

# DANIEL QUIGLEY

Linguistics and Artificial Intelligence PhD Candidate | dquigleydev@gmail.com | (414) 335-2754  
dquigley.dev | github.com/deltaquebec | linkedin.com/in/quigley-daniel

## PERSONAL PROFILE

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Highly motivated and ambitious PhD student with a passion for linguistics, artificial intelligence, mathematics, and science communication, possessing a strong interdisciplinary and diverse skillset in the natural sciences, linguistics, mathematics, programming, natural language processing, machine learning, and artificial intelligence acquired through academic study and practical experience.

## EDUCATION

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### University of Wisconsin-Milwaukee

Milwaukee, WI

*PhD, Linguistics, Artificial Intelligence | PhD Minor, Computer Science*

2025

- Interdisciplinary PhD research across linguistics, computer science, logic, and mathematics
- **Advisor:** Nicholas Fleisher

### University of Wisconsin-Milwaukee

Milwaukee, WI

*MA, Linguistics*

2023

- Interdisciplinary MA research across linguistics, computer science, logic, and mathematics
- **Advisors:** Nicholas Fleisher and Hamid Ouali (Linguistics); Susan McRoy (Computer Science)

### Universiteit Utrecht

Utrecht, The Netherlands

*MSc Certificate, Theoretical Physics*

2019

- Interdisciplinary Graduate Honors recipient
- Completed Master's coursework in Theoretical Physics and Mathematics

### University of Wisconsin-Madison

Madison, WI

*BSc, Anthropology, Astronomy, Linguistics, Mathematics, Physics*

2018

- Record holder for number of majors
- **Advisors:** Stefan Westerhoff (Physics; Astronomy; Mathematics); Monica Macaulay (Linguistics); J. Mark Kenoyer (Anthropology)

## PHD RESEARCH

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### University of Wisconsin-Milwaukee

Milwaukee, WI

*Theoretical Linguistics; Mathematics; Artificial Intelligence; Natural Language Processing*

Aug 2020 – Current

- Conducting research in interpretable neuro-symbolic artificial intelligence and natural language processing on problems in natural language understanding, knowledge representations, and semantic representations.
- Proving morphisms between intensional semantics and vector space semantics using model-theoretic, group-theoretic, and category-theoretic frameworks.
- Developing first- and second-order logic representations for intensional semantics in the context of category theory.
- Designing algorithms and computing their space and time complexities to facilitate interpretable language processing for logical reasoning tasks.
- Exploring theoretical foundations in the context of graph and group theory to explain model architectures for deep neural networks.

## MA RESEARCH

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### University of Wisconsin-Milwaukee

Milwaukee, WI

*Theoretical Linguistics; Mathematics; Artificial Intelligence; Natural Language Processing*

Aug 2020 – May 2023

- Designed and proved PSPACE-hard algorithms for language processing based on extensional and intensional semantics.
- Proved homomorphism between discrete intensional semantics models and vector space semantics.
- Derived tensor forms for semantic representations in hyperbolic spaces.

## MSC RESEARCH

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### Universiteit Utrecht

Utrecht, The Netherlands

*Theoretical Physics: Graduate Interdisciplinary Honors*

Aug 2018 – Jul 2019

- Completed coursework in Theoretical Physics, with a focus on high energy physics, cosmology, and gravitational physics.
- Completed coursework in Mathematics, with a focus on differential geometry, geometric partial differential equations, and geometric flows.
- Applied scientific expertise to interdisciplinary applications across multiple departments, including presenting independent research on geography and climate science to colleagues in the honors seminar.

**University of Wisconsin-Madison**

*Indus Valley Civilization Undergraduate Researcher*

Madison, WI

Oct 2015 – May 2018

- Reconstructed broken strings of written data from the Indus Valley Script using  $n$ -gram Markov chains and conditional entropy, and applied statistical analysis techniques to analyze the data using Python.
- Collaborated with international colleagues to analyze the Indus Valley Script data, resulting in the creation of sign frequency scores that showed the context in which different symbols were used.
- Presented results at an international academic conference.

**University of Wisconsin-Madison**

*Wisconsin Baldwin Idea Grant Project Assistant*

Madison, WI

Oct 2014 – May 2018

- Worked with Menominee elders and coordinated with team of undergraduate students, graduate students, and academic advisor.
- Recorded, documented, and prepared teaching materials for language preservation and revitalization efforts.
- Results of work integrated into Menominee reference grammar (to be published).

