

- **An explanation of any relevant background you have in category theory or any of the specific projects areas**
 - I am currently developing applications of category theory to machine learning. For example, I am working on a categorical construction to represent the relationships between models trained on different datasets. I have also done significant work with the distributional models of language semantics that the “Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces” project aims to improve upon.
- **The date you completed or expect to complete your Ph.D and a one-sentence summary of its subject matter**
 - I will begin my DPhil in Fall 2019 and I expect to complete it before the end of 2024. The goal of my DPhil is to use the constructions of category theory to improve how we build, use, and reason about statistical models.
- **Order of project preference**
 - My project preference, from highest to lowest, is:
 1. Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces
 2. Toward a mathematical foundation for autopoiesis
 3. Traversal optics and profunctors
 4. Partial evaluations, the bar construction, and second-order stochastic dominance
 5. Complexity classes, computation, and Turing categories
 6. Simplifying quantum circuits using the ZX-calculus
- **To what extent can you commit to coming to Oxford (availability of funding is uncertain at this time)**
 - I can fully commit to attend the program at Oxford.

Dan Shiebler

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INDUSTRY EXPERIENCE

Senior Machine Learning Engineer, Twitter Cortex

September 2017 - Present

- Lead a team of engineers to develop and productionize models for matching Twitter users with content. Promoted from ML Engineer II to ML Engineer III (Senior) in recognition of my team's success.
- Architected and constructed Twitter's in-house word vector modeling framework, which is used in production by NLP models throughout the company.
- Build highly scalable inference algorithms on top of Scalding, Twitter's functional programming-based MapReduce library.
- Design deep learning methods for distilling complex information from high dimensional sources like follow graphs, text, images, and user actions into compact embeddings of Twitter entities, such as users, Tweets, and hashtags.
- Establish Cortex in the Machine Learning community by writing papers and speaking at conferences.
- Built the first feature representation of Twitter for Websites data, which significantly improved new user recommendation and advertisement serving model performance.

Senior Data Scientist, TrueMotion

September 2015 - August 2017

- Created and led the research and design of the patented machine learning based distracted driving detection algorithms that form the core of TrueMotion's business model.
- Designed and developed machine learning pipelines to determine whether a user is a driver (versus a passenger), and to detect dangerous driving events from smartphone GPS and motion sensor data. These algorithms run live in production on millions of trips.
- Coordinated with actuarial teams at several top 10 insurance companies to design and implement a variety of driver risk score algorithms.
- Designed the statistical analyses and implemented the backend infrastructure for TrueMotion's A/B testing framework.
- Presented results of analyses and business recommendations to senior management at insurance companies.

Associate Software Analyst, Mathworks

June 2015 - September 2015

- Designed and implemented nonlinear multidimensional filtering algorithms in C++ to power MATLAB's Image Processing Toolbox.

ACADEMIC RESEARCH EXPERIENCE

Deep Learning Researcher, Serre Lab at Brown University

September 2016 - Present

- Design and implement novel attention mechanisms to drive neural network feature representations towards those of humans and achieve state of the art ILSVRC performance.
- Incorporate human behavioral data (<http://clickme.ai>) into neural network training in order to build networks with more human-like decision boundaries.
- Train multi-task prediction neural networks with a combination of real images and 3-D generated images to learn surface-aware and texture-invariant image representations.
- Perform experiments to quantify and understand the limitations of convolutional neural networks at performing visual reasoning tasks.
- Develop methods for understanding and comparing the representations that convolutional neural networks learn.

Computational Neurophysiology Researcher, Asaad Lab at Brown University

January 2013 - May 2015

- Built a decision game for deep brain stimulation patients to play during surgery, including both hardware (joystick) and software (MATLAB) components. Taught patients how to play the game during open-brain surgery.
- Analyzed human neuronal data recorded during these gaming sessions. Engineered a wavelet-based system for identifying changes in the frequency distribution of neuronal local field potentials that is consistent with "high-conflict" decisions.

