CURRICULUM VITAE

RYAN J. URBANOWICZ, Ph.D.

PERSONAL

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Date and place of birth:	January 28, 1982 New Milford, Connecticut, USA

EDUCATION

2005-2012	Dartmouth College Hanover, New Hampshire Mentor: Dr. Jason Moore, Department of Genetics	Ph.D. in Genetics/Computational Biology
2004-2005	Cornell University Ithaca, New York Mentor: Dr. Richard Durst, Department of Biological and Environmental Eng.	M.Eng. in Biological and Environmental Eng.
2000-2004	Cornell University Ithaca, New York Mentor: Dr. Ruth Collins, Department of Molecular Medicine	B.S. in Biological and Environmental Engineering

POSTDOCTORAL TRAINING

2012-2015	Dartmouth College Hanover, New Hampshire	Postdoctoral Research Associate

Mentors: Dr. Jason H. Moore, Department of Genetics & Dr. Eugene Demidenko, Department of Biostatistics and Epidemiology

LICENSURE AND CERTIFICATION

none

ACADEMIC APPOINTMENTS

2018-present	Assistant Professor, Clinical Educator (CE), Division of Informatics of the Department of Biostatistics, Epidemiology, and Informatics.
2015-2018	Research Associate with Dr. Jason Moore, Division of Informatics of the Department of Biostatistics, Epidemiology, and Informatics. University of Pennsylvania, Philadelphia, Pennsylvania
2012-2015	Postdoctoral Research Associate with Dr. Jason Moore, Department of Genetics and Dr. Eugene Demidenko, Department of Biostatistics and Epidemiology, Dartmouth College, Hanover, New Hampshire
2013	Faculty of the Citizen Science Program at Bard College, Annandale-on-Hudson, New York
2006-2012	Graduate Research Assistant with Dr. Jason Moore, Department of Genetics, Computational Biology Laboratory, Geisel School of Medicine, Hanover, New Hampshire
2004-2005	Graduate Research Assistant with Dr. Richard A. Durst and Dr. Antje J. Baeumner, Department of Biological and Environmental Engineering, Cornell University, Ithaca, New York
2004	Undergraduate Research Assistant with Dr. Ruth N. Collins, Department of Molecular Biology, Cornell University, College of Veterinary Medicine, Ithaca, New York
2003	Undergraduate Environmental Engineering Intern with Larry Marsicano and Joe Polulech (Engineer), Candlewood Lake Authority, Sherman, Connecticut
2000	High School Research Intern at Boehringer Ingleheim Pharmaceuticals, Ridgefield, Connecticut
1997-1999	High School Research Intern with Dr. Jacquline Burns, Cytogenetics Laboratory, Danbury Hospital, Danbury, Connecticut

OTHER PROFESSIONAL POSITIONS

none

MAJOR COMMITTEE ASSIGNMENTS AND CONSULTATIONS

International, National and Regional

2019-present	Grant Reviewer, American Heart Association (AHA)
2015-present	Cornell Alumni Admissions Ambassadors Network (CAAAN), Alumni Ambassador of the greater Philadelphia, Pennsylvania region.
2016	Lead-Organizer, International Workshop on Evolutionary Rule-Based Machine Learning at the Genetic and Evolutionary Computing Conference (GECCO'17), Berlin, Germany
2016	Co-Organizer, International Workshop on Evolutionary Rule-Based Machine Learning at the Genetic and Evolutionary Computing Conference (GECCO'16), Denver, Colorado
2015	Chair, Hot off the Press Session at the Genetic and Evolutionary Computing Conference (GECCO'15), Madrid, Spain
2014-2015	Co-Chair, Biological and Biomedical Applications Track at the Genetic and Evolutionary Computing Conference (GECCO'15), Madrid, Spain
2014-2015	Algorithm/Prediction Consultant, MedicFP, LLC
2010-2014	Co-Organizer, International Workshop on Learning Classifier Systems (IWLCS)
2013	Chair, Session on Genetics Based Machine Learning at the Genetic and Evolutionary Computing Conference (GECCO'12), Amsterdam, The Netherlands
2013	Co-Chair, International Workshop on Learning Classifier Systems (IWLCS) at the Genetic and Evolutionary Computing Conference (GECCO'13), Amsterdam, The Netherlands
2012	Chair, Session on Genetics Based Machine Learning at the Genetic and Evolutionary Computing Conference (GECCO'12), Philadelphia, Pennsylvania
2012	Co-Chair, International Workshop on Learning Classifier Systems (IWLCS) at the Genetic and Evolutionary Computing Conference (GECCO'12), Philadelphia, Pennsylvania
2011	Co-Chair, International Workshop on Learning Classifier Systems (IWLCS) at the Genetic and Evolutionary Computing Conference (GECCO'11), Dublin, Ireland
2009	Chair, Session on Session on Bioinformatics and Computational Biology at the Genetic and Evolutionary Computing Conference (GECCO'09), Montreal, Canada

