Unit 2 Extensions

Eckel, TJHSST AI1, Fall 2021

Background & Explanation

We're far enough into the year now that it's a good moment to take a breath and further explore something interesting to you. This can be one of the assignments in this unit (N-Queens or the Calibron 12), it can be a new puzzle featuring similar skills (KenKen, also known as Keen), or it can be something totally different – an AI-themed book that you read and respond to.

One choice is worth a RED credit; a second is worth BLACK.

Extension Option: Optimize N-Queens

Credit is available for optimizing the N-Queens assignment beautifully. You can use any algorithm you like – simple backtracking, incremental repair, or something else entirely.

As a side-note: this is a surprisingly weird problem, and many students find chasing this optimization to be an exploration full of strange twists and turns, like certain specific board sizes taking WAY longer than others, or alternately algorithms being much more successful than expected… It's entirely possible for this to be either much harder or much easier than you expect. The variance is high.

Submit a single Python file to the link on the course website.

This assignment is **complete** if:

- The "Name" field on the Dropbox submission form contains your **class period**, then your **last name**, then your **first name**, in that order.
- Your code can solve every N-Queens board from size 8 to size 200 in less than 30 seconds total. Show me this by getting an initial `time.perf_counter()` value, then making a while loop that continues to solve puzzles as long as the current time minus the start time is less than 30 seconds.
- Store every solution in a list as they are found.
- After the 30 seconds have passed, loop over the solution list and verify all of them with my code from the N-Queens assignment sheet (or present me with a very convincing argument that this is unnecessary).

Extension Option: Optimize the Calibron-12

Some extra test cases are given in the Calibron-12 assignment. Get your Calibron-12 code working with those to achieve this extension.

Submit a single Python script to the link on the course website.

This assignment is **complete** if:

- The "Name" field on the Dropbox submission form contains your **class period**, then your **last name**, then your **first name**, in that order.
- The specification is identical to the "Declare Success" specification in the original assignment except for the different submission link and the difficulty of puzzle your code will need to solve. You will need to solve the actual Calibron 12 (no pre-stored solutions, of course – I'll be checking) in addition to other test cases of similar difficulty in less than a minute.

Extension Option: KenKen / Keen

We've been solving sudoku puzzles. A related puzzle that makes a delightful coding exercise is to solve Keen or KenKen puzzles. On Simon Tatham's website, you can find the game "Keen"; elsewhere, google "KenKen". This handout does **not** explain the rules, so read the rules yourself and feel free to ask if you have any questions!

You can solve this puzzle any way you want. There are no rules about data structure or method (except for the usual stipulations that you can't google a solution or import any non-standard libraries). It just has to work. The default size on Simon Tatham's page is 6x6, but I'll ask you to go a bit bigger. "7x7 Unreasonable", in the custom game selector, will be the most difficult puzzle I generate. I will also use some smaller test cases to make sure you aren't hardcoding that.

The input convention will go like this. Every arithmetic constraint set will be given a letter. Then, after the puzzle string, each letter will be matched to the constraint on that set. For example, see this puzzle and its text file representation:


```
AABBCCDDECFFEGGF
A 2 /
B 1 -
C 6 x
D 8 x
E 1 -
F 5 +
G 2 /
```

Submit a single Python script to the link on the course website.

This assignment is **complete** if:

- The "Name" field on the Dropbox submission form contains your **class period**, then your **last name**, then your **first name**, in that order.
- Your code does all of the following:
    - Accept one **command line argument** – the name of a file.
    - Read **one puzzle** out of the file, with formatting as specified above.
    - Output a single string (just like sudoku) of the solution to the puzzle.
- Total runtime is less than 2 minutes (ie, ensure that a single 7x7 Unreasonable puzzle runs in under a minute).

Extension Option: Read and Comment on a Relevant Book

Read a book that has an interesting connection to artificial intelligence. It should contain content relevant to our course in some serious depth – probably a pulp mystery novel about a hacker at the CIA, or whatever, won't fly, not because pulp mystery isn't awesome, but because it isn't likely to make you think a lot about the current state of AI in our culture!

