

Contact Information:

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Faculty Resume

Clark Savage Turner

Education

- Ph.D.**, 1999, Information and Computer Science, University of California, Irvine
- Dissertation (Software Engineering): “*Software as Product: The Technical Challenges to Social Notions of Responsibility*”
- M.S.**, 1993, Information and Computer Science, University of California, Irvine
- J.D.**, 1986, University of Maine School of Law, Portland, ME.
- Thesis: “*Patentability of Algorithms*”
- M.A.**, 1981, Mathematics, Pennsylvania State University, University Park, PA.
- Project: “*Graphs and Embeddings*”
- B.S.**, *cum laude*, 1979, Mathematics, King’s College, Wilkes-Barre, PA.
- Delta Epsilon Sigma and Aquinas awards for academic excellence

Licensing

Licensed to practice law in three states: CA, NY and MA

Academic Experience

- 1999-present** California Polytechnic State University San Luis Obispo, CA
- **Professor**, Department of Computer Science
- 1990–1998** University of California, Irvine Irvine, CA
- **Lecturer**, upper division courses in computer science (1987, 91, 98)
 - **Research Assistant** in software engineering: testing, analysis, safety (1992-1998)
 - **Teaching Assistant** in a variety of computing courses (1986-87, 1990-93)
- 1983–1986** University of Southern Maine Portland, ME
- **Lecturer** in Mathematics and Computer Science (during tenure as law student)
- 1981–1982** Bowdoin College Brunswick, ME
- **Lecturer** in the Department of Mathematics
- 1981** King’s College Wilkes-Barre, PA
- **Lecturer** in the Department of Mathematics

Related Professional Experience

- 2003 – 2004** Software Forensics Consultant Los Osos, CA
- **Accident Consultant** involving medical linear accelerator in ongoing case
- 1996-1998** Private Attorney Irvine, CA
- **Consulting Attorney** for FCC and communications regulations issues
- 1992-1993** Irvine Safety Group Irvine, CA
- **Software Requirements Research Assistant** TCAS system for FAA
- 1988-1990** Bernard, Overton & Russell Law firm Albany, NY
- **Associate Attorney** with general commercial practice
- 1987-1988** Software Forensics Consultant Albany, NY
- **Software accident investigator** - Therac-25 medical linear accelerator cases

Research Abstract

Note that my research has three foci. My efforts are multidisciplinary to support a “systems view” of computing and software engineering in context: *social-legal*, *traditional engineering*, and *educational*.

1. **Software engineering** processes are inadequate to the task of producing **safe, reliable systems**. They always will be. This is not a new problem. However, software adds a new dimension to the problem because its unique nature renders much of the traditional engineering and legal wisdom inapplicable. Safety constraints for artifacts of engineering processes are derived from both engineering and social expectations. Judges and lawyers currently struggle to derive reasonable legal expectations with respect to the software artifact. Like the engineers, they have mainly the methods and tools based on models created for traditionally engineered artifacts. My research questions the adequacy of the basic engineering and legal models used to address software safety and products liability. Its goal is to build a rational model of software engineering responsibility. I have worked on 7 refereed conference papers to present results in this area since coming to Cal Poly. I find a lot of student interest in this research. In an offshoot of this work, “open source” issues are explored as a more effective means to debug design ideas where public safety is at issue. The work seeks to publically expose underlying design ideas in safety-critical software in a way that is analagous to the law of patent. We find that current law allowing copyright of the opaque executable and trade secret protection for the readable source code to be inadequate engineering practice and not in line with basic historical notions of the purpose of copyright. I have given a talk, co-authored a Technical Report and implemented the some of these ideas in the current Cal Poly Intellectual Property Policy.
2. I also work with **Small Satellite Communication Systems and Software**. The current trend to do more for less cost has led to interest in “Smaller, Cheaper, Faster, Better” missions. This becomes more practical with the rapid advance in miniaturization and decreased power consumption. Together with Jordi Puig-Suari (Aerospace, Cal Poly) and Bob Twiggs (Aerospace, Stanford), we have developed “CubeSat” standards for construction and launch of small satellites 4 inches on a side and less than 1 Kg in mass. We have developed a deployer mechanism (P-POD) based on these standards (patent applied for). Our CubeSat effort now involves a consortium of more than 15 other Universities who build to our standards and contract with us as integrator for launch (now scheduled for early 2005). The Lab at Cal Poly, built on our MDSTL grant, has become the center for integration testing of the CubeSats as well as the development base for our own satellite, PolySat. The lab has become a leader in many of the small satellite support issues plaguing developers. Research problems include wireless networking for constellations of CubeSats, ground systems to interface with CubeSats and embedded control software. I worked on 4 conference papers in this area and have generated about \$200,000 in grants as a co-PI with Jordi Puig-Suari.
3. I have interests in **Software Engineering Education**. I am a member of the software engineering committee that developed and obtained final approval for the first B.S. degree in Software Engineering in the state of California. I developed the first course in our Capstone sequence (Requirements Engineering) for Software Engineering majors. I have modified our Professional Responsibilities course to incorporate labs where technology is tightly integrated with the ethical and professional issues it often presents. I continue my involvement with the core Software Engineers at Cal Poly as we attempt to characterize and evaluate the effectiveness of our Capstone sequence, a course sequence unique in the world to Cal Poly. I’ve worked on 4 refereed conference papers in this area.

