

Omar Hesham, PhD

Modeling, Simulation & Visualization

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Status: Canadian on a visit to Doha. Willing to relocate to Doha.

Profile

Omar Hesham is the Visualization and High-Performance Computing lead at Zetane Systems, Montreal, developing AI and Machine Learning visual debugging solutions for high-risk industries (auto, construction, medical training, and defense). He has a PhD from Carleton University's Advanced Real-time Simulation Lab, which specializes in the Discrete Event System Specification (DEVS) formalism. Omar's research on agent-based simulation has been well-received by the simulation community, earning multiple best paper awards for his work on real-time dense crowd simulation. For his MSc, he researched real-time simulation of soft tissue tearing for surgical training. Prior to academic research, Omar worked as a freelancer in the interactive multimedia and gaming industry (2009-2012), which gave him a deeper appreciation of the class of user experience (UX) and design problems that professional users of complex simulation tools face on a daily basis.

Omar's most personally rewarding academic experiences have always involved the opportunity to teach, particularly topics in Computer Architecture and Interactive Multimedia. As a university lecturer, he developed and taught an undergraduate course on modular systems and procedural design (Carleton University 2013). His adaptive approach to teaching caters to learners from various backgrounds and skills, resulting in multiple EDC Outstanding TA Award nominations. Omar's empathy drives his interactions with his students. When a student is struggling, Omar first takes that as feedback that the teaching material could be improved, and when possible, will work with each student to amend gaps in their intuition. He will equally recognize top achievers and subtly challenge them with additional thought puzzles and ideas that could inspire them to pursue new topics or consider a problem from a fresh perspective. Omar occasionally comes across students who enjoy explaining concepts to their classmates. Those interactions help them reinforce their understanding, and it helps them develop communication and mentorship skills they will find valuable in the future. Omar carefully observes such interactions and ensures they remain within academic integrity and fairness guidelines.

Professionally, Omar has mentored junior engineers and interns in highly applied fields (Real-time Graphics, ML Visualization, DevOps), who went on to become full time engineers, pursued graduate studies, or jump-started their career in Silicon Valley. To reach a broader audience, Omar started [Koldora](#), an educational channel that publishes high-quality copyright-free content to scholars around the world, with over 5400 hours of viewership and growing.

Omar is seeking the opportunity to teach again in higher education; consulting with the department leadership and senior faculty to establish or revise learning outcomes for each course he teaches within the overall context of the degree and dependent courses. He enjoys teaching undergraduate Computer Architecture (those precious aha moments when their Logisim circuit finally does the right thing); and he welcomes the opportunity to develop new courses in graphics, simulation, data visualization, mathematical programming, computational geometry, or other priorities at the department.

Education

- Ph.D.** Electrical and Computer Engineering, Carleton University. Supervisor: Dr. Gabriel Wainer (2013-2019)
M.Sc. Information and Systems Science, Carleton University. Supervisor: Dr. Chris Joslin (2009-2011)
B.I.T. Interactive Multimedia and Design, Carleton University & Algonquin College, with Distinction (2005-2009)

Teaching

Teaching Assistant – (2013 – 2017)

Department of Systems and Computer Engineering, Carleton University.

Course	Title	Semester	Instructor
SYSC 3601	Microprocessor Systems: Intel x86	2017 Winter	Dr. Ramy Gohary
SYSC 3006	Computer Organization: ARM Microarchitecture	2016 Fall	Dr. Ramy Gohary
SYSC 3303	Real-time Concurrent Systems	2016 Winter	Dr. Lynn Marshall
SYSC 3006	Computer Organization: ARM Microarchitecture	2015 Fall	Dr. Trevor Pearce
SYSC 3303	Real-time Concurrent Systems (Java)	2015 Winter	Dr. Mohamed Ibrahim
IMD 4003	3D Computer Animation	2014 Fall	Dr. Chris Joslin
IMD 3002	3D Computer Graphics (C++)	2014 Winter	Dr. Chris Joslin
SYSC 3006	Computer Organization: x86 Assembly	2013 Summer	Mr. Graham Eatherley

Instructor – IMD4005 (Winter 2013)

School of Information Technology, Carleton University.

- Designed and taught a new course on procedural computer graphics at the senior undergraduate level. Topics included generative design and behavioural swarm animation.
- Course load included lectures, labs, and term projects.