Institutional

2007-2008	Graduate Student Representative for the Molecular and Cellular Biology (MCB) Graduate Committee, Dartmouth College, Hanover, New Hampshire

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

2019-present	Institute of Electrical and Electronics Engineers (IEEE)
2012-present	International Genetic Epidemiology Society (IGES)
2007-present	Association for Computing Machinery (ACM)
2007-present	American Society of Human Genetics (ASHG)
2006-present	International Society of Computational Biology (ISCB)

EDITORIAL BOARDS

2019-present	PLOS ONE Academic Editor
2012-2015	Guest Associate Editor for Evolutionary Intelligence, Special Issue on Advancements in Learning Classifier Systems

AWARDS AND HONORS

2016	Best Paper Award, (Co-Author) Genetic and Evolutionary Computation Conference (GECCO'16), Denver, Colorado
2016	Best Paper Award, (Co-Author) EvoBIO, Porto, Portugal
2012-2015	NIH R25 Post-Doctoral Training Grant CA134286
2012	Best Paper Award, (First Author) 2012 Translational Bioinformatics Conference, Jeju, South Korea
2010	Best Paper Award, (First Author) Genetic and Evolutionary Computation Conference (GECCO'10), Portland, Oregon
2009-2010	Graduate Research Fellowship from the William H. Neukom 1964 Institute for Computational Sciences at Dartmouth College
2008	Best Paper Nomination, (First Author) Genetic and Evolutionary Computation Conference (GECCO'18), Atlanta, Georga
2007	PSB Department of Energy Travel Award, Pacific Symposium on Biocomputing, Maui, Hawaii
2004	New Horizons Summer Research Grant, Cornell University, Ithaca, New York
2004	Teaching Research Specialist Grant, Cornell University, Ithaca, New York
2000	Eagle Scout, Boy Scouts of America, Sherman, Connecticut

REFEREE ACTIVITIES

2011-present	referee for Genetic and Evolutionary Computation Conference (GECCO), International Workshop on Learning Classifier Systems (IWLCS) , and Pacific Symposium on Biocomputing (PSB), Evolutionary Intelligence (EI), Evolutionary Computation Journal (ECJ), International Journal of Molecular Sciences, American Journal of Human Genetics (AJHG), PeerJ Computer Science, Artificial Intelligence in Medicine (AIME), Translational Bioinformatics Conference (TBC), Evostar, Bioinformatics, PLOS ONE, Journal of Biomedical Informatics, Journal of the American Medical Informatics Association (JAMIA), Evolutionary Computation Journal (ECJ), Journal of Investigative Dermatology (JID), BioData Mining

MAJOR RESEARCH INTERESTS

Common human disease research has evolved into a largely complex and interdisciplinary

pursuit. Modern epidemiological challenges such as the characterization of complex systems, the management of 'big data', or the integration of data for systems biology epitomize this trend. The early stages of biomedical research typically focus on connecting predictive factors, whether they be genetic, epigenetic or environmental, to increased or decreased common disease susceptibility. This attempt to detect patterns of association is likely complicated by non-linear phenomena such as complex gene-gene interactions, gene-environment interactions, genetic heterogeneity, and phenocopy. My primary research interests focus on the development, evaluation, and application of novel computational, statistical, and visualization methods to facilitate classification and data mining in the complex, noisy domain of biomedical research.

My thesis research focused on the adaptation of a learning classifier system (LCS) algorithm to the task of detecting, modeling, and characterizing epistatic and heterogeneous associations within single nucleotide polymorphism (SNP) association studies. The development and application of LCS algorithms has since become a particular area of specialization. My post-doctoral work expanded upon this successful LCS groundwork leading to the development of ExSTraCS, an Extended Supervised Tracking and Classifying System. This work epitomizes my interest in (1) developing strategies which limit the number of assumptions made about the data, and instead allows the data to speak for itself for detecting complex or heterogeneous patterns, (2) allowing for the integration of data types by offering an algorithmic framework which functions for all combinations of discrete/continuous, attributes/endpoints, and (3) promoting a user friendly, interpretable environment for knowledge discovery. My work with LCS algorithms has also led me to pursue visual and statistical strategies with which to guide and facilitate knowledge discovery. My interests have also branched off into the theory and practice of complex disease model and data simulation, which led to the development of the open source GAMETES software package. Also, my interest in tackling issues related to 'big data' have motivated me to explore, expand and develop new feature selection approaches (e.g. ReliefF, SURF, SURF*, MultiSURF*, and MultiSURF), for computational and algorithmic flexibility and efficiency. These algorithms offer critical preprocessing steps for feature selection and the generation and application of statistical, objective, and unbiased expert knowledge to more efficiently guide stochastic algorithm learning.

