

CURRICULUM VITAE

Michael Brandon Haworth

Office: ECS 568, Engineering & Computer Science Building, University of Victoria

Web: bhaworth.ca

Email: bhaworth@uvic.ca

Phone: +1 250-472-5772

0. EXECUTIVE SUMMARY

Assistant Professor in the Department of Computer Science, Faculty of Engineering and Computer Science at the University of Victoria focused on the representative modelling of humans for simulation, design, and media. I am also the Director of the Graphics, Artificial Intelligence, Design, & Games (GAIDG) Lab and a Research Fellow at the Institute on Aging & Lifelong Health at the University of Victoria. Published 14 journal articles, 21 conference papers, 2 book chapters, 10 workshop papers, 10 posters, and 12 presentations around the world on the topics of games, animation, rehabilitation, design, and artificial intelligence. Officially supervising (or supervised) 25 student roles (2 PhD, 5 Master's, 18 Undergraduate), unofficially advised/mentored 15 student roles (3 PhD, 5 Masters, 7 Undergraduate), and have held multiple teaching roles across teaching assistantships (17) and course instructorships (6). A non-profit board member and volunteer dedicated to professional service, also serving as an associate editor (Computer Animation and Virtual Worlds journal) a frequent peer reviewer (91 invited reviews), as well as, on conference program committees (15 memberships, 36 reviews), and academic committees (5).

1. PERSONAL

Nationality: American, British, and Permanent Resident of Canada

Language(s): English

2. MAIN ACADEMIC INTERESTS

- Computer Graphics
- Computer Animation
- Human-Centred Artificial Intelligence
- Agent-based Modelling
- Game Design and Development
- Human Computer Interaction
- Virtual Reality
- Computer Vision
- Architectural Design and Optimization
- Assistive and Healthcare Technologies
- Behavioural Sciences
- Rehabilitation Sciences

3. PROFESSIONAL ASSOCIATIONS

- Member ACM
 - ▶ Member ACM Special Interest Group on Computer Graphics and Interactive Techniques (ACM SIGGRAPH)
 - ▶ Member ACM Special Interest Group on Artificial Intelligence (ACM SIGAI)

- ▶ Member ACM Committee on Women
- Member IEEE
- Member Canadian Human-Computer Communications Society, CHCCS/SCDHM Special Interest Group within the Canadian Information Processing Society (CIPS)

4. EDUCATION

- September 2014 – September 2019: **Ph. D.**, Computer Science at York University, Department of Electrical Engineering and Computer Science.
 - ▶ Thesis: Biomechanical Locomotion Heterogeneity in Synthetic Crowds
 - ▶ Supervisor: Petros Faloutsos
 - ▶ Including NSERC Create Program in Data Analytics & Visualization (2yrs)
- 01/2013 – 01/2016: **M.Sc.**, Computer Science at York University, Department of Electrical Engineering and Computer Science.
 - ▶ Thesis: Computer Games for Motor Speech Rehabilitation
 - ▶ Supervisors: Petros Faloutsos & Melanie Bajko
- 09/2008 – 12/2012: **B.Sc., Hons.**, Computer Science at York University, Department of Electrical Engineering and Computer Science.
 - ▶ Including 2011 International Summer School in Computer Science
 - Computer Vision with Xenophon Zabulis at ICS/FORTH, Heraklion, Greece

5. RESEARCH POSITIONS

- July 2020 – Present: **Director** of the Graphics, Artificial Intelligence, Design, & Games (GAIDG) Lab in the Department of Computer Science at the University of Victoria, Victoria, Canada.
- 12/2019 – 06/2020: **Post-Doctoral Fellow** with the Ontario Research Fund/Intelligent Systems for Sustainable Urban Mobility (ORF/ISSUM) in the Department of Electrical Engineering and Computer Science at York University, Toronto, Canada.
- 01/2013 – 11/2019: **Graduate Researcher/Research Assistant** at the Graphics and Multimedia at York (GaMaY) Lab in the Department of Electrical Engineering and Computer Science at York University, Toronto, Canada.
- 02/2016 – 02/2017: **Developer and Consultant** at the Speech Production Lab in the Department of Speech-Language Pathology at the University of Toronto.
- 01/2013 – 02/2017: **Graduate Researcher/Trainee** at the Vocal Tract Visualization Lab in the Communication Team at the UHN: Toronto Rehabilitation Institute.
- 01/2013 – 02/2016: **Research Assistant** at the Speech Production Lab in the Department of Speech-Language Pathology at the University of Toronto.
- 06/2012 – 12/2012: **Undergraduate Researcher** at the Graphics and Multimedia at York (GaMaY) Lab in the Department of Electrical Engineering and Computer Science at York University, Toronto, Canada.
- 06/2012 – 12/2012: **Research Assistant** at the Sunnybrook Health Sciences Centre.

6. RESEARCH AFFILIATIONS

- **Director** Graphics, Artificial Intelligence, Design, & Games (GAIDG) Lab
- **External Collaborator** Graphics and Multimedia at York (GaMaY)
- **External Collaborator** Rutgers Intelligent Visual Interfaces Lab (IVI)
- **External Collaborator** Intelligent Systems for Sustainable Urban Mobility (ISSUM)
- **Affiliate Alumnus** UBC Motion Control and Character Animation group (UBCMOCCA)
- **Alumnus** University of Toronto Speech Production Lab (SPL)
- **Alumnus** UHN: Toronto Rehabilitation Institute Vocal Tract Visualization Lab (VTV)
- **Alumnus** Practices in Enabling Technologies Lab (PIET)

- **Alumnus** Centre for Innovation in Information Visualization and Data-Driven Design (CIVDDD)
- **Alumnus** Sunnybrook Health Sciences Centre

7. INDUSTRY POSITIONS

- February 2018 – August 2018: **Research and Development Intern** (*Virtual Reality and Spatial Analysis Expert*) at Teeple Architects, Toronto, Canada.
- 07/2017 – 08/2017: **Research and Development Intern** (*Virtual and Augmented Reality Expert*) at Programize Hellas S.A., Athens, Greece.

