

# Keith Evan Schubert

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## 1 Education

- 2003                    University of California, Santa Barbara  
Ph.D. Electrical and Computer Engineering, Control Systems  
Minors: Applied Mathematics and Signals and Communication  
Dissertation: A New Look at Estimation
- 1992                    University of California, Los Angeles  
MS Electrical Engineering, Control Systems  
Minors: Applied Mathematics and Digital Signal Processing  
Project: Guidance and Control of Amateur Rockets
- 1991                    University of Redlands  
BS General Engineering  
Minor: Mathematics  
Project: Solar Desalination  
Honors: Dean's List (multiple times), Cum Laude

## 2 Experience

- 2006-present        Associate Professor of Computer Science  
2002-2006            Assistant Professor of Computer Science  
California State University, San Bernardino

I was hired at CSUSB to start the computer engineering program, which was approved by the chancellor's office spring 2006 and began Fall 2007. We currently have around 100 students and are getting an IEEE student chapter started. I have been responsible for the program design, the development of four new courses for the program, co-designed a fifth course for new computer engineering degree, writing the proposal to the chancellor, all paperwork, coordinating involved departments, getting development funding, comparing the proposed curriculum to the latest ABET standards, meeting with ABET evaluators, leading meetings, and working with local community colleges and corporations. Additionally, I have benchmarked the proposed curriculum against respected accredited programs at other universities to ensure that the final program is of the highest quality. Further, I have gone to the University of Texas at El Paso as a Hispanic Serving Institution with similar demographics, to get feedback and advice from its faculty. I was Co-PI and primary writer for the \$96k NSF Department Level Reform of Engineering grant, which supported the necessary studies, faculty time, and travel. The program I have started is the first new engineering program at a CSU that did not have an engineering program already in over 20 years.

My research is in the areas of robust estimation, numerical computation, simulation, parallel computation, and bio-medical applications. I have 20 peer reviewed conference and journal papers as well as numerous presentations and invited talks. I am the organizer of the student section of the IEEE/NASA JPL conference, Space Mission Challenges for Information Technology, and I am a visiting scientist for NASA Ames Spaceward Bound project. In grants I have received 9 grants totaling over \$800,000 in the last 5 years, from NSF, NIH, NASA and local companies. I have advised over 20 master's students in their projects and thesis. I have advised 10 undergraduate students in research activities and regularly meet with a fourth of our undergraduates for academic advising.

I have also been championing bioinformatics for the past several years and have been the lead faculty on the new BS in bioinformatics degree, which was approved by the chancellor and will begin next fall. This has involved me designing two new courses in bioinformatics. I have also been instrumental in the design of the new game programming degree and assisted with the design of four new courses to support it.

Courses I have designed and taught at California State University, San Bernardino:

**Phys 152** Introduction to Engineering Design.

**CSCI 303** Computer Engineering Design.

**CS 535** Numerical Computation.

**CS 595** Digital Imaging Independent Study.

**CS 595** Robotics Independent Study.

**CS 635** Numerical Algorithms and Simulation.

**CS 695** Signals and Estimation Independent Study.

Courses I taught at California State University, San Bernardino:

**CS 310** Digital Logic.

**CS 313** Machine Organization.

**CS 401** Contemporary Computer Architecture.

**CS 431** Algorithm Analysis.

**CS 488** Ethics and the Computing Professional.

**CS 510** Advanced Computer Architecture.

**CS 565** Systems Programming.

**CS 598** Foundations in Computer Architecture.

**CS 610** Modern Computer Architecture.

Courses I have designed for new programs but have not yet taught at California State University, San Bernardino:

**CSCI 311** Advanced Digital Design.

**CSCI 403** Circuit Design.

**CSCI 521** FPGA Design.

**CSCI 550** Advanced Bioinformatics I: Sequence Analysis.

**CSCI 551** Advanced Bioinformatics II: Numerics and Simulation.

2000 - 2002

Visiting Assistant Professor of Mathematics and Computer Science  
University of Redlands

