Ashley Mae Conard

Ph.D. Candidate Computational Biology, Computer Science track

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Providence, RI 02906, USA

Research interests

Bayesian inference modeling, temporal dynamics, interpretable deep learning, multi-omics data integration, gene regulatory network reconstruction, visualization, reproducibility, high-performance computing, game theory, protein structure prediction.

Education

2021 (expected) | Center for Computational and Molecular Biology, Brown University, RI, USA.

Ph.D. Computational Biology, Computer Science track

Thesis: It's about time: developing interpretable models to uncover regulatory mechanisms from temporal and multi-omic data

Advisors: Dr. Erica Larschan, Dr. Charles Lawrence, Dr. Lorin Crawford

2019 Computer Science, Brown University RI, USA.

M.S. in Computer Science

Thesis: *Identification of subclonal drivers and copy-number variants from bulk and single-cell DNA sequencing of tumors* (https://cs.brown.edu/research/pubs/theses/masters/2019/conard.ashley.pdf)

Advisor: Dr. Benjamin Raphael

2014 DePauw University, IN, USA.

B.A. in Computer Science, Biochemistry specialization, minor French, magna cum laude

Honors and Awards

International and National

2014-present	o National Science Foundation Graduate Research Fellowship Program (NSF GRFP)
2014–2015	o Fulbright Research Scholar, Machine Learning and Game Theory, Belgium
2015	o Belgian American Education Foundation Fellow, Machine Learning and Game Theory, Belgium
2014	o Science Mathematics and Research for Transformation (SMART). Declined due to NSF GRFP.
2010–2014	 Grace Hopper International Celebration of Women in Computing: Poster Award 2013, (scholarships: NSF 2010, Xerox 2012, Intel 2013)
2011	o Ohio Celebration of Women in Computing (OCWiC), scholarship to attend
	o National Society of Collegiate Scholars (NSCS)
2010	o Science National Honor Society
2009	o Indiana High School Athletic Association Role Model: gave speeches to promote drug-free living

DePauw University

2014	o Old Gold Award: academic excellence and high achievement
2012	o Internships in Francophone Europe: fellowship to study in Belgium and conduct research
2010–2014	o Dean's List (every semester)
	o Information Technology Associates Program (ITAP) - selective honors program
	o Science Research Fellows (SRF) - selective honors program
	o Honors Societies: Mortar Board, Chi Alpha Sigma, Phi Eta Sigma, Order of Omega, National Society for Collegiate Scholars, Alpha Lambda Delta

Skills and Experience

Programming Languages	Bash, C++, C, CSS, HTML, Julia, Java, MATLAB, pMatlab, Markdown, Python, R, RShiny, SQL
Dev. Tools/ Environments	Arduino IDE, BlueJ, Eclipse, Jupyter Notebook, Oracle's JDK, Putty, Tensorflow, Terminal, Visual Studio Code, Xcode
Big Data Tools	Apache Acculumo, Apache Hadoop, MPI, OpenMP, Slurm
Programs/ Platforms	ArcGIS, Arduino, Audacity, Business Objects, Cytoscape, Chimera, Discoverant, Dreamweaver, Final Cut Pro, GIMP, Illustrator, Infopath, MakerBot, Raspberry Pie, Raven, ROSETTA
Foreign Languages	French (fluent), Spanish (fluent)

