CAP 4630/5605 - Introduction to AI (Spring 2018) Project 3 - Due Date: Mar. 23, 2017 Friday 11:59 pm

For this project, you will design and build a knowledge-based intelligent system that collects user preferences and reasons about them.

1 Requirements

1. The system should have an easy-to-use GUI (using the Python Tkinter module[1]) for collecting names of attributes and their values, hard constraints, and preferences. The system should also allow for reading in these input from files. (See section 3 for formats of these files.)

   - Attributes (A) in this project are going to be binary.
   - Hard constraints (H) are represented as propositional formulas in the Conjunctional Normal Form (CNF).
   - The system should support preferences (T) in the preference languages we discussed in class: Penalty Logic and Possibilistic Logic. Formulas involved in the preference theories are of CNF as well.

2. The system should support the following reasoning tasks:

   - Existence of feasible objects: decide whether there are feasible objects w.r.t H, that is, whether there are models of H that are truth assignments making H true.
   - Exemplification: generate, if possible, two random feasible objects, and show the preference between the two (strict preference, equivalence, or incomparable).
   - Optimization: find an optimal object w.r.t T.
   - Omni-optimization: find all optimal objects w.r.t T.

3. The system should take advantage of the *clasp* system, a SAT solver that takes a propositional formula in CNF and computes its models. It can be used to compute feasible objects for H, check if a truth assignment satisfies a formula, etc. A short tutorial will be posted shortly.

4. For testing, the system should solve an instance, developed by you, that contains at least 6 hard constraints and at least 6 preference rules over at least 8 attributes. Also use this instance when demonstrating your system.

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[1]See https://pythonspot.com/tag/tkinter/ and https://www.python-course.eu/tkinter_labels.php for helpful references.

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5. By **Mar. 16**, you will need to meet me to discuss the progress. You will make individual appointments with me by email. Failure of this will result in deduction in the project grade.

2 Deliverables

Zip the following to name [your-last-name]_Project3.zip and submit to Canvas.

1. A text file with description of the instance (attributes and their values, hard constraints, and preferences) you used for testing.

2. A directory that contains all your source codes.

3. A README file that contains instructions to build and run your system.

4. A PDF report that describes how your system works and shows the testing results using the test instance (e.g., screen shots of various steps).

3 File Formats

3.1 Attributes File

```
appetizer:  soup, salad
entree:  beef, fish
drink:  beer, wine
dissert:  cake, ice-cream
...
```

3.2 Hard Constraints File

```
NOT soup OR NOT beer
NOT soup OR NOT wine
...
```

3.3 Preferences File (Penalty Logic)

```
fish AND wine, 10
wine OR cake, 6
...
```