

Department/School: Faculty of Computer Science

CURRICULUM VITAE

NAME:**WHIDDEN, Christopher**, Assistant Professor**DEGREES AND CREDENTIALS:****Degrees:**

Ph.D Computer Science, Dalhousie University, Nova Scotia, Canada, 2013

Certificate in University Teaching and Learning, Dalhousie University, Nova Scotia, Canada, 2013

Master of Computer Science Computer Science, Dalhousie University, Nova Scotia, Canada, 2009

Bachelor of Computer Science Computer Science, Dalhousie University, Nova Scotia, Canada, 2008

EMPLOYMENT HISTORY:

2020 – Assistant Professor, Faculty of Computer Science, Dalhousie University, Nova Scotia, Canada

2019 – 2019 Instructor, Faculty of Computer Science, Dalhousie University, Nova Scotia, Canada

2018 – 2020 Research Associate, Research Services, Dalhousie University, Nova Scotia, Canada

2013 – 2018 Postdoctoral Fellow, Public Health Sciences, Fred Hutchinson Cancer Research Center, Washington, United States

2011 – 2011 Instructor, Faculty of Computer Science, Dalhousie University, Nova Scotia, Canada

HONOURS:

2015 Simons Foundation Fellow of the Life Sciences Research Foundation, Postdoctoral Research Fellowship, Life Sciences Research Foundation

2012 Best Presentation, Best presentation decided by committee vote, Dalhousie Computer Science In-house Conference (DCSI) 2012

2012 Winner of the Open Tree of Life challenge on Synthesizing Phylogenies, 1st prize in a competitive scientific development challenge, iEvoBio 2012

2011 Killam Predoctoral Fellowship, Predoctoral Fellowship, Dalhousie University, Nova Scotia, Canada

2010 Tula Foundation Training Grant, Predoctoral Fellowship, Tula Foundation

2010 NSERC Postgraduate Fellowship, Predoctoral Fellowship, Natural Sciences and Engineering Research Council of Canada (NSERC), Ontario, Canada

2009 Best Graduate Presentation, Best graduate student presentation decided by committee vote, APICS Mathematics, Statistics & Computer Science Conference 2009

2008 Alexander Graham Bell Canada Graduate Scholarship, Master's Fellowship, Natural Sciences and Engineering Research Council of Canada (NSERC), Ontario, Canada

2007 NSERC Undergraduate Student Research Award, Worked in the lab of Dr. Vlado Keselj developing a coreference module for the question answering system Jellyfish, Dalhousie University, Nova Scotia, Canada

2005 NSERC Undergraduate Student Research Award, Worked in the lab of Vlado Keselj developing a question processing module for the question answering system Jellyfish, Dalhousie University, Nova Scotia, Canada

SCHOLARLY and PROFESSIONAL ACTIVITIES:

Journal Review Activities

2021 – Reviewer, PLOS Computational Biology

Conference Review Activities

2020 – Reviewer, 2020 European Symposium on Algorithms

Knowledge and Technology Translation

2020 – Primary Investigator, Developing machine learning tools and software for detection, species classification and tracking of fish from acoustic sonar and visual camera data

2021 – 2021 Principal Investigator, Pairing Meteorological and Power Data for Marine Hybrid Electric Boats

2019 – 2021 Collaborator, Developed a random forest machine learning redundancy model for predicting wave height and wind speed of Herring Cove Smart Buoy when buoy is unavailable due to failure or maintenance

2019 – 2020 Collaborator, Developed a deep learning framework and model "echofilter" for filtering noisy hydroacoustic data for identifying fish presence and abundance near tidal turbines in the Bay of Fundy as part of the "Pathway program

International Collaboration Activities

2012 – 2017 Collaborator, Worked with a team including Steven Kelk (Associate Professor, Maastricht University) developing novel algorithms for phylogenetic networks. This collaboration began when I was invited to attend a workshop "The future of phylogenetic networks" in Lieden in 2012 and culminated in co-authoring two papers in 2016 and 2017, one solving a long-standing problem showing that the "history bound" is equivalent to a type of maximum agreement forest and the other developing a novel fixed parameter algorithm for computing phylogenetic networks of three trees.

