Kush R. Varshney

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Education:

Massachusetts Institute of Technology, Cambridge, MA, USA
Doctor of Philosophy in Electrical Engineering and Computer Science, 2010
Thesis: Frugal Hypothesis Testing and Classification
Committee: Alan S. Willsky (advisor), John W. Fisher, III, Polina Golland, and Joshua B. Tenenbaum
Minor: linguistics

Electrical Engineer, 2010

Master of Science in Electrical Engineering and Computer Science, 2006
Thesis: Joint Anisotropy Characterization and Image Formation in Wide-Angle Synthetic Aperture Radar
Advisors: Müjdat Çetin and John W. Fisher, III
Cumulative GPA 5.00 (A = 5.00)

Cornell University, Ithaca, NY, USA
Bachelor of Science (magna cum laude) in Electrical and Computer Engineering, 2004
Honors Project: Greedy Postprocessing for Spatial Error Concealment in MPEG Video
Advisor: Sheila S. Hemami
Minor: computer science
Cumulative GPA 3.93 (A = 4.00)

Research and Industry Experience:

Manager, Data Science Theory and Algorithms Group, *IBM Thomas J. Watson Research Center*, Yorktown Heights, NY, USA, since December 2016.

Research staff member, Mathematical Sciences Department, *IBM Thomas J. Watson Research Center*, Yorktown Heights, NY, USA, November 2010–December 2016.

Post doctoral researcher, Business Analytics and Mathematical Sciences Department, *IBM Thomas J. Watson Research Center*, Yorktown Heights, NY, USA, April–November 2010.

Research assistant, Laboratory for Information and Decision Systems, *Massachusetts Institute of Technology*, Cambridge, MA, USA, October 2004–February 2010.

Intern, Systems and Decision Sciences Section, National Security Engineering Division, *Lawrence Livermore National Laboratory*, Livermore, CA, USA, May–August 2009. (Department of Energy P Clearance.)

Visiting researcher, Laboratoire de Mathématiques Appliquées aux Systèmes, *École Centrale Paris*, Châtenay-Malabry, France, May–August 2006.

Co-op intern, Enterprise Server Products Group, *Sun Microsystems*, Burlington, MA, USA, September 2002–January 2003 and May–August 2003.

Intern, Air Traffic Systems Division, *Sensis Corporation*, DeWitt, NY, USA, May–August 2001.

Summer research volunteer, Nuclear Medicine Division, *State University of New York Health Science Center*, Syracuse, NY, USA, June–September 1998.

Honors:

IBM Research Technical Accomplishments
- Extraordinary Accomplishment
  - Research Contributions to Workforce Innovation & Enterprise Transformation,[†] 2015.
- Outstanding Accomplishment
  - Computational Creativity, 2014;
  - GMU Proactive Retention, 2013.
- Accomplishment
  - IBM Leadership in Fight Against Ebola,[*] 2015;
  - WellPoint Health Insurance Exchanges Analytics, 2013;
  - Computational Creativity for Culinary Recipes,[‡] 2013;
  - Analytics-Driven Proactive Retention in the Growth Markets Unit,[†] 2012;
  - Business Impact of Outsourcing Analytics,[†] 2011;
  - Software Group Sales Analytics,[*] 2011.
    *Also IBM Outstanding Technical Achievement Award
    †Also IBM Research Division Award
    ‡Also IBM Outstanding Innovation Award

Paper Awards
- Best Research Paper Honorable Mention, SIAM International Conference on Data Mining, 2015.
- Best Social Good Paper Award, ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2014.
- Best Paper Award, IEEE International Conference on Service Operations and Logistics, and Informatics, 2013.
- Best Student Paper Travel Award, International Conference on Information Fusion, 2009.

Contributor to WellPoint Team, Gerstner Award for Client Excellence (most prestigious internal award at IBM), 2013.

IBM Eminence and Excellence Award, WellPoint/IBM Healthcare Predictive Analytics Project, 2012.

National Science Foundation Graduate Research Fellow, 2004–2009.

John McMullen Dean's Scholar, 2000–2004.

Eta Kappa Nu (electrical and computer engineering honor society), inducted 2003.

Tau Beta Pi (engineering honor society), inducted 2003.

Lockheed Martin Award for Academic Excellence (awarded to five outstanding sophomores in School of Electrical and Computer Engineering, Cornell University), 2002.

Rensselaer Medal, 1999.

Teaching and Mentoring Experience:

Adjunct project advisor, DS-GA 1003 Machine Learning and Computational Statistics, *New York University*, Spring 2015, Spring 2016.

Mentor
- IBM Social Good Fellows
  - Caitlin Kuhlman, Ph.D. candidate, *Worcester Polytechnic Institute*, How to Foster Innovation, Summer 2016.
  - Hemank Lamba, Ph.D. candidate, *Carnegie Mellon University*, Understanding the Ecospace of Philanthropic Projects, Summer 2016.
  - Subhabrata Majumdar, Ph.D. candidate, *University of Minnesota*, Hunting Zika with Machine Learning, Summer 2016.
  - Evan Patterson, Ph.D. candidate, *Stanford University*, Open Discovery Platform for a Multiple Sclerosis Cure, Summer 2016.
  - Kien Pham, Ph.D. candidate, *New York University*, Real-Time Understanding of Humanitarian Crises, Summer 2016.
  - Yumeng Tao, Ph.D. candidate, *University of California Irvine*, Disseminating the Best Treatment for Diarrhea, Summer 2016.
- Guolong Su, Ph.D. candidate, *Massachusetts Institute of Technology*, Interpretable Two-Level Rule Learning, Summer 2015.
- Michael Wattendorf, B.S. candidate, *Princeton University*, Predicting Outcomes of Individual Tennis Points, Spring 2015–Spring 2016. (Now with Google.)
- Ben Quazzo, B.S. candidate, *Princeton University*, Statistical Analysis of Professional Tennis, Spring 2015. (Now with Accel Partners.)
- Shaobo Han, Ph.D. candidate, *Duke University,* Nonparametric Bayesian Modeling of Legislation for Exploratory Analysis, Summer 2014.
- Jinfeng Yi, Ph.D. candidate, *Michigan State University*, Expertise Assessment Recommendation, Summer 2013. (Now with IBM Research.)
- Alex Gittens, Ph.D. candidate, *California Institute of Technology*, Voluntary Attrition Modeling, Summer 2012. (Now with Rensselaer Polytechnic Institute.)
- Gautam K. Bhat, M.Sc. candidate, *Karnataka State Open University*, Deconvolving the Productivity of Salespeople, Fall 2011–Summer 2012. (Now with IBM Global Technology Services.)
- John Z. Sun, Ph.D. candidate, *Massachusetts Institute of Technology*, Dynamic Matrix Factorization and Collaborative Filtering based on the Kalman Filter, Summer 2011. (Now with PDT Partners.)
- Ankan Saha, Ph.D. candidate, *University of Chicago*, Semi-Supervised Multi-Task Learning with Task-Dependent Regularization, Summer 2010. (Now with LinkedIn.)