8. SUPPORT

Research Funding & Awards

- 2022 – 2023: W.E. Cowie Faculty Innovation Award (Principal Investigator), University of Victoria
Title Withheld
 - ▶ Total: \$8,000 CAD
- 2021 – 2026: NSERC Discovery Grant (Principal Investigator), University of Victoria
Diverse Synthetic Crowds in Media, Design, and Analysis
 - ▶ \$24,000 per year for 5 years
 - ▶ \$12,500 Early Career Researcher Supplement for year 1
 - ▶ Total: \$132,500 CAD
- 2021 – 2022: Compute/Calcul Canada Resources for Research Groups 2022 (Principal Investigator), University of Victoria
Graphics, Artificial Intelligence, Design, and Games Lab
 - ▶ 512 core years, 2 GPU years, 12 TB storage, 11 TB nearline
 - ▶ Total Estimated value: \$69,102 CAD

Scholarly Funding & Awards

- 2022 – 2023: PIMS Seminar Series (Co-Applicant), University of Victoria
Mathematics of Ethical Decision-Making Systems
 - ▶ Co-Applicants: Nishant Mehta, Sowmya Somanath, Valerie King
 - ▶ Total: \$9,000 CAD

Undergraduate Student Research Funding & Awards

- 2022: W. E. Cowie Innovation Award (Principal Investigator/Supervisor)
 - ▶ Colin Johnson
 - ▶ Total: \$20,000 CAD
- 2022 – 2023: Jamie Cassels Undergraduate Research Award (Principal Investigator/Supervisor)
 - ▶ Steven Bobyn
 - ▶ Total: \$1,500 CAD
- 2022: Valerie Kuehne Undergraduate Research Award (Principal Investigator/Supervisor)
 - ▶ Liam Shatzel
 - ▶ Total: \$7,500 CAD
- 2021 – 2022: Jamie Cassels Undergraduate Research Award (Principal Investigator/Supervisor)
 - ▶ Colin Johnson
 - ▶ Total: \$1,500 CAD
- 2021: W. E. Cowie Innovation Award (Principal Investigator/Supervisor)
 - ▶ Yiping Wang
 - ▶ Total: \$18,000 CAD
- 2021: NSERC Undergraduate Summer Research Award (Principal Investigator/Supervisor)
 - ▶ Jonas Buro

- ▶ Total: \$6,000 CAD
- 2020 – 2021: Jamie Cassels Undergraduate Research Award (Principal Investigator/Supervisor)
 - ▶ Yiping Wang
 - ▶ Total: \$1,500 CAD

Funding & Awards Prior to Faculty Position

- 2019 – 2020: Ontario Research Fund (ORF/ISSUM), Post-Doctoral Fellowship
- 2016 – 2019: York Graduate Fellowship (Ph.D.)
- 2017 – 2019: NSERC CreateDAV (Ph.D.)
- 2018: Compute Canada Resources for Research Groups (RRG) Allocations (Ph.D.)
- 2017: Graduate Development Fund (Seoul, South Korea) (Ph.D.)
- 2016: Graduate Development Fund (Geneva, Switzerland) (Ph.D.)
- 2014 – 2015: York Graduate Scholarship (Ph.D.)
- 2014: Bridgeable–Bridging the Gap Award
- 2013 – 2014: York Graduate Scholarship (M.Sc.)
- 2011: York International Mobility Award (ICS/FORTH, Heraklion, Greece) (B.Sc.)
- 2011: IDCS IAM Award (ICS/FORTH, Heraklion, Greece) (B.Sc.)
- 2010: TD Meloche Monnex Bursary (B.Sc.)
- 2009: GM Bursary for Undergraduate Students in COSC (B.Sc.)
- 2008: Queen Elizabeth II Aiming for the Top Scholarship (B.Sc.)

9. PUBLICATIONS AND SCHOLARLY PRESENTATIONS

* shared first authorship

Book Chapters

- Usman, M., **Haworth, B.**, Berseth, G., Faloutsos, P., & Kapadia, M. (2021). Towards Democratizing Human-Building Simulation and Analytics in F. S. Roberts and I. A. Sheremet (Eds.), *Resilience in the Digital Age* LNCS 12660 (pp. 157–171). Springer Nature Switzerland AG.
- Berseth, G., Kapadia, M., **Haworth, B.**, & Faloutsos, P. (2016). SteerFit: Automated Parameter Fitting for Steering Algorithms in N. Pelechano, J. M. Allbeck, M. Kapadia, & N. I. Badler Editor (Ed.), *Simulating Heterogeneous Crowds with Interactive Behaviours* (pp. 197–213). Boca Raton, FL: CRC Press, Taylor & Francis Group.

Journal Articles

- Kremer, M., Caruana, P., **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2022). Automatic estimation of parametric saliency maps (PSMs) for autonomous pedestrians. *Computers & Graphics*, 104, 86-94.
- Hu, K.*, **Haworth, B.***, Berseth, G., Pavlovic, V., Faloutsos, P., Kapadia, M. (2021). Heterogeneous Crowd Simulation using Parametric Reinforcement Learning. *IEEE Transactions on Visualization and Computer Graphics*.
- Usman, M., **Haworth, B.**, Faloutsos, P., & Kapadia, M. (2021). Simulation-as-a-Service: Analyzing Crowd Movements in Virtual Environments. *Computer Animation and Virtual Worlds*, e1990.
- Kremer, M., **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2021). Modelling distracted agents in crowd simulations. *The Visual Computer*, 37(1), 107-118.
- **Haworth, B.**, Usman, M., Schaumann, D., Chakraborty, N., Berseth, G., Faloutsos, P., & Kapadia, M. (2020). Gamification of Crowd-Driven Environment Design. *IEEE Computer Graphics and Applications*, 41(4), 107-117.
- Berseth, G.*, **Haworth, B.***, Usman, M.*, Schaumann, D., Khayatkhoei, M.*, Kapadia, M., & Faloutsos, P. (2019). Interactive Architectural Design with Diverse Solution Exploration. *IEEE Transactions on Visualization and Computer Graphics*, 27(1), 111-124.