In summary, my research interests lie at the intersection of genetics, genomics, biostatistics, epidemiology, machine learning, and computer science. I have adopted a quantitative biomedical research strategy that embraces, rather than ignores, the complexity of the relationship between predictive factors and disease endpoints.

RESEARCH FUNDING
(dollar amounts are annual direct costs)

2016-2020 NIH R01 HL134015 (P.I. – Pack and Robishaw)
$574,434 0.96 cal
Approaches to Genetic Heterogeneity of Obstructive Sleep Apnea
Role: Co-I to develop multi-phenotype methodology and assist with bioinformatics analysis.

2016-2021 NIH R01-AI116794 (P.I. – Moore)
$343,833 1.68 cal
Biomedical Computing and Informatics Strategies for Infectious Disease Research

2017-2020 W81XWH-16-PRCRP-CDA (P.I.- Lynch and Moore)
DOD/Sub to Fox Chase Ctr ($13,888/yr to Urbanowicz)
` Towards Precision Prevention: Testing a Novel Risk Prediction Algorithm in Pancreatic Cancer

2015-2019 N/A (P.I. - Kawut,S)
CMREF $199,509 2.4 cal (beginning in 2018)
Center for Data Integration

2015-2019 N/A (P.I. – Polsky)
PA CURE $3,006,855 2.4 cal (beginning in 2018)
PA CURE: Smarter Big Data for a Healthy Pennsylvania

2018-2022 N/A (P.I. – Yoon)
NSF $598,266 0.60 cal
Professional Development Supports for Teaching Bioinformatics through Mobile Computing

TEACHING EXPERIENCE/CURRENT TEACHING RESPONSIBILITIES

The Perelman School of Medicine at the University of Pennsylvania (UPenn)

Courses and Lectures

2019 Lecturer for Introduction to Biomedical and Health Informatics (BMIN 505)
2018 Lecturer for 'Exploring Data Science Methods with Health Care" (NURS 849), School of Nursing, UPenn (1 lecture: Decision Trees and Random Forests) (Hosts: Kathryn Bowles and Michael Milo)
2018 Lecturer for Graduate Data Science Course (EPID600), UPenn (2 lectures: Evolutionary Algorithms and Enrichment Analysis) (Host: Blanca Himes, PhD)
2018-present Module Director for Nature-Inspired Computing in Special Topics in Biomedical and Health Informatics (BMIN 504), UPenn
2015-2017 Teaching Assistant and Lecturer for Blanca Himes, PhD, Graduate Data Science Course (EPID600), UPenn
2017 Recorded Online Lecture modules on topic of 'Data Science' for Nursing 165: Nursing Informatics, UPenn
2017 Lecturer for Nursing Informatics (165), UPenn, (1 lecture: Data Science) (Host: Kathryn Bowles)

Undergraduate Students Mentored

2019-present	Robert Zhang, UPenn – (PURM Summer Intern) Engineering & Applied Sciences,Wharton/2022
2019-present	Pranshu Suri, UPenn – (PURM Summer Intern) Engineering & Applied Sciences,Wharton/2022
2019-present	Seungmin (Kevin) Han – (VIPER Summer Intern) Engineering & Computer Science/2023
2019-present	Gabrielle Hemlick, UPenn - School of Arts and Sciences/2021
2018-present	Maria Turner, UPenn – Engineering and Computer Science, Philadelphia, PA
2018-present	Alex Xu, UPenn - Computer Science, Philadelphia, PA
2017-present	Siddharth Verma, University of Delhi - Computer Engineering, Delhi (volunteer)
2016-2019	Christopher Lo, UPenn – Bioengineering, Philadelphia, PA (Published)
2017-2018	Riley Wong, UPenn – Computer Science, Philadelphia, PA
2017	James Xue, UPenn (Wharton) – Economics/Statistics, Philadelphia, PA
2016	Tuan A. Nguyen, Swarthmore College – Mathematics, Swarthmore, PA
2016-2017	Ben Yang, UPenn – Computational Biology, Philadelphia, PA (Published)
2017	Melissa Meeker, Ursinus College - Mathematics, Collegeville, PA (Published 2)

