PRAVEEN K. PARITOSH

Cognitive Systems Division
Electrical Engineering and Computer Science
Northwestern University, 2145 Sheridan Rd
Tech L359, Evanston, IL 60208.

Email: paritosh@cs.northwestern.edu
Web: www.cs.northwestern.edu/~paritosh
Phone: (847) 467-5905 [o] (312) 927-7152 [h]
Fax: (847) 491-5258

Note: This curriculum vitae, other job packet materials, and representative papers are available for downloading at http://www.cs.northwestern.edu/~paritosh/jobpacket.

Research Interests

The intersection of Computation and Cognition: Commonsense reasoning, Qualitative reasoning, Analogical reasoning, Flexible and robust software, Knowledge-based systems, Integrated architectures for human-level intelligence, Computational modeling of higher-level cognition.

Education

Northwestern University. Ph.D. in Computer Science, expected May 2007.
  Advisor: Professor Kenneth D. Forbus.
  Committee: Professors Larry Birnbaum, Allan Collins, Dedre Gentner, and Chris Riesbeck.
  Dissertation: *Commonsense Reasoning for Alleviating the Knowledge Brittleness Bottleneck.*

Northwestern University, M.S. in Computer Science, 2004.
  Specialization in Cognitive Science.

Indian Institute of Technology, Bombay, B.Tech in Chemical Engineering, 1999.
  Honors Thesis: *Qualitative Simulation in Process Engineering.*
  Thesis was awarded the **Indian National Academy of Engineering Award for Innovative Students Projects** at Bachelor level across all disciplines.

Experience

Instructor, Northwestern University. Fall 2004. Designed and taught *CogSci 207: Introduction to Cognitive Modeling*.

Research Assistant, Qualitative Reasoning Group, Northwestern University, 2000-present.

Intern, Reflex Robotics, 1998. Developed a novel algorithm for measuring volume of falling bodies and implemented the micro-controller for an automated volume measuring sensor.

System Administrator and Webmaster, Indian Institute of Technology, Bombay, 1999.

Honors and Awards

Google Summer of Code: Awarded a grant by Google for developing software for sharing and receiving semantically structured information, Summer 2005.

Institute for the Learning Sciences Fellowship: Northwestern University, 1999-2000.

Oracle Hello World Wide Web programming contest: Ranked 2nd out of 1194 participants from 19 countries in the algorithm-intensive online programming competition, 1999.

TechFest India programming contest: First prize for developing the most accurate forecasting engine for stock market data, sponsored by i2 technologies, 1999.

Computer Society of India: First prize in national level software competition for developing educational software for high-school students, 1995.

Publications (in rigorously reviewed conferences and workshops)

Paritosh, P.K. and Bridewell, W. (2007). From Sketches to Models: A Preliminary Analysis. To appear in the *Proceedings of the 21st International Workshop on Qualitative Reasoning*.

Paritosh, P.K. (2007). Beyond Corpus Lookup: Towards Heuristic Reasoning with Text. To appear in the *Proceedings of the 3rd International Workshop on Knowledge and Reasoning in Answering Questions, at IJCAI-07*, Hyderabad.

Paritosh, P.K. (2006). The Heuristic Reasoning Manifesto. In the *Proceedings of the 20th International Workshop on Qualitative Reasoning,* Dartmouth.

Paritosh, P.K. and Klenk, M.E. (2006). Cognitive Processes in Quantitative Estimation: Analogical Anchors and Causal Adjustment. To appear in the *Proceedings of the 28th Annual Conference of the Cognitive Science Society*, Vancouver.

Paritosh, P.K. and Forbus, K.D., (2005). Analysis of Strategic Knowledge in Back of the Envelope Reasoning. In *Proceedings of the 20th National Conference on Artificial Intelligence (AAAI-05),* Pittsburgh.

Sanghi, M., Paritosh, P.K., and Thomas, R. (2005). Sub-linear Algorithms for Landmark Discovery from Black Box Models. In *Proceedings of the 19th International Workshop on Qualitative Reasoning,* Graz, Austria.