Professional Research and Computing Experience

2018-present	Center for Computational and Molecular Biology (CCMB), Brown University, Providence, RI, USA. Ph.D. Candidate. Developing Bayesian models to infer biological mechanisms from both multi-omic time series data and RNA secondary structure.
Fall 2018	Department of Health, RI, USA. Machine Learning Scholar. Designed predictive model to address a need in Rhode Island's hospital systems. The hope is to form state legislation based on findings.
2015–2017	Department of Computer Science, Brown University, Providence, RI, USA. <i>Graduate Student.</i> Designed deep learning model to improve DNA single-cell sequencing data for large region mutation (copy-number) inference. Developed pipeline to identify subclonal driver mutations in bulk sequencing cancer tumor samples across nine cancer types.
2014–2015	Department of Computer Science, Université Libre de Bruxelles, Belgium. Game Theory Researcher. Created a method to uncover binding specificities in SH3 protein domain using machine learning, cooperative game theory, and structural bioinformatics.
Summer 2013, 2014	Massachusetts Institute of Technology Lincoln Laboratory, MA, USA. <i>Bioinformatics Researcher.</i> Developed a fast protein analysis algorithm using Dynamic Distributed Dimensional Data Model (by Dr. Jeremy Kepner), merging sparse algebra, associative and distributed arrays, and triplestore/NoSQL databases (Accumulo).
Summer 2013	Department of Chemistry, DePauw University, IN, USA. <i>Chemical Inventory Database Creator – Senior Project.</i> Designed, built, and deployed database (Parse Platform) and front end (HTML, CSS). ~2000 users for many departments [link].

January 2013 | Center for Structural Biology, Vanderbilt University, TN, USA.

Visiting Scholar. Assisted in development of new structure prediction algorithms in RosettaLigand program (simulations and design of macromolecules) and proposed new machine learning techniques in Biochemical Library (BCL) drug discovery project.

2011–2012 | Technology Associate of Alumni Office, DePauw University, IN, USA.

Student Worker. Provided information technology solutions for faculty and staff. Built video presentations for award lectures and conducted interviews for alumni networking.

Summer 2012 | Eli Lilly and Company (Elanco), IN, USA.

Quality Control Researcher. Designed, tested and implemented two software programs. One for deviation documentation and the other instrument control. The former went GLOBAL for Elanco plants in Nov. 2012, the latter runs automatically daily. Learned how to use Gas Chromatography, Atomic Absorption Spectroscopy, and High Performance Liquid Chromatography.

Spring 2012 | Department of Computer Science, Université Libre de Bruxelles, Belgium.

Visiting Scholar. Analyzed the role of core amino acids in a FYN SH3 protein domain using structural bioinformatics and game theory techniques.

2010–2011 Information Technology Help Desk, Information Technology Associates Program, DePauw University, IN, USA.

Technology Associate. Project manager for team of ten that implemented technology solutions for students and faculty, including revamping websites and software troubleshooting.

Summer 2011 **JDS Uniphase, TX, NY, USA.**

Technology Sales and Marketing Associate. Researched, tested, taught, and marketed communication software, services, and solutions for Verizon, AT&T.

Summer 2011 Department of Biology, Science Research Fellowship Program, DePauw University, IN, USA.

Behavioral Ecology Researcher. Developed procedures to test and analyze different advertisement and aggressive calling patterns of Acris blanchardi. Tested parachuting behavior of Hyla chrysosclis, Acris blanchardi, and Anaxyrus fowleri.

Fall 2010 | Department of Chemistry, Science Research Fellowship Program, DePauw University, IN, USA.

Inorganic Chemistry Researcher. Synthesized ionogel and determined chemical and physical properties to use as a catalyst for biosensing, optics, and electrolytes.

Summer 2008 | Eli Lilly and Company, IN, USA.

Inorganic Chemistry Researcher. Assessed hydrolytic stability of cyclopropanecarboxylic acid esters as potential prodrugs. Synthesized an acyclovir prodrug and worked with a ghrelin O-acyltransferase inhibitor to evaluate use as a potential therapeutic target to treat obesity and diabetes.

Publications

Co-first author: *, corresponding author: ‡.

2020 A. Conard[‡], N. Goodman, Y. Hu, N. Perrimon, R. Singh, C. Lawrence[‡], E. Larschan[‡]. TIMEOR: a web-based tool to uncover regulatory mechanisms from temporal and multi-omics data. *NAR*. (In submission).

<u>A. Conard</u>*, R. Singh[‡], L. Crawford[‡]. A Bayesian Inference Approach to Predicting and Interpreting Cancer Patient Gene Regulatory Networks from Multiple Data Types. *ISMB*. (In preparation).

