

Contact

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Education

- 2021 Postdoctoral Research Associate with Dr. Wolfgang Banzhaf, BEACON Center for the Study of Evolution in Action, Michigan State University
- 2018 PhD, Computer Science, Dalhousie University
- 2018 Deep Learning and Reinforcement Learning Summer School, Canadian Institute for Advanced Research and the Vector Institute, University of Toronto
- 2012 Master of Computer Science, Dalhousie University
- 2001 Bachelor of Fine Arts, Nova Scotia College of Art and Design (NSCAD) University

Journal Publications

- 2021 Kelly, S., Smith, R., Heywood, M.I., and Banzhaf, W. Emergent Tangled Program Graphs in Partially Observable Recursive Forecasting and ViZDoom Navigation Tasks. *ACM Transactions on Evolutionary Learning and Optimization*, 2021 (Under Review)
- 2018 Kelly, S. and Heywood, M. I. Emergent Solutions to High-Dimensional Multi-Task Reinforcement Learning. *Evolutionary Computation*, 26(3):347-380. MIT Press. **Silver Award for Human-Competitive Results, Humies 2018** (<http://www.human-competitive.org>)
- 2018 Kelly, S. and Heywood, M. I. Discovering Agent Behaviors through Code Reuse: Examples from Half-Field Offense and Ms. Pac-Man. *IEEE Transactions on Games*, 10(2):195-208. IEEE.

Book Chapters

- 2020 Kelly, S. and Banzhaf, W. Temporal Memory Sharing in Visual Reinforcement Learning. *Genetic Programming Theory and Practice XVII*, pages 101-119. Springer.
- 2019 Kelly, S., Smith, R., and Heywood, M. I. Emergent Policy Discovery for Visual Reinforcement Learning through Tangled Program Graphs: A Tutorial. *Genetic Programming Theory and Practice XVI*, pages 37-57. Springer.

Conference Publications

- 2020 Kelly, S., Newsted, J., Banzhaf, W., and Gondro, C. A Modular Memory Framework for Time Series Prediction. In *Proceedings of the 2020 Genetic and Evolutionary Computation Conference*, GECCO '20, pages 949-957. ACM. **Nominated for Best Paper Award, GP**
- 2018 Kelly, S. and Heywood, M. I. Emergent Tangled Program Graphs in Multi-Task Learning. In *Proceedings of the Twenty-Seventh International Joint Conference on Artificial Intelligence*, pages 5294-5298. IJCAI. **Invited Paper**

- 2017 Kelly, S. and Heywood, M. I. Multi-Task Learning in Atari Video Games with Emergent Tangled Program Graphs. In *Proceedings of the Genetic and Evolutionary Computation Conference, GECCO '17*, pages 195–202. ACM. **Best Paper Award, DETA**
- 2017 Kelly, S. and Heywood, M. I. Emergent Tangled Graph Representations for Atari Game Playing Agents. In *European Conference on Genetic Programming*, volume 10196 of LNCS, pages 64–79. Springer. **Best Paper Award, EuroGP**
- 2016 Bonson, J. P., Kelly, S., McIntyre, A. R., and Heywood, M. I. On Synergies Between Diversity and Task Decomposition in Constructing Complex Systems with GP. In *Proceedings of the Genetic and Evolutionary Computation Conference, GECCO '16 Companion*, pages 969–976. ACM.
- 2016 Smith, R. J., Kelly, S., and Heywood, M. I. Discovering Rubik's Cube Subgroups using Coevolutionary GP: A Five Twist Experiment. In *Proceedings of the Genetic and Evolutionary Computation Conference, GECCO '16*, pages 789–796. ACM.
- 2015 Kelly, S. and Heywood, M. I. Knowledge Transfer from Keepaway Soccer to Half-Field Offense through Program Symbiosis: Building Simple Programs for a Complex Task. In *Proceedings of the Genetic and Evolutionary Computation Conference, GECCO '15*, pages 1143–1150. ACM.
- 2014 Kelly, S. and Heywood, M. I. On Diversity, Teaming, and Hierarchical Policies: Observations from the Keepaway Soccer Task. In *European Conference on Genetic Programming*, volume 8599 of LNCS, pages 75–86. Springer.
- 2014 Kelly, S. and Heywood, M. I. Genotypic versus Behavioural Diversity for Teams of Programs under the 4-v-3 Keepaway Soccer Task. In *Proceedings of the AAAI Conference on Artificial Intelligence*, pages 3110–3111. AAAI.
- 2012 Kelly, S., Lichodziejewski, P., and Heywood, M. I. On Run Time Libraries and Hierarchical Symbiosis. In *IEEE Congress on Evolutionary Computation*, pages 3245–3252. IEEE.
- 2012 Kelly, S., Lichodziejewski, P., and Heywood, M. I. On Symbiotic Policy Search and Multi-Level Selection. In *Proceedings of the Conference on the Simulation and Synthesis of Living Systems (Artificial Life 13)*, pages 559–560. MIT Press.

