

Computational Neuroscience: Neural Dynamics

Exercise 7 (essay), due January 20, 2022

Note: this essay exercise yields **three** times the bonus points of a regular exercise!

In this exercise, we invite you to write an essay that answers the question

“What is dynamic field theory?”

This exercise thus covers all that we have discussed in the lectures and exercises up to this point (and elaborated in the first four chapters of the book “Dynamic Thinking”).

Rules for the delivered essay

- Write for an audience that unfamiliar with any of the material covered in the lectures, but that is scientifically trained.
- Illustrate your writing with figures where useful to the reader. Explain the illustrations! Imagine a reader who has not seen such plots before and write for that reader.
- Write between 4000 and 5000 words, not including references and figure captions.
- It is a good idea to interact with other students, *but you must provide your own, individual text, so that you chart your own course through the issues and arguments, even if you derived insights from reading or discussing!*
- *Cite your sources for facts, arguments, evidence. Literal quotes of text will rarely be useful. You may reproduce figures if you reference the source.*

About the topic “What is DFT?”

Obviously, you cannot review everything that was covered in the lectures and sources. So it will be important that you focus on what you think is most relevant to answering the question.

To give you examples for specific angles that you could chose, here is a list of questions that you may use to focus.

- What are the central concepts of DFT?
- How may the DFT concepts be formalized mathematically?
- What are the central assumptions and postulates of DFT?
- What evidence supports these postulates?

- How do these concepts and the postulates of DFT relate to the brain?
- What is the end-goal of the research program of DFT?
- What makes that research program worthwhile?
- Which applications illustrate how DFT or elements of it can be used?
- How would you answer the question “What is DFT?” in a single sentence?

Please avoid writing about the history of DFT. We are more interested in the concepts and principles than in who contributed when.

How to go about writing the essay

Writing the essay will require more effort and planning than writing your previous exercise assignments. It will take some time to get into the flow of writing, so begin early and write a little every day rather than trying to cram everything into one long session.

Begin by making an unordered list of ideas and concepts that you want to cover. For each point, ask yourself why you think that point is worth mentioning and what level of understanding is required and then write down in bullet points all the things you want to say about it. This can be very rough at first, just short reminders, no full sentences necessary yet. Bring the points into a sequential order that makes most sense to you. There is no fixed pattern for this and different approaches may work, but going from more general concepts to more detailed ones often works well. Keep doing this and editing the bullet points until the structure seems to converge.

Consider whether any of the points would benefit from an illustration and add in the illustrations, in rough form for now. Then improve the formulations, referring to the figures to guide the reader along. Try to find the correct wording for everything and string subsequent points together until you get a first draft that you are happy with.

You may think you are done but you now have a chance to improve your essay tremendously by editing, sharpening formulations and making the text more precise. Carefully go through the text and remove all the sentences (and words!) that are redundant and do not add meaning. Then read the whole thing again and edit away things that still annoy you. At the very end, run a spell check, and breathe.

Help

If you have questions along the way, do not hesitate to post them in the discussion forum or contact Sophie (sophie.aerdker@ini.rub.de) by email.

Good luck, Merry Christmas, and a Happy New Year!