Jarrett D. Phillips, BSc. (Hons.), MBinf., PhD. (ABD)

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Professional Summary of Research Interests and Expertise

I am a highly motivated and passionate bioinformatician, data scientist and researcher naturally driven by curiosity to use mathematical, statistical and computational methods to answer fundamental and applied research questions in biodiversity science, evolutionary biology, ecology, genomics and bioinformatics, particularly related to molecular species identification and discovery through DNA barcoding and other DNA-based approaches.

Education

Doctor of Philosophy (PhD.), Computational Sciences   2016-Present

University of Guelph

- Thesis title: A Novel Statistical Framework for Assessment of Intraspecific Haplotype Sampling Completeness
- Cumulative GPA: 90%

Advisor: Dr. Daniel J. Gillis, School of Computer Science
Co-Advisor: Dr. Robert H. Hanner, Department of Integrative Biology
Committee: Dr. Deborah Stacey, School of Computer Science
                Dr. Graham Taylor, School of Engineering

An Introduction to Interactive Programming in Python   2014

Rice University

- Online course through Coursera on the development of interactive applications in Python
- Grade received: 98.4%

Master of Bioinformatics (MBinf.)   2013-2014

University of Guelph

- Primary coursework in bioinformatics, data science, statistics, and machine learning within the R Statistical Computing Environment
- Major research project title: Assessing haplotype sampling efficiency in Actinopterygii using DNA barcodes

- Cumulative GPA: 85.8%

Advisor: Dr. Robert H. Hanner, Department of Integrative Biology
Co-Advisor: Dr. Daniel A. Ashlock, Department of Mathematics and Statistics

Introduction to DNA Barcoding   2013
University of Guelph

- Online course through Open Learning and Education Support (OpenEd)
- Grade received: 97.0%

Honors Bachelor of Science (BSc. (Hons.)) Biological Science   2009-2013
University of Guelph

- Primary coursework in bioinformatics, evolutionary biology, ecology, mathematics and statistics

Research Experience

Summer Research Assistant   2016
Algoma University
Antunes Plant and Soil Ecology Lab, Department of Biology
Invasive Species Research Institute (ISRI)

- Offered bioinformatics and statistical analysis support in R
- Assisted Principal Investigator and undergraduate thesis student with initial drafting of a manuscript on invasive plant root lesion quantification

Lab Assistant Volunteer   2014-2016
Algoma University
Antunes Plant and Soil Ecology Lab, Department of Biology
Invasive Species Research Institute (ISRI)

- Offered bioinformatics and statistical analysis support in R
- Assisted with collaborative and outreach initiatives for the Terrestrial Invasive Plant Species (TIPS) Network Project through drafting communication letters to public and private conservation agencies across Canada and the USA seeking volunteers to collect invasive plant species for root lesion quantification

Undergraduate Research Assistant   2013
University of Guelph
Monteiro Vaccine Discovery Research Group

- Performed various experimental techniques (gas chromatography-mass spectrometry (GC-MS) and Nuclear Magnetic Resonance (NMR)) on bacterial polysaccharide samples for vaccine synthesis and development under the supervision of qualified graduate students

Teaching Experience

Graduate Teaching Assistant (GTA)   2016-2020
University of Guelph
CIS*3130 – System Modelling and Simulation   2020
        ~ 30 students · Python
CIS*1910 – Discrete Structures in Computing I   2017
        ~ 300 students (~ 40 students per section)
CIS*2460 – Modelling of Computer Systems   2016-2019
        ~ 60 students · R, Excel, Java

Undergraduate Student Supervision

I have directly supervised and mentored several undergraduate students in computer science and integrative biology, all of whom are coauthors on my publications. My primary role has been to guide students through the entire scientific process (i.e., formulating research questions, designing and setting up experiments to test hypotheses, collecting data and analyzing results and writing the manuscript drafts). Students completed research both as part of a course and as lab volunteers.