Masters Students Mentored

2018-present	Yuhan Cui, UPenn – Biotechnology, Philadelphia, PA (independent study)
2018-present	Piyush Borole, UPenn – Computer Science, Philadelphia, PA (post-grad RA)
2018	Saurav Bose, UPenn – Scientific Computing and Mechanical Engineering, Philadelphia, PA (highlight: programmer job at CHOP)
2016	Ted Fujimoto, UPenn – Computer Science, Philadelphia, PA
2016	Vishal Murali, UPenn - Mechanical Engineering, Philadelphia, PA

Graduate Students Mentored (Rotation or Other)

2018-present	Zihe (Emma) Zheng – Epidemiology PhD Student, Philadelphia, PA
2018	Lin Xi, UPenn – MD student, Philadelphia, PA (research intern)
2018	John Gregg, UPenn – GCB Rotation Student, Philadelphia, PA

<u>The Geisel School of Medicine at Dartmouth</u>

Courses and Lectures

2013	Bioinformatics E-Learning Module Development: Hypothesis Testing
2008	Teaching Assistant, Undergraduate Biology (BIOL 11), Dartmouth College
2007	Center for the Advancement of Learning – Teaching Series, Dartmouth College

High School Students Mentored

2010-2015	Ambrose Granizo-MacKenzie, Hanover High School, Hanover, NH (Published 2)
2008-2009	Delaney Granizo-MacKenzie, Hanover High School, Hanover, NH (highlight:

attended Princeton University). (Published)

Undergraduate Students Mentored

2014-2015	Niranjan Ramanand, class of 2017, Dartmouth College (highlight: student awarded Dartmouth Sophomore Science Scholarship) (Published)
2013	Dzung Pham, class of 2014 Saint Anselm College, NH, and class of 2015 University of Notre Dame, IN
2013	Ryan Amos, class of 2016, Dartmouth College
2013-2014	Gediminas Bertasius, class of 2014, Dartmouth College (Published)
2009-2013	Delaney Granizo-MacKenzie, Princeton University, NJ (Published)
2009-2012	Nicholas Sinnott-Armstrong, Brown University, RI (Published)
2012	Christine Cuddemi, SURF student, Emmanuelle College, MA
2010	Tyler Perry, class of 2012, Dartmouth College

Graduate Rotation Students Mentored

2014	Elizabeth Piette, Quantitative Biomedical Sciences (QBS), Dartmouth College
2013	Jie Tan, Molecular and Cellular Biology (MCB), Dartmouth College (Published)
2012-2013	James Rudd, Quantitative Biomedical Sciences (QBS), Dartmouth College (Published)

Masters Students Mentored

2009	Tamra Heberling, Mathematics, Montana State University (Published)

Bard College

Courses and Lectures

2013	Course Developer and Lecturer for "Citizen Science" (Required Freshman Course Teaching a Universal Scientific Skill Set - 4.5 Lecture Hours/Day for Three Weeks), Bard College, Annandale-on-Hudson, New York

Cornell University

Courses and Lectures

2005	Teaching Assistant, Personal Finance (HADM 3200), Cornell University
2004	Teaching Assistant, Physiological Engineering (BEE 4540), Cornell University

Other Teaching Experience

2000-2016 Adult Leader and Merit Badge Counselor for Troop 48 of the Boy Scouts of America (Engineering, Fire Safety, Emergency Preparedness, Reading, Scholarship, and Astronomy), Sherman, Connecticut

2016 Created Educational YouTube Video: 'Learning Classifier Systems in a Nutshell' https://www.youtube.com/watch?v=CRge_cZ2cJc

2008-2015 Science Educator for the "Camp-in at the Museum" Program, Astronomy/Star-Lab and Chemistry Stations, Montshire Children's Museum of Science, Norwich, Vermont

2008-2009 Science Mentor for the Montshire-Rivendell-Dartmouth Howard Hughes Medical Institute Science Camp, Norwich, Vermont

2002-2005 Substitute Teacher and Teaching Assistant for the Sherman Elementary School (K-8), Sherman, Connecticut

INVITED PRESENTATIONS

International, National and Regional

2018 "Attribute Tracking: Strategies towards improved detection and characterization of complex associations" Genetic and Evolutionary Computing Conference (GECCO'18), Kyoto, Japan, July 17.

2018 Tutorial: "Introducing Learning Classifier Systems: Rules that Capture Complexity", Genetic and Evolutionary Computing Conference (GECCO'18), Kyoto, Japan, July 15.