<u>A. Conard</u>*, Alan DenAdel*, C. Lawrence[‡]. Lessons in Bayesian Inference in Genomics and Molecular Biology. (In preparation).

- **A.** Conard, I. Nathoo, M. Tsarli, C. Lawrence, E. Larschan[‡]. XvsY: A Computational Approach to Distinguish the Temporal Sex-Specific Roles of Vital Co-Factors on Brain Development in Drosophila. (In preparation).
- M. Ray*, <u>A. Conard</u>*, E. Larschan[‡]. The CLAMP transcription factor regulates sex-specific splicing in the *Drosophila* early embryo. *Nature Communications*. (In submission).
- M. Tsarli*, <u>A. Conard</u>, E. Larschan[‡]. The *Drosophila* CLAMP protein regulates neurogenesis in the optic lobe. *Genetics*. (Under review).
- N. D'Silva*, K. McCullar*, <u>A. Conard</u>, T. Blackwater, R. Azanchi1, U. Heberlein, E. Larschan, K. Kaun[‡]. Neuromolecular and behavioral adaptation associated with alcohol deprivation. *Molecular Pharmacology*. (In preparation).
- B. Almedia, <u>A. Conard</u>, M. Ray, E. Larschan[‡]. A new link between dosage compensation and enhancers. (In preparation).
- B. Cuypers, A. Jacobsen, B. Siranosian, K. Schwahn, <u>A. Conard</u>, N. Aben, M. Hassan, N. Fatima, S. Hermans, M. Woghiren, P. Meysman, F. Rahman, A. Jigisha. Highlights from the ISCB Student Council Symposia in 2016. *F1000Research*. 2016, 5(ISCB Comm J):2852
- 2015 A. Conard, S. Dodson, J. Kepner[‡], D. Ricke[‡]. Using a Big Data Database to Identify Pathogens in Protein Data Space, *arXiv*:1501.05546.

Selected Presentations

Invited Talks

November 2020	TIMEOR: a web-based tool to uncover temporal regulatory mechanisms from multi-omics data Biological Data Science Conference, Cold Spring Harbor Laboratory, Virtual.
March 2020	TIMEOR: web-based tool to uncover regulatory mechanisms from temporal & multi-omics data Adelman-Bender-Cole-Kuroda-Larschan Joint Lab Meeting, Harvard University, MA, USA.
January 2020	Trajectory Inference and Mechanism Exploration with Omics Data in R. A computational method to uncover regulatory mechanisms of transcription factors during development Perrimon Lab Group Meeting (collaborator), Harvard University, MA, USA.
October 2019	Trajectory Inference and Mechanism Exploration with Omics Data in R. Its about time! Epigenomics Club, Brown University, RI, USA.
August 2019	Trajectory Inference and Mechanism Exploration with Omics Data in R - A method to uncover regulatory mechanisms over time Dana-Farber Cancer Institute, MA, USA.
August 2019	Time course model of alcoholism in neural development of <i>Drosophila melanogaster</i> Kaun Lab Group Meeting, Brown University, RI, USA.
June 2019	Trajectory Inference and Mechanism Exploration with Omics Data in R - A method to analyze how transcription factors influence development Boston Area Drosophila Meeting, Brown University, RI, USA. Flash talk.
June 2019	Trajectory Inference and Mechanism Exploration with Omics Data in R - A method to analyze how transcription factors influence development Adelman-Bender-Cole-Kuroda-Larschan Joint Lab Meeting, Harvard University, MA, USA.
March 2019	KO or OK? A pipeline to analyze how the CLAMP transcription factors influences development Epigenomics Club, Brown University, RI, USA.
October 2019	Student of Vision Abie Award

Grace Hopper Celebration, FL, USA. Moderator and panelist.