Guest lecturer
- CS-GY 9223 Foundations of Data Science, *New York University*, Spring 2016.
- 01:090:101 Data: What is it Good For? (Absolutely Something), *Rutgers University*, Fall 2015.
- ORF 360 Decision Modeling in Business Analytics, *Princeton University*, Spring 2015.

Teaching assistant, 6.972 Algorithms for Estimation and Inference, *Massachusetts Institute of Technology*, Fall 2006.

Group tutor, ECE 310 Introduction to Probability and Random Phenomena, *Cornell University*, Spring 2004.

Guest instructor, How Television Works, *Tompkins Seneca Tioga BOCES Community (alternative) School*, Spring 2004.

Research Interests:

Signal processing: sparse signal representation, detection and estimation theory, quantization

Machine learning: interpretable models, topological data analysis, privacy and fairness

Image processing: image formation, image segmentation, level set methods, remote sensing

Applications: workforce analytics, public affairs, olfaction, international development, health care

Publications:

Journal and Magazine Articles
Understanding the Ecospace of Philanthropic Projects. Hemank Lamba, Mary E. Helander, Moninder Singh, Nizar Lethif, Anuradha Bhamidipaty, Salman Baset, Aleksandra Mojsilović, and Kush R. Varshney. *IBM Journal of Research and Development*, in press.

Real-Time Understanding of Humanitarian Crises via Targeted Information Retrieval. Kien T. Pham, Prasanna Sattigeri, Amit Dhurandhar, Arpith C. Jacob, Maja Vukovic, Patrice Chataigner, Juliana Freire, Aleksandra Mojsilović, and Kush R. Varshney. *IBM Journal of Research and Development*, in press.

How to Foster Innovation: A Data-Driven Approach to Measuring Economic Competitiveness. Caitlin Kuhlman, Karthikeyan Natesan Ramamurthy, Prasanna Sattigeri, Aurélie C. Lozano, Lei Cao, Chandra Reddy, Aleksandra Mojsilović, and Kush R. Varshney. *IBM Journal of Research and Development*, in press.

Effectiveness of Peer Detailing in a Diarrhea Program in Nigeria. Yumeng Tao, Debarun Bhattacharjya, Aliza R. Heching, Aditya Vempaty, Moninder Singh, Felix Lam, Jason Houdek, Mohammed Abubakar, Ahmad Abdulwahab, Tiwadayo Baraimoh, Nnenna Ihebuzor, Aleksandra Mojsilović, and Kush R. Varshney. *IBM Journal of Research and Development*, in press.

Dataflow Representation of Data Analyses: Towards a Platform for Collaborative Data Science. Evan Patterson, Robert McBurney, Hollie Schmidt, Ioana Baldini, Aleksandra Mojsilović, and Kush R. Varshney. *IBM Journal of Research and Development*, in press.

Signal Processing for Social Good. Kush R. Varshney. *IEEE Signal Processing Magazine*, vol. 34, no. 3, p. 112, 108, May 2017.

Decision Making with Quantized Priors Leads to Discrimination. Lav R. Varshney and Kush R. Varshney. *Proceedings of the IEEE*, vol. 105, no. 2, p. 241–255, February 2017.

Associative Algorithms for Computational Creativity. Lav R. Varshney, Jun Wang, and Kush R. Varshney. *Journal of Creative Behavior*, vol. 50, no. 3, p. 211–223, September 2016.

Olfactory Signal Processing. Kush R. Varshney and Lav R. Varshney. *Digital Signal Processing*, vol. 48, p. 84–92, January 2016.

Data Challenges in Disease Response: The 2014 Ebola Outbreak and Beyond. Kush R. Varshney, Dennis Wei, Karthikeyan Natesan Ramamurthy, and Aleksandra Mojsilović. *ACM Journal of Data and Information Quality*, vol. 6, no. 2–3, p. 5, June 2015.

Targeting Villages for Rural Development Using Satellite Image Analysis. Kush R. Varshney, George H. Chen, Brian Abelson, Kendall Nowocin, Vivek Sakhrani, Ling Xu, and Brian L. Spatocco. *Big Data*, vol. 3, no. 1, p. 41–53, March 2015.

Optimal Grouping for Group Minimax Hypothesis Testing. Kush R. Varshney and Lav R. Varshney. *IEEE Transactions on Information Theory*, vol. 60, no. 10, p. 6511–6521, October 2014.

Bounded Confidence Opinion Dynamics in a Social Network of Bayesian Decision Makers. Kush R. Varshney. *IEEE Journal of Selected Topics in Signal Processing*, vol. 8, no. 4, p. 576–585, August 2014.

Collaborative Kalman Filtering for Dynamic Matrix Factorization. John Z. Sun, Dhruv Parthasarathy, and Kush R. Varshney. *IEEE Transactions on Signal Processing*, vol. 62, no. 14, p. 3499-3509, July 15, 2014.

Sparsity-Driven Synthetic Aperture Radar Imaging: Reconstruction, Autofocusing, Moving Targets, and Compressed Sensing. Müjdat Çetin, Ivana Stojanović, N. Özben Önhon, Kush R. Varshney, Sadegh Samadi, W. Clem Karl, and Alan S. Willsky. *IEEE Signal Processing Magazine*, vol. 31, no. 4, p. 27–40, July 2014.

Practical Ensemble Classification Error Bounds for Different Operating Points. Kush R. Varshney, Ryan J. Prenger, Tracy L. Marlatt, Barry Y. Chen, and William G. Hanley. *IEEE Transactions on Knowledge and Data Engineering*, vol. 25, no. 11, p. 2590–2601, November 2013.

