

Curriculum Vitae Of

Prabhaker Mateti

Associate Professor
Department of Computer Science and Engineering
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Personal Details

U.S. Citizen
Wife: Kalyani
Two sons (Tejasvi, b. 1979 and Kiron, b. 1983)

Education

Ph.D. in Computer Science, University of Illinois at Urbana-Champaign, USA, 1976.

M.Tech. in Computer Science, Indian Institute of Technology at Kanpur, India, 1973.

B.E. in Electrical Engineering, Regional Engineering College, Warangal (affiliated to) Osmania University, Hyderabad, A.P., India, 1969.

Employment

Associate Professor, Department of Computer Science & Engineering, Wright State University, Dec 1988 – present. Tenured: Fall 1991.

Associate Professor, Department of Computer Engineering & Science, Case Western Reserve University, 1981 – 1988.

Visiting Associate Professor, Department of Computer Science, Washington State University, 1980 – 1981.

Lecturer, Department of Computer Science, University of Melbourne, Australia, 1976 – 1981.

Instructor, Department of Computer Science, University of Texas at Austin, 1975 – 1976.

Graduate Research Assistant, Department of Computer Science, University of Illinois at Urbana-Champaign, 1972 – 1975.

Publications in Refereed Journals and Books

- Chen Ding and P. Mateti, “A Framework for the Automated Drawing of Data Structure Diagrams,” *IEEE Transactions on Software Engineering*, Vol. 16, No. 5, May 1990, 543–557.
- Mateti, P., and Ravi Manghirmalani, “Morris’ Tree Traversal Algorithm Reconsidered,” *Science of Computer Programming*, Vol. 11, 29–43, 1988.
- Mateti, P., “A Specification Schema for Indenting Programs,” *Software – Practice and Experience*, Vol.13, 163–179, 1983. (Reprinted in *Software Specification Techniques*, McGettrick and Gehani (Eds.), Addison-Wesley 1986, 269–288, ISBN: 0-201-14230-9.)
- Mateti, P., and Joxan Jaffar, “The Correctness Proof of an Indenting Program,” *Software – Practice and Experience*, Vol. 13, 199–226, 1983.
- Mateti, P. and Narsingh Deo, “Parallel Algorithms for the Single Source Shortest Path Problem,” *Computing*, Vol. 29, 31–49, 1982.
- Mateti, P., “A Decision Procedure for the Correctness of a Class of Programs,” *Journal of ACM*, Vol. 28, No.2, 215–232, April 1981.
- Mateti, P., “Pascal Versus C : A Subjective Comparison,” Springer-Verlag’s *Lecture Notes in Computer Science*, Vol. 79, 37–69. (Also reprinted in *Comparing and Assessing Programming Languages: Ada, C and Pascal*, Alan R. Feuer and Narain Gehani, editors, Prentice-Hall 1984, 32–54, ISBN: 0-13-154840-9 (pbk).)
- Mateti, P and Narsingh Deo, “On Algorithms for Enumerating all Circuits of a Graph,” *SIAM Journal on Computing*, Vol. 5, 90–99, March 1976.

