

I. IDENTIFICATION DATA

Thesis title:	Calculating Lyapunov Exponents from Time Series
Author's name:	Lejla Dobrić
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Mgr. Volodymyr Lynnyk, Ph.D.
Reviewer's department:	Department of Control Engineering

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment <i>How demanding was the assigned project?</i>	ordinarily challenging
Studying and implementing the methods for determining the Lyapunov exponents from time series is not a trivial task. Wolf's and Rosenstein's algorithms use small synthetic data sets generated by numerical software (Matlab).	

Fulfilment of assignment <i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	fulfilled with minor objections
The assignment's guidelines do not specify how many methods need to be compared and implemented in the project. On the other hand, the bibliography list of the assignment contains more than two algorithms for determining Lyapunov exponents from time series. It's being decided that only two methods would be studied and implemented: Wolf's and Rosenstein's algorithms. In addition, the project solves the accuracy of both methods on the small synthetic data sets with additive noise.	

Activity and independence when creating final thesis <i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	B - very good.
During the thesis preparation, student had a positive approach. The student consulted the conception of the project with the supervisor. The author of the thesis can work independently.	

Technical level <i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	B - very good.
The main goal of this thesis is to study the methods for determining the Lyapunov exponents from time series. The methods used in the project could be presented with more details. For example, the criteria for choosing the constant "m" for reconstructing the attractor are missing. In Table 4.1, the observation time t(s) (in seconds) is incorrect. This value seems like the sampling period. The last row of page 2 (Subsection 1.1.1) does not explain the term "subsystem". Nevertheless, the author has used many scientific articles to prepare the thesis, which required much effort.	

Formal level and language level, scope of thesis <i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	B - very good.
The student's language skills are at a reasonable level. There are some typos and grammar errors. The organization of the thesis should be better. There are some missed definitions, like "N", "M", "n", "m" in Subsection 3.3.1. The criteria for choosing the constant "m" for reconstructing the attractor are missing.	

Selection of sources, citation correctness <i>Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the</i>	B - very good.
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student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The references used in the thesis are adequate for the topic of the thesis. There is no title of the journal in Ref. [6].

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

The author showed great independence while preparing this thesis.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading.

During the thesis preparation, the student had to read several scientific papers and implement Wolf's and Rosenstein's methods for determining the Lyapunov exponents from synthetic data sets. In addition, the student analyzed the accuracy of determining the Lyapunov exponents from noisy data. The organization of the thesis could be better. The author showed great independence while preparing this thesis.

The grade that I award for the thesis is **B - very good**.

Date: 31.8.2022

Signature: