Hazel Victoria Campbell

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EDUCATION

Doctor of Philosophy Candidate, Computer Science,
under advisor Dr. Abram Hindle,
awarded Ph.D Early Achievement Prize,
awarded **Graduate Student Teaching Award, March 2016,**
University of Alberta, Edmonton, AB, 2013–present,
planning to defend in August, 2019.

Master of Science, Computer Science,
under advisor Dr. Jesse V. Johnson,
for a thesis on "Implementation of a Vertically Integrated Ice Sheet Momentum Balance Model,"
University of Montana, Missoula, MT, graduated August 2013.

Bachelor of Arts, Mathematical Sciences and Mathematical Sciences-Computer Science,
with Pure Mathematics Option and Combinatorics and Optimization Option,
a member of the Pi Mu Epsilon Mathematics Honour Society,
awarded Outstanding Senior in Pure Mathematics for 2010,
University of Montana, Missoula, MT, graduated December 2009.

TEACHING
PHILOSOPHY

I have spent my entire life working with computers, from software development to system administration. I always spend much of my free time working with new software and software development technologies. Teaching at the university level allows me to share my enthusiasm for software development and other computer technologies to the next generation of developers and researchers.

I have huge amounts of experience from numerical methods to scripting, from system administration to full-stack web development, from theoretcal CS and Mathematics to deploying technologies at scale in industry. When I give a lecture in a CS course, I use that broad understanding of a wide variety of technologies to explain not only individual concepts, but how they relate to other technologies.

I believe strongly in making my courses accessible to everyone. I always attempt to create lecture, assignemnt, lab, and exam material that emphasizes learning goals over English skills, test-taking skills, etc. My goal is for every student to gain as much understanding and skill as possible in my courses regardless of their background, abilities, or marks. I enjoy making relatable course material that the students can apply in their own lives to make their study relevant to them; I avoid presenting concepts in an abstract and isolated setting with no applications that are practical to the students.

EXPERIENCE

Graduate Research and Teaching Assistant   2013–present
Department of Computing Science
The University of Alberta, Edmonton, AB

- 2018 Instructor "**CMPUT 174** Introduction to the Foundations of Computation I." My accomplishments include:

  - Presenting lectures for one section of a multiple-section course,
  - creating new exam materials,
  - adapting old exam materials to multiple-choice format,
  - working alongside a professor and another instructor,
  - managing a class of 86 students.

- 2018 Primary Instructor "**CMPUT 296** Web Protocols and Applications." My accomplishments include:

  - adapting 400-level course content for a 200-level course,
  - course planning,
  - adapting old assignemnts, creating new assignments and marking,

- – new exams and marking,
- – adapting old lectures and creating new lectures,
- – managing a teaching assistant in the creation and execution of new labs.

- 2013-2017 **CMPUT 301**, **CMPUT 404** Head Lab Teacher and Team Leader. My accomplishments include:

  - – awarded Graduate Student Teaching Award, March, 2016,
  - – multiple instructional lab lectures every week,
  - – team manager and leader for multiple teams simultaneously,
  - – substitute lecturer for the course lecture,
  - – assignment and lab exercise creation,
  - – development of code examples.

- 2012-2018 Creation of Software Engineering Tools and Methodologies. My accomplishments include:

  - – original software engineering research,
  - – implementation of software engineering tools in Java, Perl, C++, Python/SciPy, R, ElasticSearch,
  - – implementation and deployment in industry of distributed, user-facing, scalable, software engineering services as full-stack Python/Flask/JS/HTML/CSS/Angular/ElasticSearch web applications,
  - – development of an electronic power consumption test-bed and instrumentation for mobile phones,
  - – leading and managing teams of Undergraduate researchers,
  - – leading and managing teams of Highschool students, most summers.

Graduate Research Assistant 2010–2012
Department of Computer Science
The University of Montana, Missoula, MT

- Collaboration on the Glimmer-CISM Ice Sheet Model. My accomplishments include:

  - – optimization of FORTRAN 77 and 90 code,
  - – merging code branches,
  - – maintenance of the build system,
  - – finding causes of convergence of the non-linear differential equation solver,
  - – and testing and fixing bugs.

- Substitute lecturer for an Intro to Scientific Computing class.

Software Engineer 2004–2009
Numerical Terradynamic Simulation Group
College of Forestry, The University of Montana, Missoula, MT

- Improvements to the BiomeBGC ecological carbon cycle model originally written by Steve Running. These improvements include:

  - – C language standard compliance,
  - – automated testing and model output analysis,
  - – fixes to model science requiring a deep understanding of the underlying dynamic system,
  - – rewritten build system,
  - – and implementation of TCL-based scripting system.

- Adapted pre-existing wiki software to create an easy-to-use replacement for old intranet site.
- Linux server and compute cluster administration and maintenance.

ACADEMIC
INTERESTS

The focus of my current research is applying corpus-based and natural-language processing techniques to create tools which assist software developers. This involves statistical models, machine learning, and integrating tools with existing software development tools.

I am also following a second vein vein of research, which is applying tranditional information-retrieval techniques to create tools which help organizations manage and debug crashes in widely deployed software such as web browsers.