- Zhang, X., Schaumann, D., **Haworth, B.**, Faloutsos, P., & Kapadia, M. (2019). Coupling agent motivations and spatial behaviors for authoring multiagent narratives. *Computer Animation and Virtual Worlds*, 30(3-4), e1898.
- Kearney, E., **Haworth, B.**, Scholl, J., Faloutsos, P., Baljko, M., & Yunusova, Y. (2018). Treating Speech-Movement Hypokinesia in Parkinson's Disease: Does Movement Size Matter? *Journal of Speech, Language, and Hearing Research*, 61(11), 2703-2721.
- **Haworth, B.**, Kearney, E., Faloutsos, P., Baljko, M., & Yunusova, Y. (2018). Electromagnetic articulography (EMA) for real-time feedback application: computational techniques. *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization, Advance Online Publication*.
- Kearney, E., Giles, R., **Haworth, B.**, Faloutsos, P., Baljko, M., & Yunusova, Y. (2017). Sentence-Level Movements in Parkinson's Disease: Loud, Clear, and Slow Speech. *Journal of Speech, Language, and Hearing Research*, 60(12), 3426-3440.
- Yunusova, Y., Kearney, E., Kulkarni, M., **Haworth, B.**, Baljko, M., & Faloutsos, P. (2017). Game-based augmented visual feedback for enlarging speech movements in Parkinson's disease. *Journal of Speech, Language, and Hearing Research*, 60(6S), 1818-1825.
- **Haworth, B.**, Usman, M., Berseth, G., Kapadia, M., & Faloutsos, P. (2017). On density-flow relationships during crowd evacuation. *Computer Animation and Virtual Worlds*, 28(3-4), e1783.
- **Haworth, B.**, Usman, M., Berseth, G., Khayatkhoei, M., Kapadia, M., & Faloutsos, P. (2017). CODE: Crowd-optimized design of environments. *Computer Animation and Virtual Worlds*, 28(6), e1749.
- Berseth, G., Usman, M., **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2015). Environment optimization for crowd evacuation. *Computer Animation and Virtual Worlds*, 26(3-4), 377-386.

Refereed Conference Papers

- Schwartz, M., **Haworth, B.**, Usman, M., Kapadia, M., Faloutsos, P., (2022, September). Impact of Manikin Display on Perception of Spatial Planning. In *Proceedings of SAP '22: ACM Symposium on Applied Perception*. ACM.
- Johnson, C., **Haworth, B.** (2022, September). Cognitive Model of Agent Exploration with Vision and Signage Understanding. In *Proceedings of the 21st ACM SIGGRAPH / EUROGRAPHICS Symposium on Computer Animation (SCA 2022)*. ACM.
- Kremer, M., Caruana, P., **Haworth, B.**, Kapadia, M., Faloutsos, P. (2021, October). PSM: Parametric Saliency Maps for Autonomous Pedestrians. In *Proceedings of the 14th ACM SIGGRAPH International Conference on Motion, Interaction and Games (MIG 2021)*. ACM.
- Ferreira, D., **Haworth, B.** (2021, October). DeepSolfège: Recognizing Solfège Hand Signs Using Convolutional Neural Networks. In *International Symposium on Visual Computing (ISVC 2021) (pp. 39-50)*. Springer, Cham.
- **Haworth, B.***, Berseth, G.*, Moon, S., Faloutsos, P., & Kapadia, M. (2020, October). Deep Integration of Physical Humanoid Control and Crowd Navigation. In *Proceedings of the 13th ACM SIGGRAPH International Conference on Motion, Interaction and Games (MIG 2020)*. ACM.
- Kremer, M., **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2020, October). Watch Out! Modelling Pedestrians with Egocentric Distractions. In *Proceedings of the 13th ACM SIGGRAPH International Conference on Motion, Interaction and Games (MIG 2020)*. ACM.
- Usman, M., Schaumann, D., **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2019, October). Joint Exploration and Analysis of High-Dimensional Design–Occupancy Templates. In *Proceedings of the 12th ACM SIGGRAPH International Conference on Motion, Interaction and Games (MIG 2019) (p. 35)*. ACM.
- Zhang, X., Schaumann, D., **Haworth, B.**, Faloutsos, P., Kapadia, M. (2019, April). Multi-Constrained Authoring of Occupant Behavior Narratives in Architectural Design. In *Proceedings of the Symposium on Simulation for Architecture & Urban Design (SimAUD 2019)*.

