

Venkatesh Raghavan

CONTACT INFORMATION	Department of Computer Science Worcester Polytechnic Institute 100 Institute Road, Worcester, MA 01609 USA	Voice: +1 (508) 410-7296 E-mail: venky@cs.wpi.edu WWW: www.venky.info
OBJECTIVE	Seeking a software developer position in the field of databases, information retrieval and software engineering that utilizes a collaborative effort in researching, and developing innovative products and services.	
INTERESTS	<ul style="list-style-type: none">• Operational/Real-time Business Intelligence• Multi-Criteria Decision Support Queries (Pareto-optimal, and Top-K query evaluation).• Continuous Stream Processing (Event Streams, Resource adherent Query Optimization).• Distributed Query Processing• Database Systems (Cardinality Assurance, Adaptive Processing, and Data Warehousing).• Data Mining• XML Databases (XPath Indexing, XQuery and XPath Query Evaluation).	
EDUCATION	Worcester Polytechnic Institute , Worcester, MA, USA Ph.D. Candidate, Computer Science (Anticipated Defense: Summer 2010) <ul style="list-style-type: none">• Area: Multi-criteria Decision Support Systems over Disparate Sources• Advisor: Professor Elke A. Rundensteiner• GPA of 3.8 on a 4.0 scale M.S. Computer Science (May 2004) <ul style="list-style-type: none">• Thesis: VAMANA: A High Performance, Scalable, and Cost Driven XPath Engine• Graduated with a GPA of 3.7 on a 4.0 scale University of Mumbai , Maharashtra, INDIA B.S., Computer Engineering (June 1999)	
TECHNICAL SKILLS	Extensive software experience in databases, software engineering, and user interfaces. Programming: Java, JSwing, JSP, C++, C, Servlets, JavaScript, UNIX shell scripting. Technology: JDBC, J2EE, ODBC, Parser (XML and CSV), XML (XQuery, XPath, DTD, XML Schema), UML (Rose), Web (HTML, JavaScript), JFreeChart. Databases: Oracle 10g (SQL/PLSQL), XML, MySQL, MS Access Operating Systems: Microsoft Windows, Mac OS X, Linux. Applications: \TeX , \LaTeX , \BIBTeX , Microsoft Office, OpenOffice, with strong graphic design skills using GNUPlot and Adobe Illustrator, useful for presentations as well as publications.	
RESEARCH AND DEVELOPMENT	<ul style="list-style-type: none">• ProgXe: Progressive Evaluation of Multi-Criteria Decision Queries [1, 2] Multi-criteria decision support (MCDS) applications need to report results early to formulate competitive decisions in near real-time. Designed and implemented ProgXe [2] – a progressive execution methodology that transforms “<i>blocking</i>” queries into “<i>non-blocking</i>” by returning results as they are found. Proposed output-aware join ordering techniques that maximizes responsiveness and reduces total execution time. <i>ProgXe</i> exhibits superior performance in many cases by 2-4 orders of magnitude and is robust for all distributions, cardinalities and join factors [1].• TI-Sky: Multi-Criteria Decision Support Queries Over Time-Interval Streams [5] Pareto-optimal query evaluation is computationally intensive over continuous time-interval data streams where each object has its own customized expiration time. Designed and implemented <i>TI-Sky</i> – an efficient framework to support continuous skyline evaluation. <i>TI-Sky</i> strikes a perfect balance between the costs of continuously maintaining the changing result space and the costs of	

computing the results whenever a pull-based query is received. *TI-Sky* incrementally maintains the partially precomputed result space – doing so efficiently by working at a higher level of abstraction. In comparison to current approaches *TI-Sky* has a performance improvement of up to 2 folds.

- **SkyDB: Skyline Aware Query Evaluation Framework** [11, 13, 7]

Real-world decision support applications are required to access data from disparate sources, while existing techniques define the skyline operation to work on a single set, and therefore, treat skylines as an “add-on” on top of a traditional query plan. Implemented *SkyDB* – a novel approach to support *multi-criteria decision* (Pareto-optimal) queries over joins. Designed and implemented execution strategies [11] that leverage mature DBMS technology by treating the skyline (Pareto-Optimal) operation as a first-class citizen in query processing. Proposed techniques produce on an average 50% fewer number of join results in comparison to state-of-the-art techniques and achieves 1-2 orders of magnitude fewer skyline comparisons in producing the final result. Implemented adaptive spatial reasoning to support queries over high dimensional scientific data [13].

- **QRelX: A Novel Approach to Query Cardinality Assurance** [3, 12]

Database users often follow a trial-and-error approach to find queries with the desired query cardinality. Designed *QRelX* – a novel framework to auto-generate alternate queries that maintain closeness to the original user query while satisfying cardinality constraints. Developed an incremental cardinality estimation model with spatial reasoning technique to reduce search complexity.

- **Constraint-Exploiting Adaptive Stream Processing Engine (CAPE)**[4, 6]

“*Multi-Resource Constraint Query Optimization*” – proposed techniques that generate “*robust query plans*” that are adherent to both CPU and memory restrictions [4]. In [6], we proposed polynomial time techniques to generate “*near-optimal*” continuous query plans. Contributor to the stream engine CAPE, developed at WPI. <http://davis.wpi.edu/dsrg/PROJECTS/CAPE>

- **VAMANA: A Scalable Cost Driven XPath Engine** [10]

Developed a scalable XPath Engine [10] to support large ($\geq 1Gb$) XML files and all 13 XPath axes. Proposed index-oriented query plans allow ad-hoc queries to be evaluated by while reading only a fraction of data rather than expensive structural join operations.

- **FireStream: Sensor Stream Processing Framework to Monitor Fire Spread** [9, 8]

Designed a sensor stream-processing framework that provides services for run-time monitoring and visualization of fire-spread for Fire-Engineers [9, 8]. Supported query evaluation across hundreds of sensors based on spatial orientation between pertinent sensors. Handled heterogeneous sensor types and manipulated sensor characteristics such as sampling frequency.

- **Engineering Data for Fire Science (EDaFS)**

- In collaboration with National Institute of Standards and Technology (NIST).
- <http://edafs2.wpi.edu:8050/edafs/>

Designed and developed an architecture to access and manage fire-test data and rendering 3-D VRML models. Encompassed several projects to manage: mass loading of Fire Science data, Web portal for remote access, and graphing tool for post testing analysis (J2EE - JSP and Servlets, JDBC). Built support to manage heterogeneous data sources (XML, CSV, Oracle).

PUBLICATIONS

- (1) V. Raghavan and E. Rundensteiner, “Progressive Result Generation for Multi-Criteria Decision Support Queries,” Full Paper, *International Conference on Data Engineering, (ICDE)* 2010, (Acceptance: 12.5%).
- (2) V. Raghavan, and E. Rundensteiner, “ProgXe: Progressive Result Generation Framework for Multi-Criteria Decision Support Queries,” Demonstration, **ACM SIGMOD** 2010.
- (3) M. Vartak, V. Raghavan, and E. Rundensteiner, “QRelX: Generating Meaningful Queries that Provide Cardinality Assurance,” Demonstration, **ACM SIGMOD** 2010.