Sales-Force Performance Analytics and Optimization. Moritz Baier, Jorge E. Carballo, Alice J. Chang, Yingdong Lu, Aleksandra Mojsilović, M. Jonathan Richard, Moninder Singh, Mark S. Squillante, and Kush R. Varshney. *IBM Journal of Research and Development*, vol. 56, no. 6, November/December 2012.

Generalization Error of Linear Discriminant Analysis in Spatially-Correlated Sensor Networks. Kush R. Varshney. *IEEE Transactions on Signal Processing*, vol. 60, no. 6, p. 3295-3301, June 2012.

Bayes Risk Error is a Bregman Divergence. Kush R. Varshney. *IEEE Transactions on Signal Processing*, vol. 59, no. 9, p. 4470–4472, September 2011.

Business Analytics Based on Financial Time Series. Kush R. Varshney and Aleksandra Mojsilović. *IEEE Signal Processing Magazine*, vol. 28, no. 5, p. 83–93, September 2011.

Linear Dimensionality Reduction for Margin-Based Classification: High-Dimensional Data and Sensor Networks. Kush R. Varshney and Alan S. Willsky. *IEEE Transactions on Signal Processing*, vol. 59, no. 6, p. 2496–2512, June 2011.

Classification Using Geometric Level Sets. Kush R. Varshney and Alan S. Willsky. *Journal of Machine Learning Research*, vol. 11, p. 491–516, February 2010.

Postarthroplasty Examination Using X-Ray Images. Kush R. Varshney, Nikos Paragios, Jean-François Deux, Alain Kulski, Rémy Raymond, Phillipe Hernigou, and Alain Rahmouni. *IEEE Transactions on Medical Imaging*, vol. 28, no. 3, p. 469–474, March 2009.

Quantization of Prior Probabilities for Hypothesis Testing. Kush R. Varshney and Lav R. Varshney. *IEEE Transactions on Signal Processing*, vol. 56, no. 10, p. 4553–4562, October 2008.

Sparse Representation in Structured Dictionaries with Application to Synthetic Aperture Radar. Kush R. Varshney, Müjdat Çetin, John W. Fisher, III, and Alan S. Willsky. *IEEE Transactions on Signal Processing*, vol. 56, no. 8, p. 3548–3561, August 2008.

Conference Papers

The Limits of Abstract Evaluation Metrics: The Case of Hate Speech Detection. Alexandra Olteanu, Kartik Talamadupula, and Kush R. Varshney. *ACM Web Science Conference*, Troy, NY, June 2017.

Statistical Analysis of Peer Detailing for Children's Diarrhea Treatments. Yumeng Tao, Debarun Bhattacharjya, Aliza R. Heching, Aditya Vempaty, Moninder Singh, Felix Lam, Kush R. Varshney, and Aleksandra Mojsilović. *AAAI Spring Symposium on AI for Social Good*, Stanford, CA, p. 101–106, March 2017.

Machine Representation of Data Analyses: Towards a Platform for Collaborative Data Science. Evan J. Patterson, Ioana Baldini, Aleksandra Mojsilović, and Kush R. Varshney. *AAAI Spring Symposium on AI for Social Good*, Stanford, CA, p. 53–59, March 2017.

Information Retrieval, Fusion, Completion, and Clustering for Employee Expertise Estimation. Raya Horesh, Kush R. Varshney, and Jinfeng Yi. *IEEE International Conference on Big Data*, Washington, DC, December 2016.

Stable Estimation of Granger-Causal Factors of Country-Level Innovation. Aurélie C. Lozano, Prasanna Sattigeri, Aleksandra Mojsilović, and Kush R. Varshney. *IEEE Global Conference on Signal and Information Processing*, Washington, DC, p. 1290–1294, December 2016.

Interpretable Machine Learning via Convex Cardinal Shape Composition. Kush R. Varshney. *Allerton Conference on Communication, Control, and Computing*, Monticello, IL, p. 327–330, September 2016.

Learning Sparse Two-Level Boolean Rules. Guolong Su, Dennis Wei, Kush R. Varshney, and Dmitry M. Malioutov. *IEEE Workshop on Machine Learning for Signal Processing*, Salerno, Italy, September 2016.

Dynamic Matrix Factorization with Social Influence. Aleksandr Y. Aravkin, Kush R. Varshney, and Liu Yang. *IEEE Workshop on Machine Learning for Signal Processing*, Salerno, Italy, September 2016.

Understanding Innovation to Drive Sustainable Development. Prasanna Sattigeri, Aurélie Lozano, Aleksandra Mojsilović, Kush R. Varshney, and Mahmoud Naghshineh. *ICML Workshop on #Data4Good: Machine Learning in Social Good Applications*. New York, NY, p. 21–25, June 2016.

Interpretable Two-Level Boolean Rule Learning for Classification. Guolong Su, Dennis Wei, Kush R. Varshney, and Dmitry M. Malioutov. *ICML Workshop on Human Interpretability in Machine Learning*, New York, NY, p. 66–70, June 2016.

Fidelity Loss in Distribution-Preserving Anonymization and Histogram Equalization. Lav R. Varshney and Kush R. Varshney. *Conference on Information Sciences and Systems*, Princeton, NJ, p. 30–35, March 2016.

Engineering Safety in Machine Learning. Kush R. Varshney. *Information Theory and Applications Workshop*, La Jolla, CA, February 2016.

Predictive Modeling of Customer Repayment for Sustainable Pay-As-You-Go Solar Power in Rural India. Hugo Gerard, Kamalesh Rao, Mark Simithraaratchy, Kush R. Varshney, Kunal Kabra, and G. Paul Needham. *Data for Good Exchange*, New York, NY, September 2015.

Data Science of the People, for the People, by the People: A Viewpoint on an Emerging Dichotomy. Kush R. Varshney. *Data for Good Exchange*, New York, NY, September 2015.

From Open Data Ecosystems to Systems of Innovation: A Journey to Realize the Promise of Open Data. Shubir Kapoor, Aleksandra Mojsilović, Jade Nguyen Strattner, and Kush R. Varshney. *Data for Good Exchange*, New York, NY, September 2015.