Grants and Research Funding

My funding efforts have been multidisciplinary in nature, joint with Prof. Puig-Suari in the Aerospace Engineering Department. They are aimed at creating the CubeSat laboratory in the ATL and continuing to support small satellite systems. I list the following successful grant proposals:

1. **\$33,116 “Development of Attitude Control Systems for Pico-Satellites,”** from C3RP under Dr. Opava’s ONR grant. Co-PI with Professor Jordi Puig-Suari of the Aerospace Dept. 2004.
2. **\$25,000 “Development of Launch Interfaces for the CubeSat Program,”** from C3RP under the ONR grant. Co-PI with Professor Puig-Suari of the Aerospace Department. 2002.
3. **\$150,000 “Multidisciplinary Space Technology Education at Cal Poly,”** California Space Flight Competitive Grants Program of the California Technology, Trade and Commerce Agency. Co-PI with Professor Puig-Suari of the Aerospace Department. 2001.
4. **Collaborator, NSF grant “Improving the Education of Software Testers”** funded and implemented by Cem Kaner at Florida Institute of Technology. 2001.

*currently working on a grant proposal for ultra reliable field communications for military use through C3RP.

Patents

1. **“CubeSat Spacecraft and Development Launcher System,”** Robert Twigg (Stanford), Jordi Puig-Suari (Cal Poly), Clark Turner (Cal Poly), Nov. 2000. Stanford University is pursuing the patent application.

Review and Referee

1. Springer Academic Publishers, reviews for *Software Quality Journal* 2004
2. International Association of Science and Technology for Development, conference paper reviews for Software Engineering and Applications conference, 2001-2002
3. International Society for Law and Technology, LawTech conference referee, 2000-2002.
4. Wiley and Sons, review and consulting regarding a proposed Ethics text, 2002

Publications

Peer Reviewed Conference publications:

1. Cumberland, **Turner**, *An Ad Hoc Evaluation of Workflow Modeling Tools*, Proceedings of the Eighth IASTED International Conference on Software Engineering and Applications, Cambridge, MA., Nov. 2004.
2. Nico, **Turner**, Nico, *Insecurity by Contract*, Proceedings of the Eighth IASTED International Conference on Software Engineering and Applications, Cambridge, MA., Nov. 2004.
3. **Turner**, Fisher, Stearns, *Learning Software Engineering by Doing: Progress Report on a Capstone Sequence Involving Student Managed Teams*, Proceedings of the 2004 American Society for Engineering Education Pacific Southwest Section Conference, University of the Pacific, Stockton, CA., Apr. 2004.
4. Khosmood, **Turner**, *Discovery in Negligence Analysis: Evolution of a Sufficiently Safe Spec*, Proceedings of the Seventh IASTED International Conference on Software Engineering and Applications (SEA 2003), Marina del Rey, CA. Nov. 2003
5. Nico, **Turner**, Kearns, *The Death of the Programmer?* Proceedings of the Seventh IASTED International Conference on Software Engineering and Applications (SEA 2003), Marina del Rey, CA., Nov. 2003.