Selected Solo and Collaborative Exhibitions

- 2018 *The Reality Gap*, Centre [3], Hamilton, ON
- 2016 *Open Ended Ensemble (Competitive Coevolution)*, Hamilton Artists Inc, Hamilton, ON
- 2014 *Open Ended Ensemble (Reinforcement Learning)*, Nocturne, Halifax, NS
- 2013 *Vessels*, LABoral, Gijon, Spain
- 2013 *Patch*, Dalhousie University, Halifax, NS
- 2011 *Open Tuning*, Galerie d'art Louise-et-Reuben-Cohen, Université de Moncton, Moncton, NB
- 2010 *Vessels*, Nocturne, Halifax, NS
- 2010 *Open Tuning*, Art Gallery of Nova Scotia, Halifax, NS

- 2010 *Open Tuning*, Truck Gallery, Calgary, AB
- 2009 *Open Tuning*, Eastern Edge, St. John's, NL
- 2009 *Open Tuning*, The Natural and The Manufactured, ODD Gallery, Dawson City, YT
- 2008 *Open Tuning* (WaveUp), Centre des arts actuels Skol, Montreal, QC
- 2007 *RadioRoam*, Gallery 1313 and New Adventures in Sound Art (NAISA), Toronto, ON
- 2006 *Soundroam (Halifax to Toronto)*, InterAccess Electronic Media Arts & NAISA, Toronto, ON

Selected Group Exhibitions

- 2019 *Imagining our Digital Futures*, MUTEK Festival, Place des Arts, Montreal, QC
- 2018 *Capitaine futur et la supernature*, La Gaîté Lyrique, Paris, France
- 2017 *Robotanica*, Transnatural Art & Design, Tolhuistuin, Amsterdam, Netherlands
- 2016 *Festival Montréal en Lumière*, Nuit Blanche, City Hall, Montreal, QC
- 2015 *L'Ososphère*, Jardin d'Hiver, Strasbourg, France
- 2015 *Writing Topologies: Marion McCain Atlantic Art Exhibition*, Beaverbrook Art Gallery, Fredericton, NB
- 2015 *Robotis Personae*, Eastern Bloc, Montreal, QC
- 2014 *Heat Wave*, Struts Gallery, Sackville, NB
- 2013 *Numbers in the Dark*, Southern Alberta Art Gallery, Lethbridge, AB
- 2008 *Arena: The Art of Hockey*, Art Gallery of Nova Scotia, Halifax, NS
- 2007 *In The Flesh*, Anna Leonowens Gallery, Halifax, NS
- 2006 *Awol*, Current Gallery, Baltimore, MD
- 2006 *The Idea of North*, Eyelevel gallery and Art Gallery of Nova Scotia, Halifax, NS
- 2005 *The Idea of North*, Galleri F-15, Moss, Norway

Teaching

- 2019 Physical Computing (Proposed and designed), NSCAD University
- 2018 Art and Artificial Life (Proposed, designed, and instructed since 2017), NSCAD University
- 2017 Introduction To Artificial Intelligence with Gaming Applications (TA position since 2012), Dalhousie University
- 2010 Art, Sound, and Experimental Music (Proposed, designed, and instructed), NSCAD University

Teaching (Workshops)