A Robust Nonlinear Kalman Smoothing Approach for Dynamic Matrix Factorization. Aleksandr Y. Aravkin, Kush R. Varshney, and Dmitry M. Malioutov. *Signal Processing with Adaptive Sparse Structured Representations Workshop*, Cambridge, United Kingdom, July 2015.

A Semiquantitative Group Testing Approach for Learning Interpretable Clinical Prediction Rules. Amin Emad, Kush R. Varshney, and Dmitry M. Malioutov. *Signal Processing with Adaptive Sparse Structured Representations Workshop*, Cambridge, United Kingdom, July 2015.

Optigrow: People Analytics for Job Transfers. Dennis Wei, Kush R. Varshney, and Marcy Wagman. *IEEE International Congress on Big Data*, New York, NY, p. 535–542, June–July 2015.

Health Insurance Market Risk Assessment: Covariate Shift and k-Anonymity. Dennis Wei, Karthikeyan Natesan Ramamurthy, and Kush R. Varshney. *SIAM International Conference on Data Mining*, Vancouver, Canada, p. 226–234, April–May 2015. *(Best Research Paper Honorable Mention)*

Learning Interpretable Classification Rules Using Sequential Row Sampling. Sanjeeb Dash, Dmitry M. Malioutov, and Kush R. Varshney. *IEEE International Conference on Acoustics, Speech and Signal Processing*, Brisbane, Australia, p. 3337–3341, April 2015.

Robust Binary Hypothesis Testing Under Contaminated Likelihoods. Dennis Wei and Kush R. Varshney. *IEEE International Conference on Acoustics, Speech and Signal Processing*, Brisbane, Australia, p. 3407–3411, April 2015.

Persistent Topology of Decision Boundaries. Kush R. Varshney and Karthikeyan Natesan Ramamurthy. *IEEE International Conference on Acoustics, Speech and Signal Processing*, Brisbane, Australia, p. 3931–3935, April 2015.

Targeting Direct Cash Transfers to the Extremely Poor. Brian Abelson, Kush R. Varshney, and Joy Sun. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, New York, NY, p. 1563–1572, August 2014. *(Best Social Good Paper Award)*

Predicting Employee Expertise for Talent Management in the Enterprise. Kush R. Varshney, Vijil Chenthamarakshan, Scott W. Fancher, Jun Wang, Dongping Fang, and Aleksandra Mojsilović. *ACM*

SIGKDD Conference on Knowledge Discovery and Data Mining, New York, NY, p. 1729–1738, August 2014.

An Analysis of Losing Unimportant Points in Tennis. Kush R. Varshney. *KDD Workshop on Large-Scale Sports Analytics*, New York, NY, August 2014.

Computing Persistent Homology Under Random Projection. Karthikeyan Natesan Ramamurthy, Kush R. Varshney, and Jayaraman J. Thiagarajan. *IEEE International Workshop on Statistical Signal Processing*, Gold Coast, Australia, p. 105–108, June–July 2014.

Food Steganography with Olfactory White. Kush R. Varshney and Lav R. Varshney. *IEEE International Workshop on Statistical Signal Processing*, Gold Coast, Australia, p. 21–24, June–July 2014.

Active Odor Cancellation. Kush R. Varshney and Lav R. Varshney. *IEEE International Workshop on Statistical Signal Processing*, Gold Coast, Australia, p. 25–28, June–July 2014.

Screening for Learning Classification Rules via Boolean Compressed Sensing. Sanjeeb Dash, Dmitry M. Malioutov, and Kush R. Varshney. *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Florence, Italy, p. 3360–3364, May 2014.

Prescriptive Analytics for Allocating Sales Teams to Opportunities. Ban Kawas, Mark S. Squillante, Dharmashankar Subramanian, and Kush R. Varshney. *IEEE International Conference on Data Mining Workshops*, Dallas, TX, p. 211–218, December 2013.

Quantifying and Recommending Expertise When New Skills Emerge. Dongping Fang, Kush R. Varshney, Jun Wang, Karthikeyan Natesan Ramamurthy, Aleksandra Mojsilović, and John H. Bauer. *IEEE International Conference on Data Mining Workshops*, Dallas, TX, p. 672–679, December 2013.

Quantile Regression for Workforce Analytics. Karthikeyan Natesan Ramamurthy, Kush R. Varshney, and Moninder Singh. *IEEE Global Conference on Signal and Information Processing*, Austin, TX, p. 1134, December 2013.

Flavor Pairing in Medieval European Cuisine: A Study in Cooking with Dirty Data. Kush R. Varshney, Lav R. Varshney, Jun Wang, and Daniel Meyers. *International Joint Conference on Artificial Intelligence Workshop on Cooking with Computers*, Beijing, China, p. 3–12, August 2013.

Balancing Lifetime and Classification Accuracy of Wireless Sensor Networks. Kush R. Varshney and Peter M. van de Ven. *ACM International Symposium on Mobile Ad Hoc Networking and Computing*, Bengaluru, India, p. 31–38, July–August 2013.

Expertise Assessment with Multi-Cue Semantic Information. Jun Wang, Kush R. Varshney, Aleksandra Mojsilović, Dongping Fang, and John H. Bauer. *IEEE International Conference on Service Operations and Logistics, and Informatics*, Dongguan, China, p. 534–539, July 2013. *(Best Paper Award)*

Dose-Response Signal Estimation and Optimization for Salesforce Management. Kush R. Varshney and Moninder Singh. *IEEE International Conference on Service Operations and Logistics, and Informatics*, Dongguan, China, p. 328–333, July 2013.

Cognition as a Part of Computational Creativity. Lav R. Varshney, Florian Pinel, Kush R. Varshney, Angela Schörgendorfer, and Yi-Min Chee. *IEEE International Conference on Cognitive Informatics and Cognitive Computing*, New York, NY, p. 36–43, July 2013.

Predicting and Recommending Skills in the Social Enterprise. Kush R. Varshney, Jun Wang, Aleksandra Mojsilović, Dongping Fang, and John H. Bauer. *International AAAI Conference on Weblogs and Social Media Workshop on Social Computing for Workforce 2.0*, Cambridge, MA, p. 20–23, July 2013.

A Salesforce Control Theory Analysis of Enterprise Microblog Posts. Kush R. Varshney and N. Sadat Shami. *International AAAI Conference on Weblogs and Social Media Workshop on Social Computing for Workforce 2.0*, Cambridge, MA, p. 16–19, July 2013.