6. Stearns, Dalbey, **Turner**, Kearns, *Report: A Capstone Project involving a Hundred Students, for an Industrial Partner,*” Proceedings of the International Conference on Engineering Education, Valencia, Spain, Jul. 2003.
7. Buttschardt, **Turner**, *Making a Case for Amateur Spectrum through Research, Education and Industry Cooperation,*” Proceedings of the Twentieth AMSAT-NA Space Symposium, Ft Worth, TX, Nov. 2002.
8. **Turner**, Fox, Richardson, *Strict Products Liability for Software Code Defects,* Proceedings of the Third International Conference on Law and Technology (ISLAT), Cambridge, MA. Nov. 2002.
9. Hatalsky, Corwin, and **Turner**, *The Modification Process: A Practical Means to Understand and Enhance the Software Requirements Engineering Process,* Proceedings of the Sixth IASTED International Conference on Software Engineering and Applications, Cambridge, MA., Nov. 2002.
10. **Turner**, Fox, *When Bad Code Comes From Good Specs,* Proceedings of the Sixth IASTED International Conference on Software Engineering and Applications, Cambridge, MA., Nov. 2002.
11. Puig-Suari, **Turner**, Twigg, *Cubesat: The Development and Launch Support Infrastructure for Eighteen Different Satellite Customers on One Launch,* 15th Annual AIAA/USU Small Satellite Conference, Logan, Utah., Aug. 2001.
12. **Turner**, Khosmood, *Rethinking Software Process: The Key to Negligence Liability,* Proceedings of the Fifth IASTED International Conference on Software Engineering and Applications, Anaheim, CA., Aug. 2001.
13. Stearns, Meldal, **Turner**, *Ten Pounds in a Five Pound Sack: Providing Undergraduate Software Engineering Students with Technical Management Experience,* International Conference on Engineering Education, Oslo, Norway, Aug. 2001.
14. Puig-Suari, **Turner**, Ahlgren, *Development of the Standard CubeSat Deployer and a CubeSat Class Picosatellite,* IEEE Aerospace Conference, Big Sky, MT., 2001.
15. **Turner**, Richardson, *Software and Strict Products Liability: Technical Challenges to Legal Notions of Responsibility,* Proceedings of the IASTED International Conference on Law and Technology, San Francisco, CA., Oct. 2000.
16. Puig-Suari, Schoos, **Turner**, Wagner, Connolly, Block, *CubeSat Developments at Cal Poly: The Standard Deployer and PolySat,*” Proceedings of the 45th Annual meeting of SPIE, the International Society for Optical Engineering, San Diego, CA., Jul. 2000.
17. **Turner**, Richardson, King, *Legal Sufficiency of Testing Processes,* Proceedings of the 15th International Conference on Computer Safety, Reliability and Security (SAFECOMP '96), Vienna, Austria, Oct. 1996.

Journal publications:

18. **Turner**, *Risk Management for Safety-Critical Software: A Unique Problem on the Horizon,* The Technology Report, A Publication of the Technology Section of the Academy of Legal Studies in Business, Spring/Summer, 2001.
19. Leveson and **Turner**, *An Investigation of the Therac-25 Accidents,* IEEE Computer, Vol. 26, no. 7, Jul, 1993. *Note: There have been numerous republication of “An Investigation of the Therac-25 Accidents” in compilations and textbooks.
20. Sganga, **Turner**, *Orange County Lawyer’s Salary Survey,* Orange County Lawyer, Sept. 1991.

