

# Kent Williams-King

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RESEARCH INTERESTS

- ◇ Operating systems performance and security
- ◇ Static and dynamic program analysis
- ◇ Applications of practical encryption and anonymity techniques
- ◇ Connections between programming languages and systems security

EDUCATION

- ◇ **Brown University**, Providence, Rhode Island, USA, September 2017 - August 2022 (expected)  
Ph.D in Computer Science. *Supervisor: Vasileios Kemerlis*
- ◇ **University of British Columbia**, Vancouver, Canada, September 2014 - August 2019 (withdrawal)  
M.Sc. program in Computer Science. *Supervisor: William Aiello; GPA: 90.7/100*
- ◇ **University of Calgary**, Calgary, Canada, September 2010 - June 2014  
B.Sc. Honours First Class in Computer Science,  
Minor in Pure Mathematics.  
*Honours project supervisor: John Aycock; GPA: 3.79/4.0*
- ◇ **Athabasca University**, Athabasca, Canada, 2004 - 2006  
Non-degree coursework

RESEARCH EXPERIENCE

- ◇ *Publication at ASPLOS 2020 (co-authored with David Williams-King, Hidenori Kobayashi, Vasileios Kemerlis, and others).* **Egalito: Layout-Agnostic Binary Recompilation.** Work developed a platform for performing binary analysis and recompilation on COTS binaries, allowing for the addition of hardening features without needing source access or run-time support.
- ◇ *Publication at OSDI 2016 (co-authored with David Williams-King, William Aiello, Vasileios Kemerlis, and others).* **Shuffler: Fast and Deployable Continuous Code Re-Randomization.** Work developed a platform and tool that rearranges code layout at run-time to defend against many common attack vectors on long-running services, with minimal runtime overhead (15% on compute-intensive tasks, negligible on I/O-bound tasks).
- ◇ *Master's research (supervisor: William Aiello).* Work applied formal program verification techniques to verify that cryptographic implementations lacked run-time timing information leaks.
- ◇ *Undergraduate research (supervisor: John Aycock),* May 2011 - June 2014. **Myron: a snapshot-based runtime program behaviour classifier.** Work constructed a simulator platform for real-time malicious program behaviour analysis. Publication forthcoming.
- ◇ *Pre-university research project,* September 2009 - May 2010. **Aesalon: Visualizing dynamically-allocated memory behaviour in real-time.** Work developed program introspection and instrumentation tool to collect arbitrary information on run-time behaviour; project then focused on collecting and analyzing statistics on use of dynamically-allocated memory.
- ◇ *Pre-university research project,* November 2008 - May 2009. Work evaluated the concept of exposing program AST to running instance to allow dynamic introspection.

- TEACHING EXPERIENCE
- ◇ Was a teaching assistant for CPSC 411 at the University of British Columbia (January-April 2017), a compilers course where students built a compiler for a stripped-down version of Java
  - ◇ Assisted with the instruction of the University of British Columbia's CPSC 490 (January-April 2015), an applied algorithms course, as one of three instructors
  - ◇ Taught an open seven-lecture workshop on low-level kernel development (May 2014); participants were guided through a series of exercises and constructed simple microkernels from scratch for Intel x86\_64 systems
  - ◇ Various algorithm presentations as part of the University of Calgary's Problem-Solving Club
- SEMINARS AND PRESENTATIONS
- ◇ **Trust is an illusion: Hardware and Software Backdoors in Computer Science**, November 2014. A general-audience talk on computer security and the threat of backdoors, given as part of the UBC Green College Member Series 2014/2015
- TECHNICAL SKILLS
- ◇ Programming Languages: C, C++, Intel assembly, Rust, Python, Erlang, Java, Haskell
  - ◇ Extensive experience with low-level Intel IA-32 and IA-32e architectures, plus low-level embedded MIPS and ARM
  - ◇ Experience with programming in various contexts, including operating systems, distributed systems, networking, graphics, application, web development, and embedded systems
  - ◇ Experience with Linux system administration, both on personal computers and Internet-facing servers, including automated management tools such as Puppet
- RELEVANT COURSE PROJECTS
- ◇ University of Calgary:
    - *Cyberterrorism, Cyberprotest, and Cyberwar class project*, Fall 2012. **To the root (certificate) of the matter: trusting trusted authorities**. A discussion paper on centralized and decentralized models of trust, including analysis of existing implementations such as SSL and PGP.
    - *Machine Learning Theory class project*, Winter 2013. **Probability Distribution Selection for PCFGs**. Presented Cohen and Smith (ACL 2010)'s complexity results of learning language grammars via machine learning, with a focus on how this affects machine learning of natural languages.
    - *Quantum Computation class project*, Fall 2013. **Relating PostBQP and BQP**. Presented complexity theoretic results from Adleman et. al (SIAM J. Computing, Vol 26, No 5) on relating BQP and PP, as well as Aaronson (Proc. R. Soc. A 2005)'s complexity results on postselection in quantum computing, then rederived several important results in classical complexity theory as corollaries.
    - *Category Theory class project*, Fall 2013. **Equivalence of  $\lambda$ -calculus and Cartesian-closed categories**. Presented and restated proofs from Lambek on showing adjoint-equivalence of the  $\lambda$ -calculus and the concept of a Cartesian-closed category, one of the key proofs linking higher-order logic with category theory and programming language semantics.
    - *Science and Society course project*, Winter 2014. **All's Context in Privacy and Machine Learning**. A discussion paper on the use of machine learning and 'dragnet' data collection and how it interacts with our conceptions of privacy.
- HONORS AND AWARDS
- ◇ Graduate scholarships:
    - (2014) R. Howard Webster Foundation Fellowship (\$2,500 CAD value)
    - (2014) University of British Columbia Computer Science Merit Award (\$5,000 CAD value)
    - (2014) NSERC CGS/M Graduate Scholarship (\$17,500 CAD value)
    - (2014) Queen Elizabeth II Master's Scholarship (\$10,800 CAD value, declined)

