Artificial Intelligence Concentration

Updated August 31, 2020

Symbolic Systems majors completing the new Core requirements effective for 2020-2021 must complete the following requirements to qualify for a Concentration in Artificial Intelligence. All courses must be taken for 3 units of more. Notes: Core requirements fulfilled by a course are noted in brackets "[]". "ASSR" denotes courses that fulfill the Advanced Small Seminar Requirement.

1. **Programming.** One of the following:
   - CS 107: Computer Organization and Systems [*Post-CS 106B Computation*]
   - CS 107E: Computer Systems from the Ground Up [*Post-CS 106B Computation*]

2. **Introduction.**
   - CS 221: Artificial Intelligence: Principles and Techniques [*Post-CS 106B Computation*]

3. **Artificial Intelligence Depth.** Two courses chosen from the "Select" list of AI courses (category B of the MSCS AI Track):
   - CS 223A: Introduction to Robotics
   - CS 224N: Natural Language Processing with Deep Learning (LINGUIST 284, SYMSYS 195N) [*Practicum or Integrative Requirement*]
   - CS 224S: Spoken Language Processing
   - CS 224U: Natural Language Understanding (LINGUIST 188, LINGUIST 288, SYMSYS 195U) [*Practicum or Integrative Requirement*]
   - CS 224W: Machine Learning with Graphs
   - CS 228: Probabilistic Graphical Models: Principles and Techniques
   - CS 229: Machine Learning [*Post-CS 106B Computation, Cross-Area Requirement*]
   - CS 231A: Computer Vision: From 3D Reconstruction to Recognition
   - CS 231N: Convolutional Neural Networks for Visual Recognition
   - CS 234: Reinforcement Learning
   - CS 238: Decision Making under Uncertainty [*Cross-Area Requirement*]

4. **Integrative Requirement.** Must be completed no earlier than the Junior Year:
   - Any of the Standard Options for all Concentrations specified under the Core Capstone requirement, or
   - A Concentration-Specific Integrative Course -- a course that integrates the themes of the Concentration with the Core requirements. One of the following [with more options to be added as they are approved -- some options may be
removed if they are included in the list of SYMSYS 195* project courses, in order to avoid redundancy with the Standard Options:

- COMM 326: Advanced Topics in Human Virtual Representation [ASSR]
- CS 131: Computer Vision: Foundations and Applications
- CS 181: Computers, Ethics, and Public Policy [Cross-Area Requirement]
- CS 182: Ethics, Public Policy, and Technological Change (COMM 180, ETHICSOC 182, PHIL 82, POLISCI 182, PUBLPOL 182) [Introductory Philosophy, Cross-Area Requirement]
- CS 325B: Data for Sustainable Development (same as EARTHSYS 162, EARTHSYS 262) [ASSR]
- CS 379C: Computational Models of the Neocortex
- LINGUIST 180: From Languages to Information (CS 124, LINGUIST 280) [Cross-Area Requirement]
- MUSIC 220C: Research Seminar in Computer-Generated Music [ASSR]
- NENS 220: Computational Neuroscience
- PHIL 356C: Logic and Artificial Intelligence (CS 257) [ASSR]
- PHIL 359: Topics in Logic, Information, and Interaction [ASSR]
- PSYCH 164: Brain Decoding [Cross-Area Requirement]
- PSYCH 204: Computation and Cognition: the Probabilistic Approach [Cross-Area Requirement]
- PSYCH 209: Neural Network and Deep Learning Models for Cognition and Cognitive Neuroscience [Cross-Area Requirement]
- PSYCH 242: Theoretical Neuroscience (same as APPPHYS 293) [Cross-Area Requirement]
- PSYCH 247: Topics in Natural and Artificial Intelligence [ASSR]
- PSYCH 249: Large-Scale Neural Network Modeling for Neuroscience (same as CS 375) [Cross-Area Requirement]
- SYMSYS 202: Theories of Consciousness [ASSR]

5. **Contingent Electives.** If any of requirements 1-4 are fulfilled with courses taken for Core requirements, then additional approved Contingent Elective courses must be completed to total 5 courses beyond those that are taken for the Core. These electives can be one or more courses from any of the areas above, or which are approved for a Core requirement that the student has fulfilled with a different course, or any of the following:
   - BIOMEDIN 210: Modeling Biomedical Systems: Ontology, Terminology, Problem Solving (CS 270)
   - BIOMEDIN 214: Representations and Algorithms for Computational Molecular Biology (BIOE 214, CS 274, GENE 214)
   - CS 217: Hardware Accelerators for Machine Learning
   - CS 227B: General Game Playing
   - CS 236: Deep Generative Models
   - CS 246: Mining Massive Data Sets
○ CS 330: Deep Multi-task and Meta Learning
○ CS 348I: Computer Graphics in the Era of AI
○ CS 348K: Visual Computing Systems
○ LAW 4039: Regulating Artificial Intelligence
○ MS&E 135: Networks
○ MS&E 234: Data Privacy and Ethics
○ MUSIC 220B: Compositional Algorithms, Psychoacoustics, and Computational Music
○ MUSIC 220C: Research Seminar in Computer-Generated Music
○ PHIL 20N: Philosophy of Artificial Intelligence
○ STATS 202: Data Mining and Analysis
○ STATS 315A: Modern Applied Statistics: Learning
○ STATS 315B: Modern Applied Statistics: Data Mining