October 2018	Student of Vision Abie Award Grace Hopper Celebration, TX, USA. Moderator and panelist.
October 2016	Subclonal Driver Events Across 9 Cancer Types IB ² Student Day, Université Libre de Bruxelles, Belgium.
August 2015	Applying for National and International Awards DePauw University, IN, USA.
December 2014	Determining winning SH3 coalition using Game Theory Benelux Bioinformatics Conference, Belgium.
June 2015	Determining the winning SH3 Coalition with Game Theory Regional Student Group, Belgium.
December 2014	Determining winning SH3 coalition using Game Theory Benelux Bioinformatics Conference, Belgium.
May 2014	Chemical Inventory Database System and School-Wide Integration DePauw University, IN, USA. Presentation and poster [link].
January 2014	Essential Residues within Fyn SH3 Protein Domain using Game Theory Indiana Women in Computing Conference (InWIC), IN, USA. Won 1st prize [link].
January 2014	No Fomo - User Experience Challenge Microsoft International Imagine Cup, DePauw University, IN. <i>Honorable mention</i> [link].
May 2012	Coalitional Game Theory and Feature Selection to Describe the Dependencies Between Amino Acids Within the SH3 FYN Protein Domain Chicago Women in Computing (ChiWIC), IL, USA.
May 2012	Synergistic & Antagonistic Dependencies Analyzed via Game Theory in FYN Protein Domain (Presented in French and English). Thesis in French. Université Libre de Bruxelles, Belgium.
June 2011	Censorship between China and Google Ohio Celebration of Women in Computing (OCWiC), OH, USA.
Posters	

Posters

April 2020	TIMEOR: web-based tool to uncover regulatory mechanisms from temporal & multi-omics data The Allied Genetics Conference (TAGC), Virtual.
November 2019	TIMEOR: method to uncover regulatory mechanisms from temporal and multi-omics data Fulbright Association Conference, DC, USA.
May 2019	Method characterize how transcription factors influence development with RNA & ChIP-seq RECOMB, DC, USA.
March 2019	Method characterize how transcription factors influence development with RNA & ChIP-seq Annual Drosophila Meeting, TX, USA.
November 2017	Determining the winning SH3 coalition: how cooperative game theory reveals the importance of domain residues in peptide binding Fulbright Association Conference, DC, USA.
October 2016	Coalitional Game Theory and Feature Selection to Describe the Dependencies Between Amino Acids Within the SH3 FYN Protein Domain Grace Hopper Celebration, TX, USA.
July 2015	Determining the winning SH3 Coalition with Game Theory International Society for Molecular Biology (ISMB), Ireland. <i>Won RSCB PDB Prize</i> [link].

January 2015	Using a Big Data Database to Identify Pathogens in Protein Data Space New England Database Day, MA, USA.
January 2014	Creation and Implementation of D4M Algorithm for Protein Analysis Indiana Women in Computing Conference (InWIC), IN, USA. Won 1st prize [link].
October 2013	Creation and Implementation of D4M Algorithm for Protein Analysis OurCS Conference, Carnegie Mellon, PA, USA. Won 1st prize [link].
September 2011	Male-Male Cricket Frog Aggressive Behavior DePauw University Summer Research, Science Research Fellow, IN, USA. [link].
September 2011	Parachuting Arboreal Frogs DePauw University Summer Research, Science Research Fellow, IN, USA. [link].

Teaching Experience

Spring 2019	Applied Math 0650, Statistical Inference II: undergraduate course at Brown University. Lecture on causation and estimation calculations.
Summer 2013, 2014	Arduino Programming: student workshop for Google's Computer Science Summer Institute . Created, recruited, implemented, and led Arduino workshop for more than 40 students at Google's Computer Science Summer Institute [link].
2012–2014	Biology 325, Bioinformatics: undergraduate course at DePauw University . Devised laboratory sessions, homework, helped grade, and tutored students.
2011–2014	Tutor: Created personalized lesson plans to tutor students (10 overall) in classes in the departments of Chemistry, Computer Science, Biology, French and Spanish, at DePauw University .

