A holistic approach to academic integrity in a CS1 MOOC

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ABSTRACT

Academic dishonesty presents issues in computer science education. Online environments often exacerbate these issues, such as in Harvard's popular CS50 class (Bidgood & Merrill 2017). These issues challenge acceptance of MOOCs for college credit.

Efforts exist to address this. Some look at multiple-account cheating (Northcutt, Ho & Chuang 2016). Others emphasize simulation-based grading to expand the space of possible answers while preserving autogradable metrics (Jensen, Lee & Seshia 2013; Salzmann, Gillet & Piguet 2016); these closely approximate automatically-graded programming assignments (Geigle, Zhai & Ferguson 2016).

Georgia Tech's CS1301x: Introduction to Computing

In 2016, Georgia Tech developed an online version of CS1301: Introduction to Computing focusing on enrolled students at Georgia Tech. A self-paced option was kept in mind to offer credit to future or nontraditional students at MOOC scale. Taught in Python, the course takes advantage of the online environment, including a self-paced structure, rapid individual feedback, and automated evaluation.

CS1301x's availability for credit dictated a need to provide reliable endorsement – including asserting academic integrity – at scale, but many of the online learning environment makes asserting academic integrity challenging.

A Holistic Approach

In designing courses, cheating and plagiarism detection is often applied to already-existing course designs rather than dictating the design of the course itself. In designing CS1301x, we instead adopted a holistic approach where preventing academic dishonesty guided the actual design of the course.

Homework

First, preventing collaboration on homework was impossible: early assignments are too simple to reliably identify anything but the laziest instances of cheating. Similarly, it was important to provide exemplary solutions, introducing the risk of multiple-account cheating.

Therefore, we explicitly allowed collaboration on homework and granted unlimited attempts at most problems. Thus, students may focus on homework as a learning opportunity, without the high stakes that would otherwise motivate dishonesty.

Tests

However, completion of homework is therefore not a reliable indicator of ability. So, half of the course grade is based on proctored tests. Achieving a passing grade requires strong performance on tests regardless of homework grades. These tests, then, must be sufficient indication of the student's skill.

A digital proctoring service, Proctortrack from Verificient, asserts the straightforward parts of academic honesty during tests: no external aid, no live collaboration, and one attempt per student (not per account).

However, the self-paced structure risks asynchronous collaboration: students who previously completed a test may share information with those who have not. To avoid this, the tests are designed to limit the usefulness of such information-sharing. First, we share preparation material listing the problems students will be given. To compensate, the questions are made challenging, and students are urged to work out solutions in advance. Second, problems are graded automatically and immediately, without partial credit. The problems' complexity makes it unlikely that a student could sufficiently memorize solutions without significant content knowledge, and live feedback in lieu of partial credit means students must debug and resolve issues live during the test.

Summary

Thus, the endorsement of a student's ability is based on proctored tests with reliable measures against live collaboration. Asynchronous collaboration is mitigated by providing information that could otherwise be shared, and by writing problems with the complexity and structure necessary to endorse students' ability regardless of previous collaboration and preparation.

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