**Wisconsin IceCube Particle Astrophysics Center**

*High Energy Astroparticle Physics Research Assistant*

Madison, WI

Oct 2014 – May 2018

- Designed and implemented simulations, data acquisition systems, and visualizations for HAWC (High-Altitude Water Cherenkov) gamma-ray detector.
- Resolved discrepancies in gamma-ray results across four international experiments; wrote GPS data system using ZeroMQ in C++.
- Communicated results of simulations and technical developments with international teams, demonstrating strong collaboration and communication skills.

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PROJECT EXPERIENCE

**University of Wisconsin-Madison**

*L<sup>A</sup>T<sub>E</sub>X Developer*

Milwaukee, WI

Aug 2020 – Current

- Designed L<sup>A</sup>T<sub>E</sub>X document templates, accepted by university as official resources for graduate school.
- Created document tagging and readability methods to improve designs of accessible PDF documents.
- Developing intelligent UIs for improved accessibility of PDF documents, improving usability for users with accessibility needs and machine readability.

**University of Wisconsin-Madison**

*Data Visualization and Sentiment Analysis of Movie Reviews across Four Neural Network Models*

Milwaukee, WI

May 2021

- Conducted a comprehensive comparison of performance metrics for polarity sentiment analysis of movie reviews using deep learning techniques, including the design of four different machine learning architectures (CNN, RNN, RCNN, LSTM).
- Compared the performance of the different model architectures across ten epochs, with a cutoff for validation loss, and achieved an accuracy rate of greater than 83% for each model.
- Demonstrated expertise in the application of deep learning techniques to natural language processing tasks through the successful execution and analysis of this research project.

**University of Wisconsin-Madison**

*ML Optimization: No Free Lunch*

Milwaukee, WI

May 2021

- Optimized, evaluated, and compared performance scores for classification machine learning tasks: Decision Tree Classifier; K-Nearest Neighbor; Multinomial Naive Bayes; Logistic Regression; SVC; Dummy Classifier; Neural Network.
- Optimized, evaluated, and compared performance scores for regression machine learning tasks: Decision Tree Regressor; Linear Regression; SVR; Dummy Regressor; Neural Network.
- Evaluated CNN architectures of image classification task using the Fashion-MNIST dataset.

**University of Wisconsin-Madison**

*Linux from Scratch*

Milwaukee, WI

Jul 2020

- Completed *Linux from Scratch* project, building a fully functional Linux distribution from scratch using source code and following project documentation, demonstrating strong problem-solving and troubleshooting skills to resolve issues during build process.
- Developed deep understanding of Linux operating system, including kernel, system libraries, and userland utilities, and improved skills in working with source code and building software from ground up.
- Created a customized Linux distribution that met specific needs and preferences, showcasing ability to tailor a system to meet unique requirements.

## WORK EXPERIENCE

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### Apple

*Career Experience Internship: Production Engineer*

Cupertino, CA

*Jul 2023 – Nov 2023*

- Tested and deployed demo content to channel stores across iOS, tvOS, watchOS, and macOS platforms from development to production.
- Developed, maintained, and documented sophisticated automation frameworks, using Python scripting to enhance operational efficiency.
- Validated content in twenty-one languages across twenty-five locales sensitive to local content and language requirements while crafting comprehensive test plans and technical documentation for new features and internal tools.

### Apple

*Genius Technician*

Glendale, WI

*Oct 2021 – Present*

- Demonstrated leadership while also mentoring Technical Specialists and Technical Experts; developed and implemented new processes to improve efficiency and effectiveness of Genius Bar team.
- Exceeded expectations for customer satisfaction: attained performance review scores of 88 TMS and 74 NPS, excelling in metrics for technical expertise (89) and empathy (80).
- Certified for iPhone and Mac repair, maintaining 95% repair rate on devices.

### University of Wisconsin-Milwaukee

*Instructor of Record*

Milwaukee, WI

*Aug 2020 – Present*

- Responsible for class sizes of 20-30 students per semester, providing comprehensive support and guidance.
- Designed course content to include topics in natural language processing, such as introductory concepts and artificial intelligence ethics.
- Providing effective feedback and communication to improve performance, demonstrating commitment to student success and learning.

### Apple

*Specialist*

Wauwatosa, WI

*Oct 2019 – Oct 2021*

- Lead store in business introductions and connected business sales.
- Exceeded expectations for customer satisfaction: attained performance review scores of 91 TMS and 83 NPS, excelling in metrics for knowledgeable (87), ability to connect (92), and understanding needs (92).

