

**Government by Algorithm: Artificial Intelligence in Federal Administrative Agencies, a Case of USA**

***Rubina Shaheen***

***Mir Aimal Kasi***

**Government by Algorithm: Artificial Intelligence in Federal Administrative Agencies, a Case of USA**

**Rubina Shaheen**

Institute of Management Sciences, University of Balochistan, Quetta.

Email: [rubinaphdscholar@gmail.com](mailto:rubinaphdscholar@gmail.com)

**Mir Aimal Kasi**

Institute of Management Sciences, University of Balochistan, Quetta.

Email: [aimal\_khan@live.com](mailto:aimal_khan@live.com)

**Abstract**

The report gives a presents use of artificial intelligence in few administrative agencies. In-depth thematic analysis of some institution, have been conducted to review the current trends. In thematic analysis, 12 institutions have been selected and described the details of the institutions using artificial intelligence in different departments. These analyses yielded five major findings. First, the government has a wide application of Artificial Intelligence toolkit traversing the federal administrative and state. Almost half of the federal agencies evaluated (45%) has used AI and associated machine learning (ML) tools. Also, AI tools are already enhancing agency strategies in the full span of governance responsibilities, such as keeping regulatory assignments bordering on market efficiency, safety in workplace, health care, and protection of the environmental, protecting the privileges and benefits of the government ranging from intellectual properties to disability, accessing, verifying and analyzing all risks to public safety and health, Extracting essential data from the data stream of government including complaints by consumer and the communicating with citizens on their rights, welfare, asylum seeking and business ownership. AI toolkit owned by government span the complete scope of Artificial Intelligence techniques, ranging from conventional machine learning to deep learning including natural language and image data. Irrespective of huge acceptance of AI, much still has to be done in this area by the government. Recommendations also discussed at the end.

**Keywords:** *Artificial intelligence, Machine learning, AI toolkits, Administrative agencies*

1. **Introduction**

Artificial intelligence and machine learning has strong ability to change the way government agencies do their task. Fast growth in Artificial Intelligence implies decrease in the cost in governance and its functions, Enhanced decision making, and quality in all administrative data released, thereby making the performances by government very efficient. Agencies that adopts and utilize Artificial Intelligence to access these benefits will also face vital questions bordering on the algorithm design between the private and public institution with capacities to use AI and issues bordering on their permission to use AI as well. All these are essential issues for public discuss. However, very little information is known about the use of Artificial intelligence in administrative agencies. Information on how agencies use such tools is lacking. In a bit to breach these gaps, this study ensued.

Aside promoting the unity and defense of the United States, the American citizen trusts the federal government to provide and enhance welfare, preserve the environment, improve public health, provide enabling environment for innovation, and institute employment and labor standards. The Federal agencies consistently set new guides and rules and adjudicate, implement, and otherwise effect statutory policies. As they do this, they encounter changing social, economic, and technological context. The surging sophistication of and need of machine learning (ML) and artificial intelligence (AI) is among the most essential national changes that have been available to the federal agencies in the past years (Donepudi, 2015). A lot of commentators and scholars have given foresight on how government would regulate Artificial Intelligence,

There is little information on the use of artificial intelligence by government agencies. Having a holistic idea of such application today is important for the promotion of a national Artificial Intelligence strategy that can assist in guiding the approach of the future of AI, for contemporary public sector, and for effecting adequate measures to use artificial intelligence. In the recently promulgated Artificial Intelligence in government Act, for example, seeks to “improve the use of AI across the federal government by providing access to technical expertise and streamlining hiring within the agencies.” However, AI is yet to gain full acceptance as the discuss bordering on its emergence in government continue to surface (Donepudi, 2018b). Most controversial AI continue to face resistance. This is evident in the number of jurisdiction filled to stop the application of facial recognition systems.