Exact Rule Learning via Boolean Compressed Sensing. Dmitry M. Malioutov and Kush R. Varshney. *International Conference on Machine Learning*, Atlanta, GA, p. 765–773, June 2013.

Opinion Dynamics with Bounded Confidence in the Bayes Risk Error Divergence Sense. Kush R. Varshney. *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Vancouver, Canada, p. 6600–6604, May 2013.

Interactive Visual Salesforce Analytics. Kush R. Varshney, Jamie C. Rasmussen, Aleksandra Mojsilović, Moninder Singh, and Joan M. DiMicco. *International Conference on Information Systems*, Orlando, FL, December 2012.

An Analytics Approach for Proactively Combating Voluntary Attrition of Employees. Moninder Singh, Kush R. Varshney, Jun Wang, Aleksandra Mojsilović, Alisia R. Gill, Patricia I. Faur, and Raphael Ezry. *IEEE International Conference on Data Mining Workshops*, Brussels, Belgium, p. 317–323, December 2012.

Deconvolving the Productivity of Salespeople via Constrained Quadratic Programming. Gautam K. Bhat and Kush R. Varshney. *National Systems Conference*, Annamalainagar, India, December 2012.

Decision Trees for Heterogeneous Dose-Response Signal Analysis. Kush R. Varshney, Moninder Singh, and Jun Wang. *IEEE International Workshop on Statistical Signal Processing*, Ann Arbor, MI, p. 916–919, August 2012.

Does Selection Bias Blind Performance Diagnostics of Business Decision Models? A Case Study in Salesforce Optimization. Jun Wang, Moninder Singh, and Kush R. Varshney. *IEEE International Conference on Service Operations and Logistics, and Informatics*. Suzhou, China, p. 416–421, July 2012.

Legislative Prediction via Random Walks over a Heterogeneous Graph. Jun Wang, Kush R. Varshney, and Aleksandra Mojsilović. *SIAM International Conference on Data Mining*, Anaheim, CA, p. 1095–1106, April 2012.

Dynamic Matrix Factorization: A State Space Approach. John Z. Sun, Kush R. Varshney, and Karthik Subbian. *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Kyoto, Japan, p. 1897–1900, March 2012.

Estimating Post-Event Seller Productivity Profiles in Dynamic Sales Organizations. Kush R. Varshney, Moninder Singh, Mayank Sharma, and Aleksandra Mojsilović. *IEEE International Conference on Data Mining Workshops*, Vancouver, BC, p. 1191–1198, December 2011.

A Risk Bound for Ensemble Classification with a Reject Option. Kush R. Varshney. *IEEE International Workshop on Statistical Signal Processing*, Nice, France, p. 773–776, June 2011.

Multilevel Minimax Hypothesis Testing. Kush R. Varshney and Lav R. Varshney. *IEEE International Workshop on Statistical Signal Processing*, Nice, France, p.109–112, June 2011.

MCMC Inference of the Shape and Variability of Time-Response Signals. Dmitriy A. Katz-Rogozhnikov, Kush R. Varshney, Aleksandra Mojsilović, and Moninder Singh. *IEEE International Conference on Acoustics, Speech, and Signal Processing*, p. 3956–3959, Prague, Czech Rebublic, May 2011.

Spatially-Correlated Sensor Discriminant Analysis. Kush R. Varshney. *IEEE International Conference on Acoustics, Speech, and Signal Processing*, p. 3680–3683, Prague, Czech Rebublic, May 2011.

Categorical Decision Making by People, Committees, and Crowds. Lav R. Varshney, Joong Bum Rhim, Kush R. Varshney, and Vivek K Goyal. *Information Theory and Applications Workshop*, La Jolla, CA, February 2011.

Class-Specific Error Bounds for Ensemble Classifiers. Ryan J. Prenger, Tracy D. Lemmond, Kush R. Varshney, Barry Y. Chen, and William G. Hanley. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, p. 843–852, Arlington, VA, July 2010.

Learning Dimensionality-Reduced Classifiers for Information Fusion. Kush R. Varshney and Alan S. Willsky. *International Conference on Information Fusion*, p. 1881–1888, Seattle, WA, July 2009. *(Best Student Paper Travel Award)*

Supervised Learning of Classifiers via Level Set Segmentation. Kush R. Varshney and Alan S. Willsky. *IEEE Workshop on Machine Learning for Signal Processing*, p. 115–120, Cancún, Mexico, October 2008.

Minimum Mean Bayes Risk Error Quantization of Prior Probabilities. Kush R. Varshney and Lav R. Varshney. *IEEE International Conference on Acoustics, Speech, and Signal Processing*, p. 3445–3448, Las Vegas, NV, April 2008.

Geniş Açılı Radarda Görüntü Oluşturma ve Yönbağımlılık Tespiti için Seyrek Sinyal Temsiline Dayalı bir Yaklaşım (A Sparse Signal Representation-Based Approach to Image Formation and Anisotropy Determination in Wide-Angle Radar). Kush R. Varshney, Müjdat Çetin, John W. Fisher, III, and Alan S. Willsky. *IEEE Signal Processing and Communication Applications Conference*, Eskişehir, Turkey, June 2007.

Multi-View Stereo Reconstruction of Total Knee Replacement from X-Rays. Kush R. Varshney, Nikos Paragios, Alain Kulski, Remy Raymond, Phillipe Hernigou, and Alain Rahmouni. *IEEE International Symposium on Biomedical Imaging: From Nano to Macro*, p. 1148–1151, Arlington, VA, April 2007.

Wide-Angle SAR Image Formation with Migratory Scattering Centers and Regularization in Hough Space. Kush R. Varshney, Müjdat Çetin, John W. Fisher, III, and Alan S. Willsky. *Annual Workshop on Adaptive Sensor Array Processing*, Lexington, MA, June 2006.

Joint Image Formation and Anisotropy Characterization in Wide-Angle SAR. Kush R. Varshney, Müjdat Çetin, John W. Fisher, III, and Alan S. Willsky. *SPIE Defense and Security Symposium, Algorithms for Synthetic Aperture Radar Imagery XIII*, Orlando (Kissimmee), FL, April 2006.