MEMBERSHIPS**Committee Memberships**

2020 – Chair, Undergraduate Research Committee, Dalhousie University, Nova Scotia, Canada

SUPERVISIONS:**Summary:****In Progress**

Principal Supervisor	1 Bachelor's
	1 Master's Thesis

EXTERNAL RESEARCH FUNDING:

Year(s)	Source	Type	Investigator	Amount
2021 - 2026	National Research Council Canada (NRC) (Ottawa, ON) <u>Title:</u> Deep Learning Models and Best Practices for Measuring the Effects of Seismic Oil and Gas Exploration on Commercial Fish <u>Program:</u> NRC-OGEN Studentship	<u>Type:</u> Grant	<u>My Role:</u> Principal Investigator	<u>Funding Total:</u> \$100,000.00
2021 - 2026	Ocean Frontier Institute <u>Title:</u> Deep Learning Models and Best Practices for Measuring the Effects	<u>Type:</u> Grant	<u>My Role:</u> Principal Investigator	<u>Funding Total:</u> \$50,000.00

Year(s)	Source	Type	Investigator	Amount
	of Seismic Oil and Gas Exploration on Commercial Fish <u>Program:</u> NRC-OGEN Studentship			
2021 - 2022	MEOPAR <u>Title:</u> Prediction of contaminant dispersion in the Gulf of St. Lawrence via Deep Learning <u>Program:</u> TReX Postdoc Award	<u>Type:</u> Grant	<u>My Role:</u> Principal Investigator <u>Co-applicant:</u> Uriel Zajaczkovski <u>Co-investigator:</u> Graigory Sutherland	<u>Funding Total:</u> \$25,000.00
2021 - 2021	Mathematics of Information Technology and Complex Systems (MITACS) <u>Title:</u> Pairing Meteorological and Power Data for Marine Hybrid Electric Boats <u>Program:</u> MITACS Accelerate	<u>Type:</u> Grant	<u>My Role:</u> Principal Investigator <u>Co-investigator:</u> Wayne Groszko	<u>Funding Total:</u> \$30,000.00
2021 - 2026	Natural Sciences and Engineering Research Council of Canada (NSERC) <u>Title:</u> Advancing algorithm design for phylogenetic inference using agreement forests and graph exploration <u>Program:</u> NSERC Discovery Grant	<u>Type:</u> Grant	<u>My Role:</u> Principal Investigator	<u>Funding Total:</u> \$140,000.00
2021 - 2026	Natural Sciences and Engineering Research Council of Canada (NSERC) <u>Title:</u> Advancing algorithm design for phylogenetic inference using agreement forests and graph exploration <u>Program:</u> Discovery Launch Supplement	<u>Type:</u> Grant	<u>My Role:</u> Principal Investigator	<u>Funding Total:</u> \$12,500.00
2021 - 2022	Mathematics of Information Technology and Complex Systems (MITACS) <u>Title:</u>	<u>Type:</u> Grant	<u>My Role:</u> Principal Investigator <u>Co-investigator:</u> Luis Torgo	<u>Funding Total:</u> \$105,000.00

Year(s)	Source	Type	Investigator	Amount
	Integrating multiple deep learning models to track and classify at-risk fish species near commercial infrastructure <u>Program:</u> Mitacs Accelerate			