If the understanding of how government agencies design and apply emerging AI technologies is not made known, it is not easy to make sensible and suggestion and policies that works. Most Analyst are of the view that Artificial Intelligence will further improve government presence, and heightened surveillance that would be detrimental to privacy and civil freedom. Others are of the view that Artificial Intelligence will disempower the marginalized race. Yet still, other researchers take the opinion that the efficiency of Artificial Intelligence in the private sector, without adequate understanding of how it works in the public sector, could undermine the capacities of public agencies to regulate (Serenko, 2010; Shapiro, 1992). Until now, there is little knowledge about position on the adoptability of any specific government use of Artificial Intelligence or Machine Learning tools. For this reason, the current study poses the question; how are government agencies using Artificial intelligence? What are the most essential policy and legal implications it presents? Following these questions, the study proposes the objectives below;

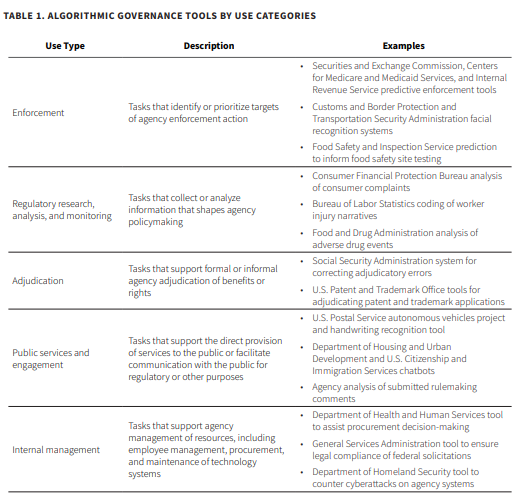
**1.2 Objectives of the study**

The study examines the Government by Algorithm: Artificial Intelligence in Federal Administrative Agencies, a Case of USA.

2.0 **Literature Review**

**2.1 The New Algorithmic Governance**

The application of Artificial Intelligence enhances technology to support interaction, decisions and implementation of government can sometimes be termed as “algorithmic governance” Algorithmic governance is already evidence in many areas most of the modern administrative state. The table below outlines Most of the application of Artificial intelligence in governance tasks. Currently, agencies of governments are already using Artificial Intelligence (Serenko, 2010). Among several functions of the government are two core tasks: the task of monitoring regulatory mandates and the task of adjudicating the benefits and rights. Nevertheless, the federal level adoption cases ranges well beyond the roles of adjudication and enforcement to several other vital governance responsibilities, including as internal personnel management, regulatory analysis, citizen engagement, rulemaking and service delivery (Shapiro, 1992).



**2.2 Case Studies of Federal Agency Deployment of Artificial Intelligence**

This section gives a holistic approach into the algorithmic of governance tools adopted or intended to be used by federal agencies. For this reason, about seven algorithmic governance applications ranging about seven governance tasks: including; hybrid civil / criminal enforcement, civil enforcement, informal adjudication, formal adjudication, public engagement, regulatory analysis, and public service provision.

**2.2.1 Regulatory Enforcement at the Securities and Exchange Commission**

Artificial Intelligence has gained access into most of governance. This, it has done in the area of agency and roles enforcement (Donepudi, 2018b). These efforts are basically essential, because enforcement is the basic focus of the modern day state in regulatory parlance. It is the basic manner in which government make available real-world impact to the legal system, hence taking the laws written on book into law which exhale action. Aside this, it serves as a primary route by which government brings to table a range of benefits accrued from policy. From clean water and air to safe drugs and food and including workplaces, labour markets and capital markets which are fair and efficient. Enforcement is the primary means through which government shield its interest towards those who tends to abuse government by evading taxes, defrauding government or bring it goods from the individual business.

**2.2.2 Artificial intelligence in** **Securities and Exchange Commission**

The objective of the Securities and Exchange Commission (SEC) is to shield stakeholders including investor, allow for a fair, ordered, and effective markets, and enhanced capital formation (Mary, 2016). To succeed in these regulatory quest, the SEC issues mandate regarding investment advisors, and mutual funds, securities exchanges, brokers and dealers. Mary (2016) opines that aside having the authority to make guidelines under different forms of laws of the federal securities laws, it also enforces actions on violators. The SEC’s range of enforcement and regulatory assignments are evident in its organization and structure.

**2.2.2. Artificial Intelligence Use in Securities and Exchange Commission**

The SEC is presently adopting or applying artificial intelligence in their algorithmic enforcement software in all five of its divisions and in many of its standalone branches. One of such tool monitors fraud in accounting and in financial reporting, about two monitors misconducts from market based trading platforms specifically insider trading. There is yet another tool which monitors investments that are unlawful; with focus on asset managers and investment advisors.