- Usman, M., Schaumann, D., **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2019, June). Joint Parametric Modeling of Buildings and Crowds for Human-Centric Simulation and Analysis. In *Proceedings of the International Conference on Computer-Aided Architectural Design Futures (CAAD Futures 2019)* (pp. 279-294). Springer, Singapore.
- Schaumann, D., Sohn, S., Usman, M., **Haworth, B.**, Faloutsos, P., & Kapadia, M. (2019, June). Spatio-Temporal Affordance Maps for Occupancy Simulation in Architectural Design. In *Proceedings of the International Conference on Computer-Aided Architectural Design Futures (CAAD Futures 2019)*, Online.
- Usman, M., Schaumann, D., **Haworth, B.**, Berseth, G., Kapadia, M., & Faloutsos, P. (2018, November). Interactive Spatial Analytics for Human-Aware Building Design. In *Proceedings of the 11th ACM SIGGRAPH International Conference on Motion, Interaction, and Games (MIG 2018)* (p. 13). ACM.
- Usman, M., **Haworth, B.**, Berseth, G., Kapadia, M., & Faloutsos, P. (2017, November). Perceptual evaluation of space in virtual environments. In *Proceedings of the 10th ACM SIGGRAPH International Conference on Motion in Games (MIG 2017)* (p. 16). ACM.
- Chakraborty, N.*, **Haworth, B.***, Usman, M., Berseth, G., Faloutsos, P., & Kapadia, M. (2017, November). Crowd sourced co-design of floor plans using simulation guided games. In *Proceedings of the 10th ACM SIGGRAPH International Conference on Motion in Games (MIG 2017)* (p. 1). ACM.
- **Haworth, B.**, Usman, M., Baljko, M., & Hamidi, F. (2016, July). The Use of Working Prototypes for Participatory Design with People with Disabilities. In *Proceedings of the 16th International Conference on Computers Helping People with Special Needs (ICCHP 2016)* (pp. 134-141). Springer, Cham.
- **Haworth, B.**, Usman, M., Berseth, G., Khayatkhoei, M., Kapadia, M., & Faloutsos, P. (2016, May). Towards computer assisted crowd aware architectural design. In *Proceedings of the 2016 ACM CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI 2016)* (pp. 2119-2125). ACM.
- **Haworth, B.**, Usman, M., Berseth, G., Kapadia, M., & Faloutsos, P. (2015, November). Evaluating and optimizing level of service for crowd evacuations. In *Proceedings of the 8th ACM SIGGRAPH International Conference on Motion in Games (MIG 2015)* (pp. 91-96). ACM.
- Berseth, G., **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2014, November). Characterizing and optimizing game level difficulty. In *Proceedings of the 7th ACM SIGGRAPH International Conference on Motion in Games (MIG 2014)* (pp. 153-160). ACM.
- Berseth, G., Kapadia, M., **Haworth, B.**, & Faloutsos, P. (2014, July). SteerFit: Automated parameter fitting for steering algorithms. In *Proceedings of the ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA 2014)* (pp. 113-122). Eurographics Association.
- **Haworth, B.**, Baljko, M., & Faloutsos, P. (2012, December). PhoVR: a virtual reality system to treat phobias. In *Proceedings of the 11th ACM SIGGRAPH International Conference on Virtual-Reality Continuum and its Applications in Industry (VRCAI 2012)* (pp. 171-174). ACM.
- Shtern, M., **Haworth, B.**, Yunusova, Y., Baljko, M., & Faloutsos, P. (2012, November). A game system for speech rehabilitation. In *Proceedings of the 5th International Conference on Motion in Games (MIG 2012)* (pp. 43-54). Springer, Berlin, Heidelberg.
- **Haworth, B.**, Baljko, M., & Faloutsos, P. (2012, November). Treating Phobias with Computer Games. In *Proceedings of the 5th International Conference on Motion in Games (MIG 2012)* (pp. 374-377). Springer, Berlin, Heidelberg.

Refereed Workshop Papers

- **Haworth, B.**, Schwartz, M. (2022, August). Universal Design of Signage through Virtual Human Simulation. In *The 4th Cultural DNA Workshop*.

- **Haworth, B.**, Kapadia, M., & Faloutsos, P. (2021, November). Representative Synthetic Crowds for Inclusive Environment Design. In *2021 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR 2021)* (pp. 150-153). IEEE.
- Wang, Y., **Haworth, B.** (2021, July). MASAI: Multi-agent Summative Assessment Improvement for Unsupervised Environment Design. At the *Unsupervised Reinforcement Learning Workshop*. International Conference on Machine Learning 2021 (ICML 2021).
- (Invited talk) **Haworth, B.** (2021, January). Learning to Move - Reinforcement Learning in Navigation. At the *Neuro-Cognitive Modeling of Humans and Environments Workshop*. 29th International Joint Conference on Artificial Intelligence and the 17th Pacific Rim International Conference on Artificial Intelligence (IJCAI 2021).
- Berseth, G., **Haworth, B.**, Kapadia, M., Faloutsos, P. (2019, December). Multi-Agent Hierarchical Reinforcement Learning for Humanoid Navigation. At the *Deep Reinforcement Learning Workshop*. 33rd Conference on Neural Information Processing Systems (NeurIPS 2019).
- **Haworth, B.**, Usman, M., Berseth, G., Kapadia, M., Faloutsos, P. (2017, August). Static and Dynamic Analysis in Computer-Aided Human-Centric Environment Design. At the *Cognition and Artificial Intelligence for Human-Centred Design Workshop*. International Joint Conferences on Artificial Intelligence (IJCAI 2017).
- **Haworth, B.**, Usman, M., Chakraborty, N., Berseth, G., Faloutsos, P., Kapadia, M. (2017, August). Crowd Sourced Co-design of Floor Plans using Simulation Guided Games. At the *Cognition and Artificial Intelligence for Human-Centred Design Workshop*. International Joint Conferences on Artificial Intelligence (IJCAI 2017).
- **Haworth, B.**, Usman, M., Berseth, G., Khayatkhoei, M., Kapadia, M., & Faloutsos, P. (2016, March). Using synthetic crowds to inform building pillar placements. In *Virtual Humans and Crowds for Immersive Environments (VHCIE 2016)*, (pp. 7-11). IEEE.
- Moghaddam, A., **Haworth, B.**, Kearney, E., Baljko, M., Faloutsos, P., Yunusova, Y. (2015, August). Artifact Removal Techniques for 3d Electromagnetic Articulography. At the *3rd International Workshop on Biomechanical and Parametric Modeling of Human Anatomy (PMHA 2015)*. Parametric Human Project.
- **Haworth, B.**, Kearney, E., Baljko, M., Faloutsos, P., & Yunusova, Y. (2014, August). Electromagnetic articulography in the development of 'serious games' for speech rehabilitation. At the *2nd International Workshop on Biomechanical and Parametric Modeling of Human Anatomy (PMHA 2014)*. Parametric Human Project.