Digital Humanities Research Assistant, Brown Center for Digital Scholarship

September 2013 - January 2015

- Performed semantic analyses on the Parliamentary Papers and spearheaded the data visualization component of the Mapping Colonial Americas Publishing Project, which was featured at the Digital Humanities 2014 conference.

EDUCATION

Brown University

Graduated May 2015

- Neuroscience Sc.B, Computer Science A.B. | Honors in Neuroscience | GPA: 4.0/4.0 | GRE: 340/340
- Magna Cum Laude, Sigma Xi Honor Society, Karen T. Romer Undergraduate Teaching and Research Award, President of Brown University Toastmasters, Head Scientific Teaching Assistant

INDUSTRY CONFERENCE PRESENTATIONS

- Bigger Problems than Big Data *DSGO (2018), MWC Americas (2018)*
- Real World Data Science Strategy *ODSC East (2018), DSGO (2017), Global Big Data Conference (2017)*
- In the Lab: AI and Machine Learning for Media Industry *Variety Innovate Summit (2017)*
- Making Deep Learning Work on Messy Sensor Data *MIT Lincoln Lab (2017), Deep Learning Summit Boston (2017)*
- The Power and Pains of Sensor Data *ODSC East (2017)*
- Machine Intelligence for Driver Safety *Machine Intelligence Summit New York (2016)*

PATENTS

- Systems and Methods for Detecting and Assessing Distracted Drivers *U.S. 2017/0105098 A1*
- Systems and Methods for Scoring Driver Trips *U.S. 2017/0349182 A1*
- Systems and Methods for Sensor-Based Vehicle Crash Prediction, Detection and Reconstruction *U.S. 2017/0210323 A1*
- Systems and Methods for Detecting Airbag Deployment Resulting From a Vehicle Crash *U.S. 2018/0126938 A1*

ACADEMIC PUBLICATIONS

- Linsley, D., Shiebler, D., Eberhardt, S., & Serre, T. *Learning what and where to attend with humans in the loop*. ICLR (2019).
- Shiebler, D., Belli, L., Baxter, J., Xiong, H., & Tayal, A. *Fighting Redundancy and Model Decay with Embeddings*. KDD Workshop on Common Model Infrastructure (2018).
- Shiebler, D., & Tayal, A. *Making Machine Learning Easy with Embeddings*. SysML (2018).
- Linsley, D., Shiebler, D., Eberhardt, S., & Serre, T. *Global-and-local attention networks for visual recognition*. Computational Cognitive Neuroscience (2018).
- Kamani, M., Shiebler, D., Tayal, A., Verma, S., & Belli, L. *Capturing Lingual Shifts in Word Embeddings with CCA*. WeCNLP (2018).
- Rabhi, S., Green, C., Verma, S., Shiebler, D., & Belli, L. *FastTweets: Measuring Embedding Quality for Highly Variable Text Data*. WeCNLP (2018).
- Shiebler, D. *A Correlation Maximization Approach for Cross Domain Co-Embeddings*. Available on arXiv (2018).
- Kim, J., Ricci, M., Shiebler, D., & Serre, T. *A Dichotomy of Visual Relations*. Computational Cognitive Neuroscience (2017).
- Eberhardt, S., Shiebler, D., Linsley, D., & Serre, T. *A Data-Driven Approach to Learning 3D Shape*. Journal of Vision (2017).
- Linsley, D., Eberhardt, S., Shiebler, D., & Serre, T. *Large-scale discovery of visual features for object recognition*. Computational and Mathematical Models in Vision (2017).
- Eberhardt, S., Cader, J., Linsley, D., Barhomi, Y., Shiebler, D., & Serre, T. *More Feedback, Less Depth: Approximating Human Vision with Deep Networks*. NIPS Workshop on Representation Learning in Artificial and Biological Neural Networks (2016).
- Shiebler, D. *Beta Shift and Decision Conflict*. Neuroscience Sc.B Honors Thesis (2015).

