

An Analysis and Recommendation of the Implementation of Automated Cheat Detection  
Systems on Honor-Based Academic Societies

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On my honor as a University Student, I have neither given nor received  
unauthorized aid on this assignment as defined by the Honor Guidelines  
for Thesis-Related Assignments

# An Analysis and Recommendation of the Implementation of Automated Cheat Detection Systems on Honor-Based Academic Societies

## **Introduction**

“On my honor as a student, I have neither given nor received aid on this assignment.”

Words that every student at the University of Virginia are intimately familiar with, and one of hundreds of similar phrases found in universities and academic setting across the world. The meaning for all of them establishes the same goal; that those in that academic group agree to follow rules for academic and personal integrity. When considering paper or assignment submissions from students, unless egregiously clear that something against the code of honor was done, it is taken on honor that students are acting in accordance with the honor system. With modern computing techniques and the changes in how academic work is submitted and analyzed in a digital format it is now possible to automate cheat detection and provide evidence at levels not previously considered when examining students work. The usage of these systems has already begun at universities and high schools across the world, but the impacts that they have on students can be profound. In addition to examining some of the reasons behind student cheating, Actor Network Theory will be used in conjunction with published sources and interviews to determine how these systems affect students and the relationships between actors in academic systems.

## **Research Question and Methods**

As universities and companies continue to develop cheat detection systems it becomes more important to understand how they affect student-student and student-faculty relationships.

How do automated cheat detection systems affect honor based academic societies, and how can they be best implemented? In order to understand how these systems work and affect existing academic environments, an understanding of the current state will be reached via a review of existing literature and conducting of several interviews with faculty at the University of Virginia who have either used systems for cheat detection in the past, or are considering implementing one. Interviews will be conducted across multiple departments, but will focus on the School of Engineering and Applied Science due to the higher amounts of collaborative work and higher incidence of systems designed or implemented “in house”. Additional interviews are conducted with students working for the University of Virginia as teaching assistants and as member of the Honor Council to gather diverse perspectives from different groups. Focus is placed on what changes in collaboration, work quality, and faculty-student interaction can be seen between courses with and without automated systems, as well as any changes over time as automated systems are used more or less.

## **Background Information**

Honor is not standardized in implementation across universities and departments, it is therefore important to understand a variety of viewpoints from students and faculty in these different areas. Initial research from Vanderbilt University indicates that some issues with automated cheat detection and cheat detection in general come down to differences in perspective between students and faculty; students being more lenient on what exactly is ethical or not (Bruff 2011). Additional research into students’ reasons and patterns behind cheating comes from David Palazzo and Lee who published an analysis of cheating patterns over the course of several assignments and plotted the degree and frequency of student cheating (Palazzo, Lee).

Earlier work from Zorana Ercegovac and John Richardson Jr. sought to better define several key terms relevant to this thesis (Ercegovac, Richardson, 2004). Cheating, according to their literature review, is “ ‘intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise’ ” (Ercegovac, Richardson, 2004). Plagiarism is considered by most institutions as a separate category from lying, cheating, or stealing, but is comprised of elements of each of these three. According to Richardson and Ercegovac, plagiarism is “ ‘intentionally or knowingly representing the word of another as one’s own in any academic exercise’ ” (Ercegovac, Richardson, 2004). Additionally, they define an additional form of academic dishonesty, fabrication, as “intentional and unauthorized falsification or invention of any information or citation in an academic exercise” (Ercegovac, Richardson, 2004).

Fabrication may seem less relevant for the purposes of this paper but could be checked by automated cheat detection systems using higher level analyses with artificial intelligence or machine learning capabilities able to recognize falsified citations. These definitions of academic dishonesty provide a baseline for what should be detected by automated systems, as lying is not as easy to detect using technical tools; it forms a subjective component to additional possible issues with an assignment, and therefore requires a form of human interaction beyond clicking an honor statement, signing a promise of integrity or stating that certain guidelines were followed.

