

David J. Hill

Assistant Professor, Department of Civil and Environmental Engineering
Rutgers, the State University of New Jersey

Contact Information

David J. Hill
Department of Civil and Environmental Engineering
Rutgers University
Piscataway, NJ 08854

phone: (217) 714-3490
fax: (732) 455-0577
e-mail: ecodavid@rci.rutgers.edu

Research Interests

- Real-time modeling of large-scale water resources systems
- Adaptive management of water resources systems
- Fusion of multi-scale measurements from remote and embedded sensor networks
- Real-time data assimilation
- Data mining and machine learning
- Remote and embedded sensing of environmental systems

Education

Ph.D. in Environmental Engineering, October 2007

University of Illinois at Urbana-Champaign, Urbana, IL, GPA 3.9

Dissertation: "Data Mining Approaches to Complex Environmental Problems"

Dissertation Advisor: Professor Barbara Minsker

M.S. in Environmental Engineering, May 2002

University of Illinois at Urbana-Champaign, Urbana, IL, GPA 3.8

Thesis: "Modeling Nitrogen Transport and Transformation in a Heterogeneous, Three-Dimensional, Tile-Drained Aquifer"

Thesis Advisor: Professor Albert Valocchi

B.S. in Civil and Environmental Engineering, May 1999

Cornell University, Ithaca, NY

Professional Experience

- 2009-present **Assistant Professor**, Department of Civil and Environmental Engineering, Rutgers, the State University of New Jersey
- 2007-2009 **Postdoctoral Researcher**, National Center for Supercomputing Applications
Developed methods and cyberinfrastructure to assist in real-time adaptive management of urban water resources. Developing methods for automatic quality control of precipitation data from radar and rain gauges. Deploying environmental sensors to evaluate management decisions in near-real time.
- 2005-2007 **Graduate Research Assistant**, Nat. Center for Supercomputing Applications
Developed methods to automatically filter erroneous data from environmental

sensor measurements. Deployed these methods within cyberinfrastructure for the Corpus Christi Bay Water and Environmental Research Systems (WATERS) Network Testbed Observatory. Supervisor: Professor Barbara Minsker

- 2004 **Graduate Teaching Assistant**, University of Illinois Urbana-Champaign
Groundwater: senior undergraduate and graduate students
Led weekly discussion sections. Provided individual instruction on an as-needed basis. Organized independent student study groups. Updated course material for new online distance learning course format.
- 2002 **Graduate Teaching Assistant**, University of Illinois Urbana-Champaign
Optimization Methods for Engineering Design: senior undergraduate and graduate students. Developed homework assignments and class project.
Tutored students on optimization software used in class.
- 2000-2004 **Graduate Research Assistant**, University of Illinois Urbana-Champaign
Developed upscaled models of solute transport in porous media through data-driven knowledge discovery with genetic programming. Supervisors: Professors Barbara Minsker and Albert Valocchi
Developed and applied a three-dimensional physically based model of nitrogen transport through tile-drained agricultural fields. Supervisor: Professor Albert Valocchi
- 1999 **Tutor**, Cornell University, Ithaca, NY
Tutored minority and women engineering students for the Engineering Minority Programs Office/Women's Programs in Engineering, on introductory fluid mechanics. Assisted students with homework and laboratory reports.
- 1997 **Environmental Engineering Technician Intern**, Cytech Industries Inc.
Conducted experiments quantifying rates of in-situ bioremediation of ammonium and nitrogen compounds and developed bioreactors for the degradation of nitriles. Supervisors: Dr. Carol English and Dr. George Pierce

Publications

Journal Articles

- Hill, D.J., & Minsker, B.S. (2009) Anomaly detection in streaming environmental sensor data: A data-driven modeling approach. *Environmental Modelling and Software*, 25(9), 1014-1022. doi:10.1016/j.envsoft.2009.08.010.
- Hill, D.J., Minsker, B.S., and Amir, E. (2009). Real-time Bayesian anomaly detection in streaming environmental data. *Water Resources Research*, 45, W00D28, doi:10.1029/2008WR006956.
- Hill, D.J., Minsker, B.S., Valocchi, A.J., Babovic, V., & Keijzer, M. (2007). Upscaling models of solute transport in porous media through genetic programming. *Journal of Hydroinformatics*, 9(4), 251–266.
- Hill, D.J., Liu, Y., Marini, L., Kooper, R., Rodriguez, A., Minsker, B.S., Myers, J., McLaren, T. A virtual sensor system for creating real-time customized environmental data products. (Under Review for *Environmental Modelling and Software*.)