Refereed Posters

- **Haworth, B.**, Kapadia, M., Faloutsos, P. (2017, November). Footstep Action Identification and Clustering from Motion Capture. Poster presented at the *10th ACM SIGGRAPH International Conference on Motion in Games (MIG 2017)*.
- Kearney, E., **Haworth, B.**, Scholl, J., Faloutsos, P., Baljko, M., Yunusova, Y. (2017, November). Game-based Speech Therapy using Visual Feedback in Parkinson's Disease. Poster presented at the *Toronto Rehabilitation Institute Research Day*. UHN: TRI.
- Giles, R., Kearney, E., **Haworth, B.**, Faloutsos, P., Baljko, M., Yunusova, Y. (2017, November). Acoustic - Kinematic Relationships in Speech: Improving Assessment and Treatment of Speech Disorder in Parkinson's Disease. Poster presented at the *Toronto Rehabilitation Institute Research Day*. UHN: TRI.
- Yunusova, Y., Kearney, E., Scholl, J., Janik-Jones, C., **Haworth, B.**, Roberts, E., Faloutsos, P., Baljko, M. (2017, September). Game-Based Augmented Visual Feedback Treatment for Apraxia of Speech After Stroke. Poster presented at the *11th World Stroke Congress*. CPSR.
- Usman, M., **Haworth, B.**, Berseth, G., Kapadia, M., Faloutsos, P. (2017, July). Understanding spatial perception and visual modes in the review of architectural designs. Poster presented at

the 16th annual ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA 2017). Eurographics Association.

- Kearney, E., Yunusova, Y., **Haworth, B.**, Faloutsos, P., & Baljko, M. (2014, February). Articulatory Working Space as a Kinematic Target in Augmented Feedback Applications. Poster presented at the 17th Biennial Motor Speech Conference.
- **Haworth, B.**, Kearney, E., Yunusova, Y., Faloutsos, P., & Baljko, M. (2014, February). Rehabilitative Speech Computer Game Calibration Using Empirical Characterizations of Articulatory Working Space (AWS). Poster presented at the 17th Biennial Motor Speech Conference.
- **Haworth, B.**, Yunusova, Y., Kearney, E., Faloutsos, P., & Baljko, M. (2013, November). Enabling Serious Games for Speech Rehab: Movement Space Transformation. Poster presented at the Toronto Rehabilitation Institute Research Day. UHN: TRI.
- Kearney, E., **Haworth, B.**, Faloutsos, P., Baljko, M., & Yunusova, Y. (2013, November). Towards Development of Augmented Visual Feedback Targets for Speech Rehabilitation: Articulatory Working Space. Poster presented at the Toronto Rehabilitation Institute Research Day. UHN: TRI.
- **Haworth, B.**, Baljko, M., & Faloutsos, P. (2012, November). Treating phobias with computer games using consumer level hardware and software components. Poster presented at the 5th International Conference on Motion in Games (MIG 2012).

Invited Colloquiums

- **Haworth, B.** (2020, May). Representative Crowds for Inclusive Built Environment Design. *University of New Brunswick, Faculty of Computer Science.*
- **Haworth, B.** (2020, March). Representative Crowds for Inclusive Built Environment Design. *University of Victoria, Department of Computer Science.*
- **Haworth, B.** (2019, May). Human Movement Simulation: Environment optimization & diverse crowds for diverse cities. *University of Winnipeg, Department of Applied Computer Science.*

Refereed Presentations

- Johnson, C., **Haworth, B.** (2022, September). Cognitive Model of Agent Exploration with Vision and Signage Understanding. Paper presented at the 21st ACM SIGGRAPH / EUROGRAPHICS Symposium on Computer Animation (SCA 2022).
- **Haworth, B.** (2021, January). Learning to Move - Reinforcement Learning in Navigation. Invited talk at the Neuro-Cognitive Modeling of Humans and Environments Workshop. 29th International Joint Conference on Artificial Intelligence and the 17th Pacific Rim International Conference on Artificial Intelligence (IJCAI 2021).
- **Haworth, B.***, Berseth, G.*, Moon, S., Faloutsos, P., & Kapadia, M. (2020, October). Deep Integration of Physical Humanoid Control and Crowd Navigation. Paper presented at the 13th ACM SIGGRAPH International Conference on Motion, Interaction and Games (MIG 2020). ACM.
- Diamant, R.*, **Haworth, B.*** (2019, July). Reading the Shelves: The Politics of Creating a Diverse Comics Library. *The 2nd Annual Conference of the Comics Studies Society – COMICS/POLITICS.*
- Chakraborty, N.*, **Haworth, B.***, Usman, M., Berseth, G., Faloutsos, P., Kapadia, M. (2017, November). Crowd Sourced Co-design of Floor Plans using Simulation Guided Games. Paper presented at the 10th ACM SIGGRAPH International Conference on Motion in Games (MIG 2017). ACM.
- **Haworth, B.**, Usman, M., Berseth, G., Kapadia, M. & Faloutsos, P. (2017, May). On Density - Flow Relationships During Crowd Evacuation. Paper presented at the 30th Conference on Computer Animation and Social Agents (CASA 2017).

- Inampundi, B. C., Zhang, X., Geraci, F., Badler, N. I., & Kapadia, M. (2017, May). Memory Reconstruction from Autobiographic Memories of Autonomous Virtual Agents. Paper presented at the 30th Conference on Computer Animation and Social Agents (CASA 2017). (Presenter).
- **Haworth, B.**, Usman, M., Berseth, G., Khayatkhoei, M., Kapadia, M., & Faloutsos, P. (2016, May). CODE: Crowd Optimized Design of Environments. Paper presented at the 29th Conference on Computer Animation and Social Agents (CASA 2016).
- Berseth, G., Kapadia, M., & Faloutsos, P. (2016, May). ACCLMesh: Curvature-Based Navigation Mesh Generation. Paper presented at the 29th Conference on Computer Animation and Social Agents (CASA 2016). (Presenter).
- Krontiris, A., Bekris, K. & Kapadia, M. (2016, May). ACUMEN: Activity-Centric Crowd Authoring Using Influence Maps. Paper presented at the 29th Conference on Computer Animation and Social Agents (CASA 2016). (Presenter).
- **Haworth, B.**, Baljko, M., & Faloutsos, P. (2012, December). PhoVR: A Virtual Reality System to Treat Phobias. Paper presented at the 11th ACM SIGGRAPH Conference on Virtual Reality Continuum and Its Applications in Industry (VRCAI 2012).
- Shtern, M., **Haworth, B.**, Yunusova, Y., Baljko, M., & Faloutsos, P. (2012, November). A Game System for Speech Rehabilitation. Paper presented at the 5th International Conference on Motion in Games (MIG 2012).

