Alexander Murray-Watters

Research Associate
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Education

2014 M.S. Logic, Computation and Methodology. Carnegie Mellon University. Pittsburgh, PA Thesis: *The DM Algorithm: A Causal Search Algorithm for the Discovery of MIMIC Models, with an Attempt to Recover a Protein Signalling Network from a High-Dimensional Ovarian Cancer Dataset.* Advisors: Dr. Clark Glymour and Dr. Richard Scheines http://www.amurrayw.com/papers/masters_thesis_final.pdf

2013 Dual Degrees (Honors): B.S. in Economics & Statistics and B.A. in Philosophy. Additional coursework in computer science. Carnegie Mellon University. Pittsburgh, PA HSS Senior Honors Thesis (Dietrich College of Humanities and Social Sciences): *Causal Discovery and MIMIC Models.* Advisor: Dr. Clark Glymour http://www.amurrayw.com/papers/thesis_final.pdf

Additional Education

2018 Mathematical Modeling and Simulation Summer School on Statistical Modeling and Data Analysis. Oberwolfach Research Institute for Mathematics (MFO)

Summer 2010, 2011, 2012, 2016. Additional coursework in mathematics. University of Nevada. Reno, NV

Research Interests	
Causal Discovery and Modeling	Machine Learning
Empirical Validation of Computational Simulation Models	Model Selection
Non-Probability Sampling	Quantitative Models of History
Social Network Analysis	Nationalism

Academic Employment

Research Associate. (05/17-present). Perform consultations for statistical analyses. Conceptualize and write manuscripts and conference presentations. Develop and teach courses on programming in R and machine learning. Supervisor: Dr. Stefan Zins. Leibniz Institute for the Social Sciences (GESIS).

Research Associate/Systems Analyst. (8/14-5/17). Developed, improved, and applied causal search algorithms and machine learning methods for extracting biomedical/genomic knowledge from big data and high dimensional data. Identified appropriate statistical techniques and conducted analyses, involving the use of a super computer through University of Pittsburgh (Pitt). Conceptualized and wrote manuscripts. Developed instructional materials and syllabi for use in summer workshops on causal search. Supervisors: NIH Projects (2014-2017): Dr. Clark Glymour and Dr. Richard Scheines. DARPA Project (2014-2015): Dr. Peter Spirites. Center for Causal Discovery. Carnegie Mellon University (CMU).

Research Assistant (unpaid). (2012 – 2017). Created a MEMETIC model. Developed and ran Monte Carlo simulations (using R) that demonstrate a flaw in a common method in the field of psychology and law. Conceptualize and write manuscripts. Supervisor: Dr. Markus Kemmelmeier. Dept. of Sociology and Interdisciplinary Social Psychology Program, University of Nevada, Reno.

Graduate Teaching Assistant. (Fall 2013). Conducted 2 weekly recitation sections for 80-100 (Introduction to Philosophy), graded assignments, and developed weekly instructional materials including lecture material for recitation sessions when students had trouble with a concept. Supervisor: Dr. Mara Harrell. Dept. of Philosophy, CMU.

Graduate Research Assistant. (Summer 2013). Implemented algorithm from senior thesis in R. Wrote and ran simulations. Supervisor: Dr. Clark Glymour. CMU.

Undergraduate Research Assistant. (March 2012 – August 2012). NSF Research Training Grant. Algorithms, Experiments, and Implementation of Recommender Systems. Implemented a Gibbs sampler and fixed faulty code in R. Supervisor: Dr. Mike Finegold, Dept of Statistics, CMU

Volunteer Intern. (June-July 2007). University of Cambridge, England Dr. Keith Priestley's seismology lab. Assist with computer/IT issues and use of specialized software. Integrated cultural experience/interaction with university community and British politics.

Publications

Murray-Watters, A., Zins, S., Silber, H., Gummer, T., & Lechner, C. (under review). River Sampling – a Fishing Expedition: A Non-Probability Case Study. *Social Science Computer Review*.

Murray-Watters, A. & Murray, C. (under review). Research Participant Protection in Politically Hostile Environments: Lessons from Computer Science.

Murray-Watters, A. & Glymour, C. (2015). What Is Going on Inside the Arrows? Discovering the Hidden Springs in Causal Models. *Philosophy of Science*, 82 (4): 556-586. [Erratum: 2016. 83 (1): 170]. DOI: 10.1086/682962 and DOI: 10.1086/684247. http://www.journals.uchicago.edu/doi/abs/10.1086/682962

Murray-Watters, A. (2011). Inevitable? I Think Not. [*Foreign Affairs* - award winning student essay in response to prompt, "Is the decline of the West inevitable?" (1500 word maximum)]

Murray-Watters, A. (March 2, 2009). North Korea plans missile launch. *The Tartan*, 103 (18), A-1.

