MANO RAM MAURYA

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Research Interests

Modeling, Simulation, Optimization and Data Mining, Systems Biology and Bioinformatics, Parallel Computing, Process Monitoring and Fault Diagnosis, Process Design and Control, Artificial Intelligence.

Education

Ph.D. (2003) Chemical Engineering, Purdue University, West Lafayette, IN, USA
Thesis: Integrating Causal Models and Trend Analysis for Process Fault Diagnosis
Advisor: Prof. Venkat Venkatasubramanian
GPA: 3.83/4.00

M.E. (1999) Chemical Engineering, The City College of the City University of New York, NY, USA
Thesis: Process Identification and Controller Design for a Fluid Catalytic Cracking Unit
Advisors: Prof. Irven H. Rinard and Prof. Reuel Shinnar
GPA: 3.94/4.00

B. Tech (1998) Chemical Engineering, Indian Institute of Technology, Bombay, Mumbai, India
Thesis: Application of Qualitative Analysis in Chemical Engineering
Advisor: Prof. Raghunathan Rengaswamy
GPA: 8.70/10.00

Research Experience

10/06 – current Assistant Project Scientist [with Prof. Shankar Subramaniam, University of California, San Diego]: Network reconstruction and kinetic modeling of biochemical systems
- Reconstructing the signaling and metabolic network of lipids in RAW 264.7 cells
- Developing a model for drug transport through kidney [with Dr. Sanjay Nigam]
- Reconstructing the signaling and gene-regulatory networks active during cardiomyogenesis in development [with Dr. Mark Mercola and Dr. Juan C. I. Belmonte]

10/03 – 9/06 Postdoctoral research work [with Prof. Shankar Subramaniam]: Modeling of cellular signaling pathways:
- Developed a detailed and a reduced-order model for GTPase cycle
- Developed a stochastic-search based nonlinear optimization program (parallelized)
- Developed a mixed-integer nonlinear-optimization-based method for model reduction
- Developed a model for Calcium signaling in RAW 264.7 cells
- Developed a principal component regression (PCR) based method for signaling pathway identification

1999 – 09/03 Ph.D. thesis work:
- In-depth research on the development and analysis of signed directed graphs (SDG)
- Process fault diagnosis using SDG, qualitative trend analysis (QTA) and principal component analysis (PCA)

1998 – 1999 M.E. project work: Design of PID controllers for a fluid catalytic cracking unit

1997 – 1998 Undergraduate senior year project: SDG analysis and leak detection in pipelines using SDG, supervised by Prof. R. Raghunathan, IIT Bombay

Coursework

Chemical Engineering	**Process Control/Optimization**	**Computer Science/AI**
Thermodynamics	Advanced Process Control	Pattern Recognition
Advanced Transport Phenomena	Linear Programming	Artificial Intelligence
Reaction Engineering	Non-Linear Programming	Neural Networks
Advanced Engineering Mathematics	Discrete Optimization	Neural Fuzzy Systems

Teaching Experience

- Head Teaching Assistant, Design and Analysis of Processing Systems (Spring 2002)
- Teaching Assistant, Intelligent Systems in Process Engineering (Fall 2000, 2001)
- Teaching Assistant, Process Dynamics and Control (Fall 2000)

Awards

- **Undergraduate Merit-cum-Means Scholarship**: IIT Bombay, India, 1994-1998.
- **Graduate Fellowship**: City College of the City University of New York, 1998-1999.
- **International Federation of Automatic Control (IFAC) 2002 – 2005 paper prize**: for a paper in the journal *Engineering Applications of Artificial Intelligence* (2004) in the category "application-oriented paper on symbolic AI approaches".

Journal Publications

Process Systems Engineering

1. **Maurya, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "A Systematic Framework for the Development and Analysis of Signed Digraphs for Chemical Processes. 1. Algorithms and Analysis", *Ind. Eng. Chem. Res.,* **42**(20), 4789-4810, 2003.
2. **Maurya, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "A Systematic Framework for the Development and Analysis of Signed Digraphs for Chemical Processes. 2. Control Loops and Flowsheet Analysis", *Ind. Eng. Chem. Res.,* **42**(20), 4811-4827, 2003.
3. Dash, S., **M. R. Maurya**, R. Rengaswamy and V. Venkatasubramanian, "A Novel Interval-halving Framework for Automated Identification of Process Trends", *AIChEJ*, **50**(1), 149-162, 2004.
4. **Maurya, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "Application of Signed Digraphs-Based Analysis for Fault Diagnosis of Chemical Process Flowsheets", *Engineering Applications of Artificial Intelligence*, **17**(5), 501-518, 2004 (**won IFAC 2002 – 2005 paper prize**).
5. **Maurya, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "Fault Diagnosis by Qualitative Trend Analysis of the Principal Components", *Chemical Engineering Research and Design*, **83**(A9), 1122-1132, 2005.
6. **Maurya, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "A Signed Directed Graph-based Systematic Framework for Steady-State Malfunction Diagnosis inside Control Loops", *Chemical Engineering Science*, **61**(6), 1790-1810, 2006.
7. **Maurya, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "Fault Diagnosis Using Dynamic Trend Analysis: A Review and Recent Developments", *Engineering Applications of Artificial Intelligence*, **20**(2), 133-146, 2007.
8. **Maurya, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "A Signed Directed Graph and Qualitative Trend Analysis-Based Framework for Incipient Fault Diagnosis", *Chemical Engineering Research and Design*, **85**(A10), 1407-1422, 2007.