Conference (Refereed) Publications

- P. Mateti, “A Laboratory Course on Internet Security,” *ACM SIGCSE 2003*, Reno, Nevada, Feb 2003.
- P. Mateti, The TCP/IP Suite of Protocols, (to be published in) *The Internet Encyclopedia*, John Wiley 2003.
- Amitava Datta and P. Mateti “Automating the Re-Declaration of Unneeded Globals as Private,” *SAC '93, ACM Symposium on Applied Computing 1993*, Feb 14–16, 1993.
- Amitava Datta and P. Mateti, “Automated Adaptation of Programs,” *Pacific Northwest Software Quality Conference*, Portland, OR, 346–361, Oct 29–31, 1990.
- Chen Ding and P. Mateti, “The Architecture of a Prototype System for Drawing Data Structures,” *EUROGRAPHICS 90*, Montreaux, Switzerland, 401–411, Sept 1990.
- P. Mateti and Chen Ding “Aesthetic Rules in the Diagrams of Linked Data Structures,” *SEKE 90: Second International Conference on Software Engineering and Knowledge Engineering*, Skokie, IL, 239–244, June 1990.
- Kouakou Diby and P. Mateti, “A Rigorous Treatment of Stepwise Refinement,” *10th Tunisian-French Seminar of Computer Science*, pp. 16, May 1989.
- Frances Hunt, Mateti, P., Amitava Datta, Kouakou Diby, Fuyau Lin, “An Evaluation of Ada Oriented Design Languages”, *6th Annual National Conference on Ada Technology*, 145–152, March 1988.
- Mateti, P., and Gerald M. Radack, “Automated Drawing of Data Structure Diagrams,” *4th Annual National Conference on Ada Technology*, 165–172, March 1986.
- Mateti, P., and Frances Hunt, “Precision Descriptions of Software Designs: An Example,” *IEEE compsoc85*, 130–136, Oct 1985.
- William A. Slough, and P. Mateti, “Functional Specifications of a Hierarchical File System,” *Fifteenth Hawaii International Conference on System Sciences*, 210–217, Jan 1982.

Other Publications

- P. Mateti, "CGI Vulnerabilities," 25pp, June 2001.
- P. Mateti, "Watching OS Activity from a Security Point of View," 16pp, Oct 2001.
- P. Mateti, "Sniffing the Ethernet with High Quality Tools," 10pp, Nov 2001.
- P. Mateti, "Secured Distributions of Linux," 15pp, Nov 2001.
- P. Mateti, "Configuring A Linux Installation for Security," Dec 2001.
- P. Mateti, "Dynamic Security of Linux Systems," 20pp, Dec 2001.
- P. Mateti, "Securing a Linux Kernel," 20pp, Dec 2001.
- P. Mateti, "A Course on Internet Security," [http://www.cs.wright.edu/pmateti/Internet Security/ Lectures/ About 25 Web based articles for teaching Internet Security](http://www.cs.wright.edu/pmateti/Internet%20Security/Lectures/About%20Web%20based%20articles%20for%20teaching%20Internet%20Security), most with lab experiments. This count does not include the above research articles.
- P. Mateti, *Laboratory-Based Courses on Firewalls and Internet Security*, NSF CCLI Showcase Projects, ACM SIGCSE 2000, March 9 - 11, Austin, Texas.
- Mateti, P., "Rigorous Re-Design in the Formal Design Language $\hat{O}M$ of Knuth's Solution to the *Common Words Problem*," 36 pp, Dec 97.
- Mateti, P. and Kan Zhao, "Fine Grain Recompilation", 25pp, June 94.
- Mateti, P., "Towards Precision Design and Construction of Software," *International Software Quality Conference 1991*, 50–55, Oct 7–9, 1991.
- P. Mateti, Kouakou Diby, and Amitava Datta, "A Perspective on Z , VDM, and $\hat{O}M$," pp. 35, Technical Report WSU-CS-90-09.
- Mateti, P., " $\hat{O}M$: A Design Specification Language," 45 pp., Technical Report WSU-CS-90-07, Jan 1990.
- Kouakou Diby, Amitava Datta, Frances Hunt, Fuyau Lin, and P. Mateti, "A Catalog of Examples in CaseDL", 67 pp., CWRU Technical Report CES-88-03, Mar 1988.
- Mateti, P., Frances Hunt, Amitava Datta, Kouakou Diby, Fuyau Lin, "An Evaluation of Ada Oriented Design Languages", 81 pp., CWRU

Technical Report CES-88-02, Feb 1988. (A condensed version of the report appears in *6th Annual National Conference on Ada Technology*, March 1988.)

- Mateti, P., and Gerald M. Radack, “Integrating Data Structure Diagrams into Source Level Debuggers,” (abstract), *Fourteenth Annual Computer Science Conference*, February 1986, p. 407.
- Mateti, P., and Heller, Charles, “al:0 for 8086 ::= A Machine-Level Language for Intel 8086”, 60 pp., CWRU Technical Report CES-83-08, June 1983.
- Mateti, P., Jurg Nievergelt, and Edward M. Reingold, “Solutions and addenda (to the book) *Computer Approaches to Mathematical Problems* by Nievergelt, Farrar and Reingold,” Prentice-Hall, Inc., Englewood Cliffs, New Jersey, USA, 1974, 78 pp.
- Mateti, P., “An Automatic Verifier for a Class of Sorting Programs,” *Ph. D. Thesis*, Report No. UIUCDCS-R-76-832, University of Illinois at Urbana-Champaign, 1976.