Technical Reports:

21. Swann, **Turner**, *Executable Code is not the Proper Subject of Copyright Law*, Cal Poly State University Technical Report: CPSLO-CSC-04-02, 2004.
22. Nico, **Turner**, Kearns, *The Death of the Programmer?* Cal Poly State University Technical Report: CPSLO-CSC-02-01, 2002.
23. **Turner**, Richardson, *Software Defect Classes and No-fault Liability*, UCI-ICS Technical Report No. 99-17, Department of Information and Computer Science University of California, Irvine, CA. 92697-3425, 1999.
24. Leveson, **Turner**, *An Investigation of the Therac-25 Accidents*, UCI-ICS Technical Report No. 92-108, Department of Information and Computer Science, University of California, Irvine, CA. 1992.

Book chapter publication:

25. Kling and **Turner**, *The Information Labor Force*, published in Kling, Olin, Poster, Postsuburban California: The Transformation of Orange County Since World War II, UC Press, 1991.

Presentations

1. “Cal Poly – Industry Common Interests,” given to the SOFTEC industry group in Avila Beach, CA. Feb. 22, 2006.
2. “Learning by Doing: Amateur Radio as Part of a College Education in Satellite Development,” delivered to the West Coast Satellite Symposium (AMSAT) in San Mateo, CA., May 7 2005.
3. “Learning Software Engineering by Doing: Progress Report on a Capstone Sequence Involving Student Managed Teams,” delivered to the 2004 American Society for Engineering Education Conference, University of the Pacific, Stockton, CA., Apr. 2004
4. “How Programmers Should be Engineering Software,” joint with Dr. Phil Nico to the Cal Poly community sponsored by UPE Honor Society. Feb. 2004
5. “Copyright as Disincentive to Software Safety Analysis,” presentation to Cal Poly community sponsored by Cal Poly LUG. Feb. 2004.
6. “Underpinnings of Copyright, or, Life, Death and Copyright, Really!” a presentation for the Cal Poly Library Series on Feb. 13, 2003.
7. “Software and Strict Products Liability: Technical Challenges to Legal Notions of Responsibility,” a talk delivered to the IASTED International Conference on Law and Technology, San Francisco, CA., Oct. 2001.
8. “CubeSat Developments at Cal Poly: The Standard Deployer and PolySat,” Jordi Puig-Suari, Jeremy Schoos, Clark Turner, Tyler Wagner, Ryan Connolly, Richard Block, the 45th International Symposium on Optical Science and Technology, San Diego, CA., Jul. 2000.
9. “Legal and Economic Issues with Open Source Software,” a talk delivered to the Cal Poly Linux Users Group on Apr. 13, 2000.
10. “Software as Product: The Technical Challenge to Social Notions of Responsibility,” a Computer Science Colloquium, Cal Poly State University, San Luis Obispo, CA., Oct. 1999.
11. “When Ontogeny Inverts Phylogeny, Regulation in a Fully Connected World?” This panel discussion covered the implications of internet commerce; technology whose deployment preceded the chance to regulate it. The panel was held at the California Software Symposium (CSS ’98), sponsored by USC CSE and UCI IRUS, Irvine, CA; Oct. 1998.

12. "Liability for Safety-Critical Software Flaws" presented to the Bay Area Roundtable - Irvine Research Unit in Software (IRUS), in Palo Alto, CA. on Dec. 12, 1997.
13. Invited software engineering and law commentator during the ethics discussion at the meeting of the Southern California Software Process Improvement Network sponsored by the Irvine Research Unit in Software at the University of California, Irvine., Dec. 6, 1998.
14. "Legal Sufficiency of Testing Processes" - presentation of our paper to the SAFECOMP '96 conference in Vienna, Austria on Oct. 21, 1996.
15. "The Software Process and Safety-Critical Testing," presentation to the Department of Computer Science at the Technical University of Vienna, Vienna, Austria on Oct. 17, 1996.
16. **Invited Keynote** speaker on the Legal Sufficiency of Software Testing Processes at the 9th International Software Quality Week conference, San Francisco, May 24, 1996.

