

## Zhongtian (Falcon) Dai

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### Education

**Toyota Technological Institute at Chicago, Chicago, IL**

*Ph.D. in Computer Science (defended in September 2022).* September 2015 - September 2023.

- > Advised by Professor [Matthew R. Walter](#).
- > Thesis committee: Matthew R. Walter, [David McAllester](#), [Avrim Blum](#).
- > Thesis title: [On Reward Structures in Markov Decision Processes](#).
- > Select courses: learning theory, natural language processing, computer vision, dynamical systems.

**The University of Chicago, Chicago, IL**

*B.S. with Honors in Mathematics and B.A. with Honors in Physics.* September 2008 - June 2012.

Cumulative GPA: **3.76/4.00**.

- > Student Marshal of Class 2012 (top University distinction).
- > James Franck Institute Summer Undergraduate Research Fellowship, 2011.
- > Advanced courses: mathematical logic, graduate quantum mechanics, graduate general relativity.

### Publications

- > -, Walter MR. [Loop Estimator for Discounted Values in Markov Reward Processes](#). Association for the Advancement of Artificial Intelligence conference (AAAI), 2021.
- > Zheng W, Minama Reddy GK, -, Chandramani A, Brang D, Hunter S, Kohrman MH, Rose S, Rossi M, Tao J, Wu S, Byrne R, Frim DM, Warnke P, Towle VL. [Chasing Language Through the Brain: Successive Parallel Networks](#). Clinical Neurophysiology, 2020.
- > -, Walter MR. [Maximum Expected Hitting Cost of a Markov Decision Process and Informativeness of Rewards](#). Neural Information Processing Systems (NeurIPS), 2019.
- > -, Cai Z. [Towards Near-imperceptible Steganographic Text](#). Association for Computational Linguistics (ACL), 2019. [[oral presentation, nominated for best paper awards](#)]
- > Gehrmann S, -, Elder H, Rush AM. [End-to-End Content and Plan Selection for Natural Language Generation](#). International Conference on Natural Language Generation (INLG), 2018.
- > -\*, Cai Z\*. [Glyph-aware Embedding of Chinese Characters](#). Subword and Character level models in NLP workshop at Empirical Methods in Natural Language Processing conference (EMNLP), 2017.
- > Towle VL, -, Zheng W, Issa N. "[Mapping Cortical Function with Event-Related Electrocorticography](#)," in *Functional Mapping of the Cerebral Cortex*, ed. Richard W. Byrne. (Springer, 2016), 91-104.
- > Brang D, -, Zhang W, Towle VL. [Registering Imaged ECoG Electrodes to Human Cortex: A Geometry-based Technique](#). Journal of Neuroscience Methods, 64-73. 2016.
- > Brang D, Towle VL, Suzuki S, Hillyard SA, Di Tusa S, -, Wu S, Tao J, Grabowecy M. [Peripheral sounds rapidly activate visual cortex: evidence from electrocorticography](#). Journal of Neurophysiology, 3023-3028. 2015.
- > Towle VL, Minama Reddy GK, -, Zhang W, Brang D, Hunter S, Kohrman MH, Marcucilli CJ, Tao J, Rossi MA,

Frim DM, Byrne RW. Chasing Language Through the Brain: Three Successive Parallel Networks. Society for the Neurobiology of Language Conference, 2014.

## Presentations

- > Yunis D, Jung J, -, Walter MR. [Subwords as Skills: Tokenization for Sparse-Reward RL](#). Generalization in Planning workshop at NeurIPS, 2023.
- > -, Walter MR. Loop Estimator for Discounted Values in Markov Reward Processes. Poster session at Algorithmic Learning Theory (ALT), 2020.
- > -, Walter MR. Maximum Expected Hitting Cost of a Markov Decision Process and Informativeness of Rewards. Poster session at Algorithmic Learning Theory (ALT), 2020.
- > -, Walter MR. Finite Time Analysis of Potential-based Reward Shaping. Reinforcement Learning and Decision Making (RLDM), 2019. **[Student travel fellowship]**
- > Vasiljevic I, Kolkin N, Luo R, Wang H, -, Daniele AF, Mostajabi M, Basart S, Walter MR, Shakhnarovich G. [DIODE: A Dense Indoor and Outdoor DEpth Dataset](#). 3D Scene Understanding for Vision, Graphics, and Robotics workshop at Computer Vision and Pattern Recognition (CVPR), 2019.
- > -, Walter MR. Finite Time Analysis of Potential-based Reward Shaping. Midwest Machine Learning Symposium (MMLS), 2019.
- > -, Cai Z. Towards Near-imperceptible Steganographic Text. Midwest Machine Learning Symposium (MMLS), 2019.
- > -, Cai Z. Towards Near-imperceptible Steganographic Text. Midwest Speech and Language Days (MSLD), 2019.
- > - and others at RIPL @ TTIC. Rubik's cube solving robot. National robotics week special exhibit at the Museum of Science and Industry, 2019.
- > -, Walter MR. Reward-adjusted Diameters and Their Conditioning by Potential-based Reward Shaping. Learning by Instruction workshop at Neural Information Processing Systems (NeurIPS), 2018.
- > - and others at RIPL @ TTIC. Checkers-playing robot. National robotics week special exhibit at the Museum of Science and Industry, 2018.
- > Schaff C\*, -\*, Walter MR. [Towards Active Imitation Learning](#). Learning from Demonstrations in High-Dimensional Feature Spaces workshop at Robotics: Science and Systems conference (RSS), 2017. **[Student travel grant award]**
- > -, Walter MR. Notepad-Augmented Environments in Reinforcement Learning. Midwest Machine Learning Symposium, 2017.
- > -, Walter MR. Notepad-Augmented Environments in Reinforcement Learning. Midwest Robotics workshop, 2017.
- > -, Cai Z. Glyph-based Visual Chinese Character Embedding. Midwest Speech and Language Days, 2017.
- > -, Nettsheim G. Simulation and Modeling of the Anode of the Proposed Large-Area Picosecond Photo-Detector. Chicago Area Undergraduate Research Symposium, 2011.