Graduate Students

PhD Students

- Amitava Datta, *Automated Adaptations of Programs*, Ph. D. Dissertation, Wright State U, June 92. Siemens Research, Princeton, NJ.
- Chen Ding, *A Formal Framework and a Prototype System for Drawing Conceptual Line Diagrams*, Ph. D. Dissertation under my direction, Case Western Reserve University, 23 August 90. NEC Research, Dallas, TX.
- Kouakou Diby, *Foundations of Hierarchical Design Methods for Software*, Ph. D. Dissertation, Wright State U, June 90. In 1997 at Ciba-Geigy, Oberlin, OH.

MS Students

- Pothamsetty, Venkata Rama Krishna Reddy, *Laboratory Setup For Courses On Internet Security*, M.S. Thesis, July 26, 2000.
- Laura Daniels, *Transforming Sequential Programs into RPC-based Clients and Servers*, M.S. Thesis, Sept 1995.
- Richard L. Hollenbach II, *A Distributed Shell that can use Idle Unix Workstations*, M. S. Thesis, June 1995.
- C. N. Ravikiran, *Design and Implementation of Distributed Programming Primitives on SCRAMNet*, M. S. Thesis, July 1994. (Defended in my absence with R. Shock chairing the examination committee.)
- David G. Ferguson, *Object-Oriented Design of Data Communications Software in Ada*, M. S. Thesis, June 1993.
- Yain Miou Chen, *Translation of Detailed CaseDL Designs into Programs in C*, M.S. Thesis, Dec 1988.
- Himanshu Rawell, *A Model Example Catalog of Reusable Software Components*, M.S. Thesis, Dec 1988.
- Joy Kung, *A Design of CaseDL Interpreter Expressed in CaseDL*, M.S. Thesis, Dec 1988.
- Bo Liu, *GWEB: A Generalization of Knuth's WEB System*, M.S. Thesis, Dec 1988.
- Kan Zhao, *The Integration and Enhancement of **make** into a Development Environment*, M.S. Thesis, Dec 1988.
- Ilies Bougambouz, *Evaluation of Generalized Breakpoint Expressions*, M.S. Thesis, Dec 1987.
- Kouakou Diby, *The Specification of the Unix Symbolic Debugger dbx*, M.S. Thesis, January 1987.
- Joseph Warzecha, *Towards Device Independent Generation of Data Structure Diagrams*, M.S. Thesis, January 1987.

- Mohamed Boumaza, *Breakpoint Expression Editor*, M.S. Thesis, August 1986.
- Ravi Manghirmilani, *On A Semantic Approach to Recursive Algorithms and Limited Problem Domain Verification Decidability*, M.S. Thesis, August 1985.
- Fransisco Ojeda, *DDS: A Subsystem for Displaying Data Structures for Interactive Debugging*, M.S. Thesis, August 1985.
- Yoshiharu Kato, *An Inexpensive Workstation Environment Based on Editing*, M.S. Thesis, August 1985.
- Charles Heller, *A Compiler for a Second Generation Assembly Language for the Intel 8086*, M.S. Thesis, Jan 1984.
- Jay Patel, *The Design and Implementation of a Language that Clings to the Architecture of 68000*, M.S. project, Jan 1984.
- Joxan Jaffar, *A Calculus of Array Segments*, M.S. Thesis, University of Melbourne, Dec 1980.

Research Interests

I am interested in technical aspects of software engineering, computer drawings, graph algorithms, distributed systems, network firewalls, and programming language design. My current work is aimed towards constructing a computer-aided environment for the precision design of software.

