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DOCTORAL THESIS WRITING QUALIFICATION REVIEW

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1 Applicant Information

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3 Thesis Information

Thesis Title:
Phonological Features in the Deep Learning Era: A Multi-dimensional Investigation of Optimal Representational Units for Language Modeling

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4 Thesis Abstract

This doctoral thesis investigates the fundamental question of optimal representational units for computational phonology in the deep learning era. The research addresses the critical gap between traditional symbolic phonological theories (distinctive features, phonemes, constraints) and modern neural representations learned by self-supervised models like wav2vec 2.0 (Baevski et al., 2020). Through a multi-dimensional evaluation framework encompassing predictive accuracy, linguistic interpretability, cognitive plausibility, and computational efficiency, the thesis pursues three interconnected objectives: (1) empirically mapping the landscape of different representational units across diverse phonological tasks, (2) developing neuro-symbolic hybrid architectures that integrate symbolic knowledge with neural learning (Begu, 2020; Panchendrarajan & Zubiaga, 2024), and (3) validating cognitive plausibility through language acquisition simulations and behavioral comparisons (Cruz Blandón et al., 2023).

The research employs systematic experimentation using multilingual speech corpora (Ardila et al., 2020; Cho et al., 2025), implements novel architectures combining self-supervised encoders with constraint-based decoders (Tesar, 1995), and validates findings against human language processing data. Preliminary results demonstrate that discrete neural codes can maintain 85% performance while enabling symbolic manipulation (Higy et al., 2021), and that neural-parameterized Maximum Entropy Harmonic Grammar can discover phonologically meaningful constraints without supervision. Expected contributions include a unified theory of phonological representation, practical improvements in speech technology through interpretable hybrid models, and interdisciplinary insights bridging linguistics, machine learning, and cognitive science.

5 Supervisor Information

Primary Supervisor: [To be assigned]
Department of Language and Information Sciences

Co-supervisor: [To be assigned]
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6 Research Timeline

Expected Thesis Submission: March 2026

Expected Defense: May 2026

7 Declaration

I hereby confirm that the information provided above is accurate and complete. I understand that this doctoral thesis writing qualification review is conducted according to the guidelines of the Graduate School of Arts and Sciences, The University of Tokyo.

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Applicant Signature: Sora Nagano

Date: _____

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Supervisor Approval

Date: _____

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