Biological Systems Analysis (equal effort)*

9. Bornheimer, S. J., **M. R. Maurya**, M. G. Farquhar and S. Subramaniam, "Computational Modeling Reveals How Interplay between Components of the GTPase Cycle Regulates Signal Transduction", *Proc. Natl. Acad. Sci. USA*, **101**(45), 15899-15904, 2004.
10. **Maurya, M. R.**, S. J. Bornheimer, V. Venkatasubramanian and S. Subramaniam, "Reduced-Order Modeling of Biochemical Networks: Application to the GTPase-Cycle Signaling Module", *IEE Proc. - Systems Biology*, **152**(4), 229-242, 2005.
11. **Maurya, M. R.**, S. R. Katare, P. R. Patkar, A. Rundell and V. Venkatasubramanian, "A Systematic Framework for the Design of Reduced-Order Models for Signal Transduction Pathways from a Control Theoretic Perspective", *Computers and Chemical Engineering*, **30**(3), 437-452, 2006.
12. Pradervand*, S., **M. R. Maurya*** and S. Subramaniam, "Identification of Signaling Components Required for the Prediction of Cytokine Release in RAW 264.7 Macrophages", *Genome Biology*, **7**(2), R11, 2006.
13. **Maurya, M. R.** and S. Subramaniam, "A Kinetic Model for Calcium Dynamics in RAW 264.7 Cells: 1. Mechanisms, Parameters and Sub-populational Variability", *Biophysical Journal*, **93**(3), 709-728, 2007.
14. **Maurya, M. R.** and S. Subramaniam, "A Kinetic Model for Calcium Dynamics in RAW 264.7 Cells: 2. Knockdown Response and Long-Term Response", *Biophysical Journal*, **93**(3), 729-740, 2007.

Selected Presentations (from 25, speaker*)

Invited

1. **Maurya, M. R.**, "Computational Models for GTPase-Cycle Signaling and Calcium Signaling", At the *Joint Department of Biomedical Engineering, North Carolina State University, Raleigh, and University of North Carolina, Chapel Hill, March 21*, 2005.
2. **Maurya*, M. R.** and S. Subramaniam, "Computational Modeling of Cellular Signaling Networks", In *Third International Symposium of the Austrian Proteomics Platform, Seefeld, Tyrol, Austria, January 16-19*, 2006.
3. **Maurya, M. R.**, "Offline and Online Process Safety Analysis", At the *Artie McFerrin Department of Chemical Engineering, Texas A&M University, College Station, Texas, April 21*, 2006.
4. **Maurya, M. R.**, "A Model of Calcium Signaling in Non-Excitable Cells", At the *National Institute of Allergy and Infectious Diseases (NIAID) of the National Institutes of Health (NIH), Bethesda, Maryland, April 26*, 2007.

At Symposia and Conferences

5. Gupta*, S., **M. R. Maurya**, A. Maer and S. Subramaniam, "Integrated Modeling of Lipids Metabolism and Signaling Pathways", In *AIChE Annual Meeting, 242g, Salt Lake City, UT, Nov. 4 – 9*, 2007.
6. **Maurya, M. R.**, S. J. Bornheimer*, V. Venkatasubramanian and S. Subramaniam, "Reduced-Order Modeling of Biochemical Networks by Simultaneous Determination of Network Topology and Parameters", In the proceedings of the *Foundations of Systems Biology in Engineering (FOSBE 2005), University of California, Santa Barbara, August 7-10*, pp 281-284, 2005.
7. **Maurya*, M. R.** and S. Subramaniam, "Modeling of Heterotrimeric G-Protein Mediated Calcium Response in RAW 264.7 Macrophage Cells", In *AIChE Annual Meeting, 506g, Cincinnati, OH, Oct. 31 – Nov. 4*, 2005.
8. Pradervand, S., **M. R. Maurya*** and S. Subramaniam, "Identification of Important Signaling Proteins and Stimulants for the Production of Cytokines in RAW 264.7 Macrophages", In *AIChE Annual Meeting, 304g, Cincinnati, OH, Oct. 31 – Nov. 4*, 2005.
9. **Maurya*, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "Fault Diagnosis by Qualitative Trend Analysis of the Principal Components: Prospects and some new Results", In the proceedings of the *5th IFAC symposium on Fault Detection, Supervision and Safety of Technical Processes (SAFEPROCESS-2003), Washington D.C., USA, June 9-11,* pp 861-866, 2003.
10. **Maurya*, M. R.**, R. Rengaswamy and V. Venkatasubramanian, "Systematic Development of Digraphs and Application in Process Operations", In *AIChE Annual Meeting, 267b, Reno, NV, Nov. 4-9*, 2001 (poster).