Aubrey Barnard: Machine Learning Computer Scientist

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Abstract

Machine learning computer scientist with expertise in probabilistic graphical models, observational causality, medical data, temporal models, relational rule learning, databases.

Education

PhD, Computer Sciences   2019

MS, Computer Sciences   2010

    University of Wisconsin, Madison, WI

BA, Music, Computer Science   2004

    Saint Olaf College, Northfield, MN

Selected Publications

Temporal Inverse Probability Weighting for Causal Discovery in Controlled Before–After Studies. **Aubrey Barnard**, Peggy Peissig, David Page. Causal Learning and Reasoning 4, 2025.

Causal Structure Learning via Temporal Markov Networks. **Aubrey Barnard**, David Page. Probabilistic Graphical Models 9, 2018.

Identifying Adverse Drug Events by Relational Learning. David Page, Vítor Santos Costa, Sriraam Natarajan, **Aubrey Barnard**, Peggy Peissig, Michael Caldwell. AAAI 26, 2012.

Google Scholar Profile

Awards

Computation and Informatics in Biology and Medicine Postdoctoral Fellowship, National Library of Medicine, 2020–2022.

American Family Funding Initiative Data Science Grant, American Family Insurance Data Science Institute, 2020–2021.

Computation and Informatics in Biology and Medicine Fellowship, National Library of Medicine, 2013–2015.

Best focus talk, National Library of Medicine Informatics Training Conference, 2015.

Research

Research Scientist   2022–present

Obstetrics and Gynecology, UW–Madison

- Constructed matched case–control studies from electronic health records databases from multiple health systems. Analyzed them with machine learning to identify early signs of ovarian cancer. Python, SQL, Scikit-Learn, GCP.
- Mentored graduate students.
- Built tool to automatically clean laboratory test results and infer normal ranges based on convolutions and Gaussian mixture models. Python, Scikit-Learn.
- Wrote grants on detecting ovarian cancer earlier and scalable causal structure learning.

Postdoctoral Fellow   2020–2022

Biostatistics and Medical Informatics, UW–Madison

- Invented algorithm for Bayesian network structure learning via convex optimization. Julia, Python.
- Applied Bayesian network structure learning to build a causal model of dermatitis related to farm environments.
- Mentored research intern in comparing Bayesian network structure learning algorithms.

Research Assistant   2008–2019

Biostatistics and Medical Informatics, UW–Madison

- Invented causal discovery machine learning and temporal inverse probability weighting methods for discovering differences between brand and generic versions of medications by analyzing controlled before–after studies. Python, Scikit-Learn.
- Applied survival analysis to estimate the effects of common medications on the longevity of patients using electronic health records data. Python, R.
- Developed algorithm for learning the structure of causal dynamic Bayesian networks by fitting temporal Markov networks to medical event sequences. Python, Julia.
- Researched scores for identifying causal relationships among proposed cause–effect pairs. Reduced confounding by adjusting scores with a probabilistic model of patient event sequences. Python, Go, Fortran, C/C++, SQL, AWS.
- Phenotyped adverse effects of drugs by learning relational rules with inductive logic programming. Prolog, Python, SQL.

- Implemented statistical relational model that probabilistically combined relational rules using a tree-augmented naïve Bayesian network. Java.
- Cleaned, transformed, and analyzed relational electronic health records data containing millions of patients and 50k types of events. Unix core utilities, SQL, Python.
- Analyzed experimental results with statistical analyses corrected for multiple testing. Visualized data and results with charts and plots. Python, R, Matplotlib, Gnuplot, Scikit-Learn, Java.
- Managed 1000s of long-running, parallel computing jobs. Linux, Bash, Make.
- Organized and supervised research group meetings.

Applied Scientist Intern   2017

Comprehend Medical, Amazon

- Developed recurrent neural network model of medical event sequences for summarizing medical histories of patients. Visualized clusters of patients with t-SNE. Attended daily scrum stand-ups. Presented research project to team. Python, PyTorch, AWS.

Service and Teaching

Leader   2017–2019

[AI Reading Group](), UW–Madison

- Solicited and organized presentations on artificial intelligence and machine learning. Moderated discussions. Created and maintained web page and meeting archive. Presented when needed.

Official Tutor   2018

[Computer Sciences Learning Center](), UW–Madison

- Helped students with introductory and intermediate programming assignments using teaching techniques learned in the course Theory and Practice of CS Education.

Reviewer   2013–2021

NeurIPS, ICML, AAAI, UAI, KDD, ECML-PKDD.

Software Development

Programmer and Technician   2006–2007

Electronic Data Interchange, Epic Systems

- Configured and customized network interfaces between Epic's ambulatory electronic medical records software and external systems for laboratory, pharmacy, etc. Supported hospitals in the installation, operation, and maintenance of such interfaces. HL7, Caché / MUMPS, VB.

Project Assistant   2005

Center for Limnology, UW–Madison

- Processed, analyzed, and visualized gigabytes of data from a water flow simulator in support of the hydrologic and biogeochemical fluxes in land–water mosaics project. Java, Excel, VBA.

Consultant Programmer   2004

Dunn County Health Department

- Designed and implemented interactive applet for educating the public on indoor air quality and healthy homes. Java, GUI, XML.

Computer Languages and Technologies

Python, Julia, Java, SQL, C/C++, Go, Prolog, Scheme, R, HTML, CSS, XML, Basic, OCaml, Fortran, Rust. • Bash, Make, Linux, Git, LaTeX, Scikit-Learn, PyTorch, Matplotlib, Gnuplot.

Human Languages

- German: [CEFR B1]() / [Limited Working Proficiency]()
- French: [CEFR A2]() / [Elementary Proficiency]()