EAAI Birds of a Feather Session:
Preparing Model AI Assignment Resources
in Support of CS2023: ACM/IEEE-CS/AAAI
Computer Science Curricula

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Outline

• Motivation – What are we doing here?
• Organization – What are our affinity groups for possible efforts?
• Planning – How will we organize possible efforts?
• Decision – Who is committed to the possible efforts?
Motivation

• Soon to be approved: Computer Science Curricula 2023 (CS 2023)
  • Guidance for CS Educators
  • Previous version: CS 2013

• Changes:
  • What is taught ("knowledge model")
    → What is learned ("competency model")
  • Intelligence Systems (IS) Core Tier 2 Hours → AI CS Core Hours
CS 2013 Core Tier 2 Hours

• Core Tier 2 – “A computer-science curriculum should aim to cover 90-100% of the Core Tier-2 topics, with 80% considered a minimum.”

• IS Core Tier 2 Topics (10 Core Tier 2 Hours):
  • Fundamental Issues (1)
  • Basic Search Strategies (4)
  • Basic KR & R (3)
  • Basic Machine Learning (2)
CS 2023

• “CS Core - topics that every Computer Science graduate must know.” (emph. mine)
• AI Topics (11 CS Core hours)
  • Fundamental Issues (2)
  • Search (5, 3 counted under Algorithms (AL))
  • Fundamental KR&R (2, 1 counted under Mathematical & Statistical Foundation (MSF))
  • Machine Learning (4)
  • Applications and Societal Impact (2)
Imagine...

• Imagine:
  • You are a core CS educator ...
  • without recent/significant training in modern AI topics ...
  • who must now incorporate these hours for upcoming accreditation or departmental review (or because it’s important!)

• What would you want, that the EAAI community could provide?
Vision: AI CS Core Resource Development

• Imagine:
  • You pick a topic ("knowledge unit") that you particularly enjoy.
  • You join others with that same enjoyment to dream of an ideal $n$ hours of CS Core coverage, along with corresponding assignment/exercise material (and/or links/references to preexisting ones).
  • You create these materials as a team, submitting them to Model AI Assignments 2025 this fall.
  • We offer these materials freely, published via our repository to the benefit of CS educators everywhere.

• You could have high impact on the quality of CS education worldwide.
Fundamental Issues (2)

1. Overview of AI problems, Examples of successful recent AI applications
2. Definitions of agents with examples (e.g., reactive, deliberative)
3. What is intelligent behavior?
4. Problem characteristics
5. Nature of agents
6. AI Applications, growth, and Impact (economic, societal, ethics)
   • CS 2023 Gamma Draft pp. 24-25
Search (5, 3 under AL)

1. State space representation of a problem
   - States, goals, operators, hypothesis spaces, solving via graph search

2. Uninformed graph search for problem solving (See also: AL-Fundamentals:12)
   - BFS, DFS, IDDFS, uniform-cost search

3. Heuristic graph search for problem solving (See also: AL-Strategies)
   - Heuristics, admissibility, hill-climbing, local/global minima, greedy best-first search, A*

4. Space and time complexities of graph search algorithms
   - CS 2023 Gamma Draft pp. 25-26
Fundamental KR&R (2, 1 under MSF)

1. Types of representations
   a. Symbolic, logical
      i. Creating a representation from a natural language problem statement
   b. Learned subsymbolic representations
   c. Graphical models (e.g., naive Bayes, Bayesian network)

2. Review of probabilistic reasoning, Bayes theorem (See also: MSF)

3. Bayesian reasoning
   a. Bayesian inference

• CS 2023 Gamma Draft p. 27
Machine Learning (4)

1. Definition and examples of a broad variety of machine learning tasks (supervised/reinforcement/unsupervised learning)
2. Fundamental ideas (NFL, sources of error/uncertainty)
3. Simple supervised learning (e.g. linear regression or decision trees)
4. Overfitting/underfitting, bias-variance tradeoff
5. Data preprocessing
6. Representations
7. ML evaluation
8. Basic neural networks
9. Ethics

• CS 2023 Gamma Draft p. 28
Applications and Societal Impact (2)

• For the CS core, cover at least one application and an overview of the societal issues of AI/ML.

1. Applications of AI to a broad set of problems and diverse fields
   • Formulating and evaluating a specific application as an AI problem, data availability, cleanliness, preprocessing, data set / algorithmic / evaluation bias

2. Deployed deep generative models
   • High-level overview of deep image generation models and large language models

3. Societal impact of AI
   • Ethics, fairness, trust / explainability, privacy and usage of training data, human autonomy and oversight, sustainability,

• CS 2023 Gamma Draft pp. 32-33
Knowledge Unit (KU) Groups

• Please move to the sign with your favorite knowledge unit, arranged like pips on a die:

<table>
<thead>
<tr>
<th>Fundamental Issues</th>
<th>Search</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Machine Learning</td>
</tr>
<tr>
<td>Fundamental KR&amp;R</td>
<td>Applications &amp;</td>
</tr>
<tr>
<td></td>
<td>Societal Impact</td>
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</tbody>
</table>

• Feel free to rearrange or not to cover areas. Better to do most well this year, than all half-heartedly!
Group Discussion – What would be ideal?

• Consider the following high-level questions:
  • How would you imagine an ideal n CS Core hours to the given subtopics of your topic (“knowledge unit”)?
  • What demos, resources, etc. already exist to support the subtopics?
  • How might you apportion the n CS Core hours?
  • Assuming a ratio of ~3:1 out-of-class to in-class hours, what might be best assignments/exercises for demonstrating competencies of the topic?
  • Are there relevant exemplary assignments/exercises that already exist?
  • How should this be best shared? E.g. Static HTML/PDF, and/or dynamic Jupyter notebooks/web apps
  • Are there particular subtopics you would especially enjoy working on?
Group Timetable

• Consider how the work might be organized in time:
  • Do people have the most available time in the summer?
  • What might be a realistic timetable for planning goals, draft reviews, etc. before MAIA submission early fall of this year?
  • Note the consensus deadlines on your worksheets.

• How should communication take place in the group (e.g. email, Discord)?
Who is Interested?

• On the backs of your worksheets, please provide contact information for all who are interested in such work.

• If you would volunteer to be a point person for group communication, please indicate this with a check in the rightmost column. (All substantive participants would be coauthors.)

• Feel free to take photos of your group’s worksheet before turning it in to Todd Neller.

• Thank you for your interest! May we have a great positive impact on CS education in the months ahead!