**2.2.2.1 Artificial Intelligence Use in Accounting and Financial Reporting Fraud: CIRA**

SEC has designed the Corporate Issuer Risk Assessment (CIRA) to uncover fraud in the area of accounting and financial reporting. By its make, CIRA is a dashboard which shows about 200 metrics which are used to uncover anomalous trends in financial reporting of corporate issuers of securities. According to CIRA (2016), currently more than 7,000 corporate issuers have to submit financial statements, including the yearly 10-K and quarterly 10-Q forms, to the SEC (Form 10-k, 2018). These reports span through hundreds of pages in length, mainly documenting investment information, financial data, risk factors, and (Management’s Discussion and Analysis of Financial Condition and Results of Operations). To evaluate and assess such massive information’s is laborious and tedious. Secondly, the resources with which to use for such task is limited. Therefore, the objective of CIRA is to assist agency become effective to use the exhaustible resources to uncover files and information’s which requires father prop. To do this, SEC adopted artificial intelligence to evaluate large files that could be involved in suspect earnings management. The software has been designed to collect historical trends and past fillings and apply a random model to forecast and flag up probable misconducts.

**2.2.2.2. Trading-Based Market Misconduct**

SEC designed a pair of tools to monitor trading-based market misconduct. These tools are known as Advanced Relational Trading Enforcement Metrics Investigation System (ARTEMIS) and Abnormal Trading and Link Analysis System (ATLAS). According to Deven, Desai, Joshua and Kroll (2017), ARTEMIS and ATLAS tools evaluates and identifies fictitious trading by analyzing trends and association among a number of traders with the assistance of the Division’s electronic database which contains more than six billion options and equities that are electronically recorded (Mitchell, 2000). The objective of this software is to identify all cases of insider trading in the market. This further sharpens SEC’s monitoring and surveillance prowess. ARTEMIS’s is concerned with serial cheaters. Other tools used by SEC include “Registrant” Misconduct: The Form ADV Fraud Predictor which assist the SEC staffs to identify which financial expert may be operating in ways that contravenes the laws of the federal security (Clare Garvie, Alvaro Bedoya, & Jonathan Frankle, 2016).

**2.2.3. Law Enforcement at Customs and Border Protection**

While SEC, IRS, and EPA and other civil enforcement agencies have started to apply machine learning, pure law enforcement agencies had adopted even much earlier. Close to 100 local jurisdiction and state have substituted the traditional surveillance cameras with those that are more sophisticated while Artificial Intelligence-enhanced gunshot identification technology has also emerged. Others use AI-built automatic license plate decoders Axon (2019) in Los Angeles, John (2015) New Orleans, Chicago (Ali & Ingrid, 2018) and Missouri6, Police departments utilizes AI-based and forecasting policing techniques to evaluate gang-associated crimes. The Federal law enforcement establishment including the Federal Bureau of Investigations (FBI) apply same technique. However, owing to information barriers, this paper examines the agency that straddle criminal and civil divide; Customs and Border Protection (CBP).

**2.2.3.1. Customs and Border Protection (CBP)**

CBP is one of the responsibility of the Department of Homeland Security. It is a law enforcement establishment, that performs both criminal and civil sanctions in its enforcement operations (Marcy, 2019). Though CBP carries out a range of functions, the mission of the agency is to protect the border of America (Marcy, 2019). To meet this mission, consistently, the agency depends on trained officer teams, including as the CBP Aircraft Search Team, to look for contraband and arrest people who indulged in trafficking or smuggling on land (Marcy, 2019). It also complements these teams of officers with improved and modern technological tools (Donepudi, 2015). For instance, CBP deployed drones that are unmanned as at 2004 to oversee smuggling, and human trafficking, as well as illegal entries at the border (U.S, Dept Homeland, 2016) Some of the tools the agency adopts include the risk prediction and the facial recognition tools

**2.2.3.2 Facial Recognition in Customs and Border Protection (CBP)**

By 2004, Congress gave CBP the mandate to gather biometric data from all non US nationals coming into the country. Levi (2019) opines that all entry points including the airports witnessed the presence of officers who would Screen passengers to match their bio-data data as issued by airlines alongside their passenger’s passport. The Officers also retrieve the passengers’ biometric fingerprints of non-nationals to be sure that it matches the passport. The CBP and would compare that information against terrorist and criminal watch lists. By 2012, the agency commenced a global entry service kiosk at all airports. Here, the bio-data of all inbound US immigrants were captured after three years, the agency commenced facial recognition and a mobile fingerprints capturing at entrances including airport. Facial recognition technology detects a particular video or image of a face bearing an identity (Levi, 2019). In the entry kiosk or CPB port, a photo of an incoming passenger is taken, the image is cropped and a vector representation is created to accurately determine the image from the data base. The biometric detection identifies individual with the aid of traits including face, voice or fingerprints comes with several advantages (Stephen, 2016). Theoretically, all individual possesses unique physical traits which are not easy to falsify as it is in the case of written documents. CBP commenced its facial identification program as at 2017. It basically collects facial identification software from all private vendors that affectivity monitors their intellectual property, thus; making it not easy to understand or decode the built of the software. Unisys, is the information technology firm that that stands as the primary contractor handling facial recognition. The firm uses deep learning in the process of the pre- and post-image processing.