- 2018 Art and Artificial Life: Extended Braitenberg Vehicles, Centre [3], Hamilton, ON
- 2011 Linux Projects, The Centre for Art Tapes, Halifax, NS
- 2010 Physical Computing (Arduino), The Centre for Art Tapes, Halifax, NS
- 2008 Build Your Own Micro-FM Transmitter, The Banff Centre, Banff, AB
- 2007 Build Your Own Contact Microphone, Interaccess, Toronto, ON
- 2006 Open Source Software for Audio Production, Halifax Pop Explosion, Halifax, NS
- 2006 Open Source Software for Radio Production, National Campus and Community Radio Conference, Ottawa, ON
- 2005 Non-Linear Digital Audio Editing with Ardour, CKDU-FM, Halifax, NS
- 2004 DIY Pirate Radio, Halifax Free School, Halifax, NS
- 2003 Practical Electronics for Community Radio, CHMA, Sackville, NB
- 2002 Audio Art, National Campus and Community Radio Conference, St. John, NB

Awards

- 2018 Silver Award for Human-Competitive Results produced by Genetic and Evolutionary Computation, <http://www.human-competitive.org>, Kyoto, Japan
- 2017 Best Paper Award, Genetic and Evolutionary Computation Conference, Digital Entertainment and the Arts (DETA) Track, Berlin, Germany
- 2017 Best Paper Award, European Conference on Genetic Programming, Amsterdam, Netherlands
- 2012 Long-listed for Sobey Art Award, Halifax, NS
- 2006 Aliant New Media Prize, Halifax, NS
- 2006 Nominated for Lieutenant Governor of Nova Scotia Masterwork Prize, Halifax, NS

Grants

- 2019 BEACON Project Funding, collaboration with Dr. W. Banzhaf and Dr. C. Gondro
- 2019 Postdoctoral Fellowship, Natural Sciences and Engineering Research Council of Canada
- 2018 Concept to Realization Grant, Canada Council for the Arts
- 2017 Nova Scotia Graduate Scholarship
- 2016 Travel Grant for New Media Professionals, Canada Council for the Arts
- 2014 Research and Production Grant, Arts Nova Scotia
- 2014 Travel Grant for New Media Professionals, Canada Council for the Arts
- 2013 Travel Grant for New Media Professionals, Canada Council for the Arts
- 2010 New Media Research Residency Grant, Canada Council for the Arts
- 2010 New Media Production Grant, Canada Council for the Arts
- 2010 Artistic Research and Creation, Conseil des Arts et des Lettres Québec
- 2010 Exhibition Grant, Nova Scotia Department of Tourism, Culture, and Heritage
- 2007 SOCAN Foundation Grant, Composer Residency Program
- 2006 Creation Grant, Nova Scotia Department of Tourism, Culture, and Heritage

Computer Science Research Lectures and Oral Presentations

- 2020 Genetic and Evolutionary Computation Conference, Cancun, Mexico (online conference)
- 2019 Genetic Programming Theory and Practice XVII Workshop, Michigan State University, East Lansing, MI
- 2018 Machine Learning Workgroup, Institute for Bioinformatics & Evolutionary Studies (IBEST), University of Idaho, Moscow, ID
- 2018 BEACON Center for the Study of Evolution in Action, Michigan State University, East Lansing, MI
- 2018 International Joint Conference on Artificial Intelligence, Stockholm, Sweden
- 2017 Genetic and Evolutionary Computation Conference, Berlin, Germany
- 2017 European Conference on Genetic Programming, Amsterdam, Netherlands
- 2017 Faculty Research Seminar, Dalhousie University, Halifax, NS
- 2016 Discover Mondays Research Seminar, Dalhousie University, Halifax, NS
- 2015 Genetic and Evolutionary Computation Conference, Madrid, Spain
- 2014 European Conference on Genetic Programming, Granada, Spain
- 2012 World Congress on Computational Intelligence, Brisbane, Australia
- 2006 Conference on Engaging in Open Source, Dalhousie University, Halifax, NS

Computer Science Research Poster Presentations

- 2018 Deep Learning and Reinforcement Learning Summer School, Vector Institute, Toronto, ON
- 2014 Association for the Advancement of Artificial Intelligence, Quebec City, QC
- 2012 Conference on the Simulation and Synthesis of Living Systems (Artificial Life 13), East Lansing, MI
- 2012 Dalhousie Computer Science In-House Conference, Halifax, NS