Navdeep Singh (with Dan Gillis)   2021
University of Guelph
CIS*4900 · HACSim RShiny web application
Maya Persram (with Bob Hanner)   2020-present
University of Guelph
Hanner Lab volunteer
Ashley Chen (with Bob Hanner)   2020-present
University of Guelph
Hanner Lab volunteer
Olivia Friesen Kroeker   2020-present
University of Guelph
Hanner Lab volunteer
Scarlett Bootsma (with Dan Gillis)   2020-2021
University of Guelph
CIS*4900/4910 · HACSim simulation study
Christina Fragel (with Bob Hanner)   2018-2019
BINF*6999 · DNA sequence classification with machine learning
Jiaojia (Paula) Yu   2018-2019

(with Bob Hanner)
BINF*6999 · MDMAPR qPCR R Shiny app

Steven French (with Dan Gillis)   2018
CIS*4900/4910 · HACSim R package

Julia Harvie (with Bob Hanner)   2018-2019
MCB*4500/4510 · Data mining GenBank and BOLD

Ankita Bhanderi (with Bob Hanner)   2018
BINF*6999 · Data mining GenBank and BOLD

Assistantships, Awards, Scholarships and Travel Grants

Graduate Teaching Assistantships   2017-2020
University of Guelph $34,506.00-35,148.00
Graduate Research Assistantships   2017-2019
University of Guelph $11,000.00
CPES Graduate Dean's Scholarship   2017
University of Guelph $3500.00
CPES Graduate Excellence Entrance (GEE) Scholarship   2016
University of Guelph $30000.00
Arthur D. Latornell Graduate Travel Grant   2019
University of Guelph $500.00
SoCS Travel Grant   2019
University of Guelph $1000.00

Academic Service

School of Computer Science (SoCS) Search Committee   2018
University of Guelph
   • Associate Professor position in cybersecurity

School of Computer Science (SoCS) Search Committee   2017-2018
University of Guelph
   • Two-year contractually-limited Assistant Professor position in cybersecurity

Academic Peer Review Service

I have served as a reviewer for 9 manuscripts in 4 different journals, both alone or under the guidance of my PhD. supervisors.

Ecology and Evolution   2021-2022
Molecular Ecology Resources   2019-2022
Molecular Biology Reports   2020
Methods in Ecology and Evolution   2020

Proceedings

I have presented graduate research at 3 international conferences, including both oral presentations and posters.

8th International Barcode of Life Conference   2019
NTNU University Museum and Norwegian Biodiversity Information Centre
7th International Barcode of Life Conference   2017
University of Johannesburg
6th International Barcode of Life Conference   2015
University of Guelph

Skills

Programming Languages and IDEs
R · RStudio · TeX · Python · PyCharm

Document Preparation, Spreadsheet Applications, Version Control and Continuous Integration
LaTeX · RMarkdown · Excel · HTML · Git · GitHub · Travis CI

Other
R Shiny

Software Development

HACSim (**H**aplotype **A**ccumulation **C**urve **Sim**ulator) · R package · R Shiny web app
- A novel nonparametric stochastic (Monte Carlo) local search optimization method of iteratively generating species' haplotype accumulation curves through extrapolation to assess within-species sampling completeness
- Available for download through the Comprehensive R Archive Network (CRAN) package repository and accessible online at shinyapps.io
- Publication *in PeerJ Computer Science* was one of the top five most viewed papers in the category *Optimization Theory and Computation*
- Has been downloaded over 14000 times (*c*. 245 times per month) since being published in May 2019

Refereed Work

Journal Articles

Published

4. D'Ercole, J., Dincă, V., Opler, P.A., Kondla, N.G., Schmidt, C.B., **Phillips, J.D.**, Robbins, R., Burns, J.M., Miller, S.E., Grishin, N., Zakharov, E.V., deWaard, J.R., Ratnasingham, S. and Hebert, P.D.N. (2020). A DNA barcode library for the butterflies of North America. *PeerJ*.

3. **Phillips, J.D.**, French, S.H., Hanner, R.H. and Gillis, D.J. (2020). HACSim: An R package to estimate intraspecific sample sizes for genetic diversity assessment using haplotype accumulation curves. *PeerJ Computer Science*, 6(192): 1-37.

2. **Phillips, J.D.**, Gillis, D.J. and Hanner, R.H. (2019). Incomplete estimates of genetic diversity within species: Implications for DNA barcoding. *Ecology and Evolution,* 9(5): 2996-3010.

1. **Phillips, J.D.**, Gwiazdowski, R.A., Ashlock, D. and Hanner, R. (2015). An exploration of sufficient sampling effort to describe intraspecific DNA barcode haplotype diversity: examples from the ray-finned fishes (Chordata: Actinopterygii). *DNA Barcodes*, 3: 66-73.

Accepted

1. **Phillips, J.D.**, Gillis, D.J. and Hanner, R.H. (2022) Lack of statistical rigor in DNA barcoding likely invalidates the presence of a true species' barcode gap. *Frontiers in Ecology and Evolution*.