Manuscripts in Preparation

Murray-Watters, A. Burning the Haystack to Save the Needle: Dimension Reduction and Privacy in Text and Network Data. DOI: 10.31235/osf.io/z35g6. https://osf.io/preprints/socarxiv/z35g6/

Murray-Watters, A. Zins, S., Ackermann-Piek, D. Undue Influence: Identifying "Problematic" Interviewers in Surveys.

Murray-Watters, A. Spotting Matryoshka: Clustering Memetic Image Data using Twitter's Election Integrety Dataset.

Murray-Watters, A., Zins, S., Sakshaug, J. Are These Things Even Consistent? Examining the Properties of Non-Probability Samples.

Murray-Watters, A., Lechner, C. M., Bluemke, M. easyPCA: An R Package for the Bass-ackwards Procedure.

Lechner, C. M., Bluemke, M., Ignácz, Z., Murray-Watters, A. easyLCA: An R packge for a Latent Class Analysis Variant of the Bass-ackwards Procedure.

Murray-Watters, A., Kemmelmeier, M., & Hales, A. Memetic Model of Methodological Multiplication: The Verdict Certainty Index and Its Statistical Fallacy. To be submitted to *Perspectives on Psychological Science*.

Murray-Watters, A. and Glymour, C. Working title: On Feedback Cycles.

Murray-Watters, A. SocHive: A Hive Plot Convenience Wrapper for Social Scientists Combining Social Network Data with Auxiliary Information.

Statistical/Software Development

Murray-Watters, A., Lechner, C. M., Bluemke, M. easyPCA: An R Package for the Bass-ackwards Procedure.

Lechner, C. M., Bluemke, M., Ignácz, Z., Murray-Watters, A. easyLCA: An R packge for a Latent Class Analysis Variant of the Bass-ackwards Procedure.

Murray-Watters, A. SocHive: A Hive Plot Convenience Wrapper for Social Scientists.

Murray-Watters, A. An implementation of the DM causal search algorithm. Available as part of the Tetrad program (in Java) or alternatively in R (version is no longer maintained). 1. Tetrad: https://github.com/cmu-phil/tetrad 2. R Wrapper for Tetrad routine: https://github.com/bd2kccd/r-causal/blob/development/R/dm.R 3. R (depreciated): https://github.com/amurrayw/detect.MIMIC-

Murray-Watters, A. A program for enumerating TETRAD constraints in a directed cyclic graph. Available at: https://github.com/amurrayw/tetrad_constraint_enquirer.

Jason Capehart, Seung Su Han, Alexander Murray-Watters, and Elizabeth Silver (authors in alphabetical order). Developed Natural Language Processing (NLP) software used to build first- and second- order Markov models based on text. For use with R. In process of submission to the CRAN (R repository). I implemented the group's extension of this software's application to build simulated text from a Markov model based on the blog of Professor Cosma Shalizi, titled "Pseudo-Three-Toed Sloth." Shalizi posted this slide on his blog (Dec. 7, 2011); titled "My Work Here is Done (Intro to Statistical Computing)." Available with Shalizi comments: http://bactra.org/weblog/843.html .

Professional Presentations

Murray-Watters, A. & Murray, C. (accepted; March 2020). *When Anonymization Isn't Enough: Finding Ways to Protect Privacy of Participants and Researchers in an Era of Big Data*. Paper to be presented at the Annual Meeting of the Pacific Sociological Association. Eugene, OR.

Murray-Watters, A., Zins, S., Silber, H., Gummer, T., & Lechner, C. (November 2019). *River Sampling – Still Fishing: A Non-Probability Case Study*. Robert Koch-Institut Panel Workshop. Berlin, Germany.

Murray-Watters, A., Zins, S., Silber, H., Gummer, T., & Lechner, C. (May 2019). *River Sampling – a Fishing Expedition: A Non-Probability Case Study*. Paper presented at the Annual Conference of the American Association for Public Opinion Research. Toronto, Canada.

Murray-Watters, A. (March 2019). *When Weighting Goes Wrong: The Implications of M-bias for Analyzing Survey Data*. (Poster) European Causal Inference Meeting. Bremen, Germany.

Murray-Watters, A., Zins, S, Sakshaug, J. (February 2019). *Are These Things Even Consistent? Examining the Properties of Non-Probability Samples*. SurvConf19: Vierte Konferenz der Survey-Statistiker des deutschsprachigen Raumes. Bamberg, Germany.

Murray-Watters, A. (October 2018). *Using Dimension Reduction to 'Anonymize' Data.* GESIS Research Day. Cologne, Germany

Murray-Watters, A. (September 2018). *Alternative Views of Alternative Views: New Methodologies for Analyzing and Visualizing Big Data.* Studying Opinions and Populations in Online Text Data Workshop. Mannheim, Germany.