I taught three to four courses per semester and designed two new courses: a community service course and a math for teachers course. The community service course was for mathematics and science students and involved web based math tutoring of K-12 students through the web service Dr. Math, which I have been a member of since 1996. This course was very successful and was written up in the Redlands Daily Facts. I also created a math for teachers course, which involved looking at real math in cultural context such as: fractals in Africa, base conversion and division from Babylon, magic squares and geometry in China, as well as logic puzzles and game theory from various cultures. Responsible for all areas of courses taught, including textbook selection, syllabus, lesson planning, grading, testing, and holding office hours. Integrated problem based learning into curriculum, and designed labs to further explore concepts. Assisted other professors in department with computer needs. Participated in faculty assemblies and retreats.

Courses I taught at the University of Redlands:

**CS 101** Introduction to Computers.

**CS 110** Introduction to Programming with C++.

**CS 111** Data, File Structures, and OOP with C++.

**CS 221** Exploring Visual Basic.

**CS 222** Programming for the World Wide Web.

**CS 240** Theory of Computation.

**CSLC 380** Making House Calls with Dr. Math. (Designed)

**LBST 265E** EthnoMathematics.

**Math 41** Pre-Calculus.

**Math 100** Math for Liberal Arts.

**Math 121** Calculus I.

**Math 334** Numerical Analysis.

- 2000-2004 Vice President of Engineering  
Synergistix Scientific LLC  
Directed company goals and activities as a board member of a startup LLC until it was acquired. Oversaw technical aspects of fire tracking equipment, such as detectors, encoders, reliability, communication systems, and visualization. Design estimation algorithms for fire detection equipment.
- 1997-2000 Graduate Student Researcher  
University of California, Santa Barbara  
Pursued various research topics in estimation theory and application. Solved degenerate case of the optimistic bounded errors-in-variables problem (also called the degenerate minmin problem) and the minimum backward error estimator problem. Assisted in development of various column and row partitioning of estimators like the bounded errors-in-variables (also called minmax estimator). Additionally, I have worked on applications of estimation theory to problems such as oil exploration, imaging, radar tracking, and identification. Current research interests include fast numerically stable solvers for estimation problems, exploiting matrix structure in solution techniques, application of robust estimation theory, and modeling and simulation of systems.
- 1997-2000 Grader  
University of California, Santa Barbara  
Graded homework assignments for graduate and undergraduate courses in controls and signal processing areas, proctored and graded exams, helped students with homework questions, led class while professors were away, and assisted professors in assigning grades. I have graded for: ECE 147B: Digital Control Systems - Theory and Design, ECE 210: Matrix Analysis and Computation, ECE 234: Analysis of Linear Models, ECE 240A: Optimal Estimation and Filtering, and ECE 248: Kalman Filtering.
- 1996-1997, 2000 Teaching Assistant  
University of California, Santa Barbara  
Taught discussion sessions for upper division courses on continuous and discrete time signals and systems, as well as the Engineering Department course on linear algebra. Held regular office hours to help students with homework and classroom comprehension. The course titles are: ECE 130A, B, C: Signal Analysis and Processing.  
Taught discussion sessions for upper division course on linear algebra (ECE 130C: Signal Analysis and Processing), by special request of professor.
- 1996-present Engineering and Computer Consultant  
Various Companies  
Engineering study and subsequent design of robotic golf caddie, integrated CAD-CAM facilities for biomedical manufacturer, designed and set up network connectivity for small firms, installed and integrated web servers for a large desktop publishing firm, and designed frame stiffening kit for Atlantic series race cars.