Conference Presentations

A Bayesian Approach for Predicting Neotropical Primate Reservoirs of Zika Virus. Subhabrata Majumdar, Dennis Wei, Adam Perer, Benjamin Glicksberg, Aleksandra Mojsilović, Kush R. Varshney, and Barabara A. Han. *International Symposium on Business and Industrial Statistics*, Yorktown Heights, NY, June 2017.

Employee Expertise Estimation by Information Retrieval, Fusion, Completion, and Clustering. Raya Horesh, Kush R. Varshney, and Jinfeng Yi. *SDM Workshop on Women in Data Science*, Houston, TX, April 2017.

Persistent Homology of Classifier Decision Boundaries. Kush R. Varshney and Karthikeyan Natesan Ramamurthy. *STOC/SoCG Workshop on Geometry and Machine Learning*, Cambridge, MA, June 2016.

Learning Interpretable Clinical Prediction Rules using Threshold Group Testing. Amin Emad, Kush R. Varshney, and Dmitry M. Malioutov. *NIPS Workshop on Machine Learning in Healthcare*, Montréal, Canada, December 2015.

Assessing Expertise in the Enterprise: The Recommender Point of View. Aleksandra Mojsilović and Kush R. Varshney. *ACM Recommender Systems Conference*, p. 231, Vienna, Austria, September 2015.

Learning Interpretable Classification Rules via Boolean Compressed Sensing. Dmitry M. Malioutov, Kush R. Varshney, and Sanjeeb Dash. *Joint Statistical Meetings*, Seattle, WA, August 2015.

Personalization of Product Novelty Assessment via Bayesian Surprise. Nan Shao, Kush R. Varshney, Lav R. Varshney, Florian Pinel, Anshul Sheopuri, and Pavankumar Murali. *Joint Statistical Meetings*, Boston, MA, August 2014.

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Classification of IT Service Tickets for Defect Prevention. Kush R. Varshney, Dongping Fang, Aliza R. Heching, Aleksandra Mojsilović, and Moninder Singh. *INFORMS Annual Meeting*, Charlotte, NC, November 2011.

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Automatic Fingerprint Matching Systems. Kush R. Varshney. *Glimpses of Systems Theory and Novel Applications: Felicitation Volume in Honour of Professor Raj Kumar Varshney*, p. 149–164. Harjinder Singh Sekhon et al., editors. Aligarh, India: Navin Press, 2005.

Theses and Technical Reports
Frugal Hypothesis Testing and Classification. Kush R. Varshney. *Ph.D. Thesis*. Massachusetts Institute of Technology, Cambridge, MA, February 2010.

The Feature Analysis of Flow-Based Statistics for Network Traffic Classification. Kelley B. Herndon Ford, Kush R. Varshney, Tracy D. Lemmond, William G. Hanley, Barry Y. Chen, and William C. Kallander. *Technical Report*. Lawrence Livermore National Laboratory, Livermore, CA, September 2009.

Surface Evolution for 3-D Shape Reconstruction of Knee Joint Prosthetics and Bones. Kush R. Varshney and Nikos Paragios. *Technical Report 0703*. Laboratoire de Mathématiques Appliquées aux Systèmes, École Centrale Paris, Châtenay-Malabry, France, February 2007.

Joint Anisotropy Characterization and Image Formation in Wide-Angle Synthetic Aperture Radar. Kush R. Varshney. *Master's Thesis*. Massachusetts Institute of Technology, Cambridge, MA, May 2006.

Online Contributions
For Analytics to Have an Impact, Keep it Simple. Tyler H. McCormick, Cynthia Rudin, Dmitry Malioutov, and Kush Varshney. *Data Informed* (http://data-informed.com/for-analytics-to-have-an-impact-keep-it-simple), 3 August 2015.

Statistical Analysis of Serving and Breaking First in Tennis. Kush Varshney. *Jon Wertheim's Tennis Mailbag* (http://sportsillustrated.cnn.com/tennis/news/20131030/serena-williams-mailbag), 30 October 2013.

Patents:

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Active Odor Cancellation. Kush R. Varshney and Lav R. Varshney. US 9,600,793, March 21, 2017.

Food Steganography. Kush R. Varshney and Lav R. Varshney. US 9,417,221, August 16, 2016.

Predictive and Descriptive Analysis on Relations Graphs with Heterogeneous Entities. Aleksandra Mojsilović, Kush R. Varshney, and Jun Wang. US 9,195,941, November 24, 2015.

Applied

Accelerating Data-Driven Scientific Discovery. Flavio P. Calmon and Kush R. Varshney. 15/609,586, filed May 31, 2017.

Humanitarian Crisis Analysis Using Secondary Information Gathered by a Focused Web Crawler. Ioana M. Baldini Soares, Amit Dhurandhar, Abhishek Kumar, Aleksandra Mojsilović, Kien T. Pham, Kush R. Varshney, and Maja Vukovic. 15/484,325, filed April 11, 2017.

Representation of a Data Analysis Using a Flow Graph. Ioana M. Baldini Soares, Aleksandra Mojsilović, Evan J. Paterson, and Kush R. Varshney. 15/399,420, filed January 5, 2017.

Method for Market Risk Assessment for Healthcare Applications. Shilpa Mahatma, Aleksandra Mojsilović, Karthikeyan Natesan Ramamurthy, Kush R. Varshney, Dennis Wei, and Gigi Yuen-Reed. 14/699,482, filed April 29, 2015.

Computing Personalized Probabilistic Familiarity Based on Known Artifact Data. Florian Pinel, Nan Shao, Kush R. Varshney, and Lav R. Varshney. 14/587,021, filed December 31, 2014.

Association-Based Product Design. Kush R. Varshney, Lav R. Varshney, and Jun Wang. 14/561,869, filed December 5, 2014.

Nonparametric Tracking and Forecasting of Multivariate Data. Aleksandr Y. Aravkin, Dmitry M. Malioutov, and Kush R. Varshney. 14/480,704, filed September 9, 2014.

Generating Work Products Using Work Product Metrics and Predicted Constituent Availability. Debarun Bhattacharjya, Kush R. Varshney, and Lav R. Varshney. 14/459,848, filed August 14, 2014.

Method, System and Computer Program Product for Automating Expertise Management Using Social and Enterprise Data. John H. Bauer, Dongping Fang, Aleksandra Mojsilović, Karthikeyan Natesan Ramamurthy, Kush R. Varshney, and Jun Wang. 14/266,970, filed May 1, 2014.