Zins, S., Silber, H., Gummer, T., Lechner, C., Murray-Watters, A. (June 2018). *Comparing complex measurement instruments across probabilistic and non-probabilistic online surveys*. Workshop on Probability-Based and Nonprobability Survey Research. Mannheim, Germany.

Murray-Watters, A. (March 2018). *The Effective Combination and Display of Social Networks and Auxiliary Information*. Tagung des Arbeitskreises für mathematisch-statistische Methoden des statistischen Bundesamts. Wiesbaden, Germany.

Murray-Watters, A, and Murray, C. (April 2017). *Technology, Risks and Protections of Vulnerable Research Participants.* 59th Annual Meeting of the Western Social Science Association. San Francisco, CA.

Murray-Watters, A. (April 2016). *Citizens United and Donation Networks in Nevada: A Graphical Analysis*. Annual Meeting of the Western Social Science Association. Political Science Section. Reno, NV. Replication files available: https://github.com/amurrayw/Nevada_Campaign_Donation_Networks

Murray-Watters, A. and Glymour, C. (November 2014). *Discovering Endogenous Latent Structure*. Biennial Meeting of the Philosophy of Science Association. Chicago, IL.

Murray-Watters, A. (May 2013). *An Algorithm for Discovering MIMIC Models.* Meeting of the Minds (undergraduate research conference). Carnegie Mellon University.

Murray-Watters, A. (submitted & approved; Dec 2011). *US/ISAF Attributed Civilian Casualties and Insurgent Caused Violence.* Submitted for presentation at the annual conference of the Western Economic Association International. San Francisco, CA. July, 2012. (Statistical analysis utilizing the Wikileaks Afghan dataset.) In 2012, I received notice that due to an unusually high number of faculty/graduate submissions they had reversed their original position, and that this year they were not accepting any undergraduate submissions. However, along with their apology they awarded me a 1-year extension of my student membership.

Teaching

Alexander Murray-Watters and Jan-Philipp Kolb. March 2020. "Introduction to Machine Learning using R". IAB short course. Doctoral level. Nuremberg, Germany.

Alexander Murray-Watters and Jan-Philipp Kolb. 2018 and 2019. "Introduction to Data Analysis with R". GESIS Summer School. Doctoral level. Cologne, Germany.

Alexander Murray-Watters and Jan-Philipp Kolb. 2019. "Introduction to Machine Learning using R". GESIS short course. Doctoral level. Mannheim, Germany.

Graduate Teaching Assistant. (June 8–11, 2015). Center for Causal Discovery Summer Workshop. Carnegie Mellon University. Pittsburgh, USA.

Graduate Teaching Assistant. Fall 2013. Introduction to Philosophy. Carnegie Mellon University. Pittsburgh, USA.

Current Independent Research Projects/Interests

Empirically Validating and Exploiting Simulation Models Involves developing methods to empirically "verify" computational simulations, as well as using simulations to test scientific theories when data are lacking or unavailable. The current application planned is for assessing the impact of climate change on various hazards. For example, during particularly hot and dry years, rivers (such as the Rhine in Europe and the Ganges in India) have their reductions in volume partially offset by melting glaciers. In the absence of sufficient melt, various difficulties emerge, such as a reduced depth preventing the river's use for trade, an insufficient pressure head for generating hydroelectric power, or an inadequate supply of water for agricultural use. Melting glaciers also include increased risks of debris flow hazarding transportation over mountains.

Cyclic Theories of History and Causal Search. Under investigation (conducted literature review, conceptualized research question, seeking sources to create dataset). Examining Jack Goldstone, Peter Turchin, and Sergey Nefedov's different cyclic, non-linear dynamical theories of history for analysis using causal search.

The Scottish Independence Vote and Gellner's Theory of Nationalism. Under investigation (conducted literature review, conceptualized research question, identifying data to create dataset for analysis). Involves explaining the inconsistency between Ernest Gellner's account of nationalism and the current rise of the Scottish National Party (SNP) and the Scottish independence movement.

Honors and Awards

Mathematical Modeling and Simulation Summer School on Statistical Modeling and Data Analysis. 2018. Oberwolfach Research Institute for Mathematics (MFO).

CMU Senior Leadership Award. 2013. Carnegie Mellon University.

Dietrich College Senior Honors Program. 2013. Carnegie Mellon University.

Foreign Affairs Student Essay Contest. 2011. Sponsored by the journal, *Foreign Affairs*, the Council of Foreign Relations, and the Association of Professional Schools of International Affairs. Six awards were given (first place and 5 honorable mentions); I received one of the 5 honorable mentions (from among 280 submissions from across the world). (See Publications section of this CV for essay details) Award announcement available on the journal's website: https://web.archive.org/web/20130905094353/http://www.foreignaffairs.com/classroom/bulletin-board/erik-mortensen-wins-foreign-affairs-student-essay-contest-1

Odyssey Program Member, 2009-2011, Carnegie Mellon University: Invited academic research program for students identified as graduate research potential.