1993-1997	Associate Design Engineer Northrop Grumman System administration of HP/UX and Sun LAN at multiple sites, capacity planning, network design, vendor liaison, tuning and diagnosis, application configuration and user support, interdepartmental consultation and assistance. Taught courses on Kalman Filtering to engineers and lab personnel.
1992-1993	Assistant Design Engineer Grumman Aircraft Engineer on several F14 A/B Upgrade projects. System configuration, software support, and employee training for CAD system running on UNIX workstations.
Summer 1990,1991	Engineering Intern  Greer-McGuire Enterprises Responsibilities included CAD and manual drafting, preparation of materials lists, design of furnace parts and layout, system maintenance and installation, and providing informal training and assistance to designers.
1990-1991	Digital and Electronics Lab Assistant University of Redlands Helped students design and debug circuits and software controllers. Handled lab instruction. Maintained UNIX and Macintosh computer systems, wrote lab assistant's manual. Maintained inventory of parts and safety check of equipment. The courses included: Engr 151: Electronics, and Engr 152: Digital Systems Design.
1988-1989	Math, Science, and Engineering Tutor University of Redlands Tutored both individual students and groups in Physics, Chemistry, Calculus, Statics and Dynamics, and Mechanics of Solids as needed. Helped most students raise grades two letter categories on Physics tests. Tutor of Year 1988-89. Courses tutored: Phys 61,62: General Physics I&II, Chem 51,52: General Chemistry, Chem 61,62: Advanced General Chemistry, Engr 130: Mechanics, Engr 133: Mechanics of Solids, and Math 105,106,107: Analytic Geometry and Calculus I,II,III.
1986-1987	Assistant to Math Department Head Haddonfield School District Fabricated network cables, installed ROMs, and created software inventory.

### 3 Memberships and Honors

#### License

- Engineer In Training (EIT) License Number XE079701 (first half of PE License)

Member of

- IEEE
- IEEE Controls society
- IEEE Computer society
- SIAM
- Bioinformatics Organization, Inc.
- International Association of Engineers

Honors

- Erdős Number of 3.
- National Science Honorary Mention (graduate scholarship program)
- Two perfect scores on the GRE
- Tutor of the Year, University of Redlands 1988-89
- Trustee Scholar, 1987-1991
- William M. Porter Scholar 1989-1991
- Neumelar Scholar (1987)

Activities

- Member of the NASA Cal Space Grant for CSUSB.
- University of Redlands Engineering Club Member 1987-91
  - Vice-president 1990-1991
  - Secretary/Treasurer 1989-1990
- Senior Design Project President
- Circle K (Kiwanis International college service club) Member 1989-91

## 4 Grants

I have been part of over \$800k in funded grants.

1. Received \$10,000 NIH grant for research in parallellizing proton computed tomography reconstruction algorithms for graphics processors. I was the PI on this grant.
2. Received \$118,000 NSF grant for research into bioinformatics/bioimaging in conjunction with UCSB Bioimaging ITR. I am the PI on this grant.

3. Received \$15,000 NASA grant for research into reducing latency in cluster communications. I was the PI on this grant.
4. Received \$5,000 NASA grant for continuing research into reducing latency in cluster communications. I am the PI on this grant.
5. Received \$500,000 NSF grant for student scholarships. I am a Co-PI on this grant.
6. Received \$96,000 NSF grant for design of Computer Engineering program, titled PACE<sup>3</sup>. I was a Co-PI on this grant.
7. Received two grants totaling \$52,000 dollars from Synergistix Scientific, LLC to investigate differential imaging for automated surveillance. I was PI on these grants.
8. Received Collaboration through Team Teaching grant (\$5,000 CSUSB internal grant) with Kay Zemoudeh to redesign CSCI 310 labs and buy new components. Donated release time to department to help ease budget difficulties. There was no PI for this internal grant.

## 5 Publications

### 5.1 Peer-Reviewed Journals

1. R. W. Schulte, S. N. Penfold, J. T. Tafas, K. E. Schubert, "A maximum likelihood proton path formalism for application in proton computed tomography", accepted J. Medical Physics, 2008.
2. S. Chandrasekaran, M. Gu, A. H. Sayed, and K. E. Schubert, "The Degenerate Bounded Errors-In-Variables Model", SIMAX, 23(1):138-166, 2001.