2018 "A Machine Learning Aperitif", invited speaker, NIMBioS Bioacoustic Workshop, Knoxville, TN, June 25.

2017 "Avoiding Common Machine Learning Mistakes", DataPhilly Meetup, Philadelphia, PA, November 7. (https://www.meetup.com/DataPhilly/events/244140696/)

2017 Tutorial: "Introducing Rule-Based Machine Learning: Capturing Complexity", Genetic and Evolutionary Computing Conference (GECCO'17). Berlin, Germany, July 15.

2017 "Co-evolving Genetic Programming Trees and Rules in a Learning Classifier System for Problem Driven Machine Learning" Genetic Programming Theory and Practice (GPTP). Ann Arbor, Michigan, May 18.

2017 Webinar - "An Introduction to Bioinformatics" for multi-site T32 on genetics of sleep and sleep disorders (John Hopkins, University of Michigan, and Stanford), Philadelphia, PA, April 24.

2017 "An Introduction to Data Science", invited lecturer, Nursing Informatics 651, UPenn, Philadelphia, PA, April 3.

2017 "Feature Selection with REBATE", invited speaker, Epistasis Discovery in Genetics and Epidemiology (EDGE) workshop, Key West, Florida, February 9. (Host: Marylyn Ritchie).

2016 "Pareto-Inspired Multi-Objective Rule Fitness for Adaptive Rule-Based Machine Learning", International Workshop on Evolutionary Machine Learning at the Genetic and Evolutionary Computing Conference (GECCO'16). Denver, Colorado, July 20.

2016 Tutorial: "Introducing Rule-Based Machine Learning: Capturing Complexity", Genetic and Evolutionary Computing Conference (GECCO'16). Denver, Colorado, July 20.

2016 “A New ‘Front’ in Rule-Based Machine Learning”, invited speaker, Epistasis Discovery in Genetics and Epidemiology (EDGE) workshop, Key West, Florida, February 4. (Host: Marylyn Ritchie).

2015 “ExSTraCS 2.0: Description and Evaluation of a Scalable Learning Classifier System” Hot Off The Press Selection at the Genetic and Evolutionary Computing Conference (GECCO’15). Madrid, Spain, July 13.

2015 “Continuous Endpoint Data Mining with ExSTraCS: A Supervised Learning Classifier System", International Workshop on Evolutionary Machine Learning at the Genetic and Evolutionary Computing Conference (GECCO’15). Madrid, Spain, July 12.

2015 Tutorial: “Introducing Rule-Based Machine Learning: A Practical Guide” Co-presented with Will Browne PhD, Genetic and Evolutionary Computing Conference (GECCO’15). Madrid, Spain, July 11.

2015 “Modeling Complex Disease Associations with ExSTraCS: A Study of Scalability”, invited speaker, Epistasis Discovery in Genetics and Epidemiology (EDGE) workshop, Key West, Florida, February 5. (Host: Marylyn Ritchie).

2014 “An Introduction to Learning Classifier Systems", invited speaker for Evolutionary Computation Course, University of Vermont, October 23. (Host: Margaret J. Eppstein).

2014 “The Role of Genetic Heterogeneity and Epistasis in Bladder Cancer Susceptibility and Outcome: A Learning Classifier System Approach” Hot Off The Press Selection at the Genetic and Evolutionary Computing Conference (GECCO’14). Vancouver BC, Canada, July 15.

2014 “ExSTraCS: An Extended Michigan-Style Learning Classifier System for Flexible Supervised Learning Classification and Data Mining", International Workshop on Learning Classifier Systems at the Genetic and Evolutionary Computing Conference (GECCO’14). Vancouver BC, Canada, July 12.

2013 “An Introduction to Learning Classifier Systems", invited speaker for Evolutionary Computation Course, University of Vermont, October 24. (Host: Margaret J. Eppstein).

2013 “A Simple Multi-Core Parallelization Strategy for Learning Classifier System Evaluations", International Workshop on Learning Classifier Systems at the Genetic and Evolutionary Computing Conference (GECCO’13). Amsterdam, The Netherlands, July 6.

2013 “ExSTraCS: A Genetics-Based Supervised Machine Learning Tool for Epidemiological Data Mining", International Workshop on Learning Classifier Systems at the Genetic and Evolutionary Computing Conference (GECCO’13). Amsterdam, The Netherlands, July 6.

2013 Tutorial: “Introduction to Learning Classifier Systems” Co-presented with Will Browne PhD, Genetic and Evolutionary Computing Conference (GECCO’13). Amsterdam, The Netherlands, July 6.

