Organization

CPSC 383: Explorations in Artificial Intelligence and Machine Learning
Fall 2024

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Assistant Professor (Teaching)
Department of Computer Science
University of Calgary

August 8, 2024

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Organization

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Welcome!

Jonathan Hudson, Ph.D, Assistant Professor (Teaching)

Lectures: CPSC 383

L01 MonWedFri 10:00-10:50 ST 130

Office: ICT 712

Office hours: MonWed 11:00-11:50 or by email-scheduled appointments. (Zoom possible by pre-arrangement)

jwhudson@ucalgary.ca

https://cspages.ucalgary.ca/~jwhudson/CPSC383F24/

Sketch of class at above link (semester updates in D2L)

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Wait there's more!

Janet Leahy, M.Sc., Limited Term Instructor

Lectures: CPSC 383

Co-instructor!

Current plan is switch off at 1/3 & 2/3.

Office: ICT 655

Office hours: By appointment

jcleahy@ucalgary.ca

EMAIL US BOTH!

Tutorials

Tutorials will begin on Tuesday, September 10th, 2024

MS 239

T01 Colton Gowans (CPSC Undergraduate)

T02 Colton Gowans (CPSC Undergraduate)

T03 Dante Kirsman (CPSC Undergraduate)

In-person, point is active interaction with TA for material and assignment help.

Your enrollment tutorial TA is only responsible for the students enrolled in their tutorial.

Why CPSC 383?

Many of you will have seen news stories, or used an application, that does some cool and have wondered how it did that.

This course is your start down the path of how AI makes much of these things possible.

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Course Goal

From the calendar:

- "A survey of artificial intelligence and machine learning tools to cultivate an understanding of their capability, utility, and societal/ethical/legal considerations. Popular APIs will be used to develop simple applied examples. "

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Course Outcomes

From the outline:

1. **Definitions**: Define simple artificial intelligence and machine learning terms.

2. **Areas**: Identify common areas of artificial intelligence and where they occur in computing contexts.

3. **History**: Identify important eras and dates from artificial intelligence and machine learning and describe their characteristics and impact.

4. **Create**: Implement simple deployments of artificial intelligence solutions using existing technologies to solve fundamental computing problems.

5. **Compare**: Compare and contrast the capabilities of different solutions from different areas of artificial intelligence.

6. **Reflect**: Reflect on current societal, ethical, and legal considerations related to artificial intelligence.

7. **Future**: Recognize and discuss developing research areas in artificial intelligence.

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Lectures

- The course will be problem-based learning, inquiry-based, and experiential learning.

- Lectures (problem-based) are framed on scenarios (case studies) which challenge them to think about the technology, its definitions, and impacts.

- This will expand into inquiry-based level of scenarios where much in AI and machine learning is indeterminate, and students will have lectures and assessment material that ask them to apply what has been discussed to critically think about an aspect of technology and its impact.

- Computer Science is naturally experiential with the ability to solve problems with programs students create. Tutorials and simple small assignments will allow students to do this hands-own application.

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Out of lecture?

There is no attendance at tutorials but they are highly recommended

- Start next week

- TAs will use tutorials to go through exercises an AI tools.

- Material will be covered and there will also be assignment help

There will be two individual assignments and one final team assignment.

There will be a number of D2L submissions. (quizzes/participations/reflections)

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Grading

Component	Weighting %
Quizzes (best 5 of 6)	15%
Part. (best 5 of 6)	15%
3 Assignments	15% * 3
2 Discussion/Reflections	12.5% * 2

- Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

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Grading

- Quizzes (15%)
  - Best 5 of 6, D2L, open 24 hours, 15-30 minutes to finish, based on last two weeks material
- Participations (15%)
  - Best 5 of 6, Small and quick text/image-based submission, open until deadline, no extensions
- Assignment 1 and 2 (15% each)
  - Individual assignments
  - Symbolic assignment, connective assignment
- Assignment 3 (15%)
  - Team assignment
  - Combining AI
- Discussion/Reflection 1 and 2 (12.5% each)
  - In-class discussion to be held on an in-class date with required attendance, with submission of corresponding reflection to D2L a week later.

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Course Policies

- When you email include your first name, and last name.

