloo, specializing in physics-based animation through integral-equation methods, including Monte Carlo PDE solvers. My research focuses on developing robust, domain-discretization-free solvers for graphics and visual effects applications. I've interned at **Adobe** and **SideFX**, contributing to both research and production tools, including the application of Monte Carlo PDE techniques and the development of non-integral-based geometry and numerical tools. With a strong foundation in both research and applied software development, I'm eager to take on challenges in both fundamental and applied research.

RESEARCH INTERESTS

Physics-based animation, Computer graphics**,** Monte Carlo methods, Integral equations, Numerical analysis

EDUCATION

University of Waterloo, Ontario, Canada **Sept. 2020 – Sept. 2025 (Expected)**
PhD Candidate in Computer Science | Supervisors: Prof. Toshiya Hachisuka and Prof. Christopher Batty

The Hong Kong University of Science and Technology, Hong Kong **Sept. 2016 – Dec. 2019**
Bachelor of Science in Computer Science and Mathematics with First Class Honors

RESEARCH EXPERIENCE

PhD Student – University of Waterloo, Ontario, Canada **Sept. 2020 – Aug. 2025 (Expected)**
Exploring the use of integral equations and Monte Carlo methods for non-rendering tasks in computer graphics, including deformable and fluid simulation. My work spans all layers of the research stack, from developing core PDE solvers with novel integral and Monte Carlo techniques to applying them in physics-based animation. [1, 3-6, S1]

Research Scientist Intern – Adobe Inc., California, USA **May 2024 – August 2024**
Worked on a research project under the supervision of Dr. Mike Lukáč.

Undergraduate Researcher – HKUST, Hong Kong **Sept. 2018 - Jan. 2021**
Developed a real-time water animation system from a single photograph, combining deep learning and screen-space rendering for realistic, editable results. Supervised by Prof. Pedro V. Sander. [2]

WORK EXPERIENCE

Research Scientist Intern – Adobe Inc., California, USA **May 2024 – Aug. 2024**
Implemented a robust C++ prototype for research.

3D Software Developer – Side Effects Software Inc., Ontario, Canada **June 2023 – April 2024**
Contributed simulation and modeling tools to Houdini 20/20.5, including geometry nodes for solving linear systems, computing discrete Laplacians, inflating 2D shapes into 3D volumes, and measuring pointwise thickness. Also created a dynamics node for authoring artist-controllable incompressible flow fields with curves [S1], and implemented various linear algebra operations as VEX shader functions.

Machine Learning Engineer Intern – Dayta AI Limited, Hong Kong **June 2019 – Aug. 2019**
Developed a deep learning-based human detection and tracking system for retail analytics, enhancing person re-identification accuracy and efficiency using neural and classical metrics with parallelization.

SKILLS

Programming: C/C++, CUDA, Python (Proficient); JavaScript, Java, MATLAB (Familiar)

Libraries: Eigen, libigl, OpenGL, OpenCV, PyTorch **Languages**: English (fluent), Japanese (native)

PUBLICATIONS

Full Journal / Conference Papers

[6] **R. Sugimoto**, N. King, T. Hachisuka, & C. Batty
Projected Walk on Spheres: A Monte Carlo Closest Point Method for Surface PDEs
ACM SIGGRAPH Asia 2024 (Conference Papers), 2024.

[5] **R. Sugimoto**, C. Batty, & T. Hachisuka
Velocity-Based Monte Carlo Fluids
ACM SIGGRAPH North America 2024 (Conference Papers), 2024.

[4] **R. Sugimoto,** T. Chen, Y. Jiang, C. Batty, & T. Hachisuka
A Practical Walk-on-Boundary Method for Boundary Value Problems
ACM SIGGRAPH North America 2023 (Transactions on Graphics, 42(4)), 2023.

[3] D. Rioux-Lavoie*, **R. Sugimoto***, T. Özdemir, N. H. Shimada, C. Batty, D. Nowrouzezahrai, and T. Hachisuka (*joint first authors)
A Monte Carlo Method for Fluid Simulation
ACM SIGGRAPH Asia 2022 (Transactions on Graphics, 41(6)), 2022.