PUBLICATIONS:Refereed Journal Articles

18. Medisetty, S.; Ouellette, D.; Smith, F.; Richard, M.; Johnston, S.; Quirion, J.; Newport, J.; Whidden, C.; Kirsebom, O. (2021). Identification of Periodic Fish Tags with Deep Learning. *Journal of Ocean Technology*, 16(3), 132 - 149.
17. Morris, C.; Barnes, J.; Schornagel, D.; Whidden, C.; Lamontagne, P. (2021). Machine Learning Analysis of Underwater Video: Measuring Effects of Seismic Surveying on Groundfish Resources off the Coast of Newfoundland, Canada. *Journal of Ocean Technology*, 16(3), 57 - 63.
16. Kirsebom, O.; Medisetty, S.; Whidden, C.; Ouellette, D.; Smith, F.; Quirion, J.; Johnston, S. (2021). Advancing Acoustic Fish Tracking with Deep Learning. *Journal of Ocean Technology*, 16(2), 100 - 101.
15. Kess T., Lehnert S., Bentzen P., Steven D., Messmer A., Dempson B., Newport J., Whidden C., Robertson M., Chaput G. (2021). Genetic Architecture of Life History Divergence in North American Atlantic Salmon. *CCFFR/SCL 2021*.
14. Whidden C., Claywell B., Fisher T., Magee A., Fourment M., Matsen IV F. (2020). Systematic exploration of the high likelihood set of phylogenetic tree topologies. *Systematic Biology*, 69(2), 280 - 293.
13. Fourment M., Magee A., Whidden C., Bilge A., Matsen IV F., Minin V. (2020). 19 dubious ways to compute the marginal likelihood of a phylogenetic tree topology. *Systematic Biology*, 69(2), 209 - 220.
12. Fasuyi J. W., Newport J., Whidden C. (2020). A machine learning redundancy model for the Herring Cove Smart Buoy. *Journal of Ocean Technology*, 15(3), 140-157.
11. Whidden, C. (2019). Barriers to enterprise involvement in ocean data analytics. *Journal of Ocean Technology*, 14(4), 128-129.
10. Whidden C., Matsen F. (2018). Calculating the unrooted subtree prune-and-regraft distance. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 16(3), 898 - 911.
9. Gavryushkin A., Whidden C., Matsen F. (2018). The combinatorics of discrete time-trees: theory and open problems. *Journal of Mathematical Biology*, 76(5), 1101 - 1121.
8. Whidden C., Matsen IV F. (2017). Ricci–Ollivier curvature of the rooted phylogenetic subtree–prune–regraft graph. *Theoretical Computer Science*, 699, 1 - 20.
7. Matsieva J., Kelk S., Scornavacca C., Whidden C., Gusfield D. (2016). A resolution of the static formulation question for the problem of computing the history bound. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 14(2), 404 - 417.
6. Van Iersel L., Kelk S., Lekic N., Whidden C., Zeh N. (2016). Hybridization number on three rooted binary trees is EPT. *SIAM Journal on Discrete Mathematics*, 30(3), 1607 - 1631.
5. Whidden C., Beiko R., Zeh N. (2015). Fixed-Parameter and Approximation Algorithms for Maximum Agreement Forests of Multifurcating Trees. *Algorithmica*, 74, 1019–1054.
4. Whidden C., Matsen IV F. (2015). Quantifying MCMC Exploration of Phylogenetic Tree Space. *Systematic Biology*, 64(3), 472 - 491.
3. Whidden C., Zeh N., Beiko R. (2014). Supertrees based on the subtree prune-and-regraft distance. *Systematic Biology*, 63(4), 566 - 581.

2. Boon E., Meehan C., Whidden C., Wong D., Langille M., Beiko R. (2014). Interactions in the microbiome: communities of organisms and communities of genes. *FEMS Microbiology Reviews*, 38(1), 90 - 118.
1. Whidden C., Beiko R., Zeh N. (2013). Fixed-parameter algorithms for maximum agreement forests. *SIAM Journal on Computing*, 42(4), 1431 - 1466.

Conference Publications

9. Lee B., Whidden C. (2021). Implementation and Optimisations for Computing Maximum Agreement Forests for Rooted Multifurcating Trees. In *Dalhousie Computer Science In-house Conference (DCSI 2021)*.
8. Chris Whidden, Jason Newport, Mahtab Sarvmaili and Scott Lowe. (2021). Automating the post-processing of noisy hydroacoustic fish surveying for monitoring tidal turbines. In *International Conference on Ocean Energy (ICOE2021)*.
7. Whidden C., Matsen IV F. (2018). Efficiently inferring pairwise subtree prune-and-regraft adjacencies between phylogenetic trees. In *The Fifteenth Workshop on Analytic Algorithmics and Combinatorics (ANALCO)* (p. 77-91).
6. Whidden C., Matsen IV F. (2016). Ricci–Ollivier curvature of the rooted phylogenetic subtree–prune–regraft graph. In *The Thirteenth Workshop on Analytic Algorithmics and Combinatorics (ANALCO16)* (p. 106-120).
5. Whidden C., Beiko R., Zeh N. (2010). Fast FPT algorithms for computing rooted agreement forests: Theory and experiments. In *International Symposium on Experimental Algorithms* (p. 141-153).
4. Whidden C., Zeh N. (2009). A unifying view on approximation and FPT of agreement forests. In *International Workshop on Algorithms in Bioinformatics* (p. 390-402).
3. Kešelj V., Liu H., Zeh N., Blouin C., Whidden C. (2009). Finding optimal parameters for edit distance based sequence classification is NP-hard. In *KDD'09 Workshop on Statistical and Relational Learning in Bioinformatics, StReBio'09* (p. 17 - 21).
2. Abou-Assaleh T., Whidden C., Kešelj V., Tanta-ngai H., Cercone N. (2007). DaITREC 2007 QA System Jellyfish: Experiment with integration of Lucene and GATE, and improved usage of WordNet and Qrel. In *The Sixteenth Text REtrieval Conference (TREC 2007)*.
1. Abou-Assaleh T., Cercone N., Doyle J., Keselj V., Whidden C. (2005). DaITREC 2005 QA System Jellyfish: Mark-and-Match Approach to Question Answering. In *The Fourteenth Text REtrieval Conference (TREC 2005)*.