**2.2.4. Formal Adjudication at the Social Security Administration (SSA)**

Unlike all federal courts joined together, the Federal agencies adjudicate more cases. In order to guarantee due process consequence on the increase case presents one on the issues the administrative adjudication would have to grapple with especially since their task entails going through volumes of scholarly and research work. The moment an immigrant seeks asylum, the appellation by a veteran on grounds of the benefits of disability. A file challenging the rejection of medical consent. These are all typical daily issues that the adjudicators attain to. How can they reach an accurate conclusion? Is there a way to increase consistency? What are the potentials of Artificial intelligence at eliminating these concerns making the wandering issues in national decision qualitative?

**2.2.4.1 Clustering for Micro-Specialization**

The Appeals Council has thought through the application of clustering algorithms to enhance case processing. In a random manner, the available approach randomly allocates cases to adjudicators. According to SSA, case clustering could assist adjudicators to gather proficiency about and bring down the research time in order to make regulations and policies by verifying cases and claims that are same together. This has the potential to reduce the time taken to process a case as well as the error. One of the advantage of the case clustering would be the ability to develop specialty units, such that adjudicators totally concentrates on specific areas of law. However, as a way out to concerns on differential workloads, the clustering algorithm was used so that a particular adjudicator could (a) get the same and randomly choose set of cases as was the case before, but (b) get the suggested order to treat them. For instance, “micro-specialization still allows adjudicators to design proficiency in one aspect and adopt the related statutes and regulations to make comparison into cases.

The clustering software adopt and make use of meta-data that are present in the case management system such as the claimant’s age, state of origin, impairments, and other information that processed at the time of hearing level—to give clusters which are of same claims. Nick (2018) opines SSA recorded about 12% decrease in all case processing time and about 7.5% decrease in revenue from the administrative appeal judges to attorneys (Nick, 2018). However, the program is being applied only on a need basis and it is not clear how these impacts were calculated. If more adjudicators were motivated to adopt and use micro-specialization or if the implementation of program was along with many other quality improvement concerns, then the benefits reported could be overstated.

**2.2.4.2. Natural Language Processing for Quality Assurance**

In other to maintain quality and control, SSA consistently seeks ambitiously technology to improves its operation (Shapiro, 1992). Tools which takes on after natural language processing (NLP) is regarded as the most ambitious technological version. For instance, a tool used by the SSA, known as the Insight program designed by Kurt Glaze. Kurt Glaze is a programmer after serving as an attorney for years. He designed Insight programme to assist improve quality in decision writing. During hearing, Insight is applied to identify limitations in draft views, allowing that adjudicators have adequately done the analysis as stipulated by regulations. It is then applied to flag inconsistencies in views at the Appeals Council level which may arise by claimants or on the motion of the Council. At the level of the Appeals Council, the use and adoption and is voluntary. At the hearing level, the application is necessary to arrive at an accurate decision (Jon, 2018). Since its inception in August 2017, the program has been applied 200,000 times at the level of the Appeals Council. At the hearing level, the tool has been put to use for over 70,000 times. There is the likelihood to further expand the program. Congregational testimony done during the 2018 summer indicated the possibility of an expansion in the application if the tool for quality review. Since October 2018, the tool has been used approximately 70,000 times at the hearing level. The SSA may be further expanding the program—Congressional testimony in the summer of 2018 indicated an intention to expand the use of NLP for quality review (Alexandra Chouldechova & Aaron Roth, 2018)

**2.2.5 Regulatory Analysis at the Food and Drug Administration**

**2.2.5.1 The Food and Drug Administration** (FDA)

The FDA monitors products that counts in excess of $2.5 trillion in yearly consumption, or above 20% of spending’s made by household in the US economy. This large scale consumption connotes the demand and need of machine learning and artificial intelligence as tools by Food and Drug Administration for the substantial role and impact it plays.The main statutory authority regulating the Food and Drug Administration is the food, drug and cosmetic act of 1938 which saddles the Food and Drug Administration with task of monitoring and promoting safety drugs, foods and cosmetic. To checkmate inappropriate conducts, Food and Drug Administration has enforced and sanctions culprit using different mechanisms such as suspension of licenses, recalls and seizure of products (Felix, Bajandas & Gerald, 2018). These different regulatory strategies allow the Food and Drug Administration in achieving the statutory responsibilities irrespective lacking the resources.

