

Evaluation form for PhD dissertation

Evaluation form

Title of the thesis

A NEURAL NETWORK APPROACH TO MODELING THE ACOUSTIC EFFECTS OF PHONOLOGICAL NEIGHBORHOOD DENSITY AND WORD FREQUENCY IN POLISH SPEECH

Affiliation of the reviewer

Computer Science Department, University of Pisa, Italy

Report

The dissertation presents an interdisciplinary study situated at the intersection of psycholinguistics, speech technology, and artificial intelligence. The work investigates the effects of phonological neighbourhood density and word frequency in Polish speech, comparing human speech production with contemporary AI-based speech synthesis and recognition systems. The topic is timely and relevant, particularly given the growing importance of AI speech technologies and the relative scarcity of studies focusing on non-English languages.

The thesis is generally well organised and clearly written. The research questions are explicitly stated, the literature review demonstrates broad knowledge of the relevant domains, and the methodological design is carefully developed. The comparison between human speech production and AI-generated speech constitutes an original and interesting contribution, especially in the context of Polish language research.

The dissertation also demonstrates strong technical competence in acoustic analysis and neural speech technologies. The discussion of limitations and practical implications is appreciated, particularly regarding speech synthesis and recognition systems.

Some aspects of the thesis could nevertheless be improved through minor revisions. In particular:

1. Certain sections of Chapter 2 are overly extensive and occasionally assume the character of a general tutorial on neural networks and AI rather than remaining tightly focused on the dissertation's specific research objectives. Those could be shortened or made more directly connected to the dissertation's specific research aims.
2. The discussion occasionally risks overinterpreting similarities between human cognitive/psycholinguistic processes and internal representations of AI systems. Greater caution would strengthen the theoretical framing and avoid possible anthropomorphising of model behaviour. I would be cautious since the thesis sometimes risks implying equivalence

between: human lexical competition and latent model representations.

3. Some methodological and statistical decisions could benefit from clearer justification and more concise presentation.

Confidential report (it will not be shown to the candidate)

The thesis is generally well-structured, clearly written, and grounded in an extensive review of the relevant literature. The research questions are explicitly formulated, and the methodological design demonstrates substantial effort and technical competence. In particular, the comparison between human speech production and AI speech systems constitutes an original and potentially publishable contribution, especially in the context of non-English-language research.

The dissertation's strengths include:

- a clear articulation of the research problem and hypotheses;
- strong interdisciplinary integration between psycholinguistics and AI speech technologies;
- a careful experimental design with controlled stimuli;
- explicit acknowledgement of methodological limitations;
- and relevant practical implications for speech synthesis and recognition.

At the same time, some aspects would benefit from revision and clarification before final submission. In particular:

Certain sections of Chapter 2 are overly extensive and occasionally assume the character of a general tutorial on neural networks and AI rather than remaining tightly focused on the dissertation's specific research objectives.

The discussion occasionally risks overinterpreting similarities between human cognitive/psycholinguistic processes and internal representations of AI systems. Greater caution would strengthen the theoretical framing and avoid possible anthropomorphising of model behaviour.

Some methodological and statistical decisions could benefit from clearer justification and more concise presentation.

Overall, these issues do not undermine the scientific validity or quality of the dissertation, which constitutes a solid and meaningful contribution to the field. I therefore recommend admission to the defence, subject to minor revisions.

It is a solid, strong thesis, but probably not sufficiently original or theoretically transformative for cum laude. The work extends existing paradigms rather than inventing entirely new theoretical or methodological frameworks.

Evaluation file (optional)

Presentation and clarity

☐ None ☐ Poor ☐ Average ☒ Good ☐ Excellent

The reviewer should be able to read the text without difficulty. This implies that the dissertation is clear and 'user friendly', without duplications or repetitions.

Integration and coherence

☐ None ☐ Poor ☐ Average ☒ Good ☐ Excellent

The manuscript should present logical and rational links between different parts of the thesis.

Introduction to scientific background

☐ None ☐ Poor ☐ Average ☐ Good ☒ Excellent

The text should contain a satisfactory introduction to the scientific background which is relevant to the research, preparing the reader to the exposition of the problem.

Review of relevant literature

☐ None ☐ Poor ☐ Average ☒ Good ☐ Excellent

The candidate must have a detailed knowledge of original sources, have a thorough knowledge of the field, and understand the main theoretical and methodological issues.

Statement of research problem

☐ None ☐ Poor ☐ Average ☐ Good ☒ Excellent

A clear statement of the research problem should be made, together with specific hypotheses, predictions, or questions which the research is designed to address.

Originality

☐ None ☐ Poor ☐ Average ☒ Good ☐ Excellent

The research must be the candidate's own work. The degree of independence may vary according to the research topic.

Contribution to knowledge and scientific relevance

☐ None ☐ Poor ☐ Average ☒ Good ☐ Excellent

The dissertation should be substantial enough to be able to form the basis of two articles on refereed journal, a book or research monograph.

Mastery of the English language

☐ None ☐ Poor ☐ Average ☐ Good ☒ Excellent

The candidate must be proficient in written English and show mastery of appropriate scientific/technical language.

The thesis can be considered for a 'cum laude' award

☐ Yes ☒ No

A major goal of the review process is to evaluate if the present version of the thesis is:

- 1) adequate as is
- 2) require minor revision
- 3) require major revision

for admission of the candidate to the defense of the work in front of a national evaluation board.

☐ Accept as is ☒ Minor revision ☐ Major revision

Date: 5/20/2026

Reviewer: Malizia Alessio