

# William Chan

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## Education

### Carnegie Mellon University

PhD Electrical and Computer Engineering 2016  
Thesis: *End-to-End Speech Recognition Models*  
Research Areas: *Machine Learning, Deep Learning, Speech Recognition*

### University of Waterloo

BASc Computer Engineering, Management Sciences Option 2011

### National University of Singapore

Computer Engineering Exchange Student 2010

## Professional Experiences

**Google Research** - Google Brain Research Scientist 2017 - current

- *InferLite: Simple Universal Sentence Representations from Natural Language Inference Data*
- *Illustrative Language Understanding: Large-Scale Visual Grounding with Image Search*
- Manager: Geoffrey Hinton
- Research Areas: machine learning, deep learning, natural language processing

**Google Research** - Google Brain Research Intern 2016

- *Latent Sequence Decompositions*
- *Very Deep Convolutional Networks for End-to-End Speech Recognition*
- Mentors: Navdeep Jaitly and Quoc Le
- Research Areas: machine learning, deep learning, speech recognition

**Google Research** - Google Brain Research Intern 2015

- *Listen, Attend and Spell*
- Mentors: Navdeep Jaitly, Quoc Le and Oriol Vinyals
- Research Areas: machine learning, deep learning, speech recognition

**Google Research** - Google Brain Research Intern Part-Time 2015

- Cooking secret sauces part-time while continuing PhD @CMU
- Various code optimizations, ??% efficiency in CPU and memory over baseline DistBelief implementation
- Research Areas: machine learning, deep learning

**Google Research** - Natural Language Processing Research Intern Part-Time 2014

- Continuation of summer internship but now working 1 day / week while continuing PhD @CMU
- ?x production inference code optimization under certain scenarios
- Research Areas: machine learning, deep learning, natural language processing

**Google Research** - Natural Language Processing Research Intern 2014

- SAFT Machine Intelligence
- Deep Learning, Natural Language Processing and Multilingual Coreference Resolution
- ?% increase in coref performance on the CoNLL dataset over baseline system
- Research Areas: machine learning, deep learning, natural language processing

- Google** - Machine Learning Ads Intern 2012
- Display Campaign Optimizer
  - Replaced a heuristic ranking model with a machine learning ranking model, ??% increase in Click Through Rate and ??% increase in customer return on investment in certain scenarios (patent pending)
  - Added various Map-Reduce analysis scripts
  - Added Business Value: higher ROI for customers, higher revenue for Google and more satisfied customers
- TD Securities** - Quantitative Financial Engineer Intern 2010
- TD Bank's trade floor in the Quantitative Research Group
  - Optimized Monte Carlo Simulation through dividend events consolidation, 500%-1700% performance gain on dividend heavy deals
  - Added a new mixed Dividend Pricing Pricing Model, allows pricing of most exotic derivatives using an inter-blended discrete dollar and proportional dividend schedule
  - Architected new 2D Interpolation Infrastructure and added Thin Plate Spline Interpolation for Local Volatility Surfaces
  - Cholesky decomposition optimizations for FX/Equity correlation matrices by bootstrapping similar matrices used in Monte Carlo Simulations
  - Added Business Value: faster execution, more accurate pricing, happier clients, better risk management and hedging
- Amazon** - Software Engineer Intern 2009
- Amazon Prime AdAttribution
  - Re-architected database schemas (Oracle and MySQL)
  - Modified data mining infrastructure to more efficiently attribute Amazon Prime signups to specific ads for statistical analysis
  - Added Business Value: faster and more effective analysis of customer behaviour
- Google** - Disk Platform Engineer Intern 2009
- Research and analysis on disk latency and bandwidth
  - Data analysis on disk performance across entire Google's server fleet
  - Added a new Linux Kernel Power Capping Module to output detailed CPU usage to assist in power management across Google's server fleet
  - Added Business Value: maximize utility, lower capital and operating costs, negotiation leverage with disk vendors
- Intel** - Mobile Platform Architecture Engineer Intern 2008
- Adaptive Power Algorithms Research
  - Designed and prototyped several dynamic frequency algorithms for CPU/GPU to reduce dynamic power, +55% CPU power reduction with no performance penalty in certain apps/games
  - Multi-Chip Package Power Controller Integral Algorithm
  - New methodology to increase CPU and GPU performance while maintaining same thermal design power envelope
  - Statistical Data Analysis on Power Traces - analyze and isolate power events for simulation and forecasting next generation mobile platform architectures
  - Added Business Value: additional product value with zero capital and marginal unit cost
- NVIDIA** - Driver Software Engineer Intern 2007
- Driver Optimizations
  - Various driver optimizations including +20% performance on Call of Duty 2 on G80
  - Added Business Value: additional product utility without additional capital or marginal costs, product differentiation against competitor