## GRADUATE COURSEWORK

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**Linguistics:** Phonetics; Phonology; Morphology; Syntax; Semantics; 2nd Language Acquisition; Seminar: Ellipsis; Typology and Universals; Historical and Comparative Linguistics; Seminar: Research Methods; Seminar: Double Object Constructions; Advanced Phonetics; Advanced Phonology; Advanced Syntax; Advanced Semantics; Foundations of Formal Logic; Advanced Independent Study

**Computer Science:** Machine Learning and Applications; Introduction to Natural Language Processing; Introduction to Artificial Intelligence; Artificial Intelligence in Business; Advanced Independent Study; Advanced Machine Learning; Algorithm Design and Analysis

**Physics:** Quantum Field Theory; Statistical Field Theory; General Relativity; String Theory; Field Theory in Particle Physics; Cosmology; Radiative Processes; High Energy Astrophysics

**Mathematics:** Differential Geometry; Geometric Partial Differential Equations; Mathematical Methods in Theoretical Physics; Algebraic Structures

## PROFESSIONAL INTERESTS

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**Linguistics:** formal logic; mathematical models; model theory; ellipsis; double object constructions; transitivity mismatches; case stacking; construction grammar; scope; binding; degree and comparison; typology; language change

**Computer Science:** algorithm design; complexity; formal logic; mathematical models; model theory; machine learning methods for language processing; human language technologies; human-computer interaction

**Artificial Intelligence:** neural networks; natural language processing; explainable artificial intelligence; geometric neural networks; graph neural networks

**Physics:** gravitational physics; black hole physics; early universe physics; topological defects; quantum field theory in curved spacetime

**Mathematics:** category theory; group theory; differential geometry; geometric PDEs; geometric flows; Ricci flow; operator theory; formal logic; model theory

**Anthropology:** writing; calendrical systems; power and social relations; gender; ethnoarchaeology; archaeoastronomy

## PROFESSIONAL AFFILIATIONS

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American Mathematical Society (AMS)

American Physical Society (APS)

Association for Computational Linguistics (ACL)

Association for the Advancement of Artificial Intelligence (AAAI)

Language Creation Society (LCS)

Linguistic Society of America (LSA)

## HONORS AND AWARDS

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University of Wisconsin-Milwaukee	Graduate Teaching Assistantship	Aug 2020 – Current
University of Wisconsin-Milwaukee	Chancellor's Graduate Student Award	2020, 2023
Universiteit Utrecht	Graduate Honors	2019
University of Wisconsin-Madison	Record - Number of Majors (5)	2018

## PRESENTATIONS AND PUBLICATIONS

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### Presentations

- **Quigley, Daniel** (2023). *Tensor Space and Category-Theoretic Semantics for Resolving Long-Distance Linguistic Expressions in Natural Language Processing*. PhD preliminary paper and presentation.
- **Quigley, Daniel** (2023). *Decoding Authorial Style, Tone, and Mood in Poetic Translations through Natural Language Processing: An Analysis of Beowulf*. Workshop in General Linguistics.
- **Quigley, Daniel** (2023). *L<sup>A</sup>T<sub>E</sub>X for Linguists*. Summer Workshop.

### Publications

- **Quigley, Daniel** (2023). *Exploring Category-Theoretic Morphisms for Model-Theoretic Semantics*. Manuscript submitted for review.
- **Quigley, Daniel** (2023). *Decoding Authorial Style, Tone, and Mood in Poetic Translations through Natural Language Processing: An Analysis of Beowulf*. In Proceedings: Workshop in General Linguistics.

## SKILLS

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**Programming Languages and Development Tools:** Python (NumPy, Keras, Scikit-Learn, Gensim, Stanza, NLTK, PyTorch, Pandas, IDLE), L<sup>A</sup>T<sub>E</sub>X, VIM

**Machine Learning, Language Processing, Data Analysis, and Development Tools:** TensorFlow, Excel, Mathematica, Keras, Scikit-Learn, PyTorch, PRAAT, Stanza, NLTK

**Operating Systems and Software:** Linux, Windows, MacOS, Conda, CUDA (GPU Programming), MS Office Suite

## LANGUAGES

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**Native:** English

**Conversational:** German

**Elementary:** Dutch; Finnish

**Some Study:** Menominee; Arabic (MSA); Sanskrit; Georgian