The burden of lessening academic dishonesty does not rely fully on technical solutions. Professor Pritchard of the Massachusetts Institute of Technology notes that a switch from online homework submission and lectures, when switched to a studio model of small groups and closer student-faculty interaction, reduced incidences of detectable cheating by about 75% (Young 2010). While many assignments, such as essays or more traditional problem sets and long form responses may benefit heavily from automated detection for plagiarism or cheating, alternative

solutions outside of the purely technical realm may offer longer lasting and beneficial results when paired with automated detection systems.

## **STS Framework**

I intend to use primarily Actor Network Theory as an analytical framework. Actor Network Theory provides an interesting perspective for analysis of honor and university systems for several reasons. First, it depends entirely on the relationships between groups instead of inherent qualities of those groups; the qualities are represented and contribute to analysis in how they affect relationships and the system. For relationships between students and faculty, as well as between students, faculty, and other institutional factors, Actor Network Theory allows a single framework to apply to many different relationships effectively. Due to the focus on relationships and interaction, time and ongoing interaction is not necessarily required, a strong benefit to analysis of transient and constantly changing populations like those found at universities.

A main critique of Actor Network Theory is that it does not consider preexisting relationships or power dynamics in the system being analyzed (Cressman, 2009). The constant shifting of both the student body and the courses and faculty, as well as which students interact with which courses and when creates a system constantly in flux. Actor Network Theory being focused on how groups interact provides a more flexible system in which to look at each set of interactions on its own, as well as in the context of the overall system. The expected divisions in interactions are those between students and students, students and faculty, and courses and students. Once an automated cheat detection system is in place in a class the dynamic present between all involved groups will change, and continue to develop with how much presence the automated system has in the course. Between students it may induce an apprehension of working

with one another too closely, affecting student performance. Alternatively, it may lead to an environment where it is considered unjust if it gives a false positive, breaking down the relationships of trust between student and faculty.

Actor Network Theory is also dependent on power balance and dynamic between groups of actors, which fits well at the university level with groups of students, teaching assistants who may also be students, faculty, and student honor panels. Similar to the previously discussed benefits of Actor Network Theory on changing populations, the differences in power dynamics change constantly between groups at universities. Unlike the changes in relationship between students and faculty, the structures of legal and financial influence can be influenced by outside factors such as state legislature, available compute tools and services, etc.

In conjunction with the background material and interviews with faculty at the University of Virginia a basis for relationship analysis from one group is available, and given that the faculty and academics are responsible for the development and implementation of automated cheat detection systems, they are a key component to understanding the effects and reasons for use that these systems have. While automated cheat detection systems are a clear technical solution to a larger problem, further perspectives are gathered from students, both as teaching assistants and on the Honor Council at the University of Virginia. These perspectives shift the problem from one of technical analysis to a problem better suited to Actor Network Theory due to the diversity of relationships, perspectives and motivations present.

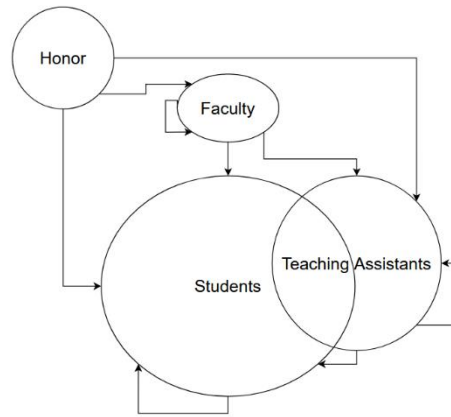
## **Research Questions and Methods**

How do automated cheat detection systems impact honor based academic societies? In order to understand the question, an understanding of the societies and actors must be present,

including students, educators, teaching assistants, and how those different groups interact with each other across a diverse set of academic fields and the variety of interaction and relation types present. Information about the patterns of student cheating, differences in opinion about actions and [], and a historical review of the development of automated systems, their implementation, and how student options and activities have developed with technology are of importance and present in the research for this paper. Additional information and context is gathered from interviews with faculty, teaching assistants, and students from the University of Virginia to ensure representation of the major actor groups. Actor Network Theory (ANT) is the main STS framework used in the analysis of the gathered information. Actor Network Theory was chosen due to the flexibility of the theory, as well as the ability to consider nonhuman objects or concepts as important contributors to a system. Actor Network Theory also focuses on relationships, and thus can be applied to changing and inconsistent systems such as student bodies or constantly changing course offerings and other facts of academic life at many institutions.