Workshops and other Continuing Education

1. 2nd Annual CubeSat Developer's Workshop, Cal Poly, Apr. 2005.
2. "Grounding Student Retention and Recruitment in Computer Science Programs in Sound Research Methodology and Data: a CSU System-wide Workshop," Apr. 2004
3. 2004 West Coast Space Symposium, College of San Mateo, Apr. 2004
4. 1st Annual CubeSat Developer's Workshop, Cal Poly, Apr. 2004
5. Technical Work Group / Symposium, Storage Networking Industry Association, San Jose, Oct. 2002.
6. DARPA/NSF Study on Human-Robot Interaction (Invitation Only Workshop) at Cal Poly State University, Sept. 2001.
7. Java Test Development, SunTest / Irvine Research Unit in Software, Nov. 1996.

Poster Presentations

1. "Internalizing Risk: Making Risk Consideration a Routine Part of the Safety-Critical Software Process," California Software Symposium, (CSS '97), sponsored by IRUS and USC CSE, University of California, Irvine, Nov. 1997.
2. "Internalizing Risk: Making Risk Consideration a Routine Part of the Safety-Critical Software Process," 19th International Conference on Software Engineering (ICSE '97), Boston, MA. Mar. 1997.

Student Mentoring

A sample of recent Senior Projects supervised:

1. Noe, "Design and Implementation of the Communications Subsystem for the Cal Poly CP2 CubeSat System," (CPE, 2004) It involved design and implementation of a board, hardware and software, to implement the communications subsystem for the Cal Poly CubeSat. This senior project won the Accenture Scholarship award for outstanding senior project in CPE. He is planning an M.S. in Aerospace Engineering here at Cal Poly.
2. Swann, "Software and the Social Bargain." (CSC, 2004) This project develops a historical notion for the purpose of copyright and shows a mismatch in its implications for executable code. He now works at Microsoft Corporation.

A sample of recent Master's Theses supervised:

1. Pond, "RapidGUI.net: An online collaborative prototyping tool designed to facilitate communication between developer and end-user on early user-interface requirements," defended and submitted Spring 2004. This author explores some user-interface issues in distributed collaboration on software requirements work by building a prototype system to solve the problem. He took a job at Northrup-Grumman.

- Sosinski, "Electronic Voting Systems: A Requirements Analysis," defended and submitted Spring 2004. The author uses safety-critical analyses to show defects in Diebold's software requirements. He currently attends McGeorge School of Law in Sacramento.

Teaching philosophy

Teaching is my main interest. I enjoy working with students. I teach with the expectation of hard work, some frustration, synthesis and discovery. I will work with any student willing to develop the skills necessary to master the class material. The brightest of students often challenge me to make the course worth their time and effort. I encourage these students to go beyond the standard course material towards the goal of *systems level thinking*. After all, computers and software are mainly put to a specific purpose in some other problem domain.

I measure my teaching success by: (1) the success of my students in mastering the basic course material and (2) their ability to use the basic material to synthesize solutions to new problems.

I continue to encourage and facilitate undergraduate student research as a part of my own continuing work. I maintain a three pronged multidisciplinary research program: (1) in order to keep my teaching relevant to the state-of-the-art (and the systems nature of computing and software); and, (2) to enhance student learning by encouraging involvement in the more accessible aspects of my research.

Teaching Recognition

- Computer Science Teacher of the Year** awarded by Cal Poly Computer Science students (ACM) 2002.
- Nomination for "Distinguished Educator Award," CFA, 2002.
- Nomination by the Society for Women in Engineering for "Most Supportive Professor" Spring 2001.
- Professor of the Year** awarded by Cal Poly Computer Science students (ACM) 2000.

