

**BIOGRAPHICAL SKETCH**

NAME Gregory F. Cooper, M.D., Ph.D.		POSITION TITLE Associate Professor of Biomedical Informatics and of Intelligent Systems	
eRA COMMONS USER NAME gfc@cbmi.pitt.edu			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
M.I.T., Cambridge, MA	B.S.	1977	Computer Science
Stanford University, Palo Alto, CA	Ph.D.	1985	Medical Information Sciences
Stanford University, Palo Alto, CA	M.D.	1986	Medicine

**A. Positions and Honors****Professional Experience**

1986 - 1987	Research Affiliate, Medical Informatics, Stanford University
1987 - 1989	Research Associate, Medical Informatics, Stanford University
1989 - 1990	Senior Research Associate, Medical Informatics, Stanford University
1990 - 1996	Assistant Professor of Medicine, University of Pittsburgh
1997 - 2006	Associate Professor of Medicine, University of Pittsburgh
1997-	Associate Professor of Intelligent Systems, University of Pittsburgh
2006 -	Associate Professor of Biomedical Informatics, University of Pittsburgh
2006 -	Vice Chair, Department of Biomedical Informatics, University of Pittsburgh

**Honors**

1975	Tau Beta Pi, M.I.T.
1977-1984	Medical Scientist Training Program Trainee, Stanford University, Stanford, CA
1985	Martin Epstein award for best paper in the student paper competition at the Ninth Annual Symposium on Computer Applications in Medical Care
1991	Elected as a Fellow of the American College of Medical Informatics
1999	General Chair, Conference on Uncertainty in Artificial Intelligence
2005	Distinguished paper award, Symposium of the American Medical Informatics Association
2006	Elected as a Fellow of the Association for the Advancement of Artificial Intelligence (AAAI)
2007-2008	Executive board committee member, American College of Medical Informatics

**B. Selected Publications** (Selected from 116 peer-reviewed publications)

1. Wirtschafter DD, Cooper GF, Russo A, Mesel E. A retrieval system for a time-oriented database. In: *The Sixth Annual Conference of the Society for Computer Medicine* (1976).
2. Cooper GF. The computational complexity of probabilistic inference using Bayesian belief networks, *Artificial Intelligence* 42 (1990) 393–405.
3. Herskovits EH, Cooper GF. Algorithms for Bayesian belief-network precomputation, *Methods of Information in Medicine* 30 (1991) 81–89.
4. Shwe MA, Middleton B, Heckerman DE, Henrion M, Horvitz EJ, Lehmann H, Cooper GF. Probabilistic diagnosis using a reformulation of the INTERNIST-1/QMR knowledge base — The probabilistic model and inference algorithms. *Methods of Information in Medicine* 30 (1991) 241–255.
5. Shwe MA, Cooper GF. An empirical analysis of likelihood-weighting simulation on a large, multiply-connected belief network. *Computers and Biomedical Research* 24 (1991) 453–475.

