

I. IDENTIFICATION DATA

Thesis title:	Multiplayer games in the context of computational biology
Author's name:	Jan Matyáš Křišťan
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Computer Science
Thesis reviewer:	doc. Ing. Tomáš Kroupa, Ph.D.
Reviewer's department:	Department of Computer Science

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
The theme of thesis requires working knowledge of cooperative game theory and computational complexity. The application is in computational biology. I can imagine that an expanded version of this project assignment can easily be transformed into a fully fledged PhD research topic.	

Fulfilment of assignment	fulfilled
<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>	
I can only conclude that all the five items set forth in the Guidelines of this master's project have been fulfilled.	

Methodology	correct
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The author proceeds from the survey of existing algorithms to the design of his own computational method(s) and, further, to the application of newly developed concepts to microarray gene analysis. I believe that this is the standard methodology considering the type of project and project's goals.	

Technical level	B - very good.
<i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	
The thesis is technically sound. The student was able to apply his theoretical knowledge (complexity, discrete mathematics, game theory) to the application domain. The motivation for the study of microarray games and additive voting games could have been explained better, although the former class of games is sufficiently described in available literature and some of the cited papers. I appreciate the clear exposition of voting power (Banzhaf/Shapley values) and examples in Section 2.4.	

Formal and language level, scope of thesis	C - good.
<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>	
The thesis shows that the student has a good command of English, which is completely sufficient for doing research and reading papers. Unfortunately there are several issues which do not contribute to readability of the text.	
<ol style="list-style-type: none"> 1. It seems that Section 4 was written in rush as there are many issues and inconsistencies in notations (see my questions below). 2. (p.6,7) The use of singular "they" in place of "he/she" can easily become confusing in the context of coalitional game theory. This is because it is often very important to make a clear distinction between individual rationality (singular) and coalitional rationality (plural). And I believe that it is even wrong using "they" to denote impersonal nouns, such as "coalition". 	

Selection of sources, citation correctness**A - excellent.**

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The student cited almost all relevant sources in the area of coalitional games, voting games, and the articles analyzing computational complexity of computing Shapley/Banzhaf values for selected classes of games. The selection of references is therefore completely adequate.

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.

See my overall evaluation.

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. Pose questions that should be answered during the presentation and defense of the student's work.

My evaluation of this project is very high. The detailed analysis of computational complexity of designed algorithms in Section 3 clearly stands out as being above standards of the usual knowledge level of a master student at FEE. The data analysis and the implementation part are described in detail and very clearly. Unfortunately the core theoretical bridge between coalitional games and computational biology applications, Section 4, contains many mistakes and dubious formulations. Only for this reason my recommendation is not **A**.

Questions

1. Definitions 42 and 49 do not make sense. I also think that Lemma 44 and Lemma 46 are false. Please provide correction.
2. Why do you introduce the notion of equivalence for games (p.37)? It is just an equality of functions.

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

Date: **11.6.2020**

Signature:

