

Weekly Report 3

Yiduo Ke

CS 4999 Supervised by Professor Halpern

What I did

I did the assigned problems in the textbook.

What I thought about it

I think it was really helpful. I had no problems with any of them except finding the Nash equilibria of some of the challenge problems (the last problem in each chapter), which are all pretty much games with infinite numbers of pure strategies. The solutions sometimes just present me with the equilibria and show why they are correct rather than showing me how to systematically and algorithmically calculate them (i.e. they go backwards rather than forwards). As a computer science major, I'm not used to having no solid algorithm to rely on, or not knowing if one even exists. I tried Googling "how to always find Nash equilibria or conclude none exists" but couldn't find much. I do remember this part from the textbook (2.6):

Unfortunately, when the game has too many players or too many strategies – and it is thus impossible or impractical to represent it as a set of tables – there is no quick procedure for finding the Nash equilibria: one must simply apply the definition of Nash equilibrium. This is illustrated in the following example.

It seems kind of primitive to just "apply the definition of Nash equilibrium". Is this an active research area? I couldn't find many papers when I googled this. I'm interested in reading up on it! And I guess this is very related to what we talked about in our first meeting, that I should proactively think about computational problems that run into trouble in infinite contexts.

Also, I didn't think of this the previous weeks, but the notion of Nash equilibrium reminds me of the stable matching problem in that a stable matching (i.e. "equilibrium") has no pair of people who prefer to be matched to each other instead of their current partners, and Nash equilibrium is when no player prefers another strategy. (This isn't a formal or in-depth comparison/reduction, it just reminded me of stable matching, probably because the concept of equilibrium is very prevalent.)

What I will do next week?

What will I do next week?