## **Results and Discussion**

How automated cheat detection systems affect honor based academic societies is a complex one, and the overall answer is, in the analysis of many relationships, ‘it depends’. In a somewhat absolute sense, the implementation and use of automated cheat detection systems is beneficial to honor and academic environments, but the consequences at levels beyond those relating to the student or objective measures of results indicate that care should be taken when implementing or making decisions on cheat detection systems. In order to characterize the affects and the groups involved, Figure I includes a directed graph of the how responsibility to maintain honor exists between groups, with responsibility flowing in the direction of the arrow.



*Figure 1: Directed graph of influence between Actors*

The changes on student-student interactions are largely minimal according to an interview with Professor Ann Reimers of the University of Virginia, and a study from Georgia Tech indicates that collaboration can be maintained while reducing occurrences of dishonest behavior. Student-faculty relations are not affected in substance but do have an improvement in the validation that students in larger courses or infrequent courses are acting appropriately. Additional benefits of student-faculty relations come in the case when a transgression has been made; the availability and technical nature of evidence has led to faster acknowledgements of wrongdoing and willingness to correct problems or behavior in the future (Ann Reimers, personal communication, February 19 2020). Faculty-faculty relationships are less clear. While not directly impacted by the results of cheat detection systems due to the nature of the relationships, the disparities in usage, enforcement and justification may lead to problematic differences in opinion or result between members of the same faculty or teachers of different sections of a course.

The reasons students cheat, particularly in engineering, seem to be drawn largely into three main categories. First, the influence of time pressure and other course demands, coupled with the time intensity of the assignments as referenced by an MIT analysis of student cheating



(Palazzo, Lee, Warnakulasooriya, Pritchard, 2010). Second, what is attributed to technology by Trevor Harding of California Polytechnic in the form of “technological detachment syndrome” (Piascik, Brazeau, 2010). Technological detachment syndrome is not restricted to working on assignments on a device, but also includes access to online materials for unauthorized assistance on problems (Piascik, Brazeau, 2010). While it is impractical to assume that course demands and scheduling can be managed at a high level to ensure student success and sufficient time, and equally impossible to fully restrict access to the materials online or actions of students with technology, the third influential factor can be addressed effectively in courses. A clear and well presented view of expectations and interpretations of honor led to a reduction of offenses in multiple studies, indicating that clearly expressing the policy and answering questions can influence student behavior outside of the presence of an automated system (Palazzo, Lee, Warnakulasooriya, Pritchard, 2010. Mason, Gavrilovska, Joyner, 2018).

The purpose of a cheat detection system is not singular. While the initial usage and impressions of several interviewed subjects, including Professor Brynn Seabrook of the University of Virginia, focused on the usage of cheat detection systems as a way for cheating, the reason for usage can be changed if the expectations are properly communicated (Brynn Seabrook, personal communication, February 19 2020). Viewing the solution to academic honor in this way creates a change in the type of solution. Cheat detection software or services focuses on implementing a technical solution which can create artificial barriers to interested parties, and provides a defined set of acceptable and unacceptable parameters to student submissions. If, instead of a technical solution, a combination of social, interaction, and technical measures was used, the results become quite different. This approach has been used or identified across three

primary case studies. The aforementioned Georgia Tech paper, an analysis of cheating at the Massachusetts Institute of Technology, and in the beginning stages at the University of Virginia.

Professor Ann Reimers of the University of Virginia teaches an online Introduction to Engineering Analysis course to incoming engineering students. Due to the large number of enrolled students compared to teachers and teaching assistants, a ratio of roughly 700:15, and previous problems with cheating on the weekly assignments, she began implementing a basic automated check for cheating among student submissions (Ann Reimers, personal communication, February 19 2020). After an initial testing phase, a first round of warnings was issued with evidence presented, and met with apologies and questions from the students about fixing the issues in future assignments. While taught almost exclusively in an online format, the course does have one mandatory in person lecture, in which the honor policy is clearly presented to students, as well as available as presented in an introductory quiz. This combined approach of a clear set of policies, with reinforcement, coupled with individual discussion has reduced argument and led to students accepting their mistakes and the correct course of action faster when used with a cheat detection system than with only manual review.