- High Bandwidth Video Playback Research and Development
- Developed custom video system for 1920x1080 @ 120Hz playback with throughput of over 6Gb/s and designed to scale over 240Hz
- Developed (Verilog) FPGA for a custom proprietary board for converting a DVI/HDMI signals to LVDS for a variety of LCD panels
- Floating-point Optimizations (SSE2 and SSE3)
- Added Business Value: capital cost savings (> 100k CAD) with custom in-house solutions vs commercial purchases

## Research Publications

1. Jamie Ryan Kiros and **William Chan**, "InferLite: Simple Universal Sentence Representations from Natural Language Inference Data," in EMNLP 2018.
2. Jamie Ryan Kiros, **William Chan** and Geoffrey Hinton, "Illustrative Language Understanding: Large-Scale Visual Grounding with Image Search," in ACL 2018.
3. Takaaki Hori, Shinji Watanabe, Yu Zhang and **William Chan**, "Advances in Joint CTC-Attention based End-to-End Speech Recognition with a Deep CNN Encoder and RNN-LM," in INTERSPEECH 2017.
4. **William Chan**, Yu Zhang, Quoc Le and Navdeep Jaitly, "Latent Sequence Decompositions," in ICLR 2017.
5. Yu Zhang, **William Chan** and Navdeep Jaitly, "Very Deep Convolutional Networks for End-to-End Speech Recognition," in ICASSP 2017.
6. **William Chan** and Ian Lane, "On Online Attention-based Speech Recognition and Joint Mandarin Character-Pinyin Training," in INTERSPEECH 2016.
7. Guan-Lin Chao, **William Chan** and Ian Lane, "Speaker-Targeted Audio-Visual Models for Speech Recognition in Cocktail-Party Environments," in INTERSPEECH 2016.
8. **William Chan**, Navdeep Jaitly, Quoc Le and Oriol Vinyals, "Listen, Attend and Spell: A Neural Network for Large Vocabulary Conversational Speech Recognition," in ICASSP 2016. **Best Student Paper Award.**
9. **William Chan** and Ian Lane, "Deep Recurrent Neural Networks for Acoustic Modelling," in arXiv 2015.
10. **William Chan**, Nan Rosemary Ke and Ian Lane, "Transferring Knowledge from a RNN to a DNN," in INTERSPEECH 2015.
11. **William Chan** and Ian Lane, "Deep Convolutional Neural Networks for Acoustic Modeling in Low Resource Languages," in ICASSP 2015.
12. **William Chan** and Ian Lane, "Distributed Asynchronous Optimization of Convolutional Neural Networks," in INTERSPEECH 2014.
13. Le Nguyen, Pang Wu, **William Chan**, Wei Peng and Joy Zhang, "Predicting Collective Sentiment Dynamics from Time-series Social Media," in ACM SIGKDD WISDOM 2012.
14. **William Chan** and Jason Lohn, "Spike Timing Dependent Plasticity with Memristive Synapse in Neuromorphic Systems," in IEEE IJCNN 2012. **Travel Fellowship for Spiking Neural Networks.**

## Service

- Reviewer (past and/or present) for:
  - IEEE International Conference on Acoustics, Speech and Signal Processing
  - IEEE Signal Processing Letters
  - IEEE Transactions on Evolutionary Computation
  - IEEE Transactions on Neural Networks and Learning Systems
  - International Conference on Artificial Intelligence and Statistics (AISTATS)
  - International Conference on Learning Representations (ICLR)

- International Conference on Machine Learning (ICML)
- INTERSPEECH
- Neural Information Processing Systems (NIPS)

## References

- Chris Dyer (Carnegie Mellon University and DeepMind)
- Bhiksha Raj (Carnegie Mellon University)
- Florian Metze (Carnegie Mellon University)
- Ian Lane (Carnegie Mellon University)
- Navdeep Jaitly (Google Brain)
- Oriol Vinyals (DeepMind)
- Quoc Le (Google Brain)