Danny Dig
Associate Professor at U of Colorado
Adjunct Professor at U of Illinois
Director PPI Center
danny.dig@colorado.edu
cell: 914-282-9355
web: http://danny.cs.colorado.edu

School of Computing
University of Utah

Nov 22nd, 2022

Dear Faculty Search Committee,

I am writing to apply for a tenure-track professorship at your department. I got a Ph.D. in Computer Science at the University of Illinois at Urbana-Champaign in 2007 and postdoc at MIT in 2008. Afterwards I held faculty positions at Illinois, OSU, and CU Boulder, and I've been tenured since 2016. I am the Founder and Director of the NSF IUCRC Center on Pervasive Personalized Intelligence (PPICenter.org) which advances the science and education on IoT systems. We launched in 2020 together with colleagues from two universities, industry members from several IoT verticals, and the NSF.

I got particularly interested in the position at Utah during my recent three visits to discover whether Utah can join us as a university site at the PPI Center. As I visited with faculty from the SoC, the dean's office, the president's office, and from industry in Utah, I fell in love with the vision for the FinTech Center, the leadership style, the values, the culture, and the lifestyle in Utah. I am impressed that the SoC has a long tradition of successful research in PL, a strong commitment to teaching, and a pioneer spirit towards grad and undergrad programs in Software Development. I want to continue this tradition.

I am attracted by Utah and SoC because of the opportunity of serving along and partnering with Utah faculty on several exciting initiatives. First, I am excited about President Randall's vision for FinTech that will bring together expertise from the SoC and the School of Business to provide unprecedented value for Utahns, create high-quality jobs, and make Utah known as the epicenter for FinTech. I plan to collaborate and be thinking partners with the faculty already working on this initiative and share my extensive experience of conducting discovery sessions with more than 100 C-level executives.

Second, I am excited about the prospect of launching together with faculty from SoC a new IUCRC site at Utah. Aligning the PPI Center with the strong research & faculty in SoC, there are tremendous synergies with the Systems group (e.g., POWDER with their testbed for smart connected IoT services and 5G – per discussions with Kobus Van der Merwe), Data Science (per discussions with Jeff Philips), the PL (per discussions with Ganesh Gopalakrishnan), Security, and the SCI Institute (with visualizations for various smart IoT verticals). Together, we can make the SoC an R&D partner for the vibrant high-tech industry in the Silicon Slopes, so that we bring additional value, beyond the workforce development.

Third, I am impressed about the pioneering spirit in education at Utah and the desire to align with the Utah Legislator to create software development degrees and certificates. I would like to be a thinking partner and contribute to (i) the growth of the Software Development degree that launched in Fall'22, (ii) the Master of Software Development program (per discussions with Matt Flatt).

Next I describe how my research, funding, and teaching experience enables me to be a partner and contribute to the great initiatives in the SoC. My research interests are in Software Engineering, with a focus on *interactive program transformations* that improve programmer productivity and software quality. I successfully pioneered interactive program transformations by opening the field of refactoring in cutting-edge domains including AI/ML, mobile, concurrency and parallelism, component-based, testing, and end-user programming. With my emphasis on interactive, performance-driven program transformations, my research allows me to serve as a bridge between the Utah's Formal Methods and Verification group , the HCI group, and the Scientific Computing group, while the PPI Center and the IUCRC Center affords synergies with other groups (e.g., POWDER, SCI, and Security).

I (co)-authored 60+ journal and conference papers that appeared in top places in SE, and according to Google Scholar have been *cited 6200+* times. My research group targets the most selective venues in SE, thus 88% of our papers are in the flagship

& top ACM/IEEE venues. My group's research was recognized with 9 awards at the flagship and top conferences in SE, 4 award runner-ups, 1 most influential paper award (N-10 years), and 3 winners at the ACM Student Research Competition in Software Engineering. We collaborate with academic researchers (MIT, UIUC, NC State, IA State, Portland State, Concordia) and industry partners (IBM TJ Watson, IBM Zurich, Intel, Microsoft, Boeing, Oracle, JetBrains). We *released dozens of industrial-strength* software systems, among them the world's first open-source refactoring tool. Some of the techniques we developed are shipping with the official release of the popular Eclipse, NetBeans, Visual Studio, Android Studio, and IntelliJ development environments, and **are used by millions of Java and C# programmers everyday**. Thus, I am very aligned to further pursue President Randall's strong vision for impact in industry.

