Francis Chang

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# Objective

My professional goal is to research and develop the next generation software technologies for virtual worlds, multimedia streaming, distributed computing systems, mobile platforms and new user interface paradigms.

# Education

## Ph. D. in Computer Science and Engineering, 2014

## Portland State University (Systems and Networking Lab)

* Dissertation: “Towards Constructing Interactive Virtual Worlds”, 2014. Advisor: Dr. Wu-chi Feng
* Research involvement: multimedia visualization of 3D environments, network traffic analysis, packet classification algorithms, network processors and digital video analysis.
* Designed and instructed CS 199: Introduction to Video Game Development – an undergraduate course to teach non-CS majors basic video game development principles including computer programming, 3D modelling and animation and simulated physics using Second Life as a game development platform.
* Designed and instructed OMSE 510: Computing Foundations – a graduate level course teaching the fundamentals of computer architecture and operating systems.
* Instructed CS 510: Malicious Code and Forensics – a graduate level course focusing on techniques and examples of malicious code as well as forensic analysis of techniques and protection and recovery from malware.
* Recipient of the Outstanding Graduate Student award.
* Member of the PSU Brazilian Jiu-Jitsu and PSU Kickboxing clubs.

## Master of Science in Computer Science and Engineering, 2004

## OGI School of Science & Engineering at OHSU (Systems Software Lab)

* Instructed CSE506/606 NWP: Network Practicum – a graduate level course in network processor development, focusing on the Intel IXP1200 platform. Received a class rating of 4.7/5.0, the second highest for an instructor teaching that quarter.
* Teaching Assistant: CSE58x: Network Practicum – Tasks involved creating assignment curriculum, lecturing, grading, assisting students and lab administration.
* Teaching Assistant: CSE513: Introduction to Operating Systems – Created the assignment curriculum, marking, conducting tutorials and general instruction in NACHOS operating system
* Recruiting, interviewing and management of undergraduate interns in SySL

## Honours Bachelor of Mathematics in Computer Science, 2001

## University of Waterloo

* Undergraduate research work with real-time volumetric rendering in the Computer Graphics Lab under Dr. Michael McCool.
* Vice President of the Archery Club & Member of the Badminton Club
* Received various high school scholarships & awards
* Extracurricular work involved porting ssh to win32, development of portable 4-dimensional stereogram engine, contributor to the Linux on Laptops Survey, volunteer work for the Ronald McDonald House

## Queen Elizabeth Park High School, 2001

* Set up, designed and maintained QEP's Internet website
* Instructed basic website development
* Teaching assistant for math and computer programming
* Extracurricular activities involved Oakville Youth Symphony Orchestra (violin) and local band (guitar)

# Selected Publications

## Virtual World Infrastructure

* Huaiyu Liu, Mic Bowman, Francis Chang. “Survey of State Melding in Virtual Worlds”, ACM Computing Surveys (CSUR), Volume 44 Issue 4, Article No. 21, August 2012

## Terrain Streaming

* Francis Chang, Wu-chi Feng. "Streaming Terrains", Proceedings of NOSSDAV 2007, June 2007

## Packet Classification

* Francis Chang, Wu-chang Feng, Wu-chi Feng, Kang Li, "Efficient Packet Classification with Digest Caches", Network Processor Design: Issues and Practices, Editors: Patrick Crowley, Mark Franklin, Haldun Hadimioglu, Peter Onufryk, Morgan Kaufmann Publishers, 2005, ISBN: 0-12-088476-3
* Francis Chang, Wu-chang Feng, Wu-chi Feng, Kang Li, “Efficient Packet Classification of Digest Caches”, in Proc. of the Third Workshop on Network Processors & Applications (NP3), February 2004, Madrid, Spain.
* Francis Chang, Kang Li, Wu-chang Feng, “Approximate Caches for Packet Classification”, in Proc. IEEE INFOCOM 2004, March 2004, Hong Kong.
* Kang Li, Francis Chang, Damien Berger, Wu-chang Feng, “Architectures for Packet Classification Caching”, In proceedings of the 11th IEEE International Conference on Networks (ICON 2003)
* Francis Chang, Kang Li, Wu-chang Feng, "Approximate Caches for Packet Classification", ACM SIGCOMM (poster session), August 2003, Karlsruhe, Germany.)
* Game Network Traffic Measurement

## Internet Gaming & Traffic Measurement

* Francis Chang, Wu-chang Feng, “Modeling Player Session Times of On-line Games”, In Proceedings of NetGames 2003, May 2003.
* Wu-chang Feng, Francis Chang, Wu-chi Feng, Jonathan Walpole, "Provisioning On-line Games: A Traffic Analysis of a Busy Counter-Strike Server", In Proceedings of the Internet Measurement Workshop, November 2002.
* Francis Chang, Wu-chang Feng, Wu-chi Feng, Jonathan Walpole, "Provisioning On-line Games: A Traffic Analysis of a Busy Counter-Strike Server", ACM SIGCOMM (poster session), August 2002, Pittsburgh, Pennsylvania.

## Virtual Human Interaction

* Nick Yee, Jeremy N. Bailenson, Francis Chang, Dan Merget. (2006, in press). "The Unbearable Likeness of Being Digital: The Persistence of Nonverbal Social Norms in Online Virtual Environments". The Journal of CyberPsychology and Behavior.