Research Grants

- *Laboratory-Based Courses on Firewalls and Internet Security*, Proposal Number: 99-226-10, NSF CCLI DUE-9951380, \$69,114. WSU Account 664089, Prabhaker Mateti (PI), Wright State University.
- *Microsoft Instructional Grant*, Microsoft, 1997, \$48,207, (Visual J++/Office 97 / Windows NT), principal investigator: Thirunarayan Krishnaprasad; co-investigators: P. Bergstein, P. Mateti, K. Meyer, and S. Narayanan.
- *A Flexible User Interface for the Manufacturable Mechanical Design of Agitators*, Chemineer, Inc., Dayton, \$4,135, 1996, WSU Account Number 663214, principal investigator: Mateti.
- *Transformations of Drawings among Different Graphics Standards*, Modern Technology Corporation (Dayton), \$30,400, 1990, WSU Account Number 661582, principal investigator: Mateti.
- *Precision Design of Software*, IBM Shared University Research program, \$297K for Jan 87–Dec 88, Case Western Reserve University Acct No 342-5916, principal investigator: Mateti.
- *A Calculus of Data Abstraction Models*, \$93K, NSF, 1983-85, MCS83-03140, principal investigator: Mateti.
- *Implementation of al:0 and microEmacs*, \$8,000 in equipment, Intel, 1985.
- *Portable Operating Systems*, Australian Grants Commission, #F7815426 I, principal investigators: Poole, Mateti, McDonnell.

Software Design Environments

I am currently building a *design environment*, called DOME. This environment will facilitate not only the process of design, but also the manipulation of the resulting designs. Designs are expressed in $\hat{O}M$. It will contain limited domain theorem provers to facilitate qualitative analysis, design knowledge bases to guide ongoing process of design, and visually oriented debuggers and test generators that can profitably use the abstract views as found in designs. To date, over a dozen MS theses, and three PhD dissertations (two under my direction) have been produced on this project.

- Amitava Datta, *Automated Adaptations of Programs*, Ph. D. Dissertation, Wright State U, June 92.
- Kouakou Diby, *Foundations of Hierarchical Design Methods for Software*, Ph. D. Dissertation, Wright State U, June 90.
- Kan Zhao, *The Integration and Enhancement of **make** into a Development Environment*, M.S. thesis, Case Western Reserve University, 1988.
- Yoshiharu Kato, *An Inexpensive Workstation Environment Based on Editing*, M.S. thesis, Case Western Reserve University, August 1985.
- Himanshu Rawell, *A Model Example Catalog of Reusable Software Components*, M.S. thesis, Case Western Reserve University, Dec 1988.
- Bo Liu, *GWEB: A Generalization of Knuth's WEB System*, M.S. thesis, Case Western Reserve University, Dec 1988.
- Bougambouz, *Evaluation of Generalized Breakpoint Expressions*, M.S. thesis, Case Western Reserve University, Dec 1987.
- Kouakou Diby, *The Specification of the Unix Symbolic Debugger dbx*, M.S. thesis, Case Western Reserve University, January 1987.
- Mohamed Boumaza, *Breakpoint Expression Editor*, M.S. thesis, Case Western Reserve University, August 1986.

Formal Methods in Software Engineering

Work on DÔME focusses on developing formal specifications and correctness proofs of realistic, but still rather small, programs with computer support essential for the application of formal methods to be fruitful in practice.

- Mateti, P., “A Specification Schema for Indenting Programs,” *Software – Practice and Experience*, Vol.13, 163–179, 1983. (Reprinted in *Software Specification Techniques*, McGettrick and Gehani (Eds.), Addison-Wesley 1986.)
- Mateti, P., and Joxan Jaffar, “The Correctness Proof of an Indenting Program,” *Software – Practice and Experience*, Vol. 13, 199–226, 1983.
- William A. Slough, and P. Mateti, “Functional Specifications of a Hierarchical File System,” *Fifteenth Hawaii International Conference on System Sciences*, 210–217, Jan 1982.
- Mateti, P., and Frances Hunt, “Precision Descriptions of Software Designs: An Example,” *IEEE compsoc85*, 130–136, Oct 1985.
- Kouakou Diby, Amitava Datta, Frances Hunt, Fuyau Lin, and P. Mateti, “A Catalog of Examples in ÔM”, 67 pp., CWRU Technical Report CES-88-03, Mar 1988.
- Kouakou Diby, *Foundations of Hierarchical Design Methods for Software*, Ph. D. Dissertation, Wright State U, June 90.
- P. Mateti, Kouakou Diby, and Amitava Datta, “A Perspective on Z, VDM, and ÔM,” pp. 35, Technical Report WSU-CS-90-09.
- P. Mateti and Kouakou Diby, “Design Documentation of Knuth’s Solution to the *Common Words Problem*”, 42pp, Technical Report WSU-CS-90-08.
- Kouakou Diby and P. Mateti, “A Rigorous Treatment of Stepwise Refinement,” *10th Tunisian-French Seminar of Computer Science*, pp. 16, May 1989.
- Research Grant, *Precision Design of Software*, IBM Shared University Research program, \$297K cash, \$35K in equipment for Jan 87–Dec 88, principal investigator: Mateti.