Completed TA Training Workshops

- Supporting and Accommodating Students with Disabilities
- Managing Challenging Teaching Situations

Miscellaneous

- Bilingual (English; Arabic).
- Co-supervised Srivastav Janpalli for SYSC5900 Masters' project (Winter 2018).
- Guest lecturer on Parallel DEVS for SYSC5104 Methodologies for Discrete-Event M&S (Fall 2016).
- Guest lecturer on Match-moving Techniques for IMD3002 Computer Graphics (Winter 2015).
- Online Guest Lecturer on Game Engines for graduate students from IŞIK University, Turkey (May 2010).
- Undergraduate Tutor for Carleton University Learning Support Services in Math and CG courses (2006-2008).
- Created educational particle and grid-based fluid animation demos using Maya and RealFlow, accompanied by original tutorials to be taught in senior year IMD classes (2008).
- Designed and taught a 25-hour course on Computer Graphics to forty grade 8-11 students as part of the Enrichment Mini-Course Program (2010). Introduced them to specialised art equipment, including a live Mo-Cap session. Received positive response from parents.

Research

Ph.D. Electrical and Computer Engineering (2013-2019)

Advanced Real-time Simulation Lab, Carleton University

- Modeling crowd and pedestrian dynamics using the Discrete Event System Specification (DEVS).
- UI and toolset overhaul of several in-lab devkits and simulation engines. Emphasis on portability, usability, rapid iteration, and developer-friendly pipelines.
- Dissertation: *Centroidal Particle Dynamics: An Explicit Model of Pedestrian Personal Space for the Simulation of Short-Range Collision-Avoidance and Emergent Motion Patterns in Dense Crowds.*
- Research homepage: <https://omarhesham.com/arslab/>

M.Sc. Information and Systems Science (2009-2011)

School of Information Technology, Carleton University

- Funded by Ontario Research Fund - Research Excellence Grant (2009-2011).
- Dissertation: *Fast Meshless Simulation of Anisotropic Tearing in Elastic Solids.*
- VoroDyn: a novel Voronoi-based implicit collision detection simulation of thick fluids and granular materials on limited mobile devices, written in Java and OpenGL.
- Supervised several experiment runs for fellow Cognitive Science PhD students (2010-2011).

Honours and Awards

- Outstanding Contribution in Reviewing, Elsevier Simulation Modeling Practice and Theory Journal (2017).
- Bernard Pagurek and Murray Woodside award (2017).
- Carleton EDC Outstanding TA Award nominee (2016-2017).
- Ontario Graduate Scholarship (OGS) (2016-2017).
- Dr. Roger Kaye Memorial Scholarship for Ontario Students (2015-2016).
- Queen Elizabeth II Graduate Scholarship in Science & Technology (QEII-GSST) (2015-2016).
- Carleton EDC Outstanding TA Award nominee (2015-2016).
- Carleton Graduate Scholarship (2013-2016).
- Ontario Graduate Scholarship (OGS) (2010-2011).
- Deans' Honour List (2005-2009).
- Carleton Entrance Scholarship (2005-2009).
- Cambridge ICE Award (2005).

Academic Service

Primary Reviewer: Served as scientific committee member or primary reviewer for the following publications:

- Symposium on Simulation for Architecture and Urban Design (SIMAUD 2018).
- Winter Simulation Conference (WSC 2017).
- Simulation Modelling Practice and Theory (SIMPAT) Special Issue on Agent-based Modeling, Elsevier. June 2017.

Secondary Reviewer: Assisted various committee members as secondary reviewer for the following publications:

- ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (SIGSIM PADS 2017).
- IEEE Conference on Enabling Technologies: Infrastructure for Collaborative Enterprises (WETICE 2016).
- International Conference on Cellular Automata for Research and Industry (ACRI 2016).
- Winter Simulation Conference (WSC 2016).
- IEEE International Symposium on Network Computing and Applications (NCA 2016).
- Summer Solstice International Conference on Discrete Models of Complex Systems (SSIC 2015).
- Computer Graphics International (CGI 2012).

Publications

Google Scholar Profile: <https://scholar.google.com/citations?user=JiRM1gQAAAAJ&hl=en>

Journal

1. **O. Hesham** and G. Wainer, "Explicit Modeling of Personal Space for Improved Local Dynamics in Simulated Crowds," *ACM Transactions on Modeling and Computer Simulation*, vol. 31, no. 4, pp. 1–29, Jul. 2021.
2. **O. Hesham** and G. Wainer, "Advanced models for centroidal particle dynamics: short-range collision avoidance in dense crowds," *Simulation*, vol. 97, no. 8, pp. 529–543, Aug. 2021.