Paritosh, P.K. (2004). Symbolizing Quantity. In *Proceedings of the 26th Annual Conference of the Cognitive Science Society,* Chicago.

Paritosh, P.K. and Forbus, K.D. (2004). Using Strategies and AND/OR Decomposition for Back of the Envelope Reasoning. In *Proceedings of the 18th International Workshop on Qualitative Reasoning,* Evanston.

Paritosh, P.K. and Forbus, K.D. (2003). Qualitative Modeling and Similarity in Back of the Envelope Reasoning. In *Proceedings of the 25th Annual Conference of the Cognitive Science Society,* Boston.

Paritosh, P.K. (2003). A Sketch of a Theory of Quantity. In *Proceedings of the 17th International Workshop on Qualitative Reasoning,* Brasilia, Brazil.

Paritosh, P.K and Forbus, K.D. (2001). Common Sense on the Envelope. In *Proceedings of the 15th International Workshop on Qualitative Reasoning,* San Antonio.

Knop, M.W., Paritosh, P.K., Dinda, P.A. and Schopf, J.M. (2001). Windows Performance Monitoring and Data Reduction using WatchTower and Argus. In *Proceedings of Supercomputing 2001*.

Patents

U.S.Patent #(Application: VIB-061267) "Method and System for Filtering a Short Message Service Communication" Patent Filed.

Unpublished Manuscripts and Theses

Wagner, E.J., Paritosh, P.K., and Birnbaum, L.A. (2005). Anchoring News Events in Time.

Paritosh, P.K. (2002). Comparability and Mental Accounts.

Paritosh, P. K. (1999). Qualitative Simulation in Process Engineering. Unpublished thesis, PROCISS Lab, IIT Bombay.

Research Projects: Systems Built

BotE-Solver: *2001 to present*

Designed and implemented a system that generates back of the envelope estimates for questions like "How much money is spent on healthcare in the US?" BotE-Solver uses an AND/OR tree for keeping track of problem solving progress, and uses a 1.2 million fact subset of the Cyc knowledge base. It is built on top of FIRE reasoning engine, an integrated architecture jointly developed in collaboration with Xerox PARC. I also contributed to the implementation of some of FIRE's core facilities. This work was presented at *AAAI 2005*.

CARVE: *2002 to present*

CARVE is a computational model of *quantity sense,* of what and how people learn about quantities from experience. It starts with a set of examples represented in predicate calculus and generates qualitative representations for all the quantities in the examples. It automatically finds the phase transitions, important points on the range of values where there are qualitative discontinuities. CARVE has been presented at *Cognitive Science 2004*, and was the inspiration for sublinear algorithms (developed in collaboration with Manan Sanghi and Reuben Thomas) for engineering applications where such qualitative representations are crucial for automated diagnosis.

newspiQue: *July 2005 to present*

newspiQue is a browser extension for reading news. It automatically builds a timeline of relevant events using DateRank, an algorithm that exploits the link structure of temporal references to infer importance of the event. It also clusters news articles based on event structure. This is joint work with Earl Wagner and Larry Birnbaum.

ATTEXT: *February 2005 to December 2005*

ATTEXT is a system for filtering out spam in TXT (SMS) messages. It is essentially a Bayesian spam filter, but since TXT messages are only 160 characters long, it consists of an additional toolbox of techniques including n-grams, approximate regular expressions matching, good/bad lists that it learns to weigh together to make final judgment.

Watchtower/Argus: *March 2001 to December 2001*

A system for analyzing logs generated by Windows PCs to determine the state of machine for building distributed cycle-stealing applications. The goal of this project was to simplify the collection of this data and then to determine how to reduce this high-dimensionality data to a compact form that still provides significant information about the state of the machine. This is joint work with Mike Knop, Peter Dinda and Jennifer Schopf and was presented at *Supercomputing 2001*.

QSA: *March 1998 to April 1999*

QSA (Qualitative Shape Analysis) is a system for extracting qualitative trends from noisy online sensor data. In a process plant, operators constantly monitor a large number of sensors from the control room. QSA converts the numeric sensor data into qualitative trends in natural

language. QSA uses syntactic pattern recognition and wavelet based methods. This work was incorporated by Honeywell into their monitoring systems.

Research Projects: Psychological Experiments

Verbal think-aloud protocols during quantitative estimation, 2005. We collected protocols for experts performing estimation tasks, for example, a used car salesman estimating the price given the description of a car. Our hypothesis is that most of the *adjustment* is done using qualitative laws of the domain. This is joint work with Matthew Klenk and was presented at the Annual Cognitive Science Conference in July 2006.

Exploring effects of language and culture on similarity and analogical reasoning, 2002. We were interested in cross linguistic variation in the perception of different types of similarity, e.g., mere appearance, analogy, equivalence, etc., given that there is considerable variation in labels for these types of similarity across languages. The task was free sorting cards containing pictures exemplifying different types of similarity. I was involved in the design and running of experiments. We collected data in India, Taiwan and USA. This is joint work with Dedre Gentner, Verna Lo, Kathleen Braun and Mei-Hung Chiu.

Teaching Experience

Instructor, Northwestern University
Cognitive Science 207. *Introduction to Cognitive Modeling*. Introductory course for cognitive science majors. Fall 2004. http://www.cogsci.northwestern.edu/courses/cg207/

Teaching assistant, Northwestern University
Responsibilities included teaching classes, organizing recitations, designing and grading homework assignments and model solutions.
    CS 110, Introduction to Computer Science (for Larry Birnbaum).
    CS 348, Introduction to Artificial Intelligence (for Kris Hammond)
    CS 336, Design and Analysis of Algorithms (for Ming-Yang Kao).
    CS 344, The Design of Computer Problem Solvers (for Ken Forbus)
    CS 395, Knowledge Representation (for Ken Forbus)

Process Control, Identification and Systems Simulation Laboratory, IIT Bombay
Taught an informal course on design of simulation software in C++ that was attended by my research group including graduate students and professors, Fall 1998.

UPTRON Academy of Computer Learning, India
Designed and taught a course on how to use the internet for laypersons, Summer 1999.

Professional Affiliations

American Association for Artificial Intelligence, Cognitive Science Society, Association for Computing Machinery, American Psychological Association

Community Work

Organizing committee member, AAAI 2007 Workshop on Evaluating Architectures for Intelligence

Technical reviewer, International Conference of the Learning Sciences, 2006

Technical reviewer, Cognitive Science Conference, 2004, 2005, 2006

Technical reviewer, International Conference on Cognitive Modeling, 2004

Technical reviewer, IEEE Conference on Cluster Computing, 2002

References

Ken Forbus
Walter P. Murphy Professor of Computer
  Science and Education
Electrical Engineering and Computer Science
Northwestern University
2133 Sheridan Road
Evanston IL 60208
Phone: (847) 491-7699
Fax: (847) 491-5258
E-mail: forbus@northwestern.edu

Larry Birnbaum
Associate Professor of Electrical Engineering
  and Computer Science and Education and
  Social Policy
Northwestern University
2133 Sheridan Road
Evanston IL 60208
Phone: (847) 491-3640
Fax: (847) 491-5258
E-mail: birnbaum@cs.northwestern.edu

Dedre Gentner
Professor of Psychology and Education
Department of Psychology
Northwestern University
2029 Sheridan Road
Evanston, IL 60208
Phone: (847) 467-2035
Fax: (847) 491-7859
Email: gentner@northwestern.edu

Chris Riesbeck
Associate Professor of Electrical Engineering
  and Computer Science
Northwestern University
2133 Sheridan Road
Evanston IL 60208
Phone: (847) 491-7279
Fax: (847) 491-5258
E-mail: c-riesbeck@northwestern.edu