Thesis Portfolio

How Do Students Collaborate? Analyzing Group Choice in a Collaborative Learning Environment

(Technical Report)

Artificial Intelligence in Court: An STS Framework Analysis of the vulnerability of Computer-Aided Decision-Making Processes

(STS Research Paper)

An Undergraduate Thesis

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Socio-technical Synthesis: Student Collaboration and Court Algorithm

My technical and STS research are connected through the idea of a network. Both works identify the actors in a certain network and study their roles in the evolution of the network. Additionally, both networks exist in an engineering application setting. My technical work focuses on a student collaboration network in a Computer Science course, and my STS research explores the social aspects of a network centered around an algorithmic product. However, they differ in how the network is analyzed. My technical paper derives conclusions about the network through mathematical computation and hypothesis testing, while my STS paper studies the interactions between actors in the network through the employment of a theoretical framework.

My technical publication observes how the student collaboration network evolves in size and membership, given a groupwork policy encouraging students to choose up to four partners for each coding and written assignment. The goal is to calculate the best team size and identify factors that influence students' collaboration choices. We observe a strong correlation between choosing to collaborate instead of working alone and performance. Groups of size 4 achieve the best results among all group sizes for coding homework, and groups of sizes 4 and 5 have the best performance for written homework, leading to a conclusion that 4-person teams are the most achieving. Additionally, factors such as perceived homework difficulty, prior grade release, student performance, and homework type affect how students change their collaborators. Specifically, students have a higher tendency to collaborate when the given assignment has a high perceived difficulty, and they add more and remove fewer teammates when completing a challenging assignment immediately followed by an easier one. Additionally, students tend to remove more collaborators after grade release, and collaboration occurs more frequently among students with higher grades. Lastly, collaborator removal correlates with the homework types.

My STS paper identifies the actors in the network of the COMPAS algorithm used in court to facilitate sentencing and analyzes why this network fails by applying the Actor-Network Theory to a case study involving racial bias. I study the network during the "Translation" process in the research. Specifically, the algorithm developer company Northpointe and the New York Division of Criminal Justice Service are network builders. They recruit actors such as the contract, the data, the algorithm, the judges, the warning messages of COMPAS scores, the defendants, and the evaluation metrics during the interessement stage. Their interactions and limitations create a deviation from their scripted actions in the enrolment stage, resulting in the current vulnerable COMPAS network. The limitations and room for improvement can help engineers and law enforcers better understand AI mechanisms in law settings, which can prompt them to design and improve justly in the face of racial biases.

Working on these two projects together brings me greater insight into both. My technical work helps me understand how non-human factors impact students' choices of collaborators. The results, in turn, inspire me to explore how the interactions of actors affect the stability of the COMPAS network methodologically for my STS topic, which helps me comprehend the limitations of any high-tech tool. Working on these topics simultaneously allow me to explore the evolvement of network through both a CS and social lens, obtaining greater values about the techniques and difficulties in analyzing, developing, and using any technical product.