TEACHING EXPERIENCE

Guest Lecturer, NYC Data Science Academy *September 2017 - Present*

- Invited to hold several guest lectures on sensor data, mobile analytics, and dealing with noisy labels.

Head Scientific Computing Teaching Assistant, Brown University *Jan-May 2014, Jan-May 2015*

- Created course materials, held recitation lectures, hired and managed approximately 20 Undergraduate Teaching Assistants for an undergraduate Scientific Computing course.

Linear Algebra Teaching Assistant, Brown University *Sept 2014 - Dec 2014*

- Taught weekly labs, held office hours, graded homeworks and exams for an undergraduate Linear Algebra course.

Independent Tutor *May 2012 - Sept 2013*

- Tutored High School students for the USA Computing Olympiad, SAT, SAT2 and AP exams.

ADDITIONAL PROJECTS AND PROGRAMMING LANGUAGES

- Publish articles and share machine learning software at danshiebler.com. Examples include a TensorFlow package for performing deep Taylor decompositions and a music-composing recurrent neural network that was featured by Google Brain Magenta.
- Built The Population Dynamics Simulator, a set of MATLAB tools that simulate evolution and population dynamics. These tools are used by Brown University Computational Molecular Biology students and researchers.
- Built MessageHunt, an iOS geolocation social networking app (written in Swift). You can download MessageHunt on the App Store.
- Primarily use Python and Scala. Sometimes use C/C++, Javascript, Java, MATLAB, SQL and Swift.

The ACT 2019 school is an unparalleled opportunity for me to dive into the applied category theory community and learn alongside other researchers with different backgrounds and skill sets. Over the past several years I have been lucky enough to be a part of the machine learning research groups at Twitter Cortex and the Serre Lab at Brown University. Through these experiences I have learned the degree to which a strong and engaging research community cultivates ideas and sharpens arguments. I therefore feel that building relationships with peers and mentors in applied category theory will help me reach my research goals. The ACT 2019 school is the perfect venue for me to develop this network of people to inspire and challenge me.

I am also confident that the ACT 2019 school's curriculum will help me achieve my research objectives. By immersing myself in a research project that lies a bit outside of my main area of expertise, I will develop a broader and more comprehensive perspective on Category Theory. My goal to build a category theoretical construction for modern machine learning is ambitious, and I will need both this broad perspective and deep network in order to accomplish it.

Finally, I feel that I can make a positive impact on the ACT 2019 school community. My research experience in machine learning and neural networks gives me a unique perspective on compositional systems. Furthermore, as both an engineer at Twitter and an academic researcher I can effectively balance practicality and rigor. I feel that this wide range of experience will help me make a significant contribution to my research group at ACT 2019.



Applied Category Theory <act2019school@gmail.com>

[ACT2019] Recommendation for Dan Shiebler

1 message

Cezar Ionescu <cezar.ionescu@conted.ox.ac.uk>

Mon, Jan 28, 2019 at 11:01 AM

To: act2019school@gmail.com

Hi,

I am writing this in support of Dan Shiebler's application to attend ACT 2019.

Dan has applied for admittance to the part-time DPhil programme of Continuing Education. His envisaged research topic is the application of category theory to machine learning. I (as potential supervisor) and Jeremy Gibbons (co-supervisor) have interviewed him and have confirmed his suitability for the DPhil programme (in particular, that means that Dan meets the standards required for admission to a DPhil in Computer Science).

One of the main difficulties of a part-time DPhil student, in Oxford as much as elsewhere, is that of access to the peers and faculty network. I believe that admitting Dan to the ACT would be a great way to alleviate this difficulty. Dan is a mature student, with relevant background knowledge to enable him to follow the discussions and to shed new and interesting perspectives on the topics. He is fully committed to taking advantage of this opportunity, and has the resources (both temporal and financial) to do so.

Therefore, I hope he will gain admission to the ACT. Please let me know if I can be of any further assistance in the matter.

Best wishes,
Cezar Ionescu

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Dr. Cezar Ionescu

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