Selected Artist Talks

- 2020 *Machine Learning as Material: Research-Creation Approaches to Behaviour and Imagination*. Panel Discussion with Ben Bogart, Stephanie Dinkins, Sofian Audry, Stephen Kelly, and Suzanne Kite. The 26th International Symposium on Electronic Art (ISEA online conference)
- 2020 *Sustainable Open Endedness in Coevolving Artworks*. Workshop on Interdisciplinary Approaches to A-Life and the Digital Arts. Organized by Chris Salter, Takashi Ikegami, Alexandre Saunier, and Sofian Audry. The 2020 Conference of Artificial Life, Montreal, QC
- 2018 *Function Keys*, Conference of New Technology and Digital Culture, Hamilton, ON
- 2016 *Echo Artists Talks*, Hamilton Arts Council, Hamilton, ON (<https://youtu.be/SMrDvAKP668>)
- 2015 McMaster University, Co-hosted by the School of the Arts as well as Communications Studies & Multimedia, Hamilton, ON
- 2014 *Dorkbot*, Oboro, Montreal, QC
- 2014 Struts Gallery and Faucet Median Centre, Sackville, NB
- 2013 LABoral Art and Industrial Creation Centre, Gijón, Spain
- 2012 *Environment, Sustainability and Society Public Lectures*, Dalhousie University, Halifax, NS
- 2010 Art Gallery of Nova Scotia, Halifax, NS
- 2010 Alberta College of Art and Design, Calgary, AB
- 2010 *Environment, Sustainability and Society Public Lectures*, Dalhousie University, Halifax, NS
- 2009 Klondike Institute of Art and Culture, Dawson City, YT
- 2009 Eastern Edge Gallery, St. John's NL
- 2008 Centre des arts actuels Skol, Montreal, QC
- 2008 Deep Wireless Festival of Radio and Transmission Art, Toronto, ON
- 2007 Banff Centre for Arts and Creativity, Banff, AB
- 2007 Gros Morne National Park, The Rooms Art Gallery, Woody Point, NL
- 2007 Interaccess Electronic Media Arts Centre, Toronto, ON
- 2006 Dalhousie University, Halifax, NS

Artist Residencies

- 2016 Hamilton Artists Inc, Hamilton, ON
- 2014 Eastern Bloc, Montreal, QC
- 2013 LABoral Art and Industrial Creation Centre, Gijón, Spain
- 2013 Perte de Signal, Montreal, QC
- 2012 Dalhousie Art Gallery, Halifax, NS
- 2009 KIAC, The Natural and The Manufactured, Dawson City, YT
- 2007 Gros Morne National Park, The Rooms Art Gallery, Woody Point, NL
- 2007 Deep Wireless Festival, New Adventures in Sound Art, Toronto, ON
- 2006 Centre for Art Tapes, Halifax, NS

- 2005 Galleri F15, Moss, Norway
2002 Curatorial Resident, Khyber, Halifax, NS

Selected Professional Activity

- 2021 Machine Learning Lead, Sandler Consultancy, Halifax, NS (2018 -)
2017 Selection Committee, Joggins Fossil Institute Artist-In-Residence Program, Joggins, NS
2013 Mentor, Centre for Art Tapes' Media Arts Scholarship Program, Halifax, NS
2011 Chair, Board of directors, Centre for Art Tapes, Halifax, NS (2008 -)
2003 Programming Committee, Centre for Art Tapes, Halifax, NS
2003 Technical Consultant, Farmer Mentorship Program, Halifax, NS

Related Employment

- 2018 Research Assistant with Dr. Malcolm I. Heywood, Dalhousie University (2011 -)
2011 Electronics Technician, Architextile Research Lab, NSCAD University (2008 -)
2008 Research Assistant with Robert Bean, NSCAD University
2009 Broadcast Technician, CKDU-FM, Dalhousie University (2001 -)

Selected Curatorial Projects

- 2008 Broadcasting For Reels: News/Noise, Centre for Art Tapes, Halifax, NS
2007 Broadcasting For Reels: Eco Echo, Centre for Art Tapes, Halifax, NS
2003 The Project Box, Silver Shower at the Centre for Art Tapes, Halifax, NS

Selected Discography

- 2012 The Just Barelys, Mad Bits, LP
2006 The Just Barelys, Top, LP
2004 Original music for "Assembled", film by Becka Barker. Winner of Best Soundtrack at 2006 AFSCOOP awards, Best International Film at the Seoul Experimental Film and Video Festival
1999 The Confidence Band, Songs of Dance and Fractured Romance, LP (with Matt Reid)
1997 LMNOP, Cassette compilation, Issues L and M
1994 The Greatest Love of All, 7" compilation