**2.2.5.2 The Food and Drug Administration** (FDA)

Since 2016, the Food and Drug Administration has tried out several of with AI/ML methods to verify data to help the agency in identifying and addressing effect of drug made known to them through its routine market monitoring regime. Specifically, the agency seeks to design innovative, Artificial Intelligence-based techniques to go above the millions of text formats reports of adverse effects that are lodged in the FAERS. FAERS is important for the post and routine market surveillance.

**2.2.6. Public Engagement at the Federal Communications Commission and Consumer Financial Protection Bureau**

Administrative institutions are increasingly adopting Artificial Intelligence and Machine Language as an instrument to work with and give direct services to US nationals. Such engagements are “customer service interactions, including; demanding for a license, passport, or benefits (Jacob, 2014). These tools enhance the quality of adverse interactions which may likely ensue between the government and the public. For a smooth operation, the Federal Communications Commission applies machine language and artificial learning to analyze huge comments from the general public. The use of AI fetches the comments and feedback from numerous users and processes them into information necessary for courses of actions to be taken. Example of such tool include The Electronic Frontier Foundation, do published a “DearFCC” automated comment-generator for use by concerned citizens (DearFCC, 2017). Such tools do developed outputs that seem like bot-developed comments. Second, is the CFPB’s NLP tool which augments its platform for analyzing complaints (the Consumer Response System) (Edward, 2005). Some of the areas which it has been applied include the FCC’s Net Neutrality Proceeding and the CFPB’s Reliance reports.

Other areas in which machine learning and artificial intelligence has been applied in governance include Autonomous Vehicles for Mail Delivery at the United States Postal Service to a huge text database to enhance effectiveness and efficiency of processing, analysis and responsiveness during delivering and hauling of parcels and mails. It also used in building and developing internal capacity of all public administrations. Artificial intelligence and Machine learning indeed has a place in public administration. There is the need to channel them effectively into where they work best.

**3.3 Technique and Data Analysis**

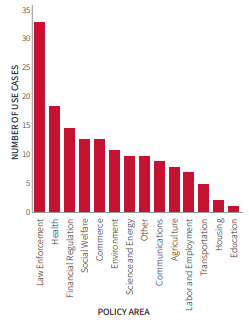
The method adopted in this study is descriptive statistics and a thematic synthesis of literature. In the first place, the mean, frequencies, graphs and proportions are some of the descriptive statistics used. The author selected a sizable proportions of publications bordering on the subject, excluding those that were deemed as irrelevant to the focus. The thematic approach was done in two stages. In the first stage, a summary for each journal read was done and the information gathered recorded. Next, each source was coded with inscription identifying major themes. Information on the summaries were source, the research technique which was used, the result and limitations. In the second stage of the thematic analysis involved production of a textual analysis of the data as it concerns the focal questions. In relation to the kind of sources used, peer-reviewed journals, publication and conference papers formed the bulk of the source. The peer-reviewed papers consisted of about 70% of the adopted source. Conference papers is about 20% of the used source, while the remaining 10% of sourced material being include the working papers. This imply that a greater proportion of the material used were peer reviewed academic journal paper. Owing to the quality of the sources of information used, a certain level of confidence in the findings a conclusion was advanced.

**4.0 Result Presentation**

***Figure 1: Top Ten Users of Artificial Intelligence***

**Source: David et al. 2020**

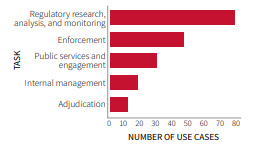
The above figure shows the top ten agency in artificial intelligence.The first is the office of justice programs with about 16% of Artificial intelligence tools. The second is the Securities and Exchange Commission holds about 13% of the sample population. Thirdly, the National Aeronautics and Space Management has deployed over 12%. Fourth is the Food and drug Administration (10%), Fifth, is the United State Geological Survey (10%), Sixth is United State Postal Service (10%), In the seventh position