Paid Summer Internships
at the University of California, Irvine

The *University of California, Irvine* consistently ranks among the top research universities in the world. Meanwhile, the California city of *Irvine* consistently ranks among the "best places to live" in North America and the surrounding Orange County beach cities are among the top tourist destinations in the United States. Founded only 50 years ago, UC Irvine has already produced three Nobel laureates and is known for combining academic achievement with an unsurpassed quality of life. The university is about 5 miles from the Pacific Ocean, 45 miles from Los Angeles and 80 miles from San Diego.

The research group of Professor Michael Franz is welcoming applications for research interns to temporarily join our team during the **Spring/Summer of 2015**. We work on a wide range of "Systems" research topics at the intersection of compilers, virtual machines, and security. These internships are primarily **designed for undergraduate students** (ideally one year before completing the Bachelor degree) **who are planning to eventually get a Ph.D.** and want to "try out" what working in a U.S. university research lab is like. For these internships, which can range from 10 to 16 weeks, we typically cover all of your travel expenses to our campus as well as pay you a stipend of $450 a week to cover your living expenses.

Note: In the United States, **you do not need a Master degree** to begin a Ph.D. At almost all universities, Students typically enter Ph.D. programs **immediately after their Bachelor**.

Our research group is well known for inventing trace tree compilation, the technology that is behind the *TraceMonkey* JIT for JavaScript in Firefox. Its co-inventor, former UCI Ph.D. student Andreas Gal, is now the CTO of Mozilla. More recently, we also transitioned the "compartmental garbage collector" invented in our lab into Firefox, which not only makes JavaScript in Firefox a lot safer (invalidating most heap spraying attacks) but surprisingly also faster. Another open-source project that we have contributed to is the LLVM compiler infrastructure.

Over the past few years, our research has moved further into security, because that is where some of the most interesting "Systems" problems are these days. One of our current projects involves compiler-generated software diversity as a defense mechanism against cyber attacks. Imagine an "App Store" containing a diversification engine (a "multicompiler") that automatically generates a unique version of every program for every user. All the different versions of the same program behave in exactly the same way from the perspective of the end-user, but they implement their functionality in subtly different ways. As a result, any specific attack will succeed only on a small fraction of targets. An attacker would require a large number of different attacks and would have no way of knowing a priori which specific attack will succeed on which specific target. We have built such a multicompiler which can diversify large software distributions such as the Chromium and Firefox web browsers, or a complete Linux distribution.

This project has received coverage even in the popular press ranging from *The Economist* (http://www.economist.com/news/science-and-technology/21602664-organisms-stop-infections-spreading-being-diverse-so-can-computer-apps-divided) to *Wired Magazine* (http://www.wired.com/2014/12/software-clones-genetic-variation-technology/).

Our research is appearing in some of the most competitive publication venues. For example, we just had two papers accepted at the 2015 Network and Distributed System Security Symposium (NDSS) which by some measure is the 4th ranked publication venue across ALL of computer science (see http://www.cs.cornell.edu/andru/csconf.html). These two papers (which will be presented in February 2015) provide a very good idea of the flavor of research that we do in our group.

> V. Mohan, P. Larsen, S. Brunthaler, K. Hamlen, and M. Franz: "Opaque Control-Flow Integrity;" to appear at 2015 Network and Distributed System Security Symposium, http://www.ics.uci.edu/~perl/ndss15_opaque_cfi.pdf

> S. Crane, A. Homescu, S. Brunthaler, P. Larsen, and M. Franz: "Thwarting Cache Side-Channel Attacks Through Dynamic Software Diversity;" to appear at 2015 Network and Distributed System Security Symposium, http://www.ics.uci.edu/~perl/ndss15_sidechannels.pdf

Please address your inquiries to Prof. Michael Franz (franz@uci.edu). Applications should be made by **15th January 2015**. More information about the program and a link to the application page can be found at http://www.ics.uci.edu/ugrad/internship/ .

Picture: Aerial View of the UC Irvine campus