# Otman Benchekroun

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## EDUCATION

**University of Toronto** — Sep. 2022 – May 2026

*PhD. in Computer Science – in progress* — *Supervisor: Eitan Grinspun*

**Thesis**: *Interactive and Controllable Physics Simulations*

**University of Toronto** — Sep. 2020 – August 2022

*MSc. in Computer Science* — *Co-Supervisors: Eitan Grinspun , Alec Jacobson*

**Thesis**: *Fast Complementary Dynamics*

**McGill University** — Sep. 2015 – May 2020

*BEng. in Honour's Electrical Engineering* — *Co-Supervisors: Brett H. Meyer, Derek Nowrouzezahrai*

**Thesis**: *Minimalist Scene Geometry* Reconstruction

## PUBLICATIONS

\* Denotes equal contribution.

**Shape Space Spectra**

*ACM Transactions on Graphics (Proc. SIGGRAPH North America 2025)*

*Yue Chang,* **Otman Benchekroun**, *Maurizio M. Chiaramonte, Peter Yichen Chen, Eitan Grinspun*

We propose a framework for computing eigenfunctions of PDE operators across families of shapes, enabling challenging shape optimization tasks.

**Fast Subspace Fluid Simulation with a Temporal-Aware Basis**

*ACM Transactions on Graphics (Proc. SIGGRAPH North America 2025)*

*Siyuan Chen, Yixin Chen, Jonathan Panuelos,* **Otman Benchekroun**, *Yue Chang, Eitan Grinspun*

We introduce Dynamic Mode Decomposition to the graphics community, and show how it can offer new avenues for fluid control.

**Actuators À La Mode: Modal Actuators for Soft Body Locomotion**

*ACM Transactions On Graphics (Proc. SIGGRAPH Asia 2024)*

**Otman Benchekroun**, *Kaixiang Xie, Hsueh-Ti Derek Liu, Eitan Grinspun, Sheldon Andrews, Victor Zordan*

We propose an actuation space for arbitrary elastic characters and use it to automatically find natural locomotions.

**Subspace Mixed Finite Elements for Real-Time Heterogeneous Elastodynamics**

*ACM Transactions On Graphics (Proc. SIGGRAPH Asia 2023)*

*Ty Trusty\*,* **Otman Benchekroun\***, *Eitan Grinspun, Danny M. Kaufman, David I. W. Levin*

We propose an elastodynamic solver for real-time physics simulation of heterogeneous domains.

**Fast Complementary Dynamics via Skinning Eigenmodes**

*ACM Transactions On Graphics (Proc. SIGGRAPH North America 2023)*

**Otman Benchekroun**, *Jiayi Eris Zhang, Siddhartha Chaudhuri, Eitan Grinspun, Yi Zhou, Alec Jacobson*

We add physics-based secondary effects to rig animations in real-time by proposing a subspace well suited for deformable body simulation.

**Adaptive Merging for Rigid Body Simulation**

*ACM Transactions On Graphics (Proc. SIGGRAPH North America 2020)*

*Eulalie Coevoet,* **Otman Benchekroun**, *Paul G. Kry*

We speed up rigid body simulations by leveraging the insight that consistent contacts generally incur slow-changing forces, which allows us to merge multiple contacting bodies into one

## Experience

**Meta Research Intern**                         June 2024 – September 2024
*Meta*                                    *Redmond, WA, USA*
Supervised by : Philip Allen Etter, Maurizio Chiaramonte

**Roblox Research Intern**                       May 2023 – September 2023
*Roblox*                                    *San Mateo, CA, USA*
Supervised by : Hsueh-Ti Derek Liu, Sheldon Andrews, Victor Zordan

**Geometry Processing Teaching Assistant**            September 2022 – December 2022
*University of Toronto*                           *Toronto, ON, Canada*
Supervised by : Alec Jacobson

**Adobe Research Intern**                         September 2021 – December 2021
*Adobe*                                    *Toronto, ON, Canada*
Supervised by : Yi Zhou, Siddartha Chaudhuri, Alec Jacobson

**Physics Based Animation Teaching Assistant**         September 2020 – December 2020
*University of Toronto*                           *Toronto, ON, Canada*
Supervised by : David I.W. Levin

**Geometry Processing and Simulation Research Assistant**    May 2020 – August 2020
*University of Toronto*                           *Toronto, ON, Canada*
Supervised by : Eitan Grinspun, Alec Jacobson

