NATIONAL UNIVERSITY OF SINGAPORE
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

ACADEMIC YEAR 2025-2026
SEMESTER 1

EE2213: Introduction to AI

ASSIGNMENT 4: L12-L13

Assignment 4 (5% of total grade)
Submission Deadline: 7 November 2025 (Friday), 23:59

Problem Statement:

You find yourself on an island inhabited by three people—Alex, Ben, and Chloe. The islanders are of two types: Knights, who always tell the truth, and Knaves, who always lie. They make the following statements:

- Alex says: "Ben is a Knave."
- Ben says: "Alex and I are of the different type."
- Chloe says: "At least one of Alex and I is a Knight."

Your task is to model this puzzle using propositional logic and implement the model-checking algorithm in Python to determine the type of each person.

Your function will construct a Knowledge Base (KB) from the statements above, construct model-checking algorithm for entailment check, and finally return the result that determines the type of each person.

Instructions:

1. Please use the provided template named **A4_StudentMatriculationNumber.py** (replace "StudentMatriculationNumber" with your own student matriculation number) for this assignment.

2. Your Python code must contain a function def A4_StudentMatriculationNumber (query) specified as follows:

- **Input** query: The query will be a sympy expression (e.g., A, Not(B)).
- **Output** result: The result is a string indicating the logical status of the query based on the Knowledge Base (KB): *"True"* if the *query* is a Knight, *"False"* if the query is a Knave, and *"Not Sure"* if the type of the query cannot be determined.

3. KB:

- Inside your function, define three propositional symbols to represent the propositions: A for "Alex is a Knight", B for "Ben is a Knight", and C for "Chloe is a Knight".
- Translate the three statements into logical sentences using these symbols.
- Combine these sentences into a single KB.

4. Model-Checking Algorithm:

- Your function must implement the model-checking algorithm as described in Lecture 13.

5. You can **ONLY** use libraries already imported in the template:

- `from sympy import symbols, And, Not, Or, Implies, Equivalent`
- `from sympy.logic.boolalg import truth_table`

6. Rename both your file and your function using your student matriculation number.
For example, if your matriculation ID is **A1234567R**, then:

- Filename should be **"A4_A1234567R.py".**
- Function name should be **"A4_A1234567R".**

You must follow instructions strictly; marks will be deducted otherwise due to large class size.

Marks Allocation:

- Correct KB Construction: 1.5%
- Correct Model-Checking Implementation: 2%
- Correct Outputs: 1.5%

Important Notes:

Please **replace** both " StudentMatriculationNumber " and " StudentMatriculationNumber " in your **filename and function name** with your **actual matriculation number**.

Submission folder: Canvas→EE2213→Assignments→A4

Deadline:
7 November 2025 (Friday), 23:59
No extensions will be granted.

Late submission policy:

- Up to 12 hours late: 80% of your grade
- 1 day late: 50% of your grade
- 2 days late: 30% of your grade
- More than 2 days late: No marks (0%)