- ◇ Undergraduate scholarships:
  - (2013) Jason Lang Scholarship (\$1,000 CAD value)
  - (2013) Poynt Undergraduate Scholarship in Computer Science (\$3,000 CAD value)
  - (2012) Norman and Ruth MacTavish Mani Science/Engineering Bursary (\$4,900 CAD value)
  - (2011, 2012) Louise McKinney scholarship (\$2,500 CAD value) — awarded to the academically top 2% percent of students in Alberta
  - (2010) Wilfred Archibald Bursary (\$2,500 CAD value)
  - (2010, 2011) University of Calgary Entrance Scholarship (\$1,000 CAD value)
  - (2010) University of Calgary Dean’s Merit Admission Award (\$1,000 CAD value)
  - (2010) Alexander Rutherford scholarship (\$1,300 CAD value)
  - (2009) Full tuition ‘Genius’ Scholarship to Sierra Nevada College, Nevada (\$96,000 USD value, declined)

COMPETITIONS ◇ Programming Competitions:

- Participated in the 2014 ACM Pacific Northwest Regional Programming Competition; won fourth place.
- Invited to attend and participate in the 2013 ACM International Collegiate Programming Competition in St. Petersburg, Russia as a member of one of 120 teams invited worldwide; placed with Honourable Mention
- Invited to attend and participate in the 2013 University of Chicago Invitational Programming Competition in Chicago, Illinois as a member of one of 23 teams invited from North America; placed with Honourable Mention
- Principal problem-setter and judge in the 2014 Calgary Collegiate Programming Competition
- Participated in the 2013 Calgary Collegiate Programming Competition; won first place
- Participated in the 2010, 2011, 2012, and 2013 Alberta Collegiate Programming Competitions; won fourth, third, fourth, and first place, respectively
- Participated in the 2010, 2011, 2012, and 2013 ACM Rocky Mountain Regional Programming Competitions; won fifth, second, first, and second place, respectively

◇ Science and engineering fairs:

- (2009-2010) Invited to participate in the Intel International Science and Engineering Fair (ISEF) as one of sixteen high school students from Canada
- (2009) Second-place IEEE Computer Society award, received at 2009 ISEF (\$300 USD value)
- (2008) Invited to participate in the Canada-Wide Science Fair, winning a silver medal and cash prize (\$750 CAD value)
- (2007-2010) Participated in Calgary Youth Science Fair four times, winning two silver and two gold medals, in addition to five special awards

EXTRA-CURRICULAR ACTIVITIES

- ◇ (2010-2014) Member of the University of Calgary’s Problem-Solving Club (Vice President of Operations from 2011-2014)
- ◇ (2012-2014) Mentor in Youth Science Canada’s Team Canada Mentorship program, providing suggestions and advice to candidates in the Team Canada application process
- ◇ (2011-2014) Judge in the Calgary Youth Science Fair