6. Cooper GF, Herskovits EH. A Bayesian method for the induction of probabilistic networks from data. *Machine Learning* 9 (1992) 309–347.
7. Cooper GF, Aliferis CF, Ambrosino R, Aronis J, Buchanan BG, Caruana R, Fine MJ, Glymour C, Gordon G, Hanusa BH, Janosky J, Meek C, Mitchell T, Richardson T, Spirtes P. An evaluation of machine-learning methods for predicting pneumonia mortality *Artificial Intelligence in Medicine* 9 (1997) 107-138.
8. Citro G, Banks G, Cooper G. INKBLOT: A neurological diagnostic decision support system integrating causal and anatomical knowledge. *Artificial Intelligence in Medicine* 10 (1997) 257-267.
9. Cooper GF. A simple algorithm for efficiently mining observational databases for causal relationships. *Journal of Data Mining and Knowledge Discovery* 1 (1997) 203-224.
10. Spirtes P, Cooper GF. An experiment in causal discovery using a pneumonia database. In: *Proceedings of the International Workshop on Artificial Intelligence and Statistics* (1999) 162-168.
11. Cooper GF, Yoo C. Causal discovery from a mixture of experimental and observational data. In: *Proceedings of the Conference on Uncertainty in Artificial Intelligence* (1999) 116-125.
12. Glymour C, Cooper GF (eds.) *Computation, Causation, and Discovery* (MIT Press, Cambridge, MA, 1999).
13. Mani S, Cooper GF. A study in causal discovery from population-based infant birth and death records. In: *Proceedings of the Fall Symposium of the American Medical Informatics Association* (1999) 315-319.
14. Monti S, Cooper GF. A Bayesian network classifier that combines a finite mixture model and a naïve Bayes model, In: *Proceedings of the Conference on Uncertainty in Artificial Intelligence* (1999) 447-456.
15. Cooper GF, Fine MJ, Gadd CS, Obrosky DS, Yealy DM. Analyzing causal relationships between treating clinicians and patient admission and mortality in low-risk pneumonia patients. *Academic Emergency Medicine* 7 (2000) 470-471.
16. Yoo C, Thorsson V, Cooper GF. Discovery of gene-regulation pathways from a mixture of experimental and observational DNA microarray data. In: *Pacific Symposium on Biocomputing* (2002) 498-509.
17. Dash D, Cooper GF. Exact model averaging with naive Bayesian classifiers. In: *Proceedings of the International Conference on Machine Learning* (2002) 91-98.
18. Wong WK, Moore AM, Cooper GF, Wagner MM. Rule-based anomaly pattern detection for detecting disease outbreaks. In: *Proceedings of the National Conference on Artificial Intelligence (AAAI-02)*, American Association of Artificial Intelligence (2002) 217-223.
19. Wong WK, Moore A, Cooper GF, Wagner MM., Bayesian network anomaly pattern detection for disease outbreaks. In: *Proceedings of the International Conference on Machine Learning* (2003).
20. Visweswaran S, Hanbury P, Saul M, Cooper GF. Detecting adverse drug events in discharge summaries using variations on the simple Bayes model. In: *Proceedings of the Fall Symposium of the American Medical Informatics Association* (2003).
21. Yoo C, Cooper GF. An evaluation of a system that recommends microarray experiments to perform to discover gene-regulation pathways. *Artificial Intelligence in Medicine* (2004) 169-182.
22. Cooper G, Dash DH, Levander JD, Wong WK, Hogan WR, Wagner MM. Bayesian biosurveillance of disease outbreaks. In: *Proceedings of the Conference on Uncertainty in Artificial Intelligence* (2004) 94-103.
23. Dash D, Cooper GF. Model averaging for prediction with discrete Bayesian networks. *Journal of Machine Learning Research* 5 (2004) 1177-1203.
24. Visweswaran S, Cooper GF. Instance-specific Bayesian model averaging for classification. In: *Proceedings of the Neural Information Processing Systems Conference* (2004).
25. Visweswaran S, Cooper GF. Patient-specific models for predicting the outcomes of patients with community acquired pneumonia. In: *Proceedings of the Fall Symposium of the American Medical Informatics Association* (2005) 759-763.
26. Auble TE, Hsieh M, Gardner W, Cooper GF, Stone RA, McCausland JB, Yealy DM. A prediction rule to identify low-risk patients with heart failure. *Academic Emergency Medicine* 12 (2005) 514-521.

27. Yoo C, Cooper GF, Schmidt M. A controlled study to evaluate a computer-based microarray experiment-design-recommendation system for gene-regulation pathway discovery. *Journal of Biomedical Informatics* 39 (2006) 126-146.
28. Mani S, Cooper GF, Spirtes P. A theoretical study of Y structures for causal discovery. In: *Proceedings of the Conference on Uncertainty in Artificial Intelligence* (2006) 314-323.
29. Hogan WR, Cooper GF, Wallstrom GL, Wagner MM, Depinay JM. The Bayesian aerosol release detector: An algorithm for detecting and characterizing outbreaks caused by an atmospheric release of Bacillus anthracis. *Statistics in Medicine* 26 (2007) 5225-5252. PMID: 17948918
30. Jiang X, Cooper GF. A recursive algorithm for spatial cluster detection. In: *Proceedings of the Fall Symposium of the American Medical Informatics Association* (2007) 369-373. PMID: 18693860
31. Hauskrecht M, Valko M, Kveton B, Visweswaran S, Cooper GF. Evidence-based anomaly detection in clinical domains. In: *Proceedings of the Fall Symposium of the American Medical Informatics Association* (2007) 319-232. PMID: 18693850
32. Shen Y, Adamou C, Dowling JN, Cooper GF. Estimating the joint disease outbreak-detection time when an automated biosurveillance system is augmenting traditional clinical case finding. *Journal of Biomedical Informatics* 41 (2008) 224-231. PMID: 18194876
33. Rajiv W, Fridsma DW, Saul MI, Penrod LE, Visweswaran S, Cooper GF, Chapman W. Analysis of a failed clinical decision support system for management of congestive heart failure. *Proceedings of the Symposium of the American Medical Informatics Association* (2008) 773-777. PMID: 18999183
34. Dara J, Dowling JN, Travers D, Cooper GF, Chapman WB. Evaluation of preprocessing techniques for chief complaint classification, *Journal of Biomedical Informatics* 41 (2008) 613-623. PMID: 18166502
35. Jiang X, Wallstrom G, Cooper GF, Wagner MM. Bayesian prediction of an epidemic curve. *Journal of Biomedical Informatics*; Feb 42(1):90-9 (2009). PMID: 18593605
36. Jiang X., Neill DB, Cooper GF. A Bayesian network model for spatial event surveillance. *International Journal of Approximate Reasoning* (to appear).
37. Shen Y, Cooper GF. A new prior for Bayesian anomaly detection – Application to biosurveillance. *Methods of Information in Medicine* (to appear).
38. Neill DB, Cooper GF. A multivariate Bayesian scan statistics for early event detection and characterization. *Machine Learning* (to appear).
39. Jiang X, Cooper GF. A real-time temporal Bayesian architecture for event surveillance and its application to patient-specific multiple disease outbreak detection. *Data Mining and Knowledge Discovery* (to appear).
40. Jiang X, Neill DB, Cooper GF. Generalized AMOC curves for evaluation and improvement of event surveillance. In: *Proceedings of the 2009 Symposium of the American Medical Informatics Association* (to appear).