### 5.2 Conference Invited Talk/Speaker

1. E. Gomez, R. Ruttimann, and K.E. Schubert, "Challenges and Advantages in Using Open Source Components" at the International Conference on Computer Science and its Applications, 2006.

### 5.3 Peer-Reviewed Conferences

1. S. N. Penfold, R. W. Schulte, Y. Censor, V. Bashkirov, S. Macallister, K. E. Schubert, and A. B. Rozenfeld, "Block-Iterative and String-Averaging Projection Algorithms in Proton Computed Tomography Image Reconstruction", The Huangguoshu International Interdisciplinary Conference on Biomedical Mathematics - Promising Directions in Imaging, Therapy Planning and Inverse Problems, 2008.

2. V. Bashkirov, R. Schulte, G. Coutrakon, B. Erdelyi, K. Wong, H. Sadrozinski, S. Penfold, A. Rosenfeld, S. McAllister, and K. Schubert, "Development of proton computed tomography for applications in proton therapy", CAARI Conf. Rec., 2008.
3. T.S. Lee, K.E. Schubert, R. Schulte, "Computational Algorithm for Modeling and Correction of Gradient Nonlinearity Distortions in Magnetic Resonance Imaging" in Transactions of the World Congress on Engineering and Computer Science - International Conference on Computer Science and Applications, 2008.
4. J. Curnutt, E. Gomez, K.E. Schubert, "Patterned Growth in Extreme Environments" in Bioastronomy-2007.
5. Fadi Shihadeh, Reinhard Schulte, Keith Schubert, and Pani Chakrapani, "Performance Analysis of an Optoelectronic Localization System for Monitoring Brain Lesioning with Proton Beams" in 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2007 (EMBS 2007), pages 4693 - 4698, IEEE, 2007.
6. T.S. Lee, K.E. Schubert, and R.W. Schulte MD, "Gradient Non-Linearity Correction of MR Images for Functional Radiosurgery", in N. Ishii and R. Lee, editors, *Proceedings of the 5<sup>th</sup> IEEE/ACIS International Conference on Computer and Information Science*, pages 338-343, IEEE, Los Alamitos, CA, 2006.
7. T.S. Lee, K.E. Schubert, and R.W. Schulte MD, "Software Development For Correction Of Gradient-Nonlinearity Distortions In MR Images", in P.P. Dey, M.N. Amin, and T.M. Gattton, editors, *Proceedings of the International Conference on Computer Science and its Applications*, pages 275-279, US Education Service, San Diego, 2006.
8. R. Cai, J. Curnutt, E. Gomez, G. Kaymaz, T. Kleffel, K. Schubert, and J. Tafas, "A Scalable Distributed Datastore for BioImaging", in P.P. Dey, M.N. Amin, and T.M. Gattton, editors, *Proceedings of the International Conference on Computer Science and its Applications*, pages 11-14, US Education Service, San Diego, 2006.
9. E. Gomez, Y. Karant, K.E. Schubert, "Multiple Column Partitioned Min Max", in P.P. Dey, M.N. Amin, and T.M. Gattton, editors, *Proceedings of the International Conference on Computer Science and its Applications*, pages 1-7, US Education Service, San Diego, 2005.
10. E. Gomez, Y. Karant, K.E. Schubert, "Preventing Deadlock with Dynamic Message Scheduling", in H. Selvaraj and V. Muthukumar, editors, *Proceedings of the 18<sup>th</sup> International Conference on Systems Engineering*, pages 52-57, IEEE, Los Alamitos, Ca, 2005.