Tutorials, Talks, Panels, Demonstrations, and Posters:

Tutorials

Artificial Intelligence and Machine Learning.
- United Nations Data Innovation Lab, Nairobi, Kenya, March 13, 2017.

Introduction to Business Analytics.
- IEEE International Conference on Acoustics, Speech, and Signal Processing, Kyoto, Japan, March 25, 2012.

Invited Talks

Data for Good.
- School of Social Policy and Practice, University of Pennsylvania, Philadelphia, PA, March 30, 2017.

On Making Machine Learning Safe.
- PDT Partners, New York, NY, June 8, 2017.
- IEEE International Conference on Signal Processing and Integrated Networks, Noida, India, February 3, 2017.
- Computer Science Colloquium, University at Albany, Albany, NY, November 7, 2016.
- *Keynote Lecture*, INFORMS Southeast Michigan Symposium, Rochester, MI, May 14, 2016.

Learning Classification Rules via Boolean Compressed Sensing with Application to Workforce Analytics.
- Optimization Seminar, Department of Operations Research and Financial Engineering, Princeton University, Princeton, NJ, January 22, 2015.
- Communications Seminar, Coordinated Science Laboratory, University of Illinois at Urbana-Champaign, Urbana, IL, November 3, 2014.
- Interdisciplinary Distinguished Seminar Series, Department of Electrical and Computer Engineering, North Carolina State University, Raleigh, NC, October 4, 2013.

Detecting Poverty with Satellite Imagery.
- Nielsen Machine Learning Webinar, December 16, 2016.
- *Keynote Address*, Big Data Summit, University of Illinois Research Park, Champaign, IL, November 5, 2014.
- Data Analysts for Social Good Webinar, October 9, 2014.

Proactive Retention among IBM Growth Market Employees.
- Using Analytics to Optimize Your Workforce Seminar, Analytics Solutions Center, Washington, DC, March 12, 2013.

Margin-Based Classification and Dimensionality Reduction Using Geometric Level Sets.
- École Centrale Paris, Châtenay-Malabry, France, July 1, 2011.
- General Electric Global Research Center, Niskayuna, NY, January 21, 2010.
- MITRE Corporation, Bedford, MA, January 14, 2010.
- NASA Jet Propulsion Laboratory, Pasadena, CA, December 10, 2009.
- MIT Lincoln Laboratory, Lexington, MA, November 24, 2009.
- IBM Thomas J. Watson Research Center, Yorktown Heights, NY, November 16, 2009.
- Naval Research Laboratory, Washington, DC, November 10, 2009.
- National Institute of Standards and Technology, Gaithersburg, MD, November 9, 2009.
- Information, Systems and Networks Seminar, Cornell University, Ithaca, NY, November 6, 2009.
- Schlumberger-Doll Research Center, Cambridge, MA, November 2, 2009.

Supervised Classification in Sensor Networks.
- Communications, Networking, Signal and Image Processing Seminar, Purdue University, West Lafayette, IN, October 6, 2010.
- Business Analytics and Mathematical Sciences Department Seminar, IBM Thomas J. Watson Research Center, Yorktown Heights, NY, October 4, 2010.

Frugal Hypothesis Testing and Classification.

- Massachusetts Institute of Technology, Cambridge, MA, February 8, 2010.

Level Set Margin-Based Classification.
- National Security Engineering Division Seminar, Lawrence Livermore National Laboratory, Livermore, CA, August 11, 2009.
- Decision Modeling Research Initiative Seminar, MIT Lincoln Laboratory, Lexington, MA, January 16, 2009.
- Johns Hopkins University Applied Physics Laboratory, Laurel, MD, January 13, 2009.

Wide-Angle SAR Image Formation with Sparsifying Regularization.
- Decision Modeling Research Initiative Seminar, MIT Lincoln Laboratory, Lexington, MA, January 30, 2007.
- Dipartimento di Ingegneria dell'Informazione, Facoltà di Ingegneria, Università di Pisa, Italy, July 17, 2006.

Panels
Moderator, Rapid-Fire Introduction to Data Science for Social Good Organizations and Opportunities, New York, NY, June 24, 2016.

Panelist, Stories from the Frontlines of Data Science for Good, New York, NY, October 27, 2015.

Panelist, IEEE Spectrum Forecasters Panel, 2013–2015.

Demonstrations
SellerScope: Interactive Salesforce Analytics.
- IBM Information on Demand EXPO, Las Vegas, NV, October 21–24, 2012.
- IBM Investor Briefing, Yorktown Heights, NY, May 9, 2012.
- IBM Innovation Lab, Lotusphere, Orlando, FL, January 15–19, 2012.

Posters
Random Forest Classifier Performance in Low False Alarm and Low Missed Detection Regimes. Lawrence Livermore National Laboratory Institutional Summer Student Poster Symposium, Livermore, CA, August 6, 2009.

Block-Segmentation and Classification of Grayscale Postal Images. Bits on our Mind Symposium, Ithaca, NY, March 3, 2004.

Internal Talks Open to the Public
On Making Machine Learning Safe. IBM Research Africa, Nairobi, Kenya, March 15, 2017.

Debate on an Emerging Dichotomy in Data Science. Machine Learning for Lunch, IBM T. J. Watson Research Center, Yorktown Heights, NY, November 5, 2015.

Business Analytics. IBM T. J. Watson Research Center, Cambridge, MA, November 7, 2012.

Classification of IT Service Tickets. Worldwide Research Integrated Solutions Colloquium, IBM T. J. Watson Research Center, Yorktown Heights, NY, January 25, 2012.

Frugal Hypothesis Testing and Classification. Applied Probability for Lunch, IBM T. J. Watson Research Center, Yorktown Heights, NY, May 19, 2010.

Classification Using Geometric Level Sets. Machine Learning Tea, Cambridge, MA, February 15, 2010.

Distributed Dimensionality Reduction for Margin-Based Classification. LIDS Student Conference, Cambridge, MA, January 29, 2010.

Performance of Random Forests in the Low False Alarm and Low Missed Detection Regimes. Stochastic Systems Group, Massachusetts Institute of Technology, Cambridge, MA, October 14, 2009.

