

I. IDENTIFICATION DATA

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| Title: | Structure of neural activity in the hippocampus during learning |
| Author's name: | Martin Mašek |
| Type of assignment: | Bachelor Project |
| Faculty: | Faculty of Nuclear Sciences and Physical Engineering (FNSPE) |
| Department: | Department of Mathematics |
| Reviewer: | David Maximilian Berling, M.Sc. |
| Reviewer's affiliation: | Faculty of Mathematics and Physics, Charles University |

II. ASSESSMENT OF CRITERIA

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| Work assignment | demanding |
| <i>Assess how demanding the work topic is.</i> | |
| The work assignment comprised literature review and extensive data-analysis that required complex preprocessing and involved advanced computational analysis tools and can therefore be classified as demanding. | |

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| Fulfilling the assignment | fulfilled |
| <i>Consider whether the work submitted meets the assignment. If necessary, give your comments on items of the assignment not fully answered, or judge whether the scope of the assignment has been broadened. If student failed to fully treat the assignment, try to assess the importance, impact and/or the reasons for the failings.</i> | |
| The student has fulfilled the assignment without reservations. | |

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| Chosen approach to solution | appropriate |
| <i>Assess whether student applied a correct approach or method of solution.</i> | |
| The student used an appropriate approach throughout the entire thesis. | |

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| Professional standard | excellent |
| <i>Assess the professional standard of the work, application of course knowledge, references, and data from practice.</i> | |
| The student delivered a high professional standard of research, which is evidenced by the substance of his results from data-analysis, their clear presentation in terms of text and illustrations in the thesis as well as their interpretation. His thesis proves a solid background knowledge and contains appropriate referencing throughout. The quality of results obtained proof an excellent data-analysis ability. | |

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| Level of formality and of the language used | excellent |
| <i>Assess the use of scientific formalism, the typography and language of the work.</i> | |
| The thesis document fulfills a high standard of formality. | |

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| Choice of references, citation correctness | excellent |
| <i>Assess student's effort in finding and using study sources for completing their work. Give characteristics of the references chosen. Assess whether student made use of all the relevant sources. Verify whether all items used are properly distinguished from the results obtained by student and their deliberations, whether there are no violations of citation ethics, and whether the bibliography presented is complete and complies with the citation usage and standards.</i> | |
| The student rigorously cited background literature spanning a broad scale including research work giving a contextual overview to specialized literature. Whenever external work referenced, he clearly delineated | |

the referenced work from his own.

Further comments and assessment

Give your opinion on the quality of the main results obtained in the work, e.g. the theoretical results, or the applicability of the engineering or programming solutions obtained, publication outputs, experimental skills, and the like.

III. OVERALL ASSESSMENT, QUESTIONS TO BE ASKED DURING THE WORK DEFENCE, SUGGESTED GRADE

Summarize those aspects of the work that were significantly influential for your overall assessment. Suggest questions to be answered by student during the defence of the work before the examination board.

With this bachelor thesis the student demonstrated excellent data-analysis and interpretation skills. The quality of results is clearly beyond my expectation for a bachelor thesis as it not only proves the research capability of the student but also gives new (considering the scope of this thesis) scientific insights. While I recommend the grade excellent for the reasons outlined above, the following critique remains:

- Basic Neuroscience background should have been provided in larger detail. For example, at least half a page of text on the brain, brain areas, and where the hippocampus is in that, as well as, neurons, synapses and neuronal networks would have been appropriate.
- More illustrations in the background would have improved accessibility of the thesis' content to external readers.
- While the thesis has excellent quality, time pressure in the process of writing-up are evident and the student should take measures to avoid these in for potential future theses.

I want to underline again that the above mentioned points of critique provide no reason to downgrade this thesis such that it is not graded as excellent as this thesis fulfills highest standards considering it being a bachelor thesis.

Question:

Figure 3.4 on „ Progressive impact of the braking stimulus on UMAP representations in two mice over three consecutive days“

While in mouse 1 a circular pattern and correct position encoding is evident in day 1 and deteriorated at day 3. The situation is different for mouse 2: There is no solid circular and position encoding at day 1 already, which you mention may be attributed to the surprise effect of the brake stimulus.

As you say, mouse 2 adapted to the brake stimulus in day 2 as the representation improves (also supported by the structure index in Fig. 3.5). But while you say the circular pattern and position breaks down on day 3, I would argue a circular pattern clearly evolves (Fig. 3.4 F). Can you comment on whether this interpretation is correct and why such improved circular representation (however association with wrong positions evolved?

Suggested grade: A - excellent.



REVIEWER'S ASSESSMENT OF FINAL WORK

Date: 19/08/2024

Signature:

A handwritten signature in blue ink is written over the 'Signature:' label. The signature is stylized and appears to be 'D. Mys'.