Conference Proceedings

- Choi, J., Hill, D.J., and Amir, E., (2010). Lifted Inference for Relational Continuous Models. In *Proceedings of the 26th Conference on Uncertainty in Artificial Intelligence (UAI), 2010*.
- Liu, Y., Hill, D.J., Myers, J. and Minsker, B.S. (2010). Integrated Real Time Geospatial Sensor Web and Visual Analytics for Environmental Decision Support, In *Proceedings of the American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute (EWRI) World Water & Environmental Resources Congress 2010, Providence, RI, May 17-21, 2010*.
- Hill, D.J., Minsker, B., Amir, E., & Choi, J. (2009). Real-time anomaly detection in precipitation sensors. In *Proceedings of the 8th International Conference on Hydroinformatics, Concepción, Chile, January 12–16, 2009*.
- Hill, D.J., Minsker, B., & Schmidt, A. (2009). Predicting CSOs for real time decision support. In *Proceedings of the American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute (EWRI) World Water & Environmental Resources Congress 2009, Kansas City, MO, May 17–21, 2009*.
- Liu, Y., Hill, D., Marini, L., Kooper, R., Rodriguez, A., Myers, J. (2009) Web 2.0 geospatial visual analytics for improved urban flooding situational awareness and assessment. In *Proceedings of the 17th ACM SIGSPATIAL International Conference, Seattle, WA, November 4–6, 2009*
- Liu, Y., Hill, D., Minsker, B. (2009). Opportunities for Integration of Multi-Model Data for the Water Sciences Community, In *Proceedings of the Microsoft eScience Workshop 2009, Oct.15-16, 2009. Pittsburgh, PA, USA*
- Liu, Y., Hill, D., Rodriguez, A., Marini, L., Kooper, R., Myers, J., Wu, X., Minsker, B. (2009) A new framework for on-demand virtualization, repurposing and fusion of heterogeneous sensors. In *Proceedings of the 2009 International Symposium on Collaborative Technologies and Systems (CTS), Baltimore, MD, May 10-18*. IEEE. pp.54-63.
doi:<http://doi.ieeecomputersociety.org/10.1109/CTS.2009.5067462>
- Hill, D.J., Minsker, B.S., Amir, E., & Choi, J. (2008). Real time detection of anomalies in streaming radar and rain gauge data. *Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abstract H23E-1021*. (abstract only)
- Hill, D.J., Minsker, B., Liu, Y., & Myers, J. (2008). End-to-end cyberinfrastructure for real-time environmental decision support. In *Proceedings of the 4th IEEE International Conference on eScience, Indianapolis, IN, December 10–12, 2008*.
- Liu, Y., Hill, D.J., Abdelzaher, T., Heo, J., Choi, J., Minsker, B., & Fazio, D. (2008). Virtual sensor-powered spatiotemporal aggregation and transformation: A case study analyzing near-real-time NEXRAD and precipitation gauge data in a digital watershed. In *Proceedings of the Environmental Information Management Conference 2008 (EIM-2008), Albuquerque, NM, September 10–11, 2008*.
- Liu, Y., Hill, D.J., Marini, L., Kooper, R., Rodriguez, A., & Myers, J.D. (2008). Virtual Sensors in a Web 2.0 Digital Watershed. *Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abstract IN31B-1140*. (abstract only)
- Liu, Y., Hill, D., Rodriguez, A., Marini, L., Kooper, R., Futrelle, J., Minsker, B., & Myers, J. (2008). Near-real time spatiotemporal precipitation virtual sensor creation based on NEXRAD Level II Data in a semantically-enhanced digital watershed. In *Proceedings of the 16th ACM SIGSPATIAL International Conference, Irvine, CA, November 5–7, 2008*.
- Minsker, B.S., Hill, D.J., Liu, Y., Marini, L., Kooper, R., Rodriguez, A., & Myers, J. (2008). Toward the virtualization of environmental sensors: Customizing and re-purposing data streams for real-time applications. *Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abstract H51H-0960*. (abstract only)

- Hill, D.J., & Minsker, B.S. (2007). Bayesian filtering approaches for detecting anomalies in streaming environmental data. *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract H13A-0979. (abstract only)
- Hill, D.J., Minsker, B.S., & Amir, E. (2007). Real-time Bayesian anomaly detection for environmental sensor data. In *Proceedings of the 32nd Congress of IAHR, International Association of Hydraulic Engineering and Research, Venice, Italy*.
- Liu, Y., Minsker, B., & Hill, D.J. (2007). Cyberinfrastructure technologies to support QA/QC and event-driven analysis of distributed sensing data. In *Proceedings of the International Workshop on Advances in Hydroinformatics, Niagara Falls*.
- Hill, D.J., & Minsker, B.S. (2006). Bayesian filtering approaches for detecting anomalies in environmental sensor data. *Eos Trans. AGU*, 87(47), Fall Meet. Suppl., Abstract H11F-1334. (abstract only)
- Hill, D.J., & Minsker, B.S. (2006). Automated fault detection for *in-situ* environmental sensors. In P. Gourbesville, J. Cunge, and S.-Y. Liong (Eds.), *Hydroinformatics 2006: Proceedings of the 7th International Conference on Hydroinformatics*.
- Hill, D.J., & Minsker, B.S. (2006). Automated fault detection: Preparing real-time data for adaptive management. In *Proceedings of the American Water Resource Association (AWRA) Summer Specialty Conference on Adaptive Management, Missoula, MT*.
- Hill, D.J., Valocchi, A., Minsker, B.S., Babovic, V., & Keijzer, M. (2004). A data-driven approach for upscaling solute transport models. *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract SF11A-06. (abstract only)
- Hill, D.J., Valocchi, A.J., & Hudson, R.J. (2001). An explicit 3-dimensional model for reactive transport of nitrogen in tile drained fields. *Eos Trans. AGU*, 82(47), Fall Meet. Suppl., Abstract H52A-0374. (abstract only)