Limited Domain Theorem Proving

In the formal verification of programs from a rather limited domain of problems, the mathematical theorems that need to be proven have such properties that decision procedures can be devised for them. [Mateti 81] work is considered original in this area. We wished to extend our method of using closure and local implication rules to a wider class of problems than the small subset of sorting domain that we proved decidable. We have extended this to include Shell-sort also.

- Mateti, P., “A Decision Procedure for the Correctness of a Class of Programs,” *Journal of ACM*, Vol. 28, No.2, 215–232, April 1981.
- Joxan Jaffar, *A Calculus of Array Segments*, M.S. thesis, University of Melbourne, Dec 1980.
- Ravi Manghirmalani, *On A Semantic Approach to Recursive Algorithms and Limited Problem Domain Verification Decidability*, M.S.thesis, Case Western Reserve University, August 1985.

Transformations

I have studied algorithms that destructively traverse data structures, while returning it to original state before they are done. We developed the semantic notion of ”abstract equivalence” which is important for such an understanding of recursion. We demonstrated by a series of program transformations the presence of in situ stacks in Morris’ tree traversal algorithm, the Towers of Hanoi problem and the generalized list marking algorithms. I am presently developing a high-level language to express parse-tree based transformations.

- Mateti, P and James M. Boyle, “Semantics and Proofs of Transformations of Parse Trees,” pp30, working paper. Work done while visiting Argonne National Laboratory.
- Mateti, P., and Ravi Manghirmalani, “Morris’ Tree Traversal Algorithm Reconsidered,” *Science of Computer Programming*, Vol. 11, 29–43, 1988.

- Mateti, P., “A Derivation of an Iterative Solution to the Towers of Hanoi Problem,” pp. 9, May 1989. Unpublished.
- Research Grant, *A Calculus of Data Abstraction Models*, \$ 93K, NSF, 1983-85, MCS83-03140, principal investigator: Mateti.

Language Design

The design of a design specification language, called $\hat{O}M$, is an on-going task. $\hat{O}M$ gracefully merges functional programming concepts with predicative concepts.

- Mateti, P., “ $\hat{O}M$: A Design Specification Language,” 45 pp., Technical Report WSU-CS-90-07, Jan 1990.
- Mateti, P., Frances Hunt, Amitava Datta, Kouakou Diby, Fuyau Lin, “An Evaluation of Ada Oriented Design Languages”, 81 pp., CWRU Technical Report CES-88-02, Feb 1988. A condensed version of the report appears in *6th Annual National Conference on Ada Technology*, March 1988.
- Mateti, P., “Pascal Versus C : A Subjective Comparison,” Springer-Verlag’s *Lecture Notes in Computer Science*, Vol. 79, 37–69. (Also reprinted in *Comparing and Assessing Programming Languages: Ada, C and Pascal*, Prentice-Hall 1984.)
- Mateti, P., and Heller, Charles, “al:=0 for 8086 ::= A Machine-Level Language for Intel 8086”, 60 pp., CWRU Technical Report CES-83-08, June 1983.
- Charles Heller, *A Compiler for a Second Generation Assembly Language for the Intel 8086*, M.S. thesis, Case Western Reserve University, Jan 1984.
- Jay Patel, *The Design and Implementation of a Language that Clings to the Architecture of 68000*, M.S. project, Case Western Reserve University, Jan 1984.
- Joy Kung, *A Design of $\hat{O}M$ Interpreter*, M.S. thesis, Case Western Reserve University, Dec 1988.