## Working papers

- > Yunis D, Jung J, -, Walter MR. [Subwords as Skills: Tokenization for Sparse-Reward RL](#). In submission, 2024.
- > Mason W, Brenken D, -, Cruz Castillo RG, St-Martin Cormier O, Sedal A. [Acoustic Tactile Sensing for Mobile Robot Wheels](#). In submission, 2024.
- > -. [Word2vec Conjecture and A Limitative Result](#). In submission, 2019.

## Service to the community

- > Primary reviewer. IEEE Transactions on Robotics (T-RO), 2023.
- > Primary reviewer. International Conference on Learning Representations (ICLR), 2023.
- > Primary reviewer. International Conference on Machine Learning (ICML), 2021.
- > Primary reviewer. The Association for Computational Linguistics conference (ACL), 2021.
- > Primary reviewer. North American Chapter of the Association for Computational Linguistics conference (NAACL), 2021.
- > Primary reviewer. European Chapter of the Association for Computational Linguistics conference (EACL), 2021.
- > Primary reviewer. International Conference on Learning Representations conference (ICLR), 2021.
- > Primary reviewer. Association for the Advancement of Artificial Intelligence conference (AAAI), 2021.
- > Primary reviewer. Neural Information Processing Systems conference (NeurIPS), 2020.
- > Primary reviewer. Empirical Methods in Natural Language Processing conference (EMNLP), 2020.
- > Primary reviewer. International Conference on Learning Representations conference (ICLR), 2020.
- > Student volunteer. Symposium on Theory of Computing (STOC), 2020.
- > Primary reviewer. Association for Computational Linguistics conference (ACL), 2020.
- > Primary reviewer. International Joint Conference on Artificial Intelligence (IJCAI), 2020.
- > Secondary reviewer. Artificial Intelligence and Statistics (AISTATS), 2020.
- > Primary reviewer. International Conference on Learning Representations (ICLR), 2019.
- > Secondary reviewer. Neural Information Processing Systems conference (NeurIPS), 2019.
- > Student volunteer. Reinforcement Learning and Decision Making (RLDM), 2019.
- > Primary reviewer. International Journal of Robotics Research (IJRR), 2018.
- > Primary reviewer. International Conference on Learning Representations conference (ICLR), 2018.
- > Primary reviewer. International Symposium on Robotics Research (ISRR), 2017.
- > Secondary reviewer. Neural Information Processing Systems conference (NIPS), 2017.
- > Primary reviewer. Spatial-Semantic Representations in Robotics workshop at Robotics: Science and Systems conference (RSS), 2017.

## Experience

**Software engineering**, Apple Special Project Group, Santa Clara, CA.  
*Machine learning engineer (contractor)*, October 2023 - March 2024

- > Support perception, annotation tooling, annotation ops teams at the special project group.
- > Make data ingestion and annotation ETL workflows more reliable, scalable and maintainable.

**Teaching assistant to *An Introduction to Machine Learning Theory***, Toyota Technological Institute at Chicago, Chicago, IL

*Teaching assistant* (to Professor Avrim Blum), March 2022 - June 2022

- > Provided detailed technical explanations at office hours and over emails.
- > Automated the returning of graded homeworks via email with Gmail APIs.

**Technical consulting**, Waymark Inc, Detroit, MI

*Independent contractor*, January 2018 - February 2018

- > Prototyped and advised the CEO on an abstractive summarization system.

**Teaching assistant to *Duckietown***, Toyota Technological Institute at Chicago, Chicago, IL

*Teaching assistant* (to Professor Matthew Walter), October 2017 - December 2017

- > Created material for the hands-on self-driving robotics course.
- > Provided technical assistance to students.