Book Chapters

- Sastry, K., O'Reilly, U.-M., Goldberg, D.E., & Hill, D.J. (2003). Building-block supply in genetic programming. In R. Riolo and B. Worzel (Eds.), *Genetic Programming in Theory and Practice* (pp. 137–152). Boston: Kluwer Academic Publishers.

Research Funding

Years (Inclusive)	Brief Title or Description	Source of Funds	Total Funding	# of PI's & Lead PI if not Hill
2010	Similarity-Enhanced Spectral Mixture Analysis for Determining Sub-Pixel Agricultural Land Use	New Jersey Space Grant Consortium	\$16,000	1

Courses Taught

Environmental Informatics: Graduate level. This course discusses the use of sensor networks for understanding and managing large-scale environmental systems. Topics will include environmental information systems, data-driven modeling, geostatistics, and real-time decision making.

Water and Wastewater Engineering: Senior level. This course teaches design principles for water and wastewater engineering systems, water supply and distribution, wastewater collection and disposal, water treatment, and wastewater treatment. It also introduces students to the social context of water resources engineering, including health, sanitation, water scarcity, and politics of water issues.

Groundwater: Senior/Graduate level. This course introduces students to groundwater resources and teaches modeling of groundwater flow and transport of contaminants by the groundwater.

Awards and Honors

International Graduate Fellowship, International Programs in Engineering, University of Illinois at Urbana-Champaign, 2004, 2003

Outstanding Instructor Award, Center for Teaching Excellence, University of Illinois at Urbana-Champaign, Fall 2004

Based on students' responses on Instructor and Course Evaluation (ICES) questionnaires

Bienvenido Esmilla Annual Writing Award, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, 2001

Dean's List, Department of Civil and Environmental Engineering, Cornell University, 1998–1999

Professional Service and Community Outreach

NSF Panel Reviewer: Environmental Sustainability Program, Engineering Directorate

Reviewer: *Advances in Water Resources*, *Journal of Contaminant Hydrology*, *Journal of Hydroinformatics*, *Journal of Water Research*, *Journal of Water Resources Planning and Management*, *Water Science and Technology*, *Journal of Stochastic Environmental Research and Risk Assessment*

Member: American Society of Civil Engineers

- Secretary, task committee on Environmental Sensing and Cyberinfrastructure: Technologies and Applications

Member: American Geophysical Union

Member: Center for Water as a Complex Environmental System, University of Illinois at Urbana-Champaign

Volunteer Instructor: Space, Science, and Technology Camp, Urbana Park District, Urbana, IL, Summer 2005

Instructed 1st–6th grade students on topics of space exploration, science, and technology.

Engineering Open House, University of Illinois Urbana-Champaign

Exhibit Team Coordinator, “Virtual Remediation in Cyberspace,” 2004

Assembled and managed team of five graduate students to create exhibit demonstrating innovative computationally based solutions to groundwater contamination and to present

exhibit to public during the open house. Coordinated with university health and safety officers to ensure public safety. Applied for and received funding to support exhibit creation. Received award for most fun and engaging exhibit.

Exhibit Developer and Presenter, 2001–2004

Assisted with creation of exhibits demonstrating the development and use of numerical modeling for environmental preservation to raise community awareness. Presented exhibits to public and encouraged dialogue about environmental issues in everyday life.

Volunteer Tutor, Glasgow Middle School, Baton Rouge, LA, Fall 1999

Instructed middle school students for MATHCOUNTS program, a national math enrichment, coaching and competition program that promotes middle school mathematics achievement.

Professional Enhancements

Engineering Instruction in Higher Education Workshop, University of Illinois at Urbana-Champaign, Spring 2004

Participated in semester-long workshop covering topics relevant to teaching engineering at the collegiate level such as educational psychology, communication strategies, accreditation procedures, and student advising and mentoring. Learned effective teaching styles specific to engineering students and topics.

References

Barbara Minsker, Professor, Department of Civil and Environmental Engineering
University of Illinois at Urbana-Champaign
(217) 333-9017, minsker@illinois.edu

Albert Valocchi, Professor, Department of Civil and Environmental Engineering
University of Illinois at Urbana-Champaign
(217) 333-3176, valocchi@illinois.edu

Praveen Kumar, Professor, Department of Civil and Environmental Engineering
University of Illinois at Urbana-Champaign
(217) 333-4688, kumar1@illinois.edu

Eyal Amir, Assistant Professor, Department of Computer Science
University of Illinois at Urbana-Champaign
(217) 333-8756, eyal@cs.uiuc.edu