[2] **R. Sugimoto**, M. He, J. Liao, and P. V. Sander
Water Simulation and Rendering from a Still Photograph
ACM SIGGRAPH Asia 2022 (Conference Papers), 2022.

[1] **R. Sugimoto**, C. Batty, and T. Hachisuka
Surface-Only Dynamic Deformables using a Boundary Element Method
ACM SIGGRAPH / Eurographics Symposium on Computer Animation (Computer Graphics Forum, 41(8)), 2022. (**Best Paper Award**)

Short Papers

[S1] **R. Sugimoto,** J. Lait, C. Batty, & T. Hachisuka
Galerkin Method of Regularized Stokeslets for Procedural Fluid Flow with Control Curves
SIGGRAPH Asia 2024 (Technical Communications), 2024.

SELECTED TALKS

Monte Carlo Methods for Fluid Simulation
- NVIDIA High-Fidelity Physics Research Group, February 2025
- Aoyama Gakuin University, November 2024
- Institute of Science and Technology Austria (ISTA), November 2024
- RWTH Aachen University, November 2024
- The University of Tokyo, September 2024

Projected Walk on Spheres: A Monte Carlo Closest Point Method for Surface PDEs
- ACM SIGGRAPH Asia 2024, December 2024

Galerkin Method of Regularized Stokeslets for Procedural Fluid Flow with Control Curves
- ACM SIGGRAPH Asia 2024, December 2024

Velocity-Based Monte Carlo Fluids
- Visual Computing 2024 (Tokyo, Japan), September 2024
- ACM SIGGRAPH North America 2024, August 2024

A Practical Walk-on-Boundary Method for Boundary Value Problems

- The 23rd Forum on Information Technology (Hiroshima, Japan), September 2024
- CSIG SIGGRAPH Webinar Series (China, remote), December 2023
- Wētā FX Simulation Team, October 2023
- Visual Computing 2023 (Japan, remote), September 2023
- ACM SIGGRAPH North America 2023, August 2023

A Monte Carlo Method for Fluid Simulation

- Visual Computing 2023 (Japan, remote), September 2023
- ACM SIGGRAPH Asia 2022, December 2022

Water Simulation and Rendering from a Still Photograph

- Visual Computing 2023 (Japan, remote), September 2023
- ACM SIGGRAPH Asia 2022, December 2022

Surface-Only Dynamic Deformables using a Boundary Element Method

- ACM SIGRAPH / Eurographics Symposium on Computer Animation 2022, September 2022

PROFESSIONAL SERVICES

Journal / Conference Paper Reviewer
IEEE TVCG (2025), SIGGRAPH North America 2025 & 2024, Eurographics 2025, Pacific Graphics 2024, SIGGRAPH Asia 2023, Computer Graphics Forum (2023)

TEACHING EXPERIENCE

Teaching Assistant, UWaterloo School of Computer Science **Spring 2021 – April 2023**
Student Helper for a Robotics Course for Secondary School Students, HKUST ECE Dept. **Spring 2019**
Embedded System Programming Tutor, HKUST Robotics Team **Fall 2018**
Student Lab Helper for Intro to Object-Oriented Programming, HKUST CSE Dept. **Spring 2018**
Student Facilitator of Japanese Conversation Group, HKUST CLE **Sept. 2016 – May 2017**

HONORS & AWARDS

2024 Cheriton Research Symposium Posters 1st Place Winner 2024
David R. Cheriton Graduate Scholarship (Type I), UWaterloo 2023
Best Paper Award, Symposium on Computer Animation 2022 2022
Entrance Scholarship, UWaterloo 2020
Tse Cheuk Ng Tai Scholarship, HKUST 2019
University Scholarship, HKUST 2016 – 2019
Dean's List, HKUST Fall 2016 & Spring 2019
HKSAR Government Scholarship - Talent Development Scholarship 2018 & 2019
Robocon Hong Kong Contest Champion 2017 & 2018
HKSAR Government Scholarship - Reaching Out Award 2017

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