Submitted

1. Young, R.G., Persram, M., Friesen, O., Chen, A., Yu, J. **Phillips, J.D.** and Hanner, R.H. R you citing your use of the R statistical computing and graphics environment correctly? *PeerJ Computer Science.*

To Be Submitted

4. D'Ercole, J., Dapporto, L., Phillips, J.D., Dincă, V.E., Vila, R., Talavera, G. and Hebert, P.D.N. (2022). Macrogenetics of North American butterflies —the impact of Quaternary climatic changes.

3. **Phillips, J.D.**, Singh, N., Hanner, R.H. and Gillis, D.J. The HACSim R Shiny app: A web interface to estimate specimen sampling sufficiency for species genetic diversity assessment with DNA sequence data. *Bioinformatics*.

2. **Phillips, J.D.**, Bootsma, S.E., Hanner, R.H. and Gillis, D.J. (2022). Solving the genetic specimen sample size problem with a local search optimization algorithm. *Methods in Ecology and Evolution.*

1. Athey, T.B.T., **Phillips, J.D.**, Hanner, R.H. and McNicholas, P.D. (2022) VLF: An R package for the analysis of very low frequency variants in DNA sequences. *Biodiversity Data Journal.*

Conference Proceedings

3. **Phillips, J.D.**, Gillis, D. and Hanner, R. (2019). HACSim: Iterative extrapolation of haplotype accumulation curves for assessment of intraspecific COI DNA barcode sampling completeness Scientific abstracts from the 8th International Barcode of Life Conference, Trondheim, Norway (ed. Torbjørn Ekrem), *Genome*, 62(6): 349-453.

2. **Phillips, J.D.**, Gillis, D. and Hanner, R. (2017). Intraspecific sample size estimation for DNA barcoding: Are current sampling levels enough? Scientific abstracts from the 7th International Barcode of Life Conference, Johannesburg, South Africa (ed. M. van der Bank), *Genome*, 60(11): 881-1019.

1. **Phillips, J.D.**, Gwiazdowski, R.A., Ashlock, D. and Hanner, R. (2015). An exploration of sufficient sampling effort to describe intraspecific haplotype diversity in the ray-finned fishes (Chordata: Actinopterygii). Scientific abstracts from the 6th International Barcode of Life Conference, Guelph, ON., Canada (ed. S.J. Adamowicz), *Genome*, 58(5): 163-303.

Non-Refereed Work

I have communicated my research to non-technical audiences through various media.

Blog posts

5. **Phillips, J.D.** (2020). Barcode Cracking. Contributed CEPS Research Highlights article (https://www.uoguelph.ca/ceps/news/2020/02/barcode-cracking)

4. **Phillips, J.D.** (2020). Protecting Biodiversity Through the Lens of Genetic Diversity. Contributed guest post to the blog of Dr. Daniel Gillis (https://danielgillis.wordpress.com/2020/01/30/protecting-biodiversity-through-the-lens-of-genetic-diversity/).

3. **Phillips, J.D.** (2019). IBOL8 and the Midnight Sun. Contributed guest post to the blog of Dr. Daniel Gillis (https://danielgillis.wordpress.com/2019/07/02/reflections-ibol8-and-the-midnight-sun/).

2. **Phillips, J.D.** (2017). The Big Five and IBOL7. Contributed guest post to the blog of Dr. Daniel Gillis (https://danielgillis.wordpress.com/2017/12/06/reflections-the-big-five-and-ibol7/).

1. **Phillips, J.D.** (2016). Sample size estimation for DNA barcoding: Are current sampling levels enough? Contributed guest post to the DNA Barcoding Blog (http://dna-barcoding.blogspot.com/2016/01/guest-post-sample-size-estimation-for.html).

Newsletters

1. **Phillips, J.D.** (2016). Sample size estimation for DNA barcoding of ray-finned fishes: Are current sampling levels enough? Contributed newsletter article to the Barcode Bulletin, 7(1).

Volunteer Experience

1. Wireframing session volunteer   November 2021
University of Guelph
- Participated in student-led use case app prototype demonstrations for CIS*3750 – System Analysis and Design in Applications
- Graded students based on several factors via Qualtrics surveys

References

Dr. Daniel Gillis   Dr. Robert Hanner
Associate Professor   Full Professor
School of Computer Science   Department of Integrative Biology
University of Guelph   University of Guelph
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