

## RESEARCH INTERESTS

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Developing natural language processing techniques for healthcare applications: particularly using unstructured and noisy textual and speech data, with core machine learning methodologies such as transfer learning and reinforcement learning.

## EDUCATION

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- **University of Toronto** Toronto, Canada  
*MSc. in Applied Computing; Advisor: Marzyeh Ghassemi* *Sep 2017 - Jan 2019*  
*Courses: Computational Methods in Medicine, Discrete Latent Structure, Machine Learning, Computer Vision, Parallel Computer Architecture.*
- **Indian Institute of Technology, Guwahati** Guwahati, India  
*Bachelor of Technology; Advisor: Amit Sethi* *Jul 2013 - May 2017*  
*Courses: Speech Technology, Linear Algebra Multivariate Calculus, Advanced Machine Learning, Probability and Statistics.*

## EXPERIENCE

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- **Winterlight Labs** Toronto, Canada  
*Research Engineer, Machine Learning* *Jan 2019 - Current*
  - **Machine Learning Research Team:** Working in the machine learning research team on the detection and monitoring of cognitive impairment and mental health conditions from speech.
- **Philips Innovation Campus** Bengaluru, India  
*Research Intern* *May 2017 - July 2017*
  - **Research and Development Division:** Worked in the research division on the application of signal processing and machine learning to healthcare. Projects involved identifying personal information in unstructured medical text for de-identification with neural NER models and personalized sequence prediction of patient health data using LSTMs and sequence modeling.
- **Technische Universitat Dresden** Dresden, Germany  
*Visiting Scholar* *May 2016 - July 2016*
  - **Computer Vision Lab & Computer Graphics Lab:** Project involved visualization of Convolutional Neural Networks (CNNs) at a layer level in 3D by particle rendering. Developed gradient-based importance measure for each filter with respect to output classification in a CNN (using Caffe)
- **Indian Institute of Science** Bengaluru, India  
*Research Intern* *May 2015 - July 2015*
  - **Department of Electrical & Communication Engineering:** Project involved implementation of various machine learning algorithms in Theano. Analyzed how information is captured in Convolutional Neural Networks using entropy calculations.

## PUBLICATIONS

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- **Balagopalan, A.**, Novikova, N., McDermott, M. B., Nestor, B., Naumann, T. J., and Ghassemi, M., “Cross-Language Aphasia Detection using Optimal Transport Domain Adaptation”, To appear in Machine Learning for Health (ML4H) at NeurIPS 2019, To appear in PMLR
- Novikova, J., **Balagopalan, A.**, Shkaruta, K., Rudzicz, F., “Lexical Features Are More Vulnerable, Syntactic Features Have More Predictive Power”, 5th Workshop on Noisy User Generated Text, EMNLP 2019
- **Balagopalan, A.**, Novikova, J., Rudzicz, F., Ghassemi, M., “The Effect of Heterogeneous Data for Alzheimer’s Disease Detection from Speech.”, Machine Learning for Health (ML4H) at NeurIPS 2018
- Seifert, C., Aamir, A., **Balagopalan, A.**, Jain, D., Sharma, A., Grottel, S., Gumhold, S., “Visualizations of deep neural networks in computer vision: A survey”, In Transparent Data Mining for Big and Small Data (pp. 123-144). Springer, Cham., 2017

## CLINICAL ABSTRACTS

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- **Balagopalan, A.**, Kaufman, L. J., Novikova, J., Siddiqui, O., Paul, R., Ward, M. and Simpson, W., “Early development of a unified, speech and language composite to assess clinical severity of Frontotemporal Lobar Degeneration (FTLD)”, Clinical Trials in Alzheimer’s Disease (CTAD) 2019
- Simpson, W., **Balagopalan, A.**, Kaufman, L. J., Yeung, A., and Butler, A., “The Use of a Voice-based Digital Biomarker in Patients With Depression”, International Society for CNS Clinical Trials and Methodology 2019
- **Balagopalan, A.**, Yancheva, M., Novikova, J. and Simpson, W., 2019, “Using acoustic and linguistic markers from spontaneous speech to predict scores on the Montreal Cognitive Assessment (MoCA).”, Memory, 20, p.13., 2019

## PROJECTS

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- **Dynamically combining word embeddings for clinical text tasks:** Working on models using knowledge distillation for dynamically combining word embeddings (Oct '19).
- **Early Detection of Alzheimer's Disease from Speech:** Proposed neural models for detecting early signals of Alzheimer's Disease from a crowd-sourced speech dataset (Dec '18).
- **Multithreading vs Python GIL: A study:** Project involved studying the effects of the Python Global Interpreter Lock on libraries commonly used for machine learning (NumPy and Scikit-learn) by profiling for concurrency, locks, hotspots of time etc. An adaptive way to set GIL check interval was introduced as a result of profiling. (Jan '18)
- **Using Label Semantics for Image Classification:** Proposed and empirically validated optimization functions for image classification networks to account for relation or similarity between class labels (Dec '17)
- **Predicting the Aesthetic Quality and Emotion Depicted in an Image Using Deep Learning Approaches:** Use of recurrent attention models for aesthetic rating and training multi-task learning models to identify emotion invoked in a person when viewing an image using the AADB dataset.(Dec '16)

## HONORS AND AWARDS

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- MITACS Accelerate Scholarship, University of Toronto from May 2018-Dec 2018.
- Institute Silver Medal, Indian Institute of Technology Guwahati in 2017.
- DAAD Working Internships in Science and Engineering (WISE) Scholarship for a research internship under the guidance of Dr. Carsten Rother, Dr. Stefan Gumhold and Dr. Christin Seifert at TU Dresden
- Kishore Vaigyanik Protsahan Yojana (KVPY) scholarship for higher studies in Basic Sciences, 2013

## SKILLS SUMMARY

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- **Programming Languages:** Python, C++, CUDA, MATLAB, Java
- **Deep Learning Frameworks:** PyTorch, Caffe, TensorFlow

## TEACHING EXPERIENCE

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Teaching Assistant, Department of Computer Science, University of Toronto

- CSC 458: Computer Networks, Fall 2017
- CSC 358: Introduction to Computer Networks, Winter 2018

## EXTRA CURRICULAR

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- **DAAD Young Ambassador India 2016-17:** Duties included helping students learn more about research opportunities in Germany
- **Editorial Team Member, InPhase Magazine, 2016:** Was on the editorial team of the departmental magazine, InPhase, in 2016 at IIT Guwahati.
- **Volunteer:** Served as a member in National Service Scheme, 2014.
- **Member:** Electronics Club, IIT Guwahati (2015-16).