# *A Minor in Artificial Intelligence Using Liberal Arts Courses*

Contributed by *Brian O’Neill*, [*brian.oneill@quinnipiac.edu*](mailto:brian.oneill@quinnipiac.edu)*, Quinnipiac University*

## Institutional and departmental context

Location: Quinnipiac University, Hamden, CT, USA

Undergraduate student body size: Approximately 6000 students

Degree(s) offered: B.S. Computer Science, B.A. Computer Science, B.S. Software Engineering

Department/major name: Department of Engineering, School of Computing & Engineering

Number of contributing faculty: 7.5 FTE

Number of majors annually: Approximately 200 students majoring in CS or SE across all years. First-year and sophomore classes are larger than junior and senior classes.

Does the department offer any graduate programs? Yes -- M.S. Computer Science and M.S. Cybersecurity

Other context: Computer Science originated in the College of Liberal Arts (later renamed the College of Arts & Sciences) until it became part of the new School of Computing & Engineering (SCE) in 2016. The B.A. Computer Science degree largely reflects the pre-SCE curriculum, and it remains a popular option for students seeking a double major. Students completing the B.A. are required to have a second major or a minor and must complete a thesis synthesizing CS with the minor or second major.

## Description of Curricular Innovation

As noted in the context above, computing at Quinnipiac has historic ties to the College of Arts & Sciences. These ties are maintained, in part, through the Bachelor of Arts degree. In support of our connection to the liberal arts, the School of Computing & Engineering (SCE) is leading the development of a Minor in Artificial Intelligence. We believe that this minor is an opportunity to demonstrate to students not only the technical aspects of AI, but also its multidisciplinary foundations and its applications across a variety of fields. Our intent with the minor is that it should be accessible to any undergraduate student – not just those already likely to take a traditional CS1 course, let alone the typical junior/senior-level AI course in a computer science department. Instead, we developed the minor so that it uses only two computer science courses, both at the 100-level and neither part of any computing major, and so that students can apply a portion of the minor to the University Curriculum (UC), Quinnipiac’s general education requirements. We believe that this approach to a minor in Artificial Intelligence is ideal for a liberal arts institution. The required courses are not highly technical in nature, but instead highly multidisciplinary and targeted to both STEM and non-STEM undergraduate students.

As proposed, the minor is an 18 credit-hour program. Nine of the credits come from three required courses:

* CSC 105 – Computing: A Multidisciplinary Approach (existing course)
* CSC 1xx – Elements of Artificial Intelligence (new course)
* PL 2xx – Ethics and Artificial Intelligence (new course)

CSC 105 is an existing CS0-like course, largely intended for non-majors, with a focus on data collection and analysis. The class uses Python but does not cover all of the material typically seen in a CS1 course, and the learning objectives differ from our CS1 as well. This course already counts towards the UC. The other two required courses are new. Elements of Artificial Intelligence is a proposed course that would highlight the history and progress of AI and introduce a variety of AI sub-areas in this context. For example, aspects of natural language processing could be covered with comparisons between Eliza and modern large language models. Because CSC 105 would be a prerequisite for this class, we expect that we would be able to carry out small programming projects for some AI techniques, though not to the same extent as our upper-level AI course. Finally, Ethics and Artificial Intelligence will be taught for the first time in Spring 2024 by the Philosophy department. The course will be reviewed for approval for the University Curriculum moving forward.

The remaining nine credits come from an extensive menu of elective courses. The menu contains fourteen existing courses, largely from the College of Arts & Sciences (e.g., AI & Art, Cognitive Psychology, Philosophy of Mind, Game Theory, Interactive Storytelling & Narrative), though the School of Business contributed three existing courses (e.g., Marketing Analytics, Machine Learning & AI for Business). The only SCE contribution is our existing 300-level AI class, historically only taken by computing majors. Arts & Sciences and SCE also plan to re-introduce a “Philosophy of the Artificial Mind” course that was previously team-taught by CS and Philosophy faculty. Arts & Sciences and Business, as well as the other undergraduate schools, are also interested in developing new courses that could be added to the list of electives.

The minor is being proposed with several “pathways” in the elective courses. The pathways are not formal tracks or concentrations and would not appear on a transcript. Instead, these pathways serve as guides for elective courses that might fit together thematically or with common prerequisites. As examples, the proposed “technical pathway” includes the SCE 300-level AI class, Machine Learning (taught by Data Science), and AI and Games (taught by Game Design). A “cognitive pathway” includes two upper level psychology courses (Cognitive Psychology, Applied Cognition) and the Philosophy of Mind course. We have also sketched out other pathways (e.g. “sustainability pathway”, “health sciences pathway” based both on the courses currently available and as suggestions for other schools and departments that want to develop courses for the minor.

## Challenges/Limitations

Devoting resources to course development could a potential roadblock for others hoping to implement a similar program. Two of the three required courses in our minor are new, and it’s possible that other institutions would need even more curricular development time and resources. While a CS1 could substitute for our CSC 105, this would potentially dissuade non-majors from attempting this minor. On a related note, staffing new courses (or adding students to existing CS courses) could be a challenge at a time when our discipline faces higher enrollment and demand.

Another issue to consider is the “ownership” of computing at a particular institution. At Quinnipiac, computer science, data science, and computer information systems sit within three different schools/colleges (SCE, Arts & Sciences, and Business, respectively). Computing is fragmented across these three bodies, each of which has a desire and an argument to claim some ownership over artificial intelligence. While this has been a challenge in implementing our vision for the minor, the structure of the minor and the “pathways” framework have helped us gain support from across the institution.