10. TEACHING POSITIONS

- July 2020 – Present: **Course Instructor** in the Department of Computer Science at the University of Victoria, Victoria, Canada.
 - ▶ Fall 2022: CSC 578A Crowd Simulation
 - ▶ Fall 2022: CSC 305 Introduction to Computer Graphics
 - ▶ Spring 2022: CSC 578A Crowd Simulation
 - ▶ Fall 2021: CSC 473/586A Fundamentals of Computer Animation
 - ▶ Spring 2021: CSC 305 Introduction to Computer Graphics
 - ▶ Fall 2020: CSC 473/586A Fundamentals of Computer Animation
- Present: **Guest Lecturer** in the Department of Computer Science at the University of Victoria, Victoria, Canada.
 - ▶ 11/2021: SENG 310 Human Computer Interaction, *Who Do We Design For? Representing humans in the design processes of spaces we use*
 - ▶ 03/2021: CSC 595 Research Skills, *Graphics, Artificial Intelligence, Design, & Games Research + AMA Session*
- 02/2021: **Guest Lecturer** in the Department of Computer Science at Rutgers University, New Jersey, USA.
 - ▶ Topics in Artificial Intelligence, *Learning Representative Crowds*
- 01/2013 – 04/2017: **Teaching Assistant** in the Department of Electrical Engineering and Computer Science at York University, Toronto, Canada.
 - ▶ Object Oriented Programming from Sensors to Actuators
 - ▶ Professional Practice in Computing
 - ▶ Introduction to 3D Computer Graphics (x4)
 - ▶ Advanced Topics in 3D Computer Graphics
 - ▶ Introduction to Virtual Reality
 - ▶ Programming Language Fundamentals
 - ▶ Advanced Object-Oriented Programming
 - ▶ Software Engineering
 - ▶ Computers, Information, and Society
 - ▶ Research Directions in Computing
 - ▶ Introduction to COSC I

- ▶ Introduction to COSC II
 - ▶ Computer Use: Web and Database Systems
- 11/2013: **Guest Lecturer** in the Department of Electrical Engineering and Computer Science at York University, Toronto, Canada.
 - ▶ Introduction to 3D Computer Graphics (x2), *Ray Tracing* and *Illumination Models*

11. SUPERVISION

Doctoral

- Qian Wang, Computer Science at the University of Victoria.
 - ▶ University of Victoria Fellowship Award recipient
- Vahid Gholamzade, Business & Computer Science at the University of Victoria.
 - ▶ University of Victoria INTD PhD fellowship recipient

Masters

- Dominic Ferreira, Thesis-based, Computer Science at the University of Victoria.
 - ▶ University of Victoria Graduate Award 2022 recipient
- Rui Zhang, Thesis-based, Computer Science at the University of Victoria.
- Kun Peng, Thesis-based, Computer Science at the University of Victoria.
- Jonas Buro (co-supervised with Prof. Daniela Damian), Thesis-based, Computer Science at the University of Victoria.
 - ▶ University of Victoria Graduate Award 2022 recipient
- Kunal Parikh, Project-based, Computer Science at the University of Victoria.
 - ▶ University of Victoria Graduate Award 2022 recipient

Undergraduate

- Steven Bobyn, Computer Science at the University of Victoria. Jamie Cassels Undergraduate Research Award 2022-2023 recipient. Honours Capstone project.
 - ▶ Project: Crowd, Environment, Quality Learning
- Julia Putko, Computer Science + Psychology at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Bio-based Agent Learning
- Thomas Richmond, Computer Science + Geography at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Geomatics and Navigation in Real Time Simulation
- Liam Shatzel, Computer Science at the University of Victoria. Valerie Kuehne Undergraduate Research Award SU2022 recipient.
 - ▶ Project: Complex Agent Representations in Crowd Simulation
- Lucas Antonsen, Computer Science at the University of Victoria. Honours Capstone project.
 - ▶ Project: Abstract Game Playing Benchmarks
- Colin Johnson, Computer Science at the University of Victoria. Jamie Cassels Undergraduate Research Award 2021-2022 recipient. Honours Capstone project.
 - ▶ Project: Autonomous Evaluation of Signage Visibility for Accessibility Auditing
- Lindsey Bellman, Computer Science + Music at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Music Visualization
- Nick Musey, Computer Science + Psychology at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Viewpoint of Humanoid Characters in Spatial Perception

- Cairo Sanders, Computer Science + Psychology at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Virtual Avatar Representation in Spatial Perception
- Yiping Wang, Computer Science at the University of Victoria. Jamie Cassels Undergraduate Research Award 2020-2021 recipient. W.E. Cowie Innovation Award Recipient. Honours Capstone project. Now at University of Waterloo (MMath), Vector Institute Scholarship in Artificial Intelligence recipient.
 - ▶ Project: Learn by Review: Environment Generalization in Multi-Agent Reinforcement Learning
 - ▶ Project: Visual Learning Agents
- Alex Nguyen, Computer Science at the University of Victoria.
 - ▶ Project: Visual Learning Agents
- Eric Wang, Computer Science + Mathematics at the University of Victoria.
 - ▶ Project: Visual Learning Agents
- Jonas Buro, Computer Science at the University of Victoria. Honours Capstone project. NSERC Undergraduate Student Research Award (USRA) Summer 2021 recipient.
 - ▶ Project: Playing the Game of Amazons with Reinforcement Learning
- Rui Zhang, Computer Science at the University of Victoria. Honours Capstone project.
 - ▶ Project: Synthetic Crowd Evaluation for Biomechanics
- Percy Jia, Computer Science at the University of Victoria. Honours Capstone project.
 - ▶ Project: Learning Biomechanical Agents
- Jonathan Maluf, Computer Science + Physics at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Mesh Deformation for Rectification of Fisheye Images
- Chris Clarke, Computer Science + Music at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Developing Tools for Musical Creativity
- Dominic Ferreira, Computer Science + Music at the University of Victoria. Interdisciplinary Capstone project.
 - ▶ Project: Deep Learning based Solfège Hand Sign Recognition

