Undergraduate Thesis Prospectus

Efficient Encryption Algorithms with Artificial Neural Networks

(technical research project in Computer Science)

Organized Labor's Fight Against Automation in the U.S.

(sociotechnical research project)

by

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October 27, 2022

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.

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General Research Problem

How is automation affecting the workplace?

For employers, automation offers lower labor costs. In a survey of global companies, McKinsey (2020) found that in 2020, about "two-thirds of respondents say their organizations are at least piloting the automation of business processes in one or more business units or functions, compared with 57 percent who said so" in a 2018 survey. Many workers fear automation threatens their jobs. Osterman (2019) found that "most Americans – 72 percent – are worried about a future where robots and computers can do most jobs" (p. 6).

Efficient encryption algorithms with artificial neural networks

How can artificial neural networks be used to create efficient encryption algorithms?

Since the creation of encryption and decryption algorithms, there has been an arms race between these two algorithms in the cryptography world. Whenever someone creates a more efficient and better encryption algorithm to protect very sensitive and private information, there is someone who creates a decryption algorithm that will break the encryption in order to obtain this information. Neto et al. (2021) found that the U.S. has reported "more than 10,000 data breaches" (p. 1) since 2018 and that the EU has reported "more than 160,000 data breaches since May 2018" (p. 1). Some of these data breaches could have been stopped if there was a stronger encryption algorithm to fight against all the current decryption algorithms. In order to create a more efficient and better encryption algorithm, there must be a new approach. This new approach is artificial neural networks. Zolfaghari and Koshiba (2022) found that "neural networks can help improve the performance and the security of cryptosystems" (p. 1). The findings of Zolfaghari and Koshiba show that artificial neural networks can create more efficient

and better encryption algorithms. Therefore, how can artificial neural networks create more efficient and better encryption algorithms?

My project department is computer science. My technical advisor is Rosanne Vrugtman. The project is a capstone project that is associated with the CS 4991 class. There are no project collaborators. The project goal is to write an essay about a way to create efficient encryption algorithms using artificial neural networks. There are no unusual constraints.

Currently, the state of the art for encryption algorithms is the Advanced Encryption Standard (AES) algorithm. The AES algorithm is a "symmetrical block cipher algorithm that takes plain text in blocks of 128 bits and converts them to ciphertext using keys of 128, 192, and 256 bits" (Mustafeez, n.d.). Compared to the AES algorithm, the encryption algorithms made by artificial neural networks are more efficient and take up less memory when computing results. Roenko (2020) found that the neural encryption algorithms "perform cryptographic transformations faster" (p. 8) and show "significantly lower results by the criterion of system resources consumption" (p. 8) when compared to the AES algorithm.

The methods that will be used to solve the technical research problem include finding published research about encryption algorithms with artificial neural networks and choosing the ones with the most efficient encryption algorithms. If this project succeeds, an efficient encryption algorithm will be created that will create an encryption that will be very hard or impossible to crack with current decryption algorithms. This will result in less sensitive and private information being taken by criminals that are using the current decryption algorithms.

Organized Labor's Fight Against Automation in the U.S.

How does organized labor in the U.S. protect its membership from the employment threats of automation?

Many U.S. workers fear that workplace automation may cost them their jobs. Parolin (2021) found that "earnings and employment trends among occupations at greater risk of automation are conditional on the strength of organized labor" (p. 922).

Researchers have investigated union responses to automation in transportation and automaking. Weekley (1983) found that the United Auto Workers "worked very closely with Carnegie-Mellon University and other universities in the Midwest on studies of automated equipment and its effect in the future" (p. 151) in order to stay ahead of innovations in automation. According to Han, Otto, and Dresner (2019), in collective bargaining, the International Brotherhood of Teamsters demanded that "UPS agree to not use drones or self-driving trucks to automate deliveries" (p. 338). Aoyama and Alvarez Leon (2021) also found that the Amalgamated Transit Union Local 85 with other organizations in Pittsburgh "publicly demanded more equitable partnerships between the city and autonomous vehicle companies" (p. 6).

In a study of the gambling industry, Garcia (2019) found that the Culinary Workers Union Local 226 used "advocacy on the political stage, on the shop floor, and also through large demonstrations on the Las Vegas Strip" (p. 376) to negotiate for contracts with new protections against "the automation of certain jobs" (p. 379) in Las Vegas Strip casinos. According to Andrews (2009), a United Food and Commercial Workers (UFCW) local used collective bargaining to force the Superfood to agree that management "could not substitute employees with self-checkouts" (p. 121) and were "required to meet with the union to discuss the potential changes involved with the introduction of the new technology if requested" (p. 121).

Among the many U.S. unions resisting employment threats from automation, four are representative. UFCW argues that technology "needs to be used to help workers and communities succeed, not as a way to get rid of good jobs or to make things more difficult" (UFCW, n.d.). According to the Transport Workers Union (TWU), its members' greatest threat "is the rise of anti-worker technologies that have no public benefit and are designed to eliminate jobs" (TWU, n.d.). According to a spokesperson for the International Brotherhood of Teamsters, "the quality of jobs and the safety of transportation workers is not a trading piece blindly sacrificed in order to bring these automated vehicles to market as quickly as possible" (Teamsters, 2018). The Amalgamated Transit Union claims it is "fighting to ensure that frontline workers are at the center of conversations regarding automation" (ATU, 2022).

In Las Vegas and in New York City, two unions are trying to help their members resist automation in the culinary and taxi industries. In Las Vegas, the secretary-treasurer of Culinary Workers Union Local 226 stated: "we have to figure out how to make the companies understand" that automation "can be more of an opportunity for workers, and not so much mean the elimination of jobs" (Greenhouse, 2018). In New York City, the founder of the New York Taxi Alliance declared that "the regulatory framework for autonomous vehicles is that they should be banned" (Guse, 2022).

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