PRESENTATIONS:

24. Whidden C, Kandimalla V, Torgo L, Richard M and Smith F. (2021, November). "Towards the automated detection, classification and counting of fish in fish passages with deep learning". International 151st Annual Meeting of the American Fisheries Society, Virtual (hosted in Baltimore), United States.
Research Type: Scientific Research
23. Lee B and Whidden C. (2021, July). "Implementation and Optimisations for Computing Maximum Agreement Forests for Rooted Multifurcating Trees". Local Dalhousie Computer Science In-house Conference (DCSI 2021), Virtual, Canada.
Research Type: Scientific Research
22. Whidden C, Newport J, Lowe S, Sarvmaili M. (2021, April). "Automating the post-processing of noisy hydroacoustic fish surveys for monitoring tidal turbines". International Conference on Ocean Energy (ICOE 2021), Virtual, United States.
Research Type: Scientific Research
21. LaPlante J and Whidden C. (2021, March). "Automating the post-processing of noisy hydroacoustic fish surveying for monitoring tidal turbines". International OERA Webinar Series. Retrieved from <https://tinyurl.com/nczr5425>
Research Type: Scientific Research

20. (2020, November). "Using Subtree prune-and-regraft to model lateral gene transfer". Local ARETE Monthly Meeting.
Research Type: Scientific Research
19. Whidden C. (2020, March). "Machine Learning Algorithms to Predict Buoy Values". DeepSense Discovery Sessions, Canada.
18. Newport J, LaPlante J, Lowe S, Whidden C. (2020, March). "Automation for Echosounder Data". Offshore Energy Research Association Workshop on Data Automation and Data Management Options, Halifax, Canada.
17. Whidden C. (2018, January). "Efficiently Inferring Pairwise Subtree Prune-and-Regraft Adjacencies between Phylogenetic Trees". The Fifteenth Workshop on Analytic Algorithmics and Combinatorics (ANALCO18), New Orleans, United States.
16. Whidden C. (2017, October). "Developing statistical algorithms to infer the evolutionary history of viruses, antibodies and cancer cells". Annual Meeting of the Life Sciences Research Foundation, Baltimore, United States.
15. Whidden C. (2017, February). "The Shape of Subtree Prune-and-Regraft Tree Space: Current Progress and Open Problems". BIRS Workshop 17w5104 - Mathematical Approaches to Evolutionary Trees and Networks, Banff, Canada.
14. Whidden C. (2016, January). "Ricci-Ollivier Curvature of the Rooted Phylogenetic Subtree-Prune-Regraft Graph". Thirteenth Workshop on Analytic Algorithmics and Combinatorics (ANALCO16), Arlington, United States.
13. Whidden C. (2015, July). "Curvature of Random Walks on the Phylogenetic Subtree-Prune-Regraft Graph". DTRA/NSF Algorithms for Threat Detection Workshop, Arlington, United States.
12. Whidden C. (2014, October). "Quantifying MCMC Exploration of Phylogenetic Tree Space". University of Washington Postdoctoral Association Annual Research Symposium, Seattle, United States.
11. Whidden C. (2014, July). "Towards, or Away From, an Agreement Forest for Unrooted SPR Distance". Peter Ralph Symposium, Seattle, United States.
10. Whidden C. (2013, July). "Inferring Highways of Gene Sharing in Prokaryotes via Agreement Forest Based models". Society for Molecular Biology and Evolution Annual Meeting (SMBE 2013), Chicago, United States.
9. Whidden C. (2013, February). "Fixed-parameter Algorithms for Maximum Agreement Forests". The 17th Annual New Zealand Phylogenomics Meeting (DOOM 13), Mount Ruapehu, New Zealand.
8. Whidden C. (2012, October). "Observations from a 244-taxa Bacterial Supertree Constructed to Minimize Lateral Genetic Transfer". Dalhousie Computer Science In-House Conference (DCSI 2012), Halifax, Canada.
7. Whidden C. (2012). "Fixed-Parameter and Approximation Algorithms for Maximum Agreement Forests". AARMS Mathematical Biology Workshop, Halifax, Canada.
6. Whidden C. (2012). "Observations from a 244-taxa Bacterial Supertree Constructed to Minimize Lateral Genetic Transfer". iEvoBio 2012, Ottawa, Canada.
5. Whidden C. (2012). "Inferring the Network of Life via Agreement Forest Based Models". Society for Molecular Biology and Evolution Annual Meeting (SMBE 2012), Dublin, Ireland.
4. Whidden C. (2011). "Phylogenetic Tree Distance Metrics (New Advances)". Centre for Comparative Genomics and Evolutionary Biology Joint Lab Meeting, Halifax, Canada.
3. Whidden C. (2010). "Phylogenetic Tree Distance Metrics". Centre for Comparative Genomics and Evolutionary Biology Joint Lab Meeting, Halifax, Canada.
2. Whidden C. (2009). "A Unifying View on Approximation and FPT of Agreement Forests". Atlantic Provinces Council on the Sciences conference (APICS 2009), Halifax, Canada.
1. Whidden C. (2009). "A Unifying View on Approximation and FPT of Agreement Forests". 9th Workshop on Algorithms in Bioinformatics (WABI 2009), Philadelphia, United States.