12. STUDENT MENTORING & ADVISING

(In collaboration with official supervisors)

Doctoral

- Muhammad Usman, Electrical Engineering and Computer Science at York University.
 - ▶ Thesis: Spatial Analytics for Simulated User Behaviors in Virtual Environments
- Kaidong Hu, Computer Science at Rutgers University.
 - ▶ Project: Multi-agent Deep Reinforcement Learning
- Seonghyeon Moon, Computer Science at Rutgers University.
 - ▶ Project: Hierarchical Deep Reinforcement Learning for Humanoid Agents

Masters

- Yunao Shen, Shengdon Liu, Ruolin Qu, Computer Science at Rutgers University.
 - ▶ Thesis: Multi-Modal Curriculum in Multi-Agent Reinforcement Learning
- Melissa Kremer, Electrical Engineering and Computer Science at York University.
 - ▶ Thesis: Distracted Agent Modelling in Synthetic Crowds
- Muhammad Usman, Electrical Engineering and Computer Science at York University.
 - ▶ Thesis: Towards Static and Dynamic Analysis of Architectural Elements

Undergraduate

- Jeffrey Yang, Computer Science at Rutgers University.

- ▶ Project: Vehicular Traffic Simulation in Urban Environments
- Yunao Shen, Shengdon Liu, Ruolin Qu, Computer Science at Rutgers University. CS523 Computer Graphics.
 - ▶ Project: Competitive Multi-agent Inverse Reinforcement Learning
- Hemanth Chiluka, Computer Science at Rutgers University. CS523 Computer Graphics.
 - ▶ Project: Robust Multi-Agent Footstep Planning
- Duc Ngo, Computer Science at Rutgers University. Grossman Interdisciplinary Research Team (GIRT) Fellowship Capstone Project.
 - ▶ Project: Heterogeneous Simulation Platform for Pedestrian/Vehicular Interfaces
- Martin Leung, Engineering Science at the University of Toronto. Now at AMD, previously Ubisoft Toronto.
 - ▶ Thesis: Gamifying Speech Therapy for Stroke Victims

13. PROFESSIONAL SERVICE

Editorial

- February 2020 – Present: **Associate Editor** of Computer Animation and Virtual Worlds Journal

Academic Faculty & Department Committees

- February 2022 – 06/2022: **Member**, Fairness, Ethics, Accountability, Transparency, Interpretability, Theory of data privacy, Sub-Area Hiring Committee, Department of Computer Science, University of Victoria
- 11/ 2021 – Present: **Member**, Strategic Plan Working Group, Department of Computer Science, University of Victoria.
- 03/2021 – 06/2021: **Chair**, Fairness/Social Aspects/Equity in Artificial Intelligence, Sub-Area Hiring Committee, Department of Computer Science, University of Victoria
- 10/2018 – 04/2019: **Graduate Student Representative**, NSERC Create Program in Data Analytics and Visualization, York University
- 2019: **Graduate Student Representative**, York University Faculty of Graduate Studies Committee on Broadening the Dissertation

Academic Examination Committees

- August 2022: **Chair**, MSc Non-thesis Oral Examination, University of Victoria, Suyin Pan, Data Visualization of COVID-19 in Canada
- 11/2021: **External Examiner**, MSc Oral Examination, University of Victoria, Jordie Shier, The Synthesizer Programming Problem: Improving the Usability of Sound Synthesizers
- 12/2020: **External Examiner**, PhD Oral Examination, Rutgers University, Vahid Azizi, Graph-representation Learning for Human-centred Analysis of Building Layouts

Industrial/Academic Research Proposal Reviews

- July 2022: CFI College Fund Proposal
- 10/21: NSERC Discovery Grant Proposal (Internal review, UVic)
- 07/2021: Mitacs Accelerate Proposal

Industrial/Academic Awards Reviews

- October 2021: NSERC Arthur B. McDonald Fellowship

Conference Session Chair

- September 2022: ACM Symposium on Applied Perception 2022, Hands and Interaction session
- 10/2021: 16th International Symposium on Visual Computing, Pattern Recognition session
- 04/2021: 12th annual Symposium on Simulation for Architecture and Urban Design, Collaborative Design session

Conference Program/Scientific Committees

- 2023 (x2): 20th biannual Computer Aided Architectural Design Futures 2023 (CAAD Futures 2023)
- 2022 (x2): 15th Annual ACM SIGGRAPH Conference on Motion, Interaction and Games (MIG 2022)
- 2022 (x2): 13th annual Symposium on Simulation for Architecture and Urban Design (SimAUD 2022)
- 2022: 17th International Symposium on Visual Computing (ISVC 2022)
- 2022 (x4): 21st International Conference on Autonomous Agents and Multi-Agent Systems 2022 (AAMAS 2022), Demo Track
- 2021 (x3): 14th Annual ACM SIGGRAPH Conference on Motion, Interaction and Games (MIG 2021)
- 2021 (x2): 16th International Symposium on Visual Computing (ISVC 2021)
- 2021 (x2): 19th biannual Computer Aided Architectural Design Futures 2021 (CAAD Futures 2021)
- 2021 (x4): 12th annual Symposium on Simulation for Architecture and Urban Design (SimAUD 2021)
- 2021 (x2): 29th International Joint Conference on Artificial Intelligence, Workshop on Neural Cognitive Modeling of Humans and Environments (IJCAI 2021)
- 2020 (x2): 13th annual ACM SIGGRAPH conference on Motion, Interaction, and Games 2020 (MIG 2020)
- 2020 (x2): 15th International Symposium on Visual Computing (ISVC 2020)
- 2019 (x5): 12th annual ACM SIGGRAPH conference on Motion, Interaction, and Games 2019 (MIG 2019)
- 2019 (x2): 14th International Symposium on Visual Computing (ISVC 2019)
- 2018 (x3): 11th annual ACM SIGGRAPH conference on Motion, Interaction, and Games 2018 (MIG 2018)