Conference

3. S. R. Janapalli, **O. Hesham**, and G. A. Wainer, "Heterogeneous Crowd Simulation," in 2019 Spring Simulation Conference (SpringSim), Apr. 2019, pp. 1–12.
4. **O. Hesham**, Princy, W. Aburime, Z. Rabeh, S. Bhushan, and G. Wainer, "Observed behaviours in simulated close-range pedestrian dynamics," in Proceedings of the Symposium on Simulation for Architecture and Urban Design, Delft, Netherlands, Jun. 2018, pp. 1–8.
5. B. St-Aubin, **O. Hesham**, and G. Wainer, "A Cell-DEVS Visualization and Analysis Platform," in Proceedings of the 50th Computer Simulation Conference, Bordeaux, France, pp. 1-12. SummerSim 2018.
6. **O. Hesham**, C. Joslin, and R. R. Ansara, "Interactive Anisotropic Tearing of Elastic Solids," in Proceedings of the 13th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications (VISIGRAPP 2018) - Volume 1: GRAPP, Funchal, Madeira, Portugal, January 27-29, 2018, pp. 256–263.
7. **O. Hesham** and G. Wainer, "Context-sensitive personal space for dense crowd simulation," in Proceedings of the Symposium on Simulation for Architecture and Urban Design, Toronto, Canada, May 2017, pp. 1–8.
 - Awarded: Best Student Paper.
8. **O. Hesham** and G. Wainer, "Centroidal Particles for Interactive Crowd Simulation," in Proceedings of the Summer Computer Simulation Conference, Montreal, Quebec, Canada, July 2016, pp. 1-8. 2016.
 - Awarded: Best Paper SCSC.
 - Awarded: Multi-conference Overall Best Paper.
9. M. Van Schyndel, **O. Hesham**, G. Wainer and B. Malleck, 2016, "Crowd modeling in the Sun Life building". in Proceedings of Symposium on Simulation in Architecture and Urban Design (SimAUD 2016), London, UK (pp. 4-7).
10. M. Leflar, **O. Hesham**, and C. Joslin, "Use of High Dynamic Range Images for Improved Medical Simulations," in *Modelling the Physiological Human*, Springer Berlin Heidelberg, 2009, pp. 199–208.

Industrial Experience

Visualization and High-Performance Computing Lead (September 2018 – Present)

Zetane Systems, Montreal, Canada

- Lead developer: visualization pipeline for Zetane's ML and Deep Learning IDE.
- Shipping a commercial cross-platform C++ desktop application and Python API (Windows, Linux, macOS).
- Deep integration with ML frameworks (TensorFlow, Torch, and ONNX Runtime).
- Onboarding, training, and managing engineering teams and interns.
- DevOps and internal IT/cloud support.
- Writing for patents, grants, proposals, audits.

Consultant (July 2015 – September 2018)

omarhesham.com

- Boutique tech consultancy based in Ottawa developing custom simulation tools and educational videos with an emphasis on visual learning, drawing upon our experience within academia and the CG industry.
- Web design, development, and hosting for small and medium-sized businesses and research labs
- Design and development of educational videos and illustrative guides for training applications.
- Clients include: Al Noor Institute for The Blind (Doha), Swar Signs (Ottawa), Zetane Systems (Montreal).

3D Technical Director – Part Time (April 2009 – January 2010)

Interactive Media Group (iMG) / Algonquin College Applied Research & Innovations.

- Content developer for Tiontay, an online Unreal Engine 2.5 environment for CHEO Ronald McDonald House patients and their families.
- Working with Tegan Laing, Nuket Nowlan and Dr. Ali Arya, in collaboration with bitHeads and Nortel, I supervised the modeling of 3D characters, and created a Maya rigging pipeline to accommodate additional apparel and accessories for deployment to the Unreal web platform.
- Created documentation and video tutorials for colleagues and future employees.
- Our successful Tipontia launch event was featured on CTV News (July 16, 2009)

Webmaster (September 2006 – August 2008)

Rideau River Residence Association, Carleton University.

- Designed and maintained a more user-friendly UI and several ActionScript 2.0 components.
- CU Students' Charity Ball web coordinator (2007-2009).

Things we can geek out about

- C++20, Zetane, Jai, Vulkan, WebAssembly.
- Runtime optimization.
- Graphics and concurrent computing.
- Autodesk Maya, Adobe Creative Suite.
- Game dev frameworks (Unity, Unreal).
- Neat, readable, well-documented code.
- Inclusivity and mental health.

References

Gabriel Wainer

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