02180 Intro to AI, SP22

# Belief Revision Assignment

Due: May 2nd, 2022 at 23:59

## 1 Introduction

This assignment, as the first one, is to be carried out in groups of 4 students (please keep to the group you worked with on the first assignment, if only possible). You are requested to submit your solution via DTU Learn. You should hand in three separate files:

1. A pdf file containing the report.
2. A pdf file with a declaration stating division of labour among the group members.
3. A zip file containing the source code, including a readme instruction.

The goal of the assignment is to design and implement a belief revision engine, i.e., the beliefs of an agent and a method which on an input of a propositional formula outputs the revised belief.

## 2 The belief revision agent

You are asked to implement a belief revision agent. The project should run through a sequence of stages:

1. design and implementation of belief base;
2. design and implementation of a method for checking logical entailment (e.g. resolution-based);
3. implementation of contraction of belief base (based on a priority order on formulas in the belief base).

The output should be the resulting belief base.

## 3 Implementation

The engine should work for propositional logic in its symbolic form, i.e., no input in natural language is required for this assignment. You can choose whatever programming language you prefer. Your implementation should be based on methods introduced in the course: propositional logic, resolution, CNF-form, AGM revision, partial meet contraction, etc. You are of course allowed and encouraged to use methods and techniques from other courses. You are requested to use the AGM postulates to test your algorithm.

# 4 Mastermind

This is an **optional** element (i.e., it is possible to get the top grade without solving this part of the assignment) for those groups which manage to go through all the stages in Section 2: make your belief revision engine play the traditional version of the Mastermind game! You can use parts of the formalism you worked out in the exercise session in week 10 of the course. The task is to implement AI for the code-breaker. The belief base of the code-breaker should consist of the background knowledge (coding the rules of the game), and the first guess. Then, upon receiving the feedback about that guess, the code-breaker should revise the belief base accordingly, and output the next guess (taken from the new belief base). You are free to check online resources on existing Mastermind strategies and check if they are implementable in your belief revision framework. You are free to adapt the game to your needs.

# 5 Report

The report, as before, should be between 4-6 pages, describing your formalism and implementation choices. The report's structure should follow the sequence of stages listed in Section 2. The report should include Introduction in which you describe the problem of belief revision in general terms and then describe your specific approach. It should also include a section describing what you have learned while working on the project. Conclusion and further work paragraphs should be included in the final part of your report. Those who choose to implement Mastermind are allowed one extra page to describe their implementation.

# 6 Assessment

The grade will be equally based on the the quality of the report and the implementation. You should follow the stages in Section 2 incrementally, and see how far you get in month's time. The implementation will be judged on your choice of data structures and following the logical formalism. In the report, we will assess your implementation choice and how precise your description is. Try to be as mathematically precise as possible and use the technical concepts from the course, whenever appropriate.