- (4) Y. Zhu, V. Raghavan and E. Rundensteiner, "A New Look At Generating Multi-Join Continuous Query Plans: A Qualified Plan Generation Problem," *Data & Knowledge Engineering (DKE Journal)* 2010.
- (5) Nam Hun Park, V. Raghavan, and E. Rundensteiner, "Supporting Multi-Criteria Decision Support Queries Over Time-Interval Data Streams," Short Paper, *International Conference on Database and Expert Systems Applications (DEXA)* 2010.
- (6) V. Raghavan, Y. Zhu, E. Rundensteiner, and D. Dougherty, "Multi-Join Continuous Query Optimization: Covering the Spectrum of Linear, Acyclic and Cyclic Queries," *British National Conference on Databases (BNCOD)* 2009.
- (7) V. Raghavan, and E. Rundensteiner, "SkyDB-Skyline Aware Query Evaluation Framework," In *SIGMOD PhD Workshop, Innovative Database Research, (IDAR)* 2009.
- (8) A. Mukherji, E. Rundensteiner, D. Brown, and V. Raghavan, "SNIF TOOL: Sniffing for Patterns in Continuous Streams," pp. 369-378, *Conference on Information and Knowledge Management (CIKM)* 2008, (Acceptance: 17%).
- (9) V. Raghavan, E. Rundensteiner, J.P. Woycheese, and A. Mukherji, "FireStream: Sensor Stream Processing for Monitoring Fire Spread," *International Conference on Data Engineering*, pp. 1507-1508, Demonstration, (*ICDE*) 2007.
- (10) V. Raghavan, K.W. Deschler, and E. Rundensteiner, "VAMANA - A Scalable Cost-Driven XPath Engine," pp. 51-60, *International Workshop on XML Schema and Data Management (XSDM)* held in conjunction with *ICDE* 2005.
- (11) V. Raghavan, E. Rundensteiner, and S. Srivastava, "Skyline and Mapping Aware Query Evaluation Across Disparate Data Sources," *in submission*. [Technical Report: WPI-CS-TR-09-03, URL: <http://www.cs.wpi.edu/research/techreports.html>]
- (12) V. Raghavan, M. Vartak, and E. Rundensteiner, "Query Oriented Refinement for Cardinality Assurance," *in submission to VLDB*.
- (13) V. Raghavan, S. Srivastava, and E. Rundensteiner, "Efficient Handling of High Dimension Multi-Criteria Decision Support Queries," *in preparation*.

PROFESSIONAL EXPERIENCE **Charles River Analytics, Inc.**, Cambridge, MA, USA

Assistant Software Engineer

April 2006 to August 2006

- Software developer in the Decision Management Division on a Phase II SBIR for the US Office of the Secretary of Defense.
- Designed and implemented the software prototype for a mission-centric Adaptive User Interface that enhances the Situational Awareness and decision-making capabilities within an Air Operations Center (AOC).
- Implemented data modeling and visualizations tools.

Cadence Design Systems, Inc., Cambridge, MA, USA

Graduate Intern

May 2002 to September 2002

- Generated information model for VHPI, VPI, and System C in Rational Rose.
- Extracted information models into XML and initiated PERL scripts to generate application programs and header files for HDLs (Hardware Definition Languages).

ACADEMIC EXPERIENCE **Worcester Polytechnic Institute**, Worcester, MA USA

Research Assistant

June 2007 to present

Teaching Assistant: Computer Science

August 2006 to June 2007

- Assisted Junior and Senior level courses in Computer Science such as database systems and web-technologies (XML, CGI, Perl, Javascript, Java).

Knowledge Divine Information Technology, Pune, INDIA

Computer Science Faculty

May 2000 to August 2001

- Conducted courses in Databases, Software Engineering, Intro. to Programming, and XML.
- Designed and delivered lectures, course materials, and exams to 500+ students.

AWARDS

1. National Science Foundation (**NSF**) Research Grants
 - Query Mesh: A Novel Paradigm for Query Processing (IIS-0917017) for 2009 to present
 - SGER: Research Experience for K12 (IIS-0633930) for 2007-2009
2. Awarded Associate Membership for *Sigma Xi* - The Scientific Research Society, 2008
3. National Institute of Standards and Technology (NIST) research grants for 3+ years 2003-2007

MENTORING

1. Collaboration [3, 12] with Manasi Vartak, an undergraduate at WPI, whom I act as research mentor to, has received the following “*Best Undergraduate Poster*” awards at
 - *ACM SIGMOD 2009*
 - *Anita Borg and Grace Hopper Women in Computer Science Conference 2009.*
2. SGER: Research Experience for K-12 Grant
 - Mentor and Advisor to five senior Mass Academy High School students in undertaking projects that address challenging research questions, resulting in the *ProgXe* demo [2].

PROFESSIONAL
ACTIVITIES

External Reviewer: SIGMOD (2008), VLDB (2008, 2009), ICDE (2008, 2009), EDBT (2008).

Poster Sessions:

- *SkyDB: Skyline-Aware Query Evaluation Framework, New England Database Day 2009.*
- *Multi-Join Continuous Query Plan Generation: A Qualified Plan Generation Problem, NEDB-Day 2008.*

Research Groups Affiliations:

- IEEE Student Member
- New England Database Society (NEDS), 2004 to Present
- Database Systems Research Group (DSRG), WPI, 2002 to Present

REFERENCES

- **Dr. Elke Rundensteiner**
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