- Yain Miou Chen, *Translation of Detailed ÔM Designs into Programs in C*, M.S. thesis, Case Western Reserve University, Dec 1988.

Automated Drawings

Even though diagrams are used widely in all areas of design, and specifically in programming, only a few papers consider the systematic drawing of them, and address topics such as (1) what makes the displays look pleasant or unpleasant, (2) how to draw diagrams aesthetically and automatically, (3) how do diagrams affect our productivity. We have done good work towards automating the drawing of data structures.

- Chen Ding, *A Formal Framework and a Prototype System for Drawing Conceptual Line Diagrams*, Ph. D. Dissertation under my direction, Case Western Reserve University, 23 August 90.
- Chen Ding and P. Mateti, “A Framework for the Automated Drawing of Data Structure Diagrams,” *IEEE Transactions on Software Engineering*, Vol. 16, No. 5, May 1990, 543–557.
- P. Mateti and Chen Ding “Aesthetic Rules in the Diagrams of Linked Data Structures,” *SEKE 90: Second International Conference on Software Engineering and Knowledge Engineering*, Skokie, IL, June 90.
- Chen Ding and P. Mateti, “The Architecture of a Prototype System for Drawing Data Structures,” *EUROGRAPHICS 90*. Montreaux, Switzerland, Sept 1990.
- Mateti, P., and Gerald M. Radack, “Automated Drawing of Data Structure Diagrams,” *4th Annual National Conference on Ada Technology*, March 1986, 165–172.
- Mateti, P., and Gerald M. Radack, “Integrating Data Structure Diagrams into Source Level Debuggers,” (abstract), *Fourteenth Annual Computer Science Conference*, February 1986, p. 407.
- Mateti, P and Narsingh Deo, “On Algorithms for Enumerating all Circuits of a Graph,” *SIAM Journal on Computing*, Vol. 5, 90–99, March 1976.

- Joseph Warzecha, *Towards Device Independent Generation of Data Structure Diagrams*, M.S. thesis, January 1987.
- Fransisco Ojeda, *DDS: A Subsystem for Displaying Data Structures for Interactive Debugging*, M.S. thesis, August 1985.

Software Developed

I have developed the following software practicing the software engineering and formal methods principles that I preach.

Guläm

Guläm is a command line interpreter. The Atari ST (an MC68000-based personal computer) version was released as a non-profit distribution to the public in 1987. It is now kept in all the anonymous FTP archives for that machine. It is in daily use by thousands. It integrated an Emacs-like editor, command line history, etc. into a very compact program. These features are now common-place in modern shells.

a1 := 0

This is a programming language clinging to the native instruction set of a CPU. I developed two similar looking languages: `a1 := 0` for MC68000, and `a1 := 0` for i8086. My students Chuck Heller, and Jay Patel developed compilers for these.

Indent

`Indent` is a pretty-printer for Pascal source code. It was in wide use because of its speed, and compactness. It also happens to be a proven-correct program (see my Publications).

DOME

DOME is a computer-aided design environment for software based on formal methods. This is an on-going project at present.

Courses Taught

- Introduction to Java Technology
- Object Oriented Programming
- Software Engineering
- Design Methodology
- Software Design Environments
- Senior Capstone Design Projects
- Precise Specifications
- Formal Methods in Software Engineering

- Programming Language Design
- Programming Language Concepts
- Data Structures
- Distributed Computing
- Operating Systems
- Concurrent Software Design
- Systems Programming
- Assembly Language Programming

- Freshman Computer Science

Professional Society Affiliations

Senior Member, IEEE and IEEE Computer Society
Association for Computing Machinery (ACM)

Service

Panelist, NSF Graduate Research Fellowships Program, 1999-2002.

Panelist, NSF DUE CCLI.

I have refereed for IEEE Transactions on Software Engineering, JACM, SIAM J Computing, Information Processing Letters, and various conferences. I have also served as manuscript reviewer for book publishers.