Student Mentorship

Dominique Pablito, graduate student, 'Uncovering temporal sex-specific differences across multiple species'
 Isaac Nathoo, undergraduate student, 'Regulation of alternate sex specific splicing by DNA binding protein CLAMP during early embryonic development determines transcriptome heterogeneity between sexes'
 Nathaniel Goodman, undergraduate student, 'TIMEOR: a web-based tool to uncover regulatory mechanisms from temporal and multi-omics data'

Academic Service and Memberships

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Memberships	 International Society for Computational Biology (ISCB), 2015–2016, 2020–present Institute of Electrical and Electronics Engineers (IEEE), 2020–present Society for Industrial and Applied Mathematics (SIAM), 2020–present Association for Computing Machinery (ACM), 2010, 2020–present American Society for Biochemistry and Molecular Biology (ASBMB), 2018–present American Association for the Advancement of Science (AAAS), 2017–present National Science Policy Network (NSPN), 2020–present 	
Conference	 Grace Hopper Celebration, 2015–2020 Fulbright Conference, 2019, 2020 International Society of Computational Biology (ISCB) Student Council Symposium, 2016–2018 Indiana Women in Computing Conference (InWIC), 2014 	

- Internal service OCCMB Presenter Series founder, CCMB, Brown University, 2019-present
 - o Graduate student recruiting, CCMB, Brown University, 2018-present

Software

2019 TIMEOR [link]

TIMEOR - Trajectory Inference and Mechanism Exploration using Omics data in R - is a command line and front-end R Shiny tool to identify altered regulatory mechanisms from temporal and multiomics data.

Implementation details: R, R Shiny, Bash, Python

Spring 2014 Chemical Inventory Database [description link], (property of DePauw [login link])

Web-based inventory management system used in many academic departments, mainly chemistry. Users log in and use a phone to scan barcodes for automatic item entry. The application uses the Parse Platform as a relational database to house inventory for DePauw University. This system has been updated by the maintainer Dr. Dave Roberts.

Implementation details: HTML, CSS, Parse Platform

2013, 2014 Arduino-CSSI [link]

Set of Arduino workshop modules and Fritzing diagrams to teach students how to program as part of the Google Computer Science Summer Institute (CSSI).

Implementation details: C

Summer 2012 **Instrument Control** (property of Elanco)

Online internal system to monitor product batch data. Batch data is extracted from Eli Lilly's Data Mart and Data Warehouse databases and then visualized for the researcher (such as potency, and solubility fluctuations). This system now runs automatically daily, enables employees to easily inspect and verify internal processes, saving money and time.

Implementation details: SQL, Discoverant, and Business objects

Summer 2012 **Deviation Identification and Reporting** (property of Elanco)

Online internal system for deviation reporting with automatic alerts, excel exports, and editing options to identify malfunctioning manufacturing products and machines across the plant. These reports were previously on paper. This system was adopted globally for all Elanco plants in November, 2012.

Implementation details: SharePoint, Discoverant, and Business objects

January 2011 INcitizenconnect [link]

Website to keep updated with local legislation in the 2011 Indiana General Assembly.

Implementation details: Wordpress

Leadership and Activities

Professional Organizations and Positions

2018–present | **Fulbright Board of Directors**. Young professional board member [link], [profile]. Fulbright Assoc.

Student of Vision Abie Award Judge and Co-creator. Award honors students committed to creating 2015-present a future where the people who envision and build technology mirror the people and societies for which

they build. Winners receive a \$7000 prize and the chance to go to Grace Hopper [link].

2004–present **D-Day Ambassador to France**. Selected to represent U.S. for D-Day Commemoration, and to return every 4 years until the 100th anniversary of World War II. International School of Indiana.

2018 Science Writer. Wrote two articles on scientific advances targeted at advanced high school students. Infobase Learning, Science News Today.