# Work Experience

## Software Engineer, Summer 2014 - Present

## Google Inc., Google Experience Team

* Engineer for the Google Experience team, designing interactive displays in physical spaces in Google Experience Centers

## Computer Science Researcher, Summer 2008 - Spring 2009

## Intel Corporation, Architecture Systems Lab

* Researched topics on metaverses and virtual worlds
* Designed & Developed XPU (Extremely Partitioned Universe), an metaverse architecture experiment framework written in C#
* Server development of OpenSimulator, an open-source virtual world in written in C#
* Virtual world content development - scripting, modelling and art

## Virtual World Content Developer, Second Life 2004-2008

## Independent

* Virtual content design & development including programming, 3D modeling, texture art, animations, cinematography, managing contractors, marketing and business development
* Clients include General Motors Company, Toyota Motor Corporation, Nissan Motor Company Ltd., The Electric Sheep Company, and Millions of Us LLC.
* Undergraduate level teaching and workshop instruction
* Popular projects include the Dominus Shadow, Seburo Compact-eXploder, Wet Ikon Roam and Franimation Overrider
* Charity work included campaign and event management, and content development for the Electronic Freedom Foundation, Heifer International, Red Cross, American Cancer Society and VERTU.

## Research Assistant, Summer 2000

## University of Waterloo, Computer Graphics Laboratory

* Developed prototype real-time volume rendering software, based on nVidia GeForce 3 texture shader & register combiner technology, written in a mixture of Tcl/TK, C/C++ and OpenGL, with prototype nVidia specific extensions.
* Algorithms were based on fixed-grid cubic topology, with a static data-set. (MRI and CT data)

## Software Designer, Winter 2000, Fall 2000

## Proxinet Incorporated/Puma Technology Incorporated

* Software development for a proxy-based wireless web browsing solution for mobile devices
* Web browsing thin client development targeting PalmOS using Codewarrior C and Motorola 68000 assembly
* Server development on Solaris, using the Mozilla rendering engine
* Designed & wrote specifications for the thin-client browsing system, image processing and transmission protocol
* Designed, developed & maintained UNIX/Java product branding system, including image manipulation, branded resources management and file validation utilities
* Designed, developed & maintained multi-threaded Java AFTP/TCP protocol sniffer & debugging tool
* Research involved raster image compression & processing research, general compression techniques, UNIX hashing programs, and data encryption/obfuscation
* Interviewed prospective software engineering candidates

## Software Design Engineer, Summer 1999

## Microsoft Corporation

* Worked in Visual Basic Projects Team, developing using MFC/ATL/COM with Visual C++
* Adding, Designing and Extending functionality to Win9x Unicode/API wrapper libraries
* Developed new COM utilities, including the VB7 Upgrade Wizard
* Check-in Suite design and Suite Library implementation
* Developed automated tests to validate ongoing changes to the codebase
* Miscellaneous internal utility development including maintenance, bug fixes and new features

## Software Developer, Fall 1998

## Corel Corporation, Bitmap Effects Team

* Development focussed on a library for raster image manipulation for Corel Draw and Corel Photo-Paint, targeting Win32 using MS Visual C++ and MFC
* Developed new image manipulation effects, including algorithms design and implementation, and user interface design
* General library maintenance, bug fixing and performance enhancements
* Designed and developed an internal C++ code analysis utility to aid programmers in identifying portability and interface compatibility issues
* Graphics challenges included concurrent programming, anti-aliasing primitives and colour space manipulation

## Software Designer, Summer 1997, Winter 1998

## Thinkage Limited

* C/C++/YAY development, on various platform including WinNT, Win95, UNIX and GCOS
* Developed the C math libraries for the GCOS operating system (9-bit architecture) and Intel x86 machines
* Math library implementation involved designing mathematical approximations, resolving overflow/underflow and truncation errors and circumventing hardware limitations to comply with ANSI C 98 standards
* Developed a multi-threaded telnet application in Borland C++ using win32 multi-threaded constructs, with support for the Kermit file transfer protocol
* Worked on prepro, a precompiler that embedded a new macro language in C++, designed for compiler construction

## Computer Programmer, Summer 1996

## Adnet Information Systems Incorporated

* Developed a custom data-management application for Advanced Debt Technologies Ltd using Visual Basic
* Database design and manipulation using SQL, using MS Access databases
* Programming challenges included Microsoft Mail Merge, automated banking features, automated of MS Excel spreadsheets construction using OLE, and cross-platform compatibility.

## Computer Programmer and Consultant, Annex Galaxies

## Summer – Fall 1995

* Started a small business providing consulting services in website development and BBS setup and maintenance

## Systems Jr. Technician, Region of Halton

## Spring 1995

* Diagnosed, repaired, assembled and upgraded PC computers, attended to service calls
* Instructed coop students on PC maintenance and operation

## Computer Programmer & Summary Writer, McMaster University

## Summer 1994

* Developed programs to model the behavior of fractal and chaos algorithms for grad students studying fractals
* Created notes and summaries intended for graduate students studying chaos and fractals

# Interests

My hobbies include photography, wristwatches, poker, boxing, kickboxing and Brazilian jiu-jitsu.

# References

References are available on request.