2013 “Classification and Data Mining in Genetic Epidemiology: A Learning Classifier System Approach”, invited speaker for Bioinformatics course, University of Southern Maine, April 11. (Host: Clare B. Congdon).

2013 “GAMETES: Complex Genetic Model Simulation”, invited speaker, Epistasis Discovery in Genetics and Epidemiology (EDGE) workshop, Key West, Florida, January 31. (Host: Jason Moore).

2013 “Tackling Complexity in Common Human Disease Research: Machine Learning Disease Risk”, Invited Faculty Lecture, Bard College, Annandale-on-Hudson, New York, January 22. (Host: Amy Savage)

2012 "The Role of Genetic Heterogeneity and Epistasis in Bladder Cancer Susceptibility and Outcome: A Learning Classifier System Approach", Translational Bioinformatics Conference, Jeju, South Korea, Oct 13-16.
2012 "Instance-Linked Attribute Tracking and Feedback for Michigan-Style Supervised Learning Classifier Systems", Genetic and Evolutionary Computing Conference (GECCO'12), Genetics Based Machine Learning Track, Philadelphia, Pennsylvania, July 7-11.
2012 "An Analysis Pipeline with Visualization-Guided Knowledge Discovery for Michigan Style Learning Classifier Systems: Interpreting the Black Box", International Workshop on Learning Classifier Systems at the Genetic and Evolutionary Computing Conference (GECCO'12), Philadelphia, Pennsylvania, July 7-11.
2011 "Random Artificial Incorporation or Noise in a Learning Classifier System Environment", International Workshop on Learning Classifier Systems: Genetic and Evolutionary Computing Conference (GECCO'11), Dublin, Ireland, July 12-16.
2010 "The Application of Michigan-Style Learning Classifier Systems to Address Genetic Heterogeneity and Epistasis in Association Studies", Genetic and Evolutionary Computing Conference (GECCO'10), Bioinformatics Track. Portland, Oregon, July 7-11.
2008 "Mask Functions for the Symbolic Modeling of Epistasis Using Genetic Programming", Genetic and Evolutionary Computing Conference (GECCO'08), Bioinformatics Track. Atlanta, GA, July 12-16.

Institutional

2019 "Machine Learning: An Analysis Pipeline" Workshop Lecture organized jointly by IBI and LDI. (Host: PA CURE Steering Committee), May 1.
2019 "Informatics Methods: Machine Learning and AI" Guest Lecture for Introduction to Biomedical and Health Informatics (BMIN 505) UPenn (Host: Mary Boland PhD), Feb 5.
2019 "Machine Learning for Biomedical Informatics" Recruitment Lecture for GCB graduate group (Host: Ben Voight PhD), January 11.
2018 "An Introduction to Machine Learning" Workshop Lecture organized jointly by IBI and LDI. (Host: PA CURE Steering Committee), December 17.
2018 "Introducing Decision Trees and Random Forests" Guest Lecture for Data Science in School of Nursing at UPenn (Hosts: Kathryn Bowles and Michael Milo), November 28.
2018 "Functional Annotation and Enrichment Analysis" Guest Lecture for Data Science (BMIN 503/EPID600) at UPenn (Host: Blanca Himes PhD), November 15.
2018 "Evolutionary Algorithms and Rule-Based Machine Learning" Guest Lecture for Data Science (BMIN 503/EPID600) at UPenn (Host: Blanca Himes PhD), October 16.
2018 "Feature Selection and ReBATE" Lunch and Learn Series, UPenn, August 13.
2018 "An Introduction to Machine Learning: Practical Guidelines and Algorithm Selection" Lunch and Learn Series, UPenn, May 21.
2017 "Evolutionary Algorithms and Rule-Based Machine Learning" Guest Lecture for Data Science (BMIN 503/EPID600) at UPenn (Host: Blanca Himes PhD), November 16
2017 "Functional Annotation and Enrichment Analysis" Guest Lecture for Data Science (BMIN 503/EPID600) at UPenn (Host: Blanca Himes PhD), November 14 .
2017 "A New Paradigm for Data Mining in Bioinformatics: Embracing Genetic Heterogeneity" Invited candidate faculty seminar, UPenn (Host: John H. Holmes PhD), June 1.