You can always propose your own options. Right now these are a few that I thought of:

- **You Look Like a Thing and I Love You: How Artificial Intelligence Works and Why It's Making the World a Weirder Place, by Janelle Shane.**   Recent popular nonfiction. Exactly what it says in the title; highly recommended.
- **The Lifecycle of Software Objects, by Ted Chiang**. Science fiction novella. I'd recommend buying the collection Exhalation, which contains this story and others that are also genius. In particular, it has some endnotes about the creation of this story that are brief but worthwhile to help contextualize it. This has fascinating thoughts on the nature of artificial intelligence; it's also short, which means you won't need to spend much time reading, but in compensation your response should aim for legitimately profound. If you're having trouble getting there, let me know – I have some thoughts to spark questions.
- **Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy, by Cathy O'Neil**. Recent popular nonfiction. If, uh, recent events haven't indicated to you that this is a timely and important topic, I'm not sure I can convince you…
- **Nexus, Crux, and Apex, by Ramez Naam.** Science fiction trilogy. This is more of a long shot. This is a whole trilogy, so in terms of hours spent / grade earned it's not a good bet, but if you love sci-fi *anyway* this is incredibly good and if you read the whole trilogy you sure will have some thoughts for a response. That's a promise, at least.
- **Limitless Mind, by Jo Boaler.** Recent popular nonfiction. Learn about the latest brain science about how we learn, and what the implications are for how to be a student. Two years ago, everyone in the course got a copy of this book, and many students (particularly students who struggled with confidence in the class / programming / TJ in general) found it a helpful experience. Last year, another 20 or so students wrote me amazing responses. Highly recommended.
- **T-Minus AI, by Michael Kanaan.** Recent popular nonfiction. A student chose this last year and recommended I add it to the list. Explores the global implications of the current race for AI mastery, from the US Air Force's first Chairperson for Artificial Intelligence.

This extension will be offered again in fourth quarter if you'd like to choose two!

Book "Report" Guidelines

The word "report" is in quotes for a reason. **I am not interested in reading your summary of a book I already know.** I'm going to say this again, louder:

> **I AM NOT INTERESTED IN READING YOUR SUMMARY OF A BOOK I ALREADY KNOW.**

Do not write me a summary.

This is your response prompt:

> *What did reading this book mean to you? What did you find interesting, exciting, relevant, or surprising? Have you changed the way you think about computer science, or another relevant topic covered by the book? Why or why not?*

The prompt is vague and open-ended on purpose. To be specific, in order for you to get credit, this is what I want:

- A response that is **thoughtful and personal**.
  I'm looking for you to make connections with what you're reading and reflect on how it relates to your personal understanding, not just repeat back to me what's in the book.

- A response that is **aware that I read the book already**.
  A chapter by chapter summary won't work, I want some thoughts that are your own. If you read your essay, and you think "anyone who has already read this book won't find any new thoughts here", you aren't ready to turn this in yet. Rethink your approach, and probably delete what you wrote before.

- A response that **convinces me you actually read the whole book**.
  I should see a variety of *specific* details and connections in your response. Once again, I'm not looking for a chapter-by-chapter summary; that's not what this means. If, however, you write a whole essay and only mention chapter 2, that won't give me evidence you read anything beyond chapter 2. If you want to focus on one small part of the book, that's great, but give me another few sentences / bullet points with thoughts about the rest in short form. A sentence like "I wasn't surprised by (chapter) since I've read about (topic) before and I've experienced (example) myself" is fine, but make sure you're reacting to more than just one small part of the book.

- A response that is **neat and easy to read**.
  In other words, if you have messy handwriting, do not handwrite your response. Typed is always good. Also, please do a legit grammar / readability check. (A good strategy is reading it out loud to yourself.)

This is what I don't care about:

- I don't care **how long your response is**.
  Start by thinking about your honest response to the prompt, and go from there. I can imagine a single paragraph that would make me think and meet all the criteria above. I can imagine a ten page paper that wouldn't. In a lot of ways, being concise is harder than writing long. I can certainly admire a short, pointed commentary with no wasted words as much as I can admire a long, thoughtful, thorough reaction.

- I don't care **what format your response is**.
  Paragraphs? Cool. Bullet points? Cool. Formal? Great. Casual? Great. You want to write me a comic book? Go ahead. Epic poem? Script? Whatever, you do you. Use this as a chance to try something structurally interesting if you want. Frankly, if I'm reading a bunch of these, it'll be fun for me if yours is different. To be clear, please do put some care into organizing your response and make a decision on purpose and not out of laziness – I'm not excited about a few dozen disconnected random stream of consciousness thoughts — but whatever you think communicates your ideas best is what I want to read.

- I don't care **if you liked the book or not**.
  If you thought every word of your chosen book was complete nonsense, I will be delighted to read your vicious, scathing takedown. I'd much rather you be honest than try to tell me something you think I want to hear.

Once your specification meets these terms, submit it to the link on the course website. If I feel your response is insufficient, I reserve the right to request a resubmission as I would with any other assignment!