**Physics Based Animation Research Assistant**          May 2019 – August 2019
*McGill University*                              *Montreal, QC, Canada*
Supervised by : Paul G. Kry

**Machine Learning Research Assistant**               May 2018 – August 2018
*McGill University*                              *Montreal, QC, Canada*
Supervised by : Brett H. Meyer

**Machine Learning Research Assistant**               May 2017 – August 2017
*Royal Millitary College*                         *Kingston, ON, Canada*
Supervised by : Vincent Roberge, Mohammed Tarbouchi

## Projects

**Curva-GCN** | *Python*                            January 2021 – May 2021
- Extended the popular graph convolutional neural networks (GCN's) to be better suited for mesh processing algorithms by adding within them a simple curvature-sensitive feature normalization
- Very straightforward to implement and shows drastically improved results on the FAUST node classification dataset, with no additional run-time cost

**Dendritic Growth Modelling** | *MATLAB, C++*         September 2020 – December 2020
- Implemented two algorithms that could model dendritic growth phenomena for crystal growth/Hele-Shaw flow problems: one based on an Eulerian phase field method, and another on a Lagrangian front-tracking scheme

**MPM Droplet Simulation** | *Python, Taichi*           October 2020 – December 2020
- Implemented a 2D Material Point Method algorithm for modelling droplets suspended and moved along within air
- The droplets are modelled as their own dense fluid, subject to additional drag forces from the air

**Tiny-Renderer** | *C++*                           September 2018 – December 2018
- Implemented a Monte Carlo Path-tracing renderer from scratch in C++ with different BRDFs, various importance sampling strategies

**IMDweeB** | *Python*                                 January 2017
- As part of a codejam, impelemented a machine learning algorithm that classifies movies based on genre by only using the movie summary

## Leadership and Volunteer Experience

**Graduate Summer School Co-Chair** | Symposium of Computer Animation 2025     May 2025 – August 2025
- Introduced new panel sessions to the second iteration of the SCA 2025 Summer Graduate School
- Oversaw the organization of 4 introductory lectures given at SCA 2025

**Co-Chair** | CS Academy     March 2025
- Organized week-long high school outreach event for high schoolers to learn about research in Graphics.
- Expanded the academy to twice its size from the previous iteration.
- Expanded the scope of the academy from visual computing to also include machine learning, logic and theory.

**Graduate Summer School Chair** | Symposium of Computer Animation 2025     May 2024 – August 2024
- Organized graduate summer school curriculum, for the first offering of this programme at this conference.
- Found and coordinated with graduate summer school lecturers.

**Chair** | DGP Academy     March 2024
- Organized week-long high school outreach event for high schoolers to learn about research in Graphics.
- Organized entire programme involving: week-long projects, speakers, tutorial sessions, mentor pairings, social activities and provided food.

**Executive Producer** | Toronto Geometry Colloquium     August 2021 – August 2022
- Along with two other graduate students, I was in charge of organizing a weekly colloquium in which we invite two speakers to discuss their research
- Particular care is taken in selecting and promoting young researchers and researchers from under represented groups for our colloquium

**Social Media Chair** | Symposium of Geometry Processing     March 2021 – July 2021
- Advertised the 2021 virtual Symposium of Geometry Processing on twitter, boosted followers from 1000 to 1700 during tenure
- Conducted and edited video interviews with leading experts in the geometry processing community which served to draw newcomers into the field

**Editor In Chief** | The Plumber's Faucet     September 2017 – May 2019
- In charge of printing, layout editing, documenting finances, soliciting writers and overseeing the production of monthly issues of *The Plumber's Faucet*, a humour magazine at McGill
- Spearheaded a new event, The Faucet's Tap, a weekly comedy show that ran September 2018-May 2019, which promoted local comedians

**President** | McGill Improv     September 2019– May 2020
- Organized weekly improv workshops open to improvisers of all skill levels. Produced bi-monthly shows and oversaw the club as a whole

## Awards

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| **Walter C. Sumner Memorial Fellowship** | $9, 000 CAD | September 2025 – May 2026 |
| **Ontario Graduate Scholarship** | $15, 000 CAD | September 2025 – December 2026 |
| **Canada Graduate Scholarship** | $17,500 CAD | September 2021 – August 2022 |
| **Faculty of Arts and Science Fellowship** | $1 000 CAD | November 2020 |
| **University of Toronto Fellowship** | $1 000 CAD | May 2021 |
| **Queen Elizabeth II Graduate Scholarship** | $15 000 CAD | September 2020– August 2021 |