Press / Reviews / Catalogs

- 2019 Leonardo , *Behavior Morphologies of Machine Learning Agents in Media Artworks*, Sofian Audry, pp. 1-10
2016 Hamilton Artists Inc, *Open Ended Ensemble (Competitive Coevolution)*, Exhibition catalog and curatorial essay, Donna Szoke
2015 Beaverbrook Art Gallery, *Writing Topography: The Marion McCain Exhibition of Contemporary Atlantic Art*, Exhibition catalog and curatorial essay, Corinna Ghaznavi
2015 L'Ososphère à l'Université de Strasbourg, UTV, TV report on L'Ososphère event, including interview about Vessels (starting at 4:30)
2013 We Make Money Not Art, *A Fleet of Robots with Unpredictable Behaviour*, Regine Debatty
2013 Makezine.com, *Waterborne Robots Display Emergent Behaviour*, John Baichtal
2013 Lightecture, *Vessels, una instalación robótica interactiva desarrollada en Laboral*, Unknown

- 2013 El Pais, *Plagio, apropiacionismo o desconocimiento*, Bosco, Roberta and Caldana, Stefano, September 1
- 2013 Dalnews, *Art in motion: How "Patch" colourfully represents life in the Mona Campbell Building*, Ryan McNutt
- 2011 Art Engine, *Open Tuning (WaveUp)*, Exhibition review, Mireille Bourgeois
- 2010 *Islands of Resistance: Pirate Radio in Canada*, Chapter on Radio Ballroom, New Star Books
- 2010 C Magazine, *Open Tuning (WaveUp) Exhibition review*, Quyen Hoang, Autumn
- 2010 Truck Gallery, *In(fluent)s*, Exhibition essay, Kari McQueen
- 2009 Eastern Edge Gallery, *Discussing Open Tuning*, Exhibition essay, Tim Dallet
- 2009 Yukon News, *Dawson Sculptors Bend Digital Distance*, Meg Walker, August 12
- 2008 Centre Des Arts Actuels, Skol, *Course-Tuning It*, Exhibition essay, Peter Flemming
- 2008 CBC Alberta Feature Interview, Radio Free Banff
- 2007 Anna Leonowens Art Gallery, *In The Flesh*, Exhibition catalog and curatorial essay, Robert Bean
- 2007 The Toronto Star, *Radio Roam*, Peter Goddard, Saturday May 12
- 2006 Visual Arts News, *Chilling Sound*, Feature review, Dee Gibson, Vol 28, n.1, Spring
- 2006 Dalhousie Art Gallery, *The Idea of North*, Exhibition catalog and curatorial essay, Rhonda Corvese
- 2006 Visual Arts News, *Sweet Sounds*, Media Festival review, Sue Johnson, Vol 27, n.3
- 2006 The Chronicle Herald, *Breaking Sound Barriers*, Elissa Bernard, January 28
- 2006 The Coast, *Soundtown* (Cover story), Sue Carter Flinn, January 5, pp 10-13
- 2006 Canadian Art, *Fast Forward*, the Idea of North, Winter
- 2005 Moss Avis, *Kunst som hØres (Art to be heard)*, Kathrine Holt Simonsen, May 27, pp. 20
- 2005 Moss Dagblad, *En utstilling om lyd og sted (An exhibition about sound and site)*, Rebecca Østby
- 2005 KunstKritikk, *Lydkunst i Moss (Sound Art in Moss)*, Erlend Hammer, June 10
- 2003 Mix Magazine, *Radio Ballroom*, Chris Lloyd for Artist Run Culture, Winter, pp.20
- 2012 The Coast, *New Music 2012*, Stephanie Johns, June 14
- 2007 The View Hamilton arts weekly, March 17
- 2007 MuchMusic Going Costal, Television feature, February 11
- 2007 ChartAttack, *The Just Barelys benefit...* Shannon Webb Campbell, January
- 2006 The Dalhousie Gazette, *The Just Barelys' Top EP review*, November
- 2006 The Coast, *Best of 2006, The Just Barelys' Top*, December
- 2006 Exclaim!, *The Just Barelys' Top EP review*, April