

Seminar report review
Gene regulatory networks seminar
Department of Computer Science
Spring 2010

Report title: **Robustness and sensitivity analysis**
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Reviewer: Laura Langohr

This report is about robustness and sensitivity of gene regulatory networks (GRN) and their analysis. It describes robustness and sensitivity in GRN in general, their characteristics and analysis in GRN, and how robustness can be described mathematically.

The report is already a good one. It is structured, easy to read, and I had seldom difficulties to follow you. Even though, I think, it still can be improved. In the following I list suggestions for improvement: first, more general ones, about the content and structure of the report, citations and references, as well as figures and examples. Finally, I will list more detailed comments and suggestions for improving the report. These are comments and suggestions about inconsistency or things that remained unclear to me. I will give you a copy of your report where I marked the typing and other minor mistakes.

Content and structure of the report

The thread and the main point of your report should be elaborated. Now, it's more like a collection of sections and of course the reader can infer how these relate to each other, but I am sure, you could improve this report such that it is easier to read.

What is the central topic of your report? You write in the introduction that "sensitivity and robustness ... can be used to aid model development and improve prediction variability ." Development and prediction of GRN models? If so, I am missing this in the following sections. Make your introduction anyway matching the rest of your report. Now, after reading your report twice it still remains unclear what the main point of your report is. Explain also why each section is important, how it relates to the whole picture, link each section to the central topic.

In addition, you can also describe in the beginning of each section in a few sentences the content of the section. In that way you again make it easier for the reader to follow you, as he/she will know already what is the main point of the section is, before he reads the details. Otherwise he has to read the whole section before he/she gets the main point of it.

Further, scientific articles have an abstract and the introduction is the first section. I prefer to structure a seminar report in the same way. Further the introduction usually ends with a description of the following sections using phrases like "In Section 2 ...", and "In the following section ... (Section 3)" and so on. If you would change your report according to these it also makes the report easier to read and to follow you into the different sections.

Besides these, you could make your introduction more detailed. Introduce your topic in a more general way: *why* is it so interesting to develop/predict models in general (or whatever the main point of your report is)? *Why* is it important to study robustness and sensitivity in the context of model prediction?

The conclusion again starts usually with a short summary of the report. What should the reader have learned by reading the report? Further, you could improve your conclusion by referring to the main point of your report. You mention several future work directions (good!), but I have difficulties to understand their relationship to each other and to the main point of the report's content.

Throughout the report I missed often a description or explanation of used terms, of stated consequences, equations and so on. You should give the reader the possibility to make them their own reasoning or at least follow you. In the last part of this review I list the places, where I was missing more details.

Citations and references

You use citations in appropriate places, but cite in a consistently way: In computer science articles [] brackets are usually used with numbers. Partially you use them, but then you also use () brackets with number or even names. If you cite two articles you still use only brackets once, like this: [1,2].

Make the references also consistent: for example, use always the same order: first, author names; second, article title; ...; last, year. Write out the first name for all authors or abbreviate it for all. Specify for every article and book where it was published. Try not to use abbreviations (e.g., Prog Drug Res). Be careful to list all articles cited in the references (at least articles by Zhou and Doyle (1997) and Carlson and Doyle are missing there).

Figures and examples

The only figure in your report is Figure 3. Where does this figure belong to? You do not refer from anywhere to it or describe it anywhere, do you? Further, I think, it is better to make an own caption. First, the numbering can be corrected, and second, you could describe the content of the figure in your own words.

In general, I think, more figures and examples could help the reader very much to understand the content of your report. For example, in Section 1.2 you could add an example for failure tolerance and one for graceful degradation. In Section 2.1 figures of positive and negative feedback would be nice. Elsewhere figures and/or example could also be advantageous.

Detailed comments and suggestions

Introduction: You define the term robustness, you should introduce the term of sensitivity in the same way.

Section 1, last paragraph: I think, it is preferably not to make a paragraph out of a single sentence. You could add few sentences about what parameters and aspects you will introduce in the following. Are these the one of sections 1.1 - 1.3 or what? And why are these so important?

Section 1.2: Do I understand correctly that there are actually three possibilities? First, failure tolerance, where the system recovers; second, graceful degradation, where the system's performance becomes suboptimal; and third, system's failure. If so, why do you mention the third one only indirectly? Why are the first two more important – why is one interested to find features that enables these two concepts?

Section 1.3, second paragraph: You describe how global sensitivity analysis is done, but could you also describe, why it is done? What is the goal of it? Is it just to find the parameters to which the system is most sensitive or also something else? Is the comparison of system performance variability the statistical global analysis or a third method?

Section 2, second and third sentence, and elsewhere: you are mixing singular and plural several times. Check your whole report for that. As examples: second sentence (Section 2): "Systems ... face ... as inherent trade-offs [2]." or "Systems ... face ... as an inherent trade-off [2]." Third sentence (Section 2): "... architecture of the robust system ... for identifying ITS faults and countermeasure ..."

Section 2: You write "Diseases such as cancer are manifestations of co-opted robustness." I need more explanations: what is the robustness in terms of cancer?

Section 2.1, first paragraph: You describe that negative and positive feedback contributes to robustness. Could you explain the reasons for that? Maybe you can give an example or make a figure?

Section 2.1, first paragraph: What is a “robust pattern”? How do positive feedback loops form them?

Section 2.2: You describe that modularity contributes to minimize perturbation effects on the whole system, but you do not describe why or how.

Section 2.3: What do you mean by “decoupling”? What is a “bow-tie architecture”?

Section 2.3, last two sentences: This is something general about robustness, and not only about decoupling, isn't it? If so, then do not write it under the section of decoupling. This is something that could be mentioned in the end of Section 2, as a motivation why Sections 2.1-2.3 are following. This should be mentioned before as a motivation, otherwise the reader has to read Sections 2.1-2.3 before he finds out why these concepts are important and why he had to read these sections.

Section 3, equations: What kind of function is function a ? What does it represent? Could you describe equation (1) and (3) in words? Where is equation (2)? Do not copy the equations, but write them by yourself, then they are not blurred and you can fix the numbering. Why does it is specified in this way? Why can robustness be defined by it?

Section 3, last sentence: I do not understand how this follows by equation 3. Could you write few additional sentences to describe this?