Princeton Citizen Scientists member. Helped grow a group of scientists interested in policy, mobi-2017-2018 lizing at Princeton and beyond to advocate for science. Princeton University. International Society of Computational Biology (ISCB) Student Symposium Finance Chair. Led 2016-2018 a team to build new strategies bringing four new and important sponsors. We gave >20 scholarships to support international and domestic travel to the conference. ISCB AnitaB.org Board of Trustees. Student board member in program and strategies committees. Fo-2015-2017 cused efforts to build the Student of Vision Awards (an Abie Award), BRAID, Top Companies, and ABI.local. AnitaB.org February 2015 US-EU-NATO Affairs Delegate. Fulbright grantee to engage in EU Seminar in international diplomacy. Fulbright and EU Commission. Venture Crew President (2010). Vice President in 2009. Venture Crew 1121. Boy Scouts of America. 2008-2011

DePauw University Organizations and Positions

2014	Mortar Board Vice President . Helped establish structure for new society focused on achievement in scholarship, leadership, and service. <i>DePauw University</i> .
2011–2014	DePauw Farm Co-founder . Founded and built business plan for ~2-acre farm, where 25% of produce is given to local Greencastle Indiana food pantries. <i>DePauw University</i> [link].
2011–2013	Robotics Club Co-founder & Vice President . Students are provided with free tools to make whatever they wish. We visit local schools for outreach days. <i>DePauw University</i> .
January 2011	DePauw Environmental Policy Program . Testified scientific bills, Indiana Statehouse, created website [link]. <i>DePauw University</i> .
2010–2014	University Athletics. Soccer (2010-2012) and Track (2013-2014). DePauw University.

Service and Outreach

November 2019	Lifetime Achievement Award to President of Croatia Kolinda Grabar-Kitarović, NPR's Melissa Block, and Architect James S. Polshek. Presented award with Fulbright Board of Directors. Fulbright Association [link].
November 2019	Fulbright Talks host (similar to TEDx). Fulbright Association [link].
January 2019	Fulbright Prize to German Chancellor Angela Merkel . Presented award with Fulbright Board of Directors. <i>Fulbright Association</i> [link] [photo].
October 2019	Advocating the "Value and Impact of the Fulbright Program" with U.S. Senator Chris Van Hollen (D-MD). Fulbright Association [link].
June 2018	Raspberry Pi robotics outreach . Taught ~20 students in Roanoke VA. They got to keep their Raspberry Pi. <i>Virginia Tech Philosophy and Physical Computing Workshop</i> [link].
October 2016	Presented Top Companies award (audience of ~15,000) . <i>AnitaB.org</i> [link].
October 2013	IEEE High Performance Computing Conference (HPEC). Served as usher and attended. IEEE.
2012–2014	STARS Computing Corps . Student-led regional outreach group to broaden participation in computing. <i>DePauw University</i> .
November 2012	National Chemistry Week High School Competition . Organized, and executed a video and essay competition for high school students to come to the Children's Museum of Indianapolis for a day of chemistry, fun and to view undergraduate institutions. <i>American Chemical Society</i> .

Summer 2010

Service Trip to Costa Rica. Created a septic tank for 'Estación de las tortugas', worked on pineapple plantation, and helped record nesting behavior of Leather Back and Green Sea Turtles hatchlings. *Servicio en Las Américas Program, DePauw University*.

Media

July 2019	Center for Computational and Molecular Biology Ph.D. Program - Brown University [link].
July 2019	Remembering D-Day - Fulbright Association [link].
January 2019	Alumni Profile: Ashley Mae Conard - Fulbright Association [link].
May 2017	An Insider's Look at Student Board Membership - AnitaB.org [link].
October 2016	Grace Hopper Interview as AnitaB.org Board Member - The Cube [link].
October 2016	Women Who Reign: Ashley Conard - ReigningIt [link].
November 2015	Meet Ashley Conard, AnitaB.org's New Student Board Member - AnitaB.org [link].
October 2015	Putting women and computer science in every field - SiliconANGLE [link].
October 2015	Grace Hopper Interview as AnitaB.org Board Member - The Cube [link].
October 2015	Ashley Conard '14 Will Conduct Computational Biology Research in Belgium with Fulbright Award - DePauw University [link].
October 2015	All of the Above - DePauw University [link].

References

Academic

Professor Erica Larschan (Ph.D. advisor)

Richard and Edna Salomon Associate Prof. of Biology Department of Molecular Biology, Cellular Biology and Biochemistry

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External

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