Doctoral Thesis Writing Plan

Phonological Features in the Age of Deep Learning: A Multi-dimensional Exploration of Optimal Representational Units for Language Modeling

Doctoral Thesis Writing Qualification Review

Sora Nagano
Graduate School of Humanities and Sociology, Department of Language and Information Sciences
The University of Tokyo

s-oswld-n@g.ecc.u-tokyo.ac.jp

2025-08-12

1 Doctoral Thesis Writing Plan

1.1 Writing Schedule (36-month Plan)

1.1.1 Year 1 (Foundation Building Period: April 2025 - March 2026)

April-June: Theoretical Foundation Construction

- Systematic organization of prior research and refinement of theoretical framework
- Development of integration theory between Optimality Theory and self-supervised learning models
- Establishment of research methodology and ethics review procedures

July-September: Experimental Environment Setup and Pilot Research

- Computational environment preparation (GPU clusters, dataset preparation)
- Technical feasibility verification through micro-scale experiments
- Implementation and preliminary evaluation of baseline methods

October-December: Phase 1 Experiments and Interim Evaluation

- Conducting foundational experiments for RQ1 (Empirical Landscape Elucidation)
- Building comparative evaluation framework for different representational units
- Research presentation at domestic conferences (Annual Conference of the Association for Natural Language Processing)

January-March: Theoretical Extension and International Presentation Preparation

- Theoretical design of hybrid models
- Preparation for international conference submissions (ACL, INTERSPEECH)
- Publication of Year 1 research outcomes

1.1.2 Year 2 (Core Research Period: April 2026 - March 2027)

April-June: Hybrid Model Development

- Implementation of neuro-symbolic architecture
- Initiation of full-scale experiments for RQ2 (Neuro-symbolic Integration)

- Optimization of constraint learning algorithms

July-September: Large-scale Experiments and Ablation Studies

- Performance evaluation on multilingual datasets
- Analysis of architectural component contributions
- Detailed evaluation of computational efficiency

October-December: Preparation for Cognitive Plausibility Validation

- Experimental design for RQ3 (Cognitive Plausibility)
- Building developmental simulation environment using CHILDES corpus
- Preparation for collaboration with psycholinguistic experiments

January-March: Integrated Evaluation and Theoretical Considerations

- Integrated analysis of three RQs
- Clarification of theoretical contributions forming the core of the doctoral thesis
- Research presentation at top-tier international conferences

1.1.3 Year 3 (Integration and Completion Period: April 2027 - March 2028)

April-June: Cognitive Plausibility Experiments and Applied Research

- Comparative validation with human language acquisition patterns
- Consideration of practical applications (speech recognition, language learning support)
- Evaluation of social significance of research outcomes

July-September: Doctoral Thesis Writing (First Half)

- Writing introduction, literature review, and methodology chapters
- Detailed analysis of experimental results and figure/table creation
- Regular progress checks with supervisor

October-December: Doctoral Thesis Writing (Second Half)

- Writing results, discussion, and conclusion chapters
- Integrated discussion of theoretical contributions and practical significance
- Ensuring overall thesis consistency and revision

January-March: Final Adjustments and Submission Preparation

- Final proofreading and bibliography organization of doctoral thesis
- Preparation for oral examination and research outcome summary
- Doctoral thesis submission and degree acquisition procedures

1.2 Thesis Structure Plan

1.2.1 Anticipated Chapter Structure (Approximately 200 pages)

Chapter 1: Introduction (25 pages)

- Research background and problem awareness
- Research objectives and significance
- Thesis structure and contributions

Chapter 2: Literature Review and Theoretical Background (40 pages)

- Historical development of computational phonology
- Self-supervised learning and phonological representations
- Theory of neuro-symbolic integration

Chapter 3: Research Methodology (30 pages)

- Multi-dimensional definition of "optimality"
- Experimental design and datasets
- Evaluation metrics and statistical methods

Chapter 4: Empirical Landscape Elucidation (35 pages)

- RQ1 experimental results and analysis
- Performance comparison between representational units
- Evaluation of computational efficiency

Chapter 5: Neuro-symbolic Integration (40 pages)

- Design and implementation of hybrid models
- RQ2 experimental results and theoretical considerations
- Trade-offs between interpretability and predictive accuracy

Chapter 6: Cognitive Plausibility Validation (30 pages)

- RQ3 developmental simulation experiments
- Comparison with human language acquisition patterns
- Evaluation of cognitive plausibility

Chapter 7: General Discussion and Future Prospects (20 pages)

- Integrated evaluation of research outcomes
- Summary of theoretical and practical contributions
- Future research directions

1.3 Considerations for Research Implementation

1.3.1 Quality Management System

- Monthly supervisor meetings for progress management
- Regular interim presentations at laboratory seminars
- External evaluation through active submission to international conferences and academic journals
- Interdisciplinary discussions with researchers from other fields

1.3.2 Risk Management and Alternative Plans

Technical Risks: Utilizing cloud computing and incremental experimental design to address computational resource shortages

Data Risks: Securing multiple alternative data sources in case of difficulty accessing primary datasets

Theoretical Risks: Pursuing theoretical contributions through individual approaches in parallel, in case of poor hybrid model performance

1.3.3 Building International Research Networks

- Promoting collaborative research with overseas research institutions
- Active research presentation and networking at international conferences
- Qualitative improvement of research through discussions with renowned researchers

Following this writing plan, I aim to establish a new paradigm in computational phonology for the deep learning era and complete an academically and socially significant doctoral thesis.