Peer Reviews

- 2021 – present (x3): IEEE Transactions on Visualization and Computer Graphics (TVCG)
- 2021 – present (x3): IEEE Transactions on Games
- 2020 – present (x1): Engineering Applications of Artificial Intelligence
- 2020 – present (x1): Journal of Computational Science
- 2018 – present (x5): Computers & Graphics Journal (CAG)
- 2018 – present (x2): Simulation & Gaming (SAG)
- 2016 – present (x2): Computer Graphics Forum (CGF)
- 2015 – present (x9): Computer Animation & Virtual Worlds Journal (CAVW)
- 2013 – present (x18): The Visual Computer Journal (TVCJ)
- 2021: Eurographics 2022
- 2021 (x2): ACM CHI Conference on Human Factors in Computing Systems (CHI 2022)
- 2020: 34th AAI Conference on Artificial Intelligence (AAAI 2021)
- 2019 (x2): ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA 2019)
- 2019: 32nd Conference on Computer Animation and Social Agents (CASA 2019)
- 2019: Eurographics 2019
- 2019: IEEE VR 2019
- 2018 (x2): SIGGRAPH Asia 2018
- 2018: ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA 2018)
- 2018: SIGGRAPH 2018
- 2018: 31st Conference on Computer Animation and Social Agents (CASA 2018)
- 2018: Eurographics (EG 2018)

- 2017 (x2): SIGGRAPH Asia 2017
- 2017: ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA 2017)
- 2017 (x2): 30th Conference on Computer Animation and Social Agents (CASA 2017)
- 2017 (x2): SIGGRAPH 2017
- 2017 (x2): IEEE International Conference on Robotics and Automation (ICRA 2017)
- 2017: ACM CHI Conference on Human Factors in Computing Systems (CHI 2017)
- 2016: 24th Pacific Conference on Computer Graphics and Applications (Pacific Graphics 2016)
- 2016: SIGGRAPH Asia 2016
- 2016 (x2): SIGGRAPH 2016
- 2016 (x2): ACM CHI Conference on Human Factors in Computing Systems – Late Breaking Works (CHI 2016)
- 2015: 8th International ACM SIGGRAPH Conference on Motion in Games (MIG 2015)
- 2015: ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA 2015)
- 2014: 14th International Conference on Intelligent Virtual Agents (IVA 2014)
- 2014: 7th International ACM SIGGRAPH Conference on Motion in Games (MIG 2014)

14. VOLUNTEER POSITIONS

- October 2022 – Present: **Mentor** with First in Class: First Generation Student Mentorship Program, University of Victoria, Victoria, Canada.
- October 2021 – Present: **Faculty Sponsor/Liaison** UVic Game Dev Club, University of Victoria, Victoria, Canada.
- 04/2018 – Present: **Board Member & Officer** (Director of Technical Development & Acting Secretary) at The Canada Comics Open Library in Toronto, Canada.
- 03/2018 – Present: **Technical Consultant & Developer** at the Toronto Zine Library in Toronto, Canada.
- 02/2019: **Mentor** at ElleHacks 2019 in Lassonde School of Engineering at York University.
- 05/2018: **Volunteer** at AI·GI·CRV 2018.
- 02/2018: **Mentor** at ElleHacks 2018 in Lassonde School of Engineering at York University.
- 02/2014 – 09/2016: **Executive Member** of the Devices 4 Disabilities student club at York University.
 - 09/2014 – 09/2016: **President**
 - 02/2014 – 08/2014: **Vice President**
- 06/2016 – 08/2016: Data science **Collaborator** on geolocation analysis with the Toronto Tool Library at The Sharing Depot.
- 08/2010 – 08/2012: Astronomy and Cosmology **Tutor** for NATS-AID, a student-run organization in the Faculty of Science, Natural Science Division at York University.

15. WORKSHOPS, PANELS, AND PUBLIC ENGAGEMENT

- “Health and Technology” Panel, Institute on Aging and Lifelong Health – Pathways to Lifelong Health, University of Victoria, 2021.
- “Mission, Strategy, & Politics of Starting a Library” Panel, Information & Museum Studies Conference 2019 – Community Knowledge: Shared Practices of Sense-Making, Communication, & Collaboration, University of Toronto, 2019.
- “Graphics and Media at York (GaMaY) Lab – Animation and Virtual Reality”, Women in Science and Engineering (WISE) Initiative – Science Funday, York University, 2018.
- “Visualize Fast, Visualize Often: Important Insights from Small Changes in Perspective”, NSERC CreateDAV – Summer School, York University, 2018.
- “Toronto Zine Library”, Maker Festival Toronto 2018.

- “Footstep Action Identification and Clustering from Motion Capture”, NSERC CreateDAV – Data Analytics & Visualization Bootcamp, York University, 2017.
- “Graphics and Media at York (GaMaY) Lab”, NSERC CreateDAV – Lab Tours, York University, 2016.
- “Building the TalkBox Do-It-Yourself speech generating device”, Reclaiming Our Bodies and Minds (ROBAM), Ryerson University, 2016.
- “Vocal Tract Visualization (VTV) Project: Centre for Innovation in Information Visualization and Data Driven Design (CIVDDD)”, Ontario Centres of Excellence (OCE): Discovery 2015.
- “TalkBox Project: Tetra Society of North America”, Ontario Centres of Excellence (OCE): Accessibility Innovation Showcase 2015.
- “Devices 4 Disabilities (D4D) @ YorkU”, Maker Festival Toronto 2015.
- “MakeTalk Workshop”, Toronto Mini Maker Faire 2014.