# CS3641 Homework 01 Summer 2024

# 2’s Complement Agent

**Total Points: 75**

Be as brief as possible and use your own words when describing concepts.   SHOW ALL WORK for Questions requiring calculations and algorithms. IMPORTANT!!! - See bottom for instructions on submitting code (I need it in text format!).

Design and implement a model-based agent to carry out the two’s complement model for you. Remember that we have learned four different types of AI Agents in Chapter 2. Do not use the shortcut of performing an arithmetic operation of generating a one’s complement numeric value and adding 1 in your model; instead generate a bit wise processor to perform 2's complement operation one bit at a time. For example using an input string of 1100010, do not invert bits, convert to the number 29 and then add 1 as that is not an agent responding to sensor input. Instead, for example, scan the string from the right to the left bit by bit determine the next bit in the sequence 0, then 1, 1, 1, 1, 0 and finally the sign bit 0. Review the material from computer architecture, 2's complement for this assignment.

Assume the binary length is arbitrary and set by user input but the leftmost bit is a sign bit. E.g. a number like 00000 or 0000000111000 where the leftmost bit a 0 in both cases here represents the sign bit of the input.

You must write your own code for this assignment. Standard libraries are acceptable.

Submit your responses in this document below (except for the source code, see bottom of assignment regarding code).

Q-1: Provide your information:

**// Student name:**

**// Student ID:**

**// The assignment #:**

**//**

**// Signature of source code author: (you can replace text here typing your name)**

**5 points**

Q-2: Provide the State Diagram (likely a DFA) you used for this agent design.

**25 points**

Q-3: Provide the build instructions and source code in a separate ***text*** file in D2L (i.e. one of .py, .cpp, .c, cs, .java, or other language file in text or even just .txt with your code in it; see bottom of assignment)

**35 points**

Q-4: Provide a screen shot of your built source code in action on an arbitrary length binary number including any execution command (e.g. ./agent “10001110”, or ./hw01 “111100111” etc.) and its inputs and outputs.

**10 points**

**Submission Guidelines:**

* No handwritten submission is accepted, always submit answers as text within this or similar document file with any support images embedded in the file.
* **EXCEPTION**: If asked for source code implementation you can submit those individually and as separate files in ASCII format in their original file format .cpp, .java, .py, .cs etc. or even as a .txt file will be acceptable. Do not insert code into the submission document file. It ruins spacing which makes .python and some languages (perl, awk etc.) difficult to test build.
* Do not submit ZIP files… ever… for anything in D2L. The system is extremely unhelpful with regards to those filetypes and grading.
* You may include your freehand drawing/image and handwritten scans in the submission. However, the writing and images must be clearly legible. Though, it is best to present non-handwritten submissions, generally, as is done in the professional setting.
* If asked, show all work/calculations/graphs etc. in the determination of the problem.
* **Please complete your entire work in a single Word Document and Save the file as: yournetid\_CS3502\_Assignment01.docx (e.g. ogarcia5\_CS3502\_Assignment01.docx.) and upload your file in D2L.**
* Please observe the submission due date and time. After the due date there is a 50% penalty for the next 24 hours. Any submission after 24 hours of the due date will be graded at 0%.
* If you include a reference or an image taken from other sources, please cite them appropriately. APA is preferred but cite them so they can be found. **NOTE: verbatim copying or even paraphrasing is plagiarism so if the source used constitutes your answer rather than simply *supporting* the answer, it will be considered invalid. This is especially true of source code implementation answers.**
* If you resubmit, please make sure to attach the file again. Your latest submission before the due date will be the one graded.