

## Brian Christian DuSell

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CONTACT INFORMATION	bdusell1@nd.edu bdusell.com	
RESEARCH INTERESTS	Natural Language Processing, Deep Learning	
EDUCATION	<b>University of Notre Dame</b> , Notre Dame, IN Ph.D., Computer Science Advisor: David Chiang, Ph.D.	Aug 2016 to present
	<b>University of Notre Dame</b> , Notre Dame, IN B.S., Computer Science, <i>magna cum laude</i> GPA: 3.78 Major GPA: 3.95	Aug 2009 to May 2013
RESEARCH PROJECTS	<b>Stack Nondeterminism in Neural Networks</b> Drawing inspiration from automata theory, we augment neural networks with differentiable, nondeterministic stack data structures. We hypothesize that such models are better suited to learning hierarchical structures and long-distance dependencies in natural language, which has applications to language modeling and machine translation. We have demonstrated the effectiveness of this approach on formal languages and are extending this approach to more efficient use on natural language and integration with other neural architectures.	
PUBLICATIONS	Brian DuSell and David Chiang. Learning hierarchical structures with differentiable nondeterministic stacks. In <i>International Conference on Learning Representations</i> , 2022. URL <a href="https://openreview.net/forum?id=5LXw_Qp1BiF">https://openreview.net/forum?id=5LXw_Qp1BiF</a> . Spotlight paper.  Brian DuSell and David Chiang. Learning context-free languages with nondeterministic stack RNNs. In <i>Proceedings of the 24th Conference on Computational Natural Language Learning</i> , pages 507–519, Online, November 2020. Association for Computational Linguistics. URL <a href="https://www.aclweb.org/anthology/2020.conll-1.41">https://www.aclweb.org/anthology/2020.conll-1.41</a> . Accept rate: 23%.  Kenton Murray, Brian DuSell, and David Chiang. Efficiency through auto-sizing: Notre Dame NLP’s submission to the WNGT 2019 efficiency task. In <i>Proceedings of the 3rd Workshop on Neural Generation and Translation</i> , pages 297–301, Hong Kong, November 2019. Association for Computational Linguistics. doi:10.18653/v1/D19-5634. URL <a href="https://www.aclweb.org/anthology/D19-5634">https://www.aclweb.org/anthology/D19-5634</a> .	
RESEARCH EXPERIENCE	<b>Research Assistant</b> Natural Language Processing Group Department of Computer Science and Engineering University of Notre Dame Supervisor: David Chiang, Ph.D.	Aug 2016 to present

	<b>Research Assistant</b>	Sep 2011 to May 2013
	Cooperative Computing Lab Department of Computer Science and Engineering University of Notre Dame Supervisor: Douglas Thain, Ph.D. Summary: Contributed to BioCompute, a distributed computing environment for bioinformatics accessible via a web interface.	
INDUSTRY EXPERIENCE	<b>Applied Scientist Intern</b> , Amazon Web Services	Jun to Sep 2021
	Team: Amazon Translate Mentors: Xing Niu and Anna Currey Manager: Georgiana Dinu	
	<b>Applied Scientist Intern</b> , Amazon Web Services	Jun to Sep 2020
	Team: Amazon Translate Mentors: Xing Niu and Greg Hanneman Manager: Georgiana Dinu	
	<b>Software Developer</b> , Oak Financial Software Corp	May 2014 to Aug 2016
	Developed Chapulfn, a hybrid mobile and web application for executing international money transfers to Latin America. Implemented frontend and contributed to backend functionality, tools for analytics, and test automation. Technologies used: JavaScript, Cordova, Python, Node.js.	
	<b>Member of Technical Staff</b> , NetApp, Inc.	Jul 2013 to May 2014
	Performed quality assurance for data replication software included in the Data ONTAP storage OS. Technologies used: Perl, Jenkins.	
	<b>Software Engineer, Intern</b> , Wolverine Trading, LLC	Summer 2012
	Developed a high-performance Syslog daemon with a configurable message handling system and real-time GUI client. Achieved 300-fold improvement in message processing rate over previous tool. My code was deployed to 80 production servers within the next two months. Technologies used: C++, C#, WPF, XAML.	
TEACHING EXPERIENCE	<b>Instructor of Record</b>	Spring 2022
	CSE 30151: Theory of Computing Department of Computer Science and Engineering University of Notre Dame	
	<b>Teaching Assistant</b>	Fall 2018
	CSE 40657/60657: Natural Language Processing Instructor: David Chiang, Ph.D. Department of Computer Science and Engineering University of Notre Dame	
	<b>Teaching Assistant</b>	Spring 2017
	CSE 30151: Theory of Computing Instructor: David Chiang, Ph.D. Department of Computer Science and Engineering University of Notre Dame	
	<b>Teaching Assistant</b>	Fall 2016
	CSE 30151: Theory of Computing Instructor: Peter Kogge, Ph.D. Department of Computer Science and Engineering University of Notre Dame	