As a lead or sole PI, my research ideas have generated a significant amount of funding from NSF ($5.9M) and industry (Boeing, IBM, Intel, Google, Microsoft, NEC, Trimble – $1.5M) in the last ten years, and another $10M as Co-PI at Illinois prior to that. I am excited about partnering with faculty from SoC and Business so together we can access FinTech funding.

As a service to the software evolution community, I have started two popular workshops: Workshop on Refactoring Tools, and Hot Topics On Software Upgrades, that already had eight and five instances, respectively. In 2014 I was the lead organizer of a Dagstuhl Seminar on the Future of Refactoring, which gathered the top 50 international experts on refactoring. I have chaired or co-chaired 14 workshops and 1 conference, and I have served as a member of 40+ program or review committees for all top conferences in SE. From these experiences, I learned that my greatest joy comes from enabling and building communities that can go further than individuals. I am excited to see that this is a core value and the culture at the U.

I already have a strong track record for involving minorities and other under-represented groups. Since I have been supervising my own group of students, I worked with **four racial-minority students, six females, and one student with a physical disability.** I also readily involve undergrads in my research. To date I have involved **19 undergrads as researchers**, and I have published with 16 of them. I inspired more than half of them to continue their education through graduate school. I am excited to see the recently launched Utah Center for Inclusive Computing and I am looking forward to joining forces.

I will continue to expand the area of program transformations with other practical, scalable, and safe transformations. I am particularly interested to bring refactoring advances to ML engineers and data scientists in several STEM fields. Given our common interests, I plan to collaborate and interact closely with several faculty at Utah, first with the faculty from the Programming Systems area that have closer interests (e.g., Mary Hall – transformations for parallel computing, John Regehr – synthesizing bug fixing transformations from examples, Matthew Flatt – static analysis for DSL and Racket programs, Mike Kirby – IDEs and interactive transformations for HPC, Zvonimir Rakamaric – static analysis for concurrency, Pavel Panchekha – program transformations for web-systems, Miriah Meyer – software visualization, Jeff Philips – program transformation for Data Science) and then with others as I get to know them. Even more importantly, launching an IUCRC site at Utah will afford many opportunities for collaboration with the Systems Group (e.g., Kobus Van der Merwe and the POWDER testbed for smart, connected IoT services), the Data Science Group, the Security group (e.g., Mu Zhang and Jun Xu on secure IoT devices), and HCI (e.g., Jason Wiese on preserving user privacy for personalized IoT services).

I enjoy teaching and mentoring undergrad & grad students and faculty. My extensive experience allows me to teach both introductory courses at Utah (e.g., CS - 1030, 1400, 1410, 1420, 2100) and upper division and grad courses on Software Engineering and Programming Languages (e.g., CS –3500, 3505, 3550, 4000, 4011, 4500, 4230, 4530, 4550, 5470, 5510, 6010, 6011, 6015, 6018, 6019, 6800), Multicore Parallel Programming, Design and Architectural Patterns, Software Evolution, Program Analysis and Transformation, Software Development for IoT Systems, etc. I am excited to bring grad-level SE classes to Utah students, so they have equal opportunities with students in the MSD program. Beside teaching, I invest into mentoring faculty. I have been the faculty mentoring chair at my previous two institutions and I conducted faculty mentoring tracks at several conferences (FSE'18, ASE'19, ICSE'19, ICSME'19, ICSE'20, OOPSLA'21). I want to invest my time with faculty that multiply value to students, and help the U raise tomorrow's leaders.

While I am productive at CU and enjoy working with collaborators so that the PPI Center is growing exponentially, the opportunities to serve along visionary leaders that are dedicated to impact their state, combined with family reasons, make Utah an attractive destination for me and my whole family.

Enclosed are my CV which includes a list of my publications, names of four references, and statements of research, teaching and diversity interests. I thank you and the committee for volunteering your time to assess my application, and look forward to meeting with you in the near future in the Merrill Engineering Building. Given the sensitive nature of my application, I would appreciate if it could be treated with as much confidentiality as possible.

Danny Dig