INTERVIEWS AND MEDIA RELATIONS:

Broadcast Interviews

1. Interviewer: Paul Withers. (2021, March 25). *A new computer program developed in Nova Scotia is making it easier and faster to detect marine life in the turbulent and cloudy waters of the Bay of Fundy.* CBC News. CBC. Retrieved from <https://www.cbc.ca/i/caffeine/syndicate/?mediald=1878363715976>
Research Type: Scientific Research
CBC News Broadcast Interview with Jessica Douglas from FORCE and myself about the OERA echofilter software

Text Interviews

5. (2021, October 1). *Lodestar Researcher Profile.* Journal of Ocean Technology. Retrieved from https://www.thejot.net/article-preview/?show_article_preview=1279
Research Type: Scientific Research
4. Interviewer: Paul Withers. (2021, March 26). *AI software developed in N.S. provides glimpse into wild and murky Bay of Fundy.* CBC News. Retrieved from <https://www.cbc.ca/news/canada/nova-scotia/scientists-differentiate-fish-air-bubbles-1.5964650>
Research Type: Scientific Research
3. Interviewer: Stacey Pineau. (2021, March 24). *AI Innovation makes for easier fish finding on tidal-energy projects.* DalNews. Retrieved from <https://dal.ca/news/2021/03/24/ai-innovation-makes-for-easier-fish-finding-on-tidal-energy-proj.html>
2. (2020, October 20). *Researchers develop machine learning model that will support safe and accurate decision making for the Halifax Harbour.* Dal News. Retrieved from <https://dal.ca/news/2020/10/20/researchers-develop-machine-learning-model-that-will-support-saf.html>
Research Type: Scientific Research
1. (2020, September 30). *ML Model Supports Safe, Accurate Decision-making for Halifax Harbor.* Association for Computing Machinery TechNews. Retrieved from <https://technews.acm.org/archives.cfm?fo=2020-10-oct/oct-30-2020.html>
Research Type: Scientific Research

OTHER CONTRIBUTIONS:

Dissertations

3. (2013). *Efficient Computation and Application of Maximum Agreement Forests.*
2. (2009). *A Unifying View on Approximation and FPT of Agreement Forests.*
1. (2008). *Sorting by Transpositions: Fixed-parameter Algorithms and Structural Properties.*