**Research in Abstractive Summarization**, Harvard University, Cambridge, MA

*Visiting Research Intern* (hosted by [Professor Alexander Rush](#)), July 2017 - September 2017

- > Re-implemented state-of-the-art methods in paragraph-to-sentence summarization.
- > Maintained the open-sourced OpenNMT-py repository.

**Data Science and Analytics**, Strikingly Inc, Shanghai, China

*Data Scientist*, February 2015 - August 2015

- > Designed an improved web analytics implementation workflow.
- > Recruited and managed a data engineer.
- > Analyzed user behaviors, user acquisition campaigns, user referral programs.
- > Defined business growth/health metrics and implemented monitoring dashboards.

**Application of Artificial Neural Network in NLP**, Toyota Technological Institute at Chicago, Chicago, IL

*Student Visitor* (of Professor Kevin Gimpel and Professor Mohit Bansal), June 2014 - December 2014

- > Read and reviewed relevant academic articles.
- > Implemented a neural network library in Python (optimized with NumPy).

**Neurological Research**, Towle Lab, University of Chicago, Chicago, IL

*Research Assistant* (to [Professor Vernon L. Towle](#)), November 2012 - December 2014

- > Studied language processing via electrocorticographic data.
- > Developed novel methods for registering intracranial electrodes.
- > Implemented state-of-the-art medical image analysis and visualization software.

**Sociological Research**, Knowledge Lab, University of Chicago, Chicago, IL

*Research Assistant* (to [Professor James Evans](#)), October 2012 – December 2013

- > Built a machine learning pipeline to predict sociological attributes from Google StreetView images.
- > Built a web application for collecting graph-structured information from users.
- > Analyzed author networks induced by co-authorship and citations.

**TwIthinks**, a startup project, Chicago, IL and Cambridge, MA

*Co-founder*, April 2011 – January, 2014

- > Won web track in MIT-CHIEF Business Plan Contest at Massachusetts Institute of Technology
- > Built a prototype twithinks.com to visualize the Twitter users' reactions to 2012 presidential election.
- > Initiated and completed #ivoted map on election day which received 20K pageviews within 6 hours.
- > Featured on MIT-CSAIL news and a Swiss national news outlet Tages-Anzeiger.

**Summer Research Experience in Physics**, University of Chicago, IL

*Technical Support* for *Quantum Computing Project* (Professor [David Schuster](#)) and *Photon Detector Project* (Professor [Henry Frisch](#)), June 2009 – September 2009, June 2010 – September 2010, June 2011 – September 2011

- > Modeled the secondary electron emission process, implemented simulation programs, and analyzed experiment signal data.
- > Learnt basic signal processing and printed circuit board design.
- > built a custom spectrum analyzer and coded a custom GUI program.

**Computer Science Department and Mathematics Department**, University of Chicago, IL

*Teaching Assistant* for *Mobile Computing*, *Introduction to Programming (C++)*, *Grader* for *Introduction to Scientific Computing* and *Honors Calculus*, October 2010 – November 2011

- > Graded more than 30 students' work per week with detailed corrections, comments and guidance.

## Honors

- > [Best paper award finalist](#) at Association for Computational Linguistics conference (ACL), 2019.
- > Best app award at an invited hackathon in Shanghai, for a social chat app prototype, 2015.
- > 2<sup>nd</sup> place in [BattleHack hackathon in Chicago](#), for a facial recognition-assisted social payment app, 2014.
- > Ranked 164<sup>th</sup> on [Kaggle](#), 2013.
- > Co-founder of the Engineering Society at the University of Chicago, 2010.
- > 23<sup>rd</sup> team (out of 138 teams) at International Collegiate Programming Contest (ICPC) regional, 2010.
- > AP scholar after self-studying and scoring 5/5 on nine AP subjects, 2007.
- > 2<sup>nd</sup> place at Alamo regional Science & Engineering Fair; Honorable Mention at Texas state, 2007.

## Skills

- > Programming languages: python, javascript, C, C++, CUDA, Java, prolog, SQL.
- > Robotics: ROS, RGBD data.
- > "Big data" software stack: Scikit-Learn, Spark, ElasticSearch, Hadoop, Pandas, IPython.

- > Web development: React, D3js, WebGL, HTML5, CSS3, Node.js, PostgreSQL, MongoDB.
- > Software: Atom editor, Tmux, Docker, Eclipse, Git, Mathematica, Octave/Matlab, LaTeX, Linux.
- > Web API's: Amazon Web Services, DigitalOcean, Google Cloud Platform, Twitter API, WeChat API.
- > Fluent in Mandarin and Cantonese.

## Interests

- > Personal: skiing, climbing, automotive technologies, dog training, cooking, drawing, fixing electronics.
- > Academic: cognition, physics, quantum mechanics, logic.