

Thesis Project Portfolio

Automation Testing: Streamlining Quality Assurance

(Technical Report)

The Ethics of Artificial Intelligence in Software Engineering: Balancing Innovation with Responsibility

(STS Research Paper)

An Undergraduate Thesis

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Bachelor of Science, School of Engineering

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Table of Contents

Sociotechnical Synthesis

Automation Testing: Streamlining Quality Assurance

The Ethics of Artificial Intelligence in Software Engineering: Balancing Innovation with Responsibility

Prospectus

Sociotechnical Synthesis

A look into sociotechnical research on automation testing and artificial intelligence

Bridging Automation Testing and Artificial Intelligence: An Ethical and Technical Perspective

"The rapid expansion of AI is often seen as inevitable, but this perspective overlooks the critical need for intentional, ethically grounded regulation." - IBM

This semester's sociotechnical research paper on the ethics of artificial intelligence (AI) was inspired by my previous technical research on the benefits of automation testing. In researching automation testing, the many potential dangers of poor software quality were revealed. The study delved into the many software failures that could have easily been prevented with some automation tests. The question of "how much testing is adequate?" was persistent throughout the process. Eventually, the question of adequate testing transformed into an ethical question of developer's accountability of their work. Applying this to the research paper, my focus naturally shifted to a topic that is much more relevant in today's age: artificial intelligence. The topic is very ethically contentious as it's unclear where to place blame when things went wrong. Whether it's the fault of the creator, the consumer, or a combination of both, it became clear that this was a topic I should further explore.

The technical paper includes an empirical study on the impact of automation testing and its societal importance. My study was backed by numerous studies, expert testimonies, and other scholarly articles. In gauging impact, the research looked into the effect automation testing had on critical measures such as product quality, release cycle frequency, and the continuous integration (CI) success. Other considerations included test reusability, repeatability, test coverage and effort saved in test executions. The results showed that automation testing is beneficial to all aspects of code, namely quality, speed, and integration success. In terms of widespread adoption into companies, it was shown to have a positive impact in the long term. Despite the investment cost to train and integrate it into development teams, its help catching errors early ultimately served to save money in the long run. As for its societal impact, automation testing helps everyday citizens receive safe, tested products in a timely manner. After large scale software failures with companies like Nest thermostats and Boeing airplanes, automation testing measures can help to catch a significant number of errors before they harm

civilians.

Table VIII
SURVEY RESULTS FOR LIMITATIONS

Rank	Questions related to limitations	Answers on Scale ¹					Median
		5	4	3	2	1	
L.R1	L4: Compared with manual testing, the cost of AS is higher, especially in the beginning of the automation process. However, automated software testing can be more productive after a period of time	42	60	8	4	1	4
		37%	52%	7%	3%	1%	
L.R2	L3/L4: Automated testing needs extra effort for designing and maintaining test scripts.	37	64	7	6	1	4
		32%	56%	6%	5%	1%	
L.R3	L6/L7: Testers should have enough technical skills to build successful automation	40	53	12	9	3	4
		35%	46%	10%	8%	3%	
L.R4	L5: Compared with manual testing, AST requires a high investment to buy tools and train staff to use the tools	32	56	12	11	6	4
		28%	49%	10%	10%	5%	
L.R5	L5: AST requires less effort on the developers side, but cannot find complex bugs as manual testing does	19	49	19	24	4	4
		17%	43%	17%	21%	3%	
L.R6	L3: Most of the testing tools available in the market are incompatible and do not provide what you need or fits in your environment.	11	40	30	24	10	3
		10%	35%	26%	21%	9%	
L.R7	L1: Automated testing fully replaces manual testing.	1	6	16	49	43	2
		1%	5%	14%	43%	37%	

¹5=completely agree, 4=agree, 3=neutral, 2=disagree, 1=completely disagree

In my STS research paper, I explored the ethics of artificial intelligence(AI) systems, particularly from a multi-level perspective. As artificial intelligence is projected to contribute \$15.7 trillion to the global economy by 2030, the issue of ethical integration is paramount. Understanding that creating a centralized framework was out of the scope of this assignment, my research focused on analyzing the technological landscape, identifying the most relevant actors, and highlighting the many ethical concerns in order to inspire the creation of a larger framework to address them. Using the multi-level perspective, I noticed that the most important actor, the government and its legislation, was at the landscape level. However, in order for the government to enact change, it would require pressure from actors at the regime level, namely interest groups, academics, and lobbyists. With the added concerns from AI technologies such as privacy and accountability considerations and issues with algorithmic bias, the paper pointed towards the areas that needed change and it also pushed for a change in AI regulation as a whole.

Drawing from the various concepts that were covered over the past semesters, it is apparent that a sociotechnical perspective can help gain much insight and great understanding of different topics. Frameworks like actor network theory and the multi-level perspective provide a more holistic view on different subjects. Our analysis of moral foundations and different engineering case studies over the past semesters offer insight into the many dilemmas that engineers have to face and helped teach the true importance of our duties as engineers. The many lessons that were taught helped mold us into more complete engineers, understanding that technical proficiency is not everything.