	<b>Teaching Assistant</b>	Fall 2012
	CSE 30331: Data Structures	
	Instructors: Paul Brenner, Ph.D. and Raul Santelices, Ph.D.	
	Department of Computer Science and Engineering	
	University of Notre Dame	
	<b>Tutor</b>	Spring and Fall 2012
	Academic Services for Student-Athletes	
	University of Notre Dame	
	Summary: Tutored a student-athlete for the courses CSE 30151: Theory of Computing and CSE 40113: Design and Analysis of Algorithms.	
PROGRAMMING SKILLS	Proficient in Python, PyTorch, Bash scripting, Docker, JavaScript/Node.js, frontend/backend web development.	
	Very familiar with C, C++, Java, PHP, SQL, MXNet, DyNet.	
SOFTWARE	<b>GitHub Profile (<a href="https://github.com/bdusell">https://github.com/bdusell</a>)</b>	
	Features my open-source work.	
	<b>Nondeterministic Stack RNN (<a href="https://github.com/bdusell/nondeterministic-stack-rnn">https://github.com/bdusell/nondeterministic-stack-rnn</a>)</b>	
	PyTorch implementation of our Nondeterministic Stack RNN model, as well as other Stack RNN models.	
	<b>Semiring Einsum (<a href="https://bdusell.github.io/semiring-einsum/">https://bdusell.github.io/semiring-einsum/</a>)</b>	
	Efficient PyTorch implementation of einsum (a generalization of matrix multiplication) in different semirings.	
	<b>Jishosen (<a href="http://jishosen.com">jishosen.com</a>)</b>	
	A Japanese-English dictionary website based on freely available data.	
SERVICE	<ul style="list-style-type: none"> <li>• Reviewer, EMNLP 2022 <span style="float: right;">2022</span></li> <li>• Reviewer, EMNLP 2021 <span style="float: right;">2021</span></li> <li>• XSEDE Campus Champions Tech Talk: <span style="float: right;">May 2019</span>  “How to Install Literally Anything: A Practical Guide to Singularity.”  URL: <a href="https://github.com/bdusell/singularity-tutorial">https://github.com/bdusell/singularity-tutorial</a></li> <li>• Graduate Orientation Ambassador <span style="float: right;">2017-2019</span> <ul style="list-style-type: none"> <li>• Organized the orientation program for incoming graduate students at the University of Notre Dame.</li> </ul> </li> <li>• Graduate Representative <span style="float: right;">2019</span> <ul style="list-style-type: none"> <li>• Recruited fellowship awardees for the Notre Dame Graduate School.</li> </ul> </li> <li>• CSE Peer Mentor <span style="float: right;">2018-2019</span> <ul style="list-style-type: none"> <li>• Mentored first-year graduate students in the Computer Science and Engineering Department at Notre Dame.</li> </ul> </li> <li>• Organizing Committee for Midwest Speech and Language Days (MSLD) 2018 <span style="float: right;">May 2018</span></li> </ul>	
AWARDS	<ul style="list-style-type: none"> <li>• Notebaert Premier Fellowship <span style="float: right;">2016</span> University of Notre Dame Graduate School</li> <li>• First Place, Chinese Speech Contest (2nd Year Chinese) <span style="float: right;">April 2019</span> University of Notre Dame Department of East Asian Languages</li> <li>• Outstanding Graduate Teaching Assistant <span style="float: right;">Spring 2018</span> Department of Computer Science and Engineering University of Notre Dame</li> <li>• Honorable Mention, Outstanding Graduate Teaching Assistant <span style="float: right;">Spring 2017</span> Department of Computer Science and Engineering University of Notre Dame</li> </ul>	

- Member, Tau Beta Pi Engineering Honor Society 2012 to present
- Member, Upsilon Pi Epsilon Computing Honor Society 2012 to present
- College of Engineering Dean's List Fall 2010 to Spring 2013  
University of Notre Dame

LANGUAGES English (native), Japanese (basic), Mandarin (basic)

REFERENCES David Chiang, Ph.D.  
Associate Professor E-mail: [dchiang@nd.edu](mailto:dchiang@nd.edu)  
Department of Computer Science and Engineering  
University of Notre Dame

Peter Kogge, Ph.D.  
McCourtney Professor of CSE E-mail: [kogge@nd.edu](mailto:kogge@nd.edu)  
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Douglas Thain, Ph.D.  
Professor and Associate Chair E-mail: [dthain@nd.edu](mailto:dthain@nd.edu)  
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