Dean's List, with Honors, Humanities & Social Sciences, CMU (Spring 2009, Spring 2011, Fall 2012); with High Honors (Fall 2011)

First Place. Rotary Business Academy. Northern Nevada. Team leader of GNUWeb (website design & marketing competition). Student team: conceptualize, design & market a site for Rotary-identified client. $1,000 prize.

Advanced Quantitative and Social Science Coursework

Statistics and Computing

Introduction to Probability & Statistics I & II	Statistical Computing
Modern Regression	Intro/Intermediate Programming
Data Mining	Intermediate/Advanced Programming
Statistical Graphics & Visualization	Advanced Data Analysis
Multilevel & Hierarchical Modeling	

Mathematics and Logic

Differential and Integral Calculus	Calculus in 3-Dimensions
Concepts of Mathematics	Linear Algebra
Differential Equations	Real Analysis
Integration, Differential Equations, & Approximations	Formal Logic
Logic and Proofs	Topics in Logic I
Analytical Philosophy	

Economics

Advanced Microeconomics Theory	Advanced Macroeconomics Theory
Behavioral Economics	Writing for Economists
Evolution of Economic Ideas and Analysis	Econometrics
Rational Choice	Junior Honors Seminar

Political Science, Culture, and History

Social Structures, Public Policy & Ethics	Philosophy, Politics, and Economics
Introduction to World History	History: Feast & Famine
Elementary Chinese	Terrorism & Insurgency
Philosophy of Social Science	Philosophy of the Mind
Epistemology	Ancient Philosophy

Professional Service

Reviewer, Conference submissions. *BigSurv18*

Community Service, Activity, and Leadership (selected examples)

The Tartan. Carnegie Mellon University. 2009-2011. Contributing writer

Nevada State Democratic Convention. 2008. Youngest elected delegate

Washoe County, Nevada Democratic Convention. 2016. Delegate.

Friends of the Washoe County Library. Annually. Ongoing book collection activity

Food Bank of Northern Nevada. Annually. Ongoing food collection activity

Volunteer Musician. Red Cross & Hurricane Katrina Victim Fund Raising Labor Day Weekend Marathon. Sept. 2005. 4 hours playing jazz (alto saxophone) at E.J.'s Jazz Café Reno, NV

Electronic Frontier Foundation. Current member

American Civil Liberties Union. Current member

Free Software Foundation. Current member

Professional Memberships

American Statistical Association

Association for Computing Machinery (ACM) – SIGKDD, SIGCAS, SimSig, and SIGEVO

American Political Science Association

American Historical Association

American Sociological Association

Western Social Science Association

Western Economic Association International

Skills and Interests

Programming Languages: R, Java, sed/AWK, C, Python, Ruby, Common Lisp, JavaScript

Operating Systems: Linux (Debian, Ubuntu, Fedora, Arch), UNIX, Windows XP/Vista/7, MAC OS X

Software: LaTeX, Sweave, Git, Emacs, GNU make, Eclipse, MiniTab, SPSS, STATA, Photoshop, Apache, LibreOffice, Microsoft Office

Languages: Native speaker of English; Level A1 knowledge of German; Some knowledge of Mandarin Chinese

Activities: Österreichischer Alpenverein; Recreational programming; Making

Music: Alto saxophone (jazz and classical)

International Experience: Attended early primary school at Bun-Sgoil Bhorrodail, Isle of Skye, Scotland. Extensive travel throughout Scotland and England. Have lived in Germany for 2 years. Moderate travel in France and Italy.

Citizenship Dual Citizen - USA & European Union (UK/Scotland). Place of Birth: USA

References

Masters Research Advisor	Masters Research Co-Advisor
Clark Glymour, PhD	Richard Scheines, PhD
Alumni University Professor	Dean
Baker Hall 135L	Dietrich College of Humanities and Social Sciences
Dept. of Philosophy	Baker Hall 154
Carnegie Mellon University	Carnegie Mellon University
Phone: 412-268-2933	Phone: 412-268-2831
cg09@andrew.cmu.edu	scheines@cmu.edu
Undergraduate Advisor	**Supervisor**
Cosma Shalizi, PhD	Stefan Zins, PhD
Associate Professor	(Formerly of GESIS)
Dept. of Statistics	Researcher
Baker Hall 132	Dept. Statistical Methods (KEM)
Carnegie Mellon University	IAB
5000 Forbes Ave.	Nuremberg, Germany
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Phone: 412–268-7826	Stefan.Zins@iab.de
cshalizi@stats.cmu.edu	