2016 “Functional Annotation and Enrichment Analysis” Guest Lecture for Data Science (EPID600) at UPenn (Host: Blanca Himes PhD), November 17.
2016 “An Introduction to Rule-Based Machine Learning”, Lunch and Learn Series, UPenn, October 31.
2016 “Evolutionary Algorithms and Rule-Based Machine Learning” Guest Lecture for Data Science (EPID600) at UPenn (Host: Blanca Himes PhD), October 27.
2016 “Simulation Studies: Model/Dataset Generation and Study Design” Lunch and Learn Series, UPenn, June 13
2016 “Relief-Based Algorithms”, Lunch and Learn Series, UPenn, April 25.
2016 “An Introduction to Machine Learning: Practical Guidelines and Algorithm Selection”, Lunch and Learn Series, UPenn, January 11.
2015 “Functional Annotation and Enrichment Analysis” Guest Lecture for Data Science (EPID600) at UPenn (Host: Blanca Himes PhD), November 12.
2014 “Modeling Complex Disease Associations with ExSTraCS: A Study of Scalability”, Pizza Talk Series, Dartmouth College, December 12.
2014 “The Rise of Machine Learning: Advancing Epidemiological Data Mining, Prediction, and Knowledge Discovery”, Invited Faculty Interview Talk, Dartmouth College, April 8.
2013 “GAMETES: Software for Simulating Complex Epistatic Models and Heterogeneous Datasets for the Advancement of Algorithm Development", Pizza Talk Series, Dartmouth College, December 13.
2013 “ExSTraCS: The Development of a Genetics Based Supervised Machine Learning Tool for Epidemiological Data Mining", Pizza Talk Series, Dartmouth College, February 22.
2012 “The Detection and Characterization of Epistasis and Heterogeneity: A Learning Classifier System Approach", Thesis Defense, Dartmouth College. Feb. 20.
2011 “The Detection, Characterization, and Modeling of Genetic Heterogeneity and Epistasis: A Learning Classifier System Approach", MCB Research in Progress, Dartmouth College. Sept. 28.
2010 “The Detection, Characterization, and Modeling of Genetic Heterogeneity and Epistasis: A Learning Classifier System Approach", Pizza Talk Series, Dartmouth College, February 11.
2010 “The Detection, Characterization, and Modeling of Genetic Heterogeneity and Epistasis: A Learning Classifier System Approach", Institute for Quantitative Biomedical Sciences Applicant, Dartmouth College, December 20.
2010 “The Detection, Characterization, and Modeling of Genetic Heterogeneity and Epistasis: A Learning Classifier System Approach", MCB Research in Progress, Dartmouth College, November, 10.
2010 “The Detection, Characterization, and Modeling of Genetic Heterogeneity and Epistasis: A Learning Classifier System Approach", MCB Research in Progress, Dartmouth College. February, 17.
2009 “The Detection, Characterization, and Modeling of Genetic Heterogeneity and Epistasis", MCB Research in Progress, Dartmouth College. February, 11.
2008 “The Detection, Characterization, and Modeling of Genetic Heterogeneity and Epistasis", MCB Research in Progress, Dartmouth College. April, 9.
2007 “Mask Functions for Symbolic Modeling of Epistasis", MCB Research in Progress, Dartmouth College. May 23.