- Please use "CPSC383F24" as the prefix in the subject line

- Quizzes and participation submissions will have a hard deadline in D2L. Late submissions will receive a grade of 0. Only the best 5 of 6 submissions for each will be used towards the final grade, so the first missed will immediately become the lowest grade of 6 and dropped in the grade calculation.

- For late individual assignments, those submitted within 24 hours of the initial deadline will receive 10% off, and within 48 hours will receive 20% off. After 48 hours, no late assignments will be accepted.

- Reflections require in-person attendance on a specified lecture day for a discussion. Missing the in-person discussion will result in getting no marks for that portion of the reflection rubric.

- Any request for an altered deadline should come the Friday a week before the assignment deadline. Later emergency long-term requests will be reviewed on a case-by-case basis by the instructor. Students will be required to provide evidence such as through the FoS missed term work form, office hours, or by email. Any documentation collected will be handled according to university policies and regulations around its collection.
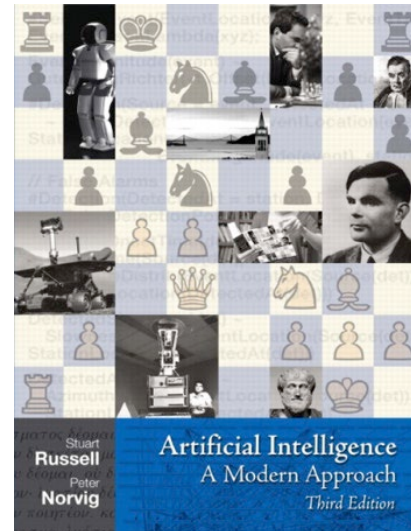
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Academic Dishonesty

- *See course outline for policies.*

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Textbook

- Not required, but for students who want to read more we recommend

    - Russell & Norvig, AI: A Modern Approach

    - Warning: Not a course textbook, so our presentation does not necessarily follow the presentation in the book.

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Warning?

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A warning (I)

This is a completely new course. From top to bottom.

Slides may have errors. Deadlines may have to move. Planned material may be adjusted. Assignments will have typos and hiccups in design.

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Not a warning (I): Logic

- There will be **no formulas** like

$$\forall x \, \exists y \, \big(P(x) \rightarrow \neg Q(y)\big)$$

$$p \, \wedge (q \, \vee \neg r)$$

$$\forall x \, \forall y \, EQ\big(f(x), g(x,y)\big)$$

  to memorize

- Also, **no Calculus** rules like

$$\frac{C \vee P \, , D \vee \neg P'}{\sigma(C \vee D)} \qquad \text{If } \sigma(P) \equiv \sigma(P')$$

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Not a warning (II): Mathematical modeling

If you take CPSC 433 instead you might see something like

$$Prob = \{(1, c_2, \ldots, c_i) \mid c_i \in \{2, \ldots, n\}, 1 \leq i \leq n\}.$$

$$Erw\left(\left((1, \ldots, c_{n-1}), ?\right), \left((1, \ldots, c_{n-1}), yes\right)\right).$$

$$Erw\left(\left((1, \ldots, c_i), ?\right), \left((1, \ldots, c_i), yes\right)\right),$$

if $f_{bound}\left((1, \ldots, c_i)\right)$ is larger or equal to the best solution to the problem instance found so far

$$Erw\left(\left((1, \ldots, c_i), ?\right), \left((1, \ldots, c_i), ?, \left((1, \ldots, c_i, c'_{i+1,1}), ?\right), \ldots, \left((1, \ldots, c_i, c'_{i+1,k}), ?\right)\right)\right),$$

$$if\ k = n - i, \{c'_{i+1,1}, \ldots, c'_{i+1,k}\} = \{2, \ldots, n\} - \{c_2, \ldots, c_i\},$$
$$c'_{i+1,j} < c'_{i+1,p}\ \text{if}\ j < p.$$

and so on

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Not a warning (III)

You will **not** have to be able to understand formulas and formal definitions like the ones on the last slides

