Assignment 3

CPSC 532L / CMPUT 654

Due March 22, 2022 (11:59pm Pacific Time)
Submit by email: `shehroze@ualberta.ca`

1. **Model**
    - Describe the setting your group is investigating.[1]
    - Describe one or more games that model elements of this setting.
    - Parameterize each game with one or more parameters, inducing a family of games. The parameter(s) can describe things like size of the problem, amount of time over which an interaction happens, degree to which agents value one option over another, etc.
    - Describe why these parameterized games capture strategically interesting questions about your setting.
2. **Classical analysis**
    - Which classical GT solution concept(s) are most appropriate for analyzing your game(s)? Why?
    - What does the corresponding game theoretic analysis say about what will happen in this setting?
3. **Behavioral models**
    - Pick 2–3 behavioral models: from class, from the literature, or of your own invention.
    - Argue why these models are substantially different from each other (Why are whatever technical differences they exhibit substantive?) and why each might be a good fit in your setting (what reasons do you have for believing that the core elements of these models matter for your domain?).
4. **Fit your training data**
    - Fit your behavioral models to your training data.[2]
    - Report your results (e.g., in terms of log likelihood, cross entropy, accuracy...). Include enough detail and explanation to persuade a knowledgeable reader that you fit the models correctly.
5. **Reflect on your training fit**
    - In what important ways do the results you obtained in Step 4 differ from the classical game theory prediction?
    - In what important ways do these results differ across behavioral models?
    - How sensitive are your fits (e.g., to subsamples of data; to random restarts or other parameters of the optimization procedure used; to the hyperparameters of each behavioral model)?

[1] Throughout this assignment, feel free to reuse text from previous assignments as appropriate.

[2] You may choose to use any software you like to fit your models to your training data. We have found Python's `scipy.optimize.minimize` to be a good option for fitting QCH, QLk, and similar models.

- Potential direction for normal-form games: do your qualitative conclusions change if you enlarge your training dataset to include games from other groups in the class?

6. **Evaluate generalization performance**

   - Collect additional data describing human play (ideally from from nonmembers of your group, if possible; else from yourselves) on one or more previously unexamined parameter values from the family of games you defined in (1). (If your training data varied the parameter, it's OK to interpolate between values that you did observe rather than extrapolating.)
   - Explain what classical game theory says about this/these new games.
   - Evaluate how well each of your behavioral model fits from Step 4 generalizes to this test data.

7. **Reflect on generalization**

   - In what ways, if any, do your qualitative conclusions about training data carry over to your test data?
   - What broad conclusions do you draw about the most appropriate behavioral model for your setting?
   - What broad conclusions do you draw about human play in your games?
   - In what ways does your analysis in this assignment inform your assessment of the most important next directions for investigating human strategic behavior in your setting?