BIBLIOGRAPHY

Refereed Publications

1. **Urbanowicz, R.J.**, White, B.C., Barney, N., Moore, J.H. Mask functions for the symbolic modeling of epistasis using genetic programming. Proceedings of the Genetic and Evolutionary Computing Conference. ACM Press, pp. 339-346 (2008). (Highlight: nominated for Best Paper Award, Bioinformatics and Computational Biology Track).
2. **Urbanowicz, R.J.**, Moore, J.H. Learning classifier systems: A complete introduction, review and roadmap. Journal of Artificial Evolution and Applications 2009, 1-25 (2009). (Highlight: cited 70 times as of November 2013)
3. **Urbanowicz, R.J.**, Moore, J.H. The application of Michigan-style learning classifier systems to address genetic heterogeneity and epistasis in association studies. Proceedings of the Genetic and Evolutionary Computing Conference. ACM Press, pp. 195-202 (2010). (Highlight: won best paper award at GECCO'10).
4. **Urbanowicz, R.J.**, Moore, J.H. The application of Pittsburgh-style learning classifier systems to address genetic heterogeneity and epistasis in association studies. Springer Lecture Notes in Computer Science pp. 195-202 (2010).
5. **Urbanowicz, R.J.**, Sinnott-Armstrong, N., Moore, J.H. Random artificial incorporation of noise in a learning classifier system environment. Proceedings of the Genetic and Evolutionary Computing Conference. ACM Press, pp. 369-374 (2011).
6. **Urbanowicz, R.J.**, Granizo-Mackenzie, A., Moore, J.H. An analysis pipeline with statistical and visualization-guided knowledge discovery for Michigan-style learning classifier systems. Computational Intelligence Magazine 7, 35-45 (2012).
7. **Urbanowicz, R.J.**, Granizo-Mackenzie, A., Moore, J.H. Instance-linked attribute tracking and feedback for Michigan-style supervised learning classifier systems. Proceedings of the Genetic and Evolutionary Computing Conference. ACM Press, pp. 927-934 (2012).
8. **Urbanowicz, R.J.**, Granizo-Mackenzie, A., Moore, J.H. Using expert knowledge to guide covering and mutation in a Michigan-style learning classifier system to detect epistasis and heterogeneity. Springer Lecture Notes in Computer Science 7491, 266-275 (2012).
9. **Urbanowicz, R.J.**, Kiralis, J., Sinnott-Armstrong, N.A., Heberling, T., Fisher, J.M., Moore, J.H. GAMETES: A fast, direct algorithm for generating pure, strict, epistatic models with random architectures. BioData Mining 5, 16 (2012). (Highlight: Top cited paper published in BioData Mining since 2012)
10. **Urbanowicz, R.J.**, Kiralis, J., Fisher, J.M., Moore, J.H. Predicting the difficulty of pure, strict, epistatic models: Metrics for simulated model selection. BioData Mining 5, 15 (2012).
11. **Urbanowicz, R.J.**, Andrew, A.S., Karagas, M.R., Moore, J.H. The role of genetic heterogeneity and epistasis in bladder cancer susceptibility and outcome: A learning classifier system approach. Journal of the American Medical Informatics Association, 20(4), 603-612 (2013). (Highlight: Won a best paper award at the 2013 Translational Bioinformatics Conference, South Korea)

12. Rudd, J., Moore, J.H., **Urbanowicz, R.J.** A simple multi-core parallelization strategy for learning classifier system evaluations. Proceedings of the Genetic and Evolutionary Computing Conference. ACM Press, 1259-1266 (2013).
13. Tan, J., Moore, J.H., **Urbanowicz, R.J.** Rapid rule compaction for knowledge discovery in a supervised learning classifier system. Advances in Artificial Life, 12. 110-117 (2013).
14. Rudd, J., Moore, J.H., **Urbanowicz, R.J.** A multi-core parallelization strategy for statistical significance testing in learning classifier systems. Evolutionary Intelligence. 6(2), 127-134 (2013).
15. **Urbanowicz, R.J.**, Granizo-Mackenzie, A., Kiralis, J., Moore, J.H. A classification and characterization of two-locus pure, strict epistatic models for simulation and detection. BioData Mining. 7(1), 8 (2014).
16. **Urbanowicz, R.J.**, Bertasius, G., Moore, J.H. An extended michigan-style learning classifier system for flexible supervised learning, classification, and data mining. Springer Lecture Notes in Computer Science 8672, 211-221 (2014).
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Abstracts

1. Wojcieszynski, A., La Cava, W., Urbanowicz R.J., Ying, X., Metz, J., Lin, A., Lukens, J., Fotouhi Ghiam, A.,Swisher-McClure, S., Moore, J.M., Baumann, B. Machine learning to predict toxicity in head and neck cancer patients treated with definitive chemoradiation**.** American Society for Radiation Oncology (ASTRO) (2019)

Submitted Publications

1. Liu, Y., Huang, J., **Urbanowicz, R.J.**, Chen, K., Manduchi, E., Greene, C.S., Scheet, P., Moore, J.H., Chen, Y. Embracing heterogeneity for finding genetic interactions in large-scale research consortia. Submitted to Genetic Epidemiology.

Publications in Preparation

1. Lin Xi, I., Moore, J.H., **Urbanowicz, R.J.** Deep learning strategies for the multiplexer problem and insights on model interpretation. (In preparation)
2. **Urbanowicz, R.J.,** Bose, S., Xu, A., Moore, J.H. Comparing strategies for scaling up Relief-based feature selection to very large feature spaces. (In preparation)
3. Turner, M., Andrews, P., **Urbanowicz, R.J.** GAMETES 2.0: software for simulating complex epistatic models and heterogeneous datasets. (In preparation)
4. Borole, P., Verma, S., **Urbanowicz, R.J.** Problem-adaptive representation for machine learning: Integrating genetic programming with learning classifier systems. (In preparation)
5. Orzechowski, P., **Urbanowicz, R.J.,** Moore J.H. Discovering interpretable correlations in big data with multi-GPU biclustering method. Submitted to International Conference on Big Data Computing (BDCAT).