### C. Current Research Support

1 R01 LM010020-01 (Cooper) 09/01/09-08/31/11

National Institutes of Health

#### Predicting Patient Outcomes from Clinical and Genome-Wide Data

The objective of this project is to develop, implement, and evaluate new computer-based methods to predict diseases and outcomes in individuals based on the use of both traditional clinical data and data about an individual's genome.

Role: PI

1 P01 HK000086-01 (Wagner) 09/30/08-09/29/12

Center for Disease Control

#### University of Pittsburgh Center for the Advanced Study of Informatics in Public Health Informatics

The overall purpose of this application is to create a Center for the Advanced Study of Informatics in Public Health (CASIPH) at the University of Pittsburgh to bring together a diverse group of investigators to carry out research focusing on improving the nation's ability to detect and characterize

cases of disease and outbreaks of disease as quickly as possible. To realize a vision of a state-of-the-art surveillance system, translated into public health practice to create a state-of-the-art surveillance unit, CASIPH will conduct two research projects and supporting Core activities. The research projects will develop a Bayesian case detection system and a Bayesian outbreak detection system that will be closely integrated. The supportive core activities will provide evaluation, software engineering, and translation-to-practice services.

Role: Project PI

NSF IIS-0911032 (Dubrawski, CMU)

9/1/2009-8/31/2012

National Science Foundation

Discovering Complex Anomalous Patterns

Many of the phenomena that we seek to discover in real-world data sets are identifiable because they simultaneously affect many different records, possibly in differing ways. The goals of this project are to develop, implement, and evaluate a general and widely applicable framework for capturing potentially complex statistical patterns in large databases. Application areas include the intensive care unit.

Role: Co-PI of a subcontract to the University of Pittsburgh

1 R01 GM088224-01 (Clermont and Hauskrecht)

09/01/09 – 06/30/12

NIH/NIGMS

Detecting Deviations in Clinical Care in ICU Data Streams

The goal of this project is to use advanced computational, rather than expert-based, solutions to detect anomalous clinical decision making in acutely ill patients. Briefly, the approach works by identifying patient-management patterns that are unusual with respect to patterns associated with comparable patients and by raising a patient-specific alert when such a patient is prospectively encountered. The hypothesis being tested is that such deviations may often define clinically important events, and are worthwhile alerting clinicians on. The project is investigating the feasibility and clinical usefulness of the approach on a wide variety patient management decisions in the intensive-care-unit environment.

Role: Co-Investigator

1 R01 LM009427 W. Chapman (PI)

07/16/07-06/30/10

National Institute of Health

NLP Foundation Studies and Ontologies for Syndromic Surveillance from ED Reports

Natural language processing (NLP) techniques can extract variables from free-text clinical records that are important for medical informatics applications including decision support, quality assurance, and biosurveillance. This project is performing an in-depth study of NLP issues that required to perform accurate discourse analysis of clinical records. The methods and tools generated from this research are anticipated to help automated systems accurately determine the clinical state of a patient from narrative reports that display negation, temporal progression, uncertainty, and coreference. The project is focusing on syndromic surveillance from emergency department (ED) reports as a case study.

Role: Co-Investigator

1 R01 LM009132 Wagner (PI)

09/30/08-09/29/12

Center for Disease Control

Decision Making in Biosurveillance

The long-term objective of this research is to advance the use of decision analysis in biosurveillance. The specific aims of the research are to (1) construct decision analyses of representative biosurveillance decision problems using standard decision analytic techniques, and (2) deploy the underlying decision models in a decision-support system for analysts and epidemiologists.

Role: Co-Investigator