The case presented in the Georgia Tech paper shows similar results presented over a longer and more rigorously documented time frame. Policies for honor and academic conduct were presented to students in a formal assessment including detailed information. Mason, Gavrilovska, and Joyner additionally claim that the usage of a formal assessment as a baseline for understanding of course honor expectations forms an effective ground between ineffective general honor policies and a comprehensive course focused solely on honor (Mason, Gavrilovska, Joyner, 2018). The impact of the cheat detection is immediate, yielding a 14-17% plagiarism rate across an entire semester for students before the addition of a quiz on the honor

policy and collaboration vs cheating was implemented. This rate dropped to a maximum of 7% on subsequent semesters with no noted change of assignment difficulty or policy. This quiz was most effectively accompanied by an aggressive enforcement policy in cases where cheating did occur and was identified by the automated system.

These two case studies and the view of technological detachment syndrome from Trevor Harding creates a reasonable set of data on which to build further tests and analyses. Using Actor Theory the relationships between relevant actors can be analyzed as the policies and tools used continue to change. A large concern I had over the known usage of cheat detection systems was the impact on collaboration, particularly in software or engineering fields where effective teamwork is critical in success later in academic and professional work. The actions taken by the team at Georgia Tech to specifically include information about acceptable collaboration and similar information from Professor Reimers at the University of Virginia show a clear awareness of the potential negative effects, and steps to prevent collaboration from occurring less frequently (Annm Reimers, February 19 2020, personal communication). The student-student relationship is therefore not strongly affected negatively by the implementation of the automated system; work can continue to be done solo or in acceptable ways while knowing that the system acts equally on all submissions instead of 'getting lucky' with handwritten assignments or a lax review of the assignment when submitted. Student-faculty interactions remains unclear, with information indicating both improvements and degradation of the relationship between the groups. The Georgia Tech case, as well as the Massachusetts Institute of Technology case studies both indicate a lack of clear communication and engagement when honor infractions occurred, with students refusing to discuss the events or dropping classes in response. The responses according to Professor Reimers however, are of a more positive nature in the ability to provide

clear evidence to clear the initial delays or denials from students and focus the conversation on needed changes. This particular relationship, while considered in something analogous to a vacuum in Actor Network Theory, varies widely from professor to professor, institution to institution, etc. I therefore propose that this relationship may be affected, but would require a deeper and focused study specifically on those interactions that is not present in this paper.

The considerations and impacts of automated cheat detection systems on honor based academic environments are wide ranging. This paper presents several case studies specific to STEM fields at a few universities, but remains limited in material to draw conclusions from. More time to understand the implementations and effects of cheat detection across different fields, such as the liberal arts or language, provides several interesting avenues for further research, such as detection of popular translation software or writing based plagiarism. Further limitations include the limited number of universities from which information is available. Due to my study at the University of Virginia, resources across multiple fields are available for study, but different universities with similar honor systems may have different approaches or results from implementation. Contact with other universities and potential cross university implementation and analysis would be valuable in determining the influences on student-student and student-faculty relationships.

## **Conclusion**

Changes to historically or culturally engrained systems at universities requires an understanding of the existing systems in place as well as the influence implementation will have on the existing relationships between impacted groups. Automated cheat detection systems provide a powerful tool in determining if students acted dishonorably, but remain a tool in need

of proper usage and understanding. Technical solutions alone will not solve problems over the long term, as seen in the Georgia Tech and University of Virginia cases' approach in adding non-technical measures to the system. It is unlikely that students will cheat less as time goes on, particularly as more information becomes available online and through other sources to alleviate the pressures or reluctance to complete assignments. The implementation of automated cheat detection systems does not erode the existing structure of honor at the student-student level, but may introduce issues between faculty and other faculty, or between students and the concept of honor at the university if not implemented correctly

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