The focus of my previous research was applying the finite element method to non-Newtonian stokes flow in order to efficiently model the behaviour of ice sheets and variational approximations. This relies heavily on non-linear differential equations, numerical approximations, techniques for improving numerical stability, linear algebra, and algorithmic and implementation efficiency.

In the past I have used opportunities in class to research subjects such as string analysis by graph-like data structures, information-preserving string hashes, SHA-3 competition candidates, linear solver algorithms and underlying theory, and approximating phylogenetic trees in linear time relative to the length of the sequences used.

PUBLICATIONS

Note: My name was formerly Joshua Charles Campbell.

Santos, Eddie Antonio, **Joshua Charles Campbell**, Dhvani Patel, Abram Hindle, and José Nelson Amaral. "Syntax and sensibility: Using language models to detect and correct syntax errors." In *2018 IEEE 25th International Conference on Software Analysis, Evolution and Reengineering (SANER)*, pp. 311-322. IEEE, 2018.

Campbell, Joshua Charles, Eddie Antonio Santos, and Abram Hindle. "The unreasonable effectiveness of traditional information retrieval in crash report deduplication." In *Mining Software Repositories (MSR), 2016 IEEE/ACM 13th Working Conference on,* pp. 269-280. IEEE, 2016.

Campbell, Joshua Charles, Abram Hindle, and Eleni Stroulia. "Latent Dirichlet allocation: extracting topics from software engineering data." In *The art and science of analyzing software data (1st ed.).*, pp. 139-159. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.

Joshua Charles Campbell, Abram Hindle, and José Nelson Amaral. 2014. Syntax errors just aren't natural: improving error reporting with language models. In *Proceedings of the 11th Working Conference on Mining Software Repositories* (MSR 2014). ACM, New York, NY, USA, 252-261.

Abram Hindle, Alex Wilson, Kent Rasmussen, E. Jed Barlow, **Joshua Charles Campbell**, and Stephen Romansky. 2014. GreenMiner: a hardware based mining software repositories software energy consumption framework. In *Proceedings of the 11th Working Conference on Mining Software Repositories* (MSR 2014). ACM, New York, NY, USA, 12-21.

Karan Aggarwal, Chenlei Zhang, **Joshua Charles Campbell**, Abram Hindle, and Eleni Stroulia. "The Power of System Call Traces: Predicting the Software Energy Consumption Impact of Changes." In *Press of the 2014 Conference of the Center for Advanced Studies on Collaborative Research*, IBM Corp. 2014.

Joshua Charles Campbell, Chenlei Zhang, Zhen Xu, Abram Hindle, and James Miller. 2013. Deficient documentation detection: a methodology to locate deficient project documentation using topic analysis. In *Proceedings of the 10th Working Conference on Mining Software Repositories* (MSR '13). IEEE Press, Piscataway, NJ, USA, 57-60.

PRESENTATIONS
AND LECTURES

"Syntax Error Location in Python," for the Natural Language Processing Group at the University of Alberta, October 2014.

"Syntax Errors just Aren't Natural," for the Consortium for Software Engineering Research 2014 Spring Meeting at the University of Alberta, May 2014.

"Model-View-Controller and Friends," for the Software Engineering Research Group at the University of Alberta, February 2014, and for CMPUT 301 Software Engineering every semester 2014–present.

"Syntax Errors just Aren't Natural," for the Workshop on Software Naturalness, at University of California Davis, May 2013.

"Syntax Errors just Aren't Natural," for the Software Engineering Research Group at the University of Alberta, February 2013.

"Compact Directed Acyclic Word Graphs and Their Predecessors," for CSCI 531 Design and Analysis of Algorithms, December 2010.

"Not your Mother's Matrices," University of Montana Conference on Undergraduate Research, April 2009. [This presentation covered
the history of linear program tableaux as maps and as a possible basis for an algebraic object similar to near-rings.]

MATH & CS BACKGROUND	*Theoretical:* Statistics, Linear and Abstract Algebra, Combinatorics, Cryptography, Computation and Information Theory *Applied:* Software Engineering, Natural Language Processing, Nonlinear Differential Systems, Tries and Word Graphs, Ciphers, Linear Optimization and Discrete Optimization
COMPUTER SKILLS	*Languages:* Python 2&3, Java, JavaScript, HTML&CSS, C, C++, Rust, Perl, R, PHP, TCL, FORTRAN, Matlab, SQL, Assembly, shell, Lex/Yacc, Haskell, LaTeX. *Environments:* Unix/Linux, Web, Clusters, AVR Microcontrollers. *Skills:* Software Engineering, Full-stack Web Development, Machine Learning, Scientific Modelling, Automatic Differentiation, Software Optimization, Software Parallelization, System Administration, Scripting, Graphics and Visualization. *Tools:* Eclipse, Angular, React, Elastic Search, SQL Databases, Topic Modelling tools such as Mallet, Vowpal Wabbit and MITLM, Linear Algebra Libraries and Solvers, OpenMP and MPI, Autotools and Make.