11. E. Gomez, Y. Karant, V. Malkoc, M. R. Neupane, K. E. Schubert, R. W. Schulte MD, "Orthogonal and Least-Squares Based Coordinate Transforms for Optical Alignment Verification in Radiosurgery", Proceedings ITCC 2005.
12. E. Gomez, Y. Karant, K.E. Schubert, "When e Is Really II", in P.P. Dey, M.N. Amin, and T.M. Gattton, editors, *Proceedings of the International Conference on Computer Science and its Applications*, pages 341-344, US Education Service, San Diego, 2004.
13. S. Faruqui, E. Gomez, Y. Karant, K.E. Schubert, "A Model for Assessing and Certifying the Resource Capabilities of Utility Computing Resource Centers", in P.P. Dey, M.N. Amin, and T.M. Gattton, editors, *Proceedings of the International Conference on Computer Science and its Applications*, pages 327-332, US Education Service, San Diego, 2004.
14. S. Chandrasekaran, E. Gomez, Y. Karant, K.E. Schubert, "Backward Error Estimation", in *Proceedings of the Hawaii International Conference on Computer Science*, pages 326-338, Honolulu, Hawaii, 2004.
15. E. Gomez, Y. Karant, K. E. Schubert, "Preventing Deadlock with Dynamic Message Scheduling", in *Proceedings of the Hawaii International Conference on Computer Science*, pages 122-140, Honolulu, Hawaii, 2004.
16. E. Gomez, Y. Karant, K. E. Schubert, "An Analytical Model for Network Flow Analysis", in *Proceedings of the Hawaii International Conference on Computer Science*, pages 289-295, Honolulu, Hawaii, 2004.
17. S. Chandrasekaran and K. E. Schubert, "Models for Robust Estimation and Identification", in P.P. Dey, M.N. Amin, and T.M. Gattton, editors, *Proceedings of the International Conference on Computer Science and its Applications*, pages 273-279, US Education Service, San Diego, 2003.)
18. S. Chandrasekaran and K. E. Schubert, "Models for Robust Estimation and Identification", in S. Van Huffel and P. Lemmerling, editors, *Total Least Squares and Errors-In-Variables Modeling*, pages 199-208, Kluwer Academic Publishers, Dordrecht, 2001.

#### 5.4 Selected Presentations Without Papers

1. G. Kaymaz, D. Havey, K.E. Schubert "Localization of Network Nodes for Extra-Terrestrial Deployment" at IEEE/NASA-JPL Space Missions Challenges for Information Technology, 2006 (SMCIT-2006).
2. R. W. Schulte, R. P. Levy, T. S. Lee, M. Neupane, F. Shihadeh, D. Slusarczyk, K. E. Schubert, and J. D. Slater, "A System for Functional Proton Radiosurgery" at the International Meeting for Brain Mapping and Surgical Treatment Planning, 2005.

3. R. W. Schulte, R. P. Levy, M. F. Moyers, M. Neupane, K. E. Schubert, "Image-guided Alignment Verification with Submillimeter Precision for Functional Proton Radiosurgery" at the 2005 Annual Meeting of the American Society for Therapeutic Radiology and Oncology.
4. J. Curnutt, E. Gomez, Y. Karant, K.E. Schubert, "Analysis of Network Test Equipment Emulation and Measurement" at Hawaii International Conference on Computer Science.
5. K.E. Schubert "The Next Page of Kalman's Filter" for the Society of Physics Students at CSUSB.
6. K.E. Schubert "A Working Introduction to L<sup>A</sup>T<sub>E</sub>X" at CSUSB Computer Science Seminar.
7. K.E. Schubert "Hardware and Robotics" at CSUSB Computer Science Seminar.
8. K.E. Schubert "Backward Thinking: Confessions of a Numerical Analyst" at CSUSB Computer Science Seminar.
9. K.E. Schubert "How Do I Know the Answer If I'm Not Sure Of The Question: Putting Robustness into Estimation" at University of Redlands Seminar.

## 5.5 Book Contributions

1. The Math Forum Drexel University, "Dr. Math Gets You Ready for Algebra: Learning Pre-Algebra is Easy! Just Ask Dr. Math!", Jossey-Bass publishers, 2003.