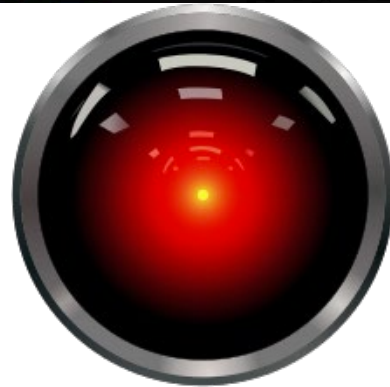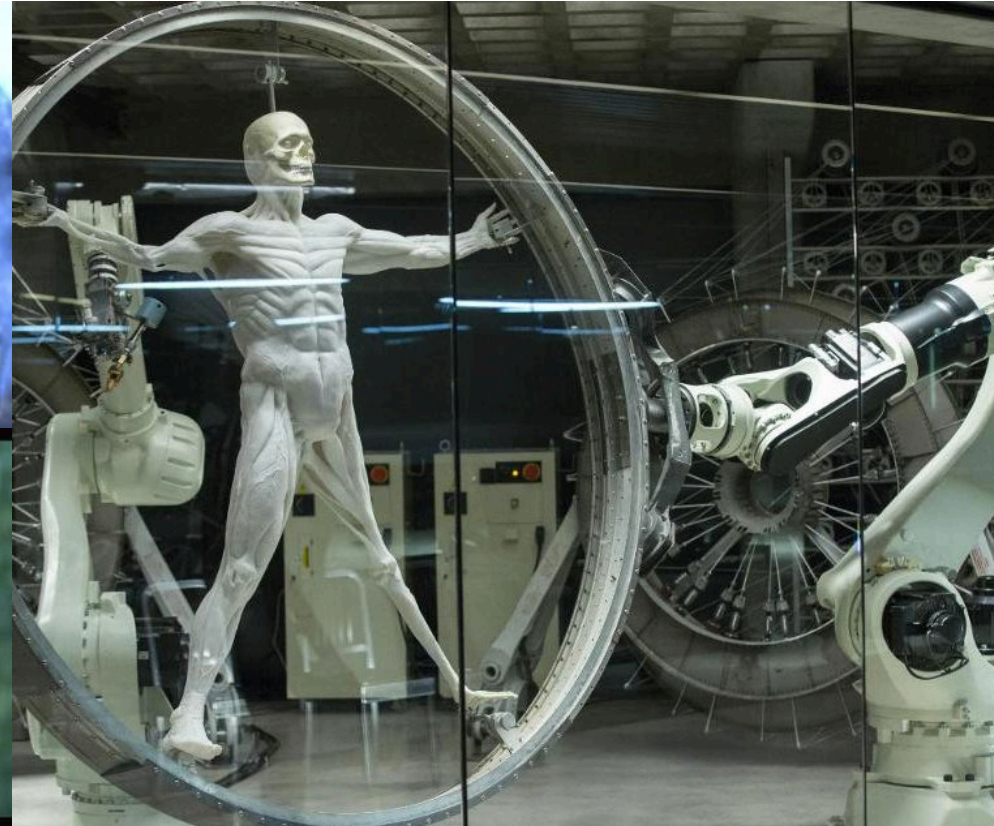You will **not** have to create such formal structures yourself!
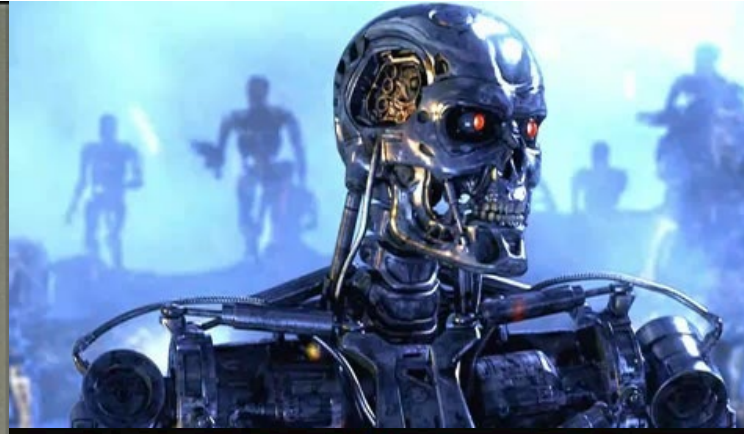
You **will** use existing languages, tools, and framework to code or link to already created AI solutions.

