**AI LAB 04\_05 REPORT**

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**Exercise 1:**

How did you represent Sudoku puzzle a CSP?

* Variables:
  + Each cell in the Sudoku grid is treated as a variable.
  + Variables are represented using row-column combinations, i.e., "A1", "B2", ..., "I9".
* Domains:
  + The domain of each variable is the set of possible values that the cell can take, i.e., digits "1" to "9".
  + If a grid is provided with some cells pre-filled, those cells' domains are restricted to the given value.
* Constraints: The CSP ensures that:
  + Each row must contain all digits from 1 to 9 exactly once.
  + Each column must contain all digits from 1 to 9 exactly once.
  + Each 3x3 sub-grid must contain all digits from 1 to 9 exactly once.

What design options did you consider, and how did you decide on this implementation?

* I decided to implement dictionaries “self.units” and “self.peers” due to their efficiency: Enable fast lookups for constraints related to a specific cell. Eliminate the need to traverse the entire grid repeatedly during constraint propagation.

**My experience:**

* The assignment was very challenging, the most difficult part for me was debugging my implementation. I tried to implement “Inference” in my Back Tracking algorithm, but it just didn't work, so I decided to use simple forward checking. Some boards took too much time to solve, especially the magic tour, which made me feel impatient. However, I learned so much while searching and watching online sources and YouTube videos. I enjoyed seeing the board displayed after being solved, even though some of it took more than 500 seconds (lol)!
* I spent the whole day working on this assignment, and I even waited nearly an hour for the program to solve the magic tour! I will continue to improve the algorithm to solve the magic tour in less time.