The Epsilon Entropy of Level Set Classifiers. LIDS Student Conference, Cambridge, MA, January 30, 2009.

Classification and Linear Dimensionality Reduction via Level Set Segmentation. Stochastic Systems Group, Massachusetts Institute of Technology, Cambridge, MA, October 8, 2008.

Bayesian Hypothesis Testing with Prototype Priors. Stochastic Systems Group, Massachusetts Institute of Technology, Cambridge, MA, October 3, 2007.

Discussion on Genomics. Stochastic Systems Group, Massachusetts Institute of Technology, Cambridge, MA, February 28, 2007.

From Different Angles. Stochastic Systems Group, Massachusetts Institute of Technology, Cambridge, MA, October 4, 2006.

Wide-Angle SAR Imaging. Stochastic Systems Group, Massachusetts Institute of Technology, Cambridge, MA, April 5, 2006.

A Sparse Signal Representation Framework for Anisotropy Characterization in SAR Imaging. LIDS Student Conference, Cambridge, MA, February 2, 2006.

Anisotropy Characterization in Synthetic Aperture Radar using Sparse Signal Representation. Stochastic Systems Group, Massachusetts Institute of Technology, Cambridge, MA, October 5, 2005.

Service and Professional Activities:

Board of directors: CriticaLink, since 2016.

Data ambassador: DataKind DataCorps, New York, NY, USA, since August 2013.

Professional societies: IEEE, since 2000 (senior member since 2015); ACM, 2013–2016; INFORMS, 2012; ISIF, 2009–2011; SIAM, 2006–2010; SPIE, 2006–2007; IEE/IET, 2005–2006.

Elected professional committees: IEEE Signal Processing Theory and Methods Technical Committee, since 2015; IEEE Machine Learning for Signal Processing Technical Committee, 2014–2017.

Journal editorial board: Digital Signal Processing: A Review Journal, 2013–2016.

Workshop and symposium organizer: 2016–2017 ICML Workshop on Human Interpretability (WHI) in Machine Learning; 2017 IEEE GlobalSIP Symposium on Signal and Information Processing for

Finance and Business; 2017 ACM SIGKDD Workshop on Machine Learning for Creativity; 2016 ICML Workshop on #data4good: Machine Learning in Social Good Applications.

Journal reviewer: Computer Methods in Biomechanics and Biomedical Engineering; Digital Signal Processing; Electronic Journal of Statistics; Entropy; IBM Journal of Research and Development (2 articles); IEE Proceedings Vision, Image and Signal Processing; IEEE Geoscience and Remote Sensing Letters; IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing; IEEE Journal of Selected Topics in Signal Processing (5 articles); IEEE Potentials Magazine (several articles); IEEE Signal Processing Letters (5 articles); IEEE Signal Processing Magazine (2 articles); IEEE Transactions on Aerospace and Electronic Systems; IEEE Transactions on Cybernetics; IEEE Transactions on Image Processing (2 articles); IEEE Transactions on Information Theory (2 articles); IEEE Transactions on Signal Processing (8 articles); Information Sciences; Inverse Problems and Imaging; Journal of Artificial Intelligence Research; Journal of Machine Learning Research (2 articles); Pattern Recognition; Remote Sensing Letters; Service Science (2 articles); Signal Processing (2 articles); Stochastic Models.

Conference program committee and reviewer: IEEE International Conference on Intelligent Transportation Systems, 2017; ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2015–2017; IEEE International Conference on Acoustics, Speech, and Signal Processing, 2014–2017; International Conference on Signal Processing and Integrated Networks, 2015–2017; NIPS Workshop on Interpretable Machine Learning in Complex Systems, 2016; IEEE International Workshop on Machine Learning for Signal Processing, 2014–2016; IEEE International Workshop on Statistical Signal Processing, 2012, 2016; Workshop on Compressed Sensing Theory and its Applications to Radar, Sonar and Remote Sensing, 2015; International Conference on Machine Learning, 2012–2014; IEEE Sensor Array and Multichannel Signal Processing Workshop, 2014; IEEE International Symposium on Information Theory, 2014; IEEE International Conference on Service Operations and Logistics, and Informatics, 2013; IEEE GlobalSIP Symposium on Signal and Information Processing in Finance and Economics, 2013; European Signal Processing Conference, 2009, 2012; IEEE International Workshop on Statistical Signal Processing, 2011; International Conference on Industrial, Engineering, and Other Applications of Applied Intelligent Systems, 2011.

Conference session chair: IEEE International Workshop on Machine Learning for Signal Processing, 2016; IEEE International Workshop on Statistical Signal Processing, 2012; INFORMS Annual Meeting, 2011.

Writer: Information Ashvins Blog (http://informationashvins.wordpress.com), since 2010; LIDS-Blog (http://lidsblog.typepad.com), 2007–2010.

Network member, *Council for Big Data, Ethics, and Society*, January–June 2016.

Organizing committee member, *Ebola Open Data Jam*, October 2014 and February 2015.

Summer intern coordinator, *Business Analytics and Mathematical Sciences Department*, IBM Thomas J. Watson Research Center, May–October 2013.

Organizing committee chair, *Stochastic Systems Symposium in Honor of Alan Willsky on the Occasion of his Sixtieth Birthday*, May 2008.

Organizer, *Stochastic Systems Group Seminars*, Fall 2007–Spring 2008.

Executive committee member, *MIT EECS Graduate Students Association*, 2006–2007.

Conference committee member, *LIDS Student Conference*, January 2005 and 2006.

Selected Coursework:

IBM Research: Technical Leadership; MicroMBA Program I & II.

Massive Open Online Courses: Quantitative Methods in Clinical and Public Health Research (HarvardX); The Challenges of Global Poverty (MITx).

Massachusetts Institute of Technology: Detection, Estimation, and Stochastic Processes; Discrete-Time Signal Processing; Optimization Methods; Machine Learning (listener); Representation and Modeling for Image Analysis; Computational Biology: Genomes, Networks, Evolution; Language and Its Structure II: Syntax; Language and Its Structure III: Semantics and Pragmatics.

Cornell University: Introduction to Computer Graphics; Signal Representation and Modeling; Digital Signal Processing; Telecommunications Systems I & II; Introduction to Scientific Computation; Geographic Information Systems; Introduction to Scanning Electron Microscopy; Computer Organization.

References:

Available upon request.