You **will** learn how to reason about when it is appropriate to use these and what they are capable of.

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AI?

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Artificial Intelligence – What you may think of

Artificial Intelligence – What you may think of

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The challenge?

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Artificial Intelligence -
An example of what we face

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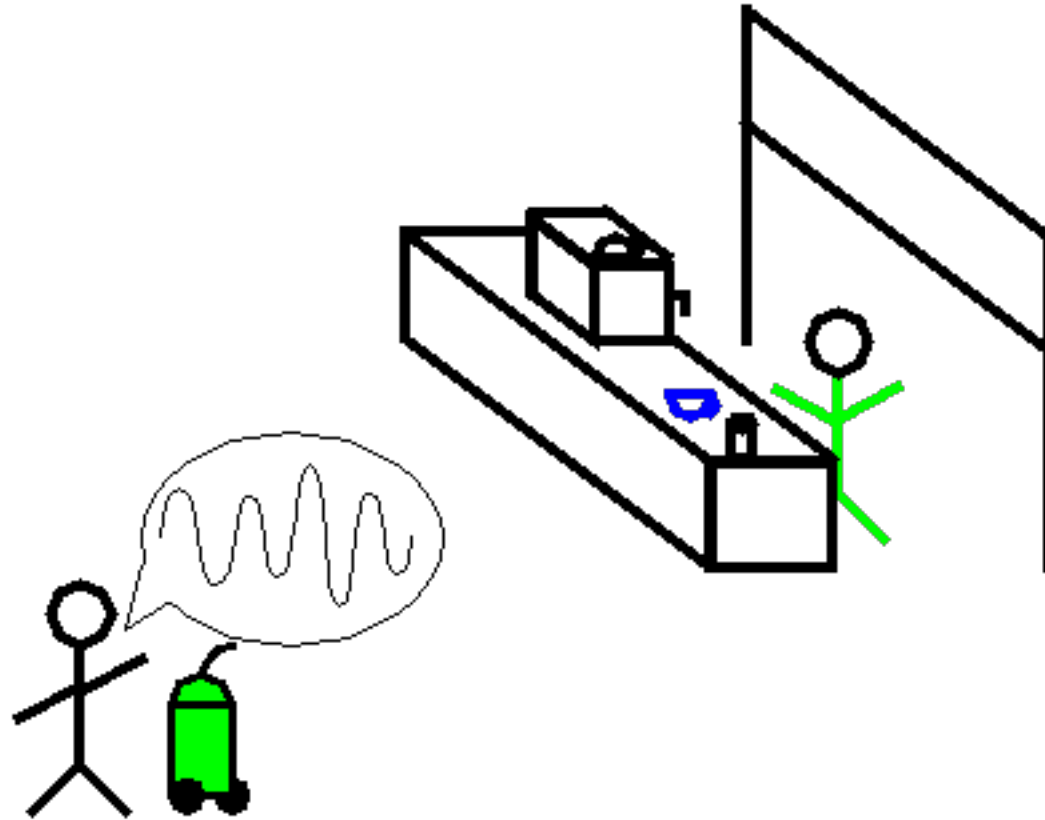
Example -
What is involved (I)

"Can you get me a coffee, please ? (or !?)"

Tasks:

- Hear the sentence and transfer it in a written version

- Parse and "understand" the written version
  (i.e. transfer it into an internal representation)

☞ Natural language understanding

☞ Knowledge Representation

- Use sensory input to identify the current situation and possibilities

☞ Vision

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Example -
What is involved (II)

- Define a goal; learned information about user (he likes his coffee with cream and sugar) is necessary

☞Machine Learning

☞Deduction

- Planning what to do:
  - Move to coffee bar
  - Interact with waiter
  - Prepare coffee (add cream and sugar; stir)
  - Bring coffee to user

☞Planning

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Example -
What is involved (III)

- Move to waiter

☞ Robotics (but also Vision, (Re-)Planning)

- Deal with waiter

☞ Natural language generation

☞ Human-computer interaction

☞ Multi-Agent Systems (if waiter is or has a robot)

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Example -
and we do not want

Next…introduction to AI

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https://cspages.ucalgary.ca/~jwhudson/

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