Sample Courses Taught, Created and Modified

- Requirements Engineering**, CPE 402
 - I developed the CPE 402 course in 2000 as part of our planned B.S. degree in Software Engineering at Cal Poly. Our program is now in place as the first B.S. in Software Engineering in the State of California
- Professional Responsibilities** (Computer and Software Ethics), CSC 300
 - Proposed (and the Dept. approved) a change to this the Professional Responsibilities course to introduce a "learning by doing" element to engineering ethics: a lab section where technology is tightly integrated into the ethics instruction. The modified course is listed in the new 2006-2008 catalog and will form the basis to write a textbook (no such textbook to accompany a Computer Ethics course with lab assignments exists as yet.)
- Graduate **Software Engineering I**, Software Requirements, CSC 508
- Graduate **Software Engineering II**, Software Design, CSC 509
- Basic **Software Engineering I**, CPE 205
- Object Oriented Programming** in Java, CPE 101

Courses below taught at other institutions prior to coming to Cal Poly:

- Software Tools and Methods**
- Structured Programming** in PASCAL
- Calculus**; differential, integral, multi-variate
- Introduction to **Probability and Statistics**
- Social Impacts of Computing**

Service Activities

Service to the University:

1. **CPIQ Board** (Cal Poly Innovation Quest), tasked as Cal Poly liaison with Cal Poly Innovation Quest, a nonprofit corporation designed to fund Cal Poly senior projects and master's theses with commercial potential. Summer 2004
2. **Intellectual Property committee** tasked with creation of a new Intellectual Property Policy for Cal Poly. **Chair** 2002-2004.
3. **California Space Day**, a day of meetings and discussions with California's elected representatives in Sacramento to explain the need for funding of space education projects. Spring 2002.

Service to the College of Engineering:

4. **CENG Project Center Task Force** tasked with creation of some of the design concepts for the Bonderson center. I represented CSC in this Task Force. 2001-2002.

Service to the Department of Computer Science:

5. **Graduate Committee** in the Department of Computer Science. 2004
6. **Colloquium Series** for the Department of Computer Science, Spring 2004
7. Faculty Advisor:
 - a. Cal Poly Linux Users Group 2000-2004
 - b. Cal Poly Amateur Radio Club 2000-2004
 - c. Graduate Student Association 2003.
8. **Software Engineering committee** in the Department of Computer Science. We developed the proposal for the B.S. program in Software Engineering that was approved and is now implemented at Cal Poly. 1999-2004.

Service to the community:

9. **FCC Amateur Radio License Instructor** on topics such as RF safety, basic theory of antennas and modulation / demodulation techniques for the Cal Poly Amateur Radio Club annual amateur radio licensing classes. 2002-2004.
10. **Conference session Chair, Software Requirements session / Software Design and Development** for the 2002, 2003 and 2004 Software Engineering and Applications conferences.
11. **Conference paper reviewer, Software Engineering and Applications** conference at several conferences 2000-2003.
12. **Invited speaker, TenayaHall panel discussion on Napster**, 2001.
13. **Board of Directors, Wesley Foundation**, an organization of the United Methodist Church that provides housing close to campus and activities for all Cal Poly (and other college) students in the San Luis Obispo area. 2001-2004

Professional Memberships

1. **IATED** (International Association of Science and Technology for Development)
2. **IEEE**, Institute for Electrical and Electronics Engineers
3. **ACM**, Association for Computing Machinery
4. **ASEE**, American Society for Engineering Education
5. **CPSR**, Computer Professionals for Social Responsibility
6. **EFF**, Electronic Frontier Foundation
7. **SNIA** , Storage Networking Industry Association (membership for University and students enhancing Software Engineering project access.)
8. **State Bar** Association of California (presently inactive)

Personal Interests

I have been an amateur radio operator since age 14. I hold an Amateur Extra Class license from the FCC. I build and repair radio transceivers as a hobby. I have been certified as a Volunteer Examiner and am qualified to give Amateur Radio License Examinations for the FCC. I am a proficient morse code operator and enjoy the practical aspects of worldwide shortwave communications. I like to run distances of 5 – 10 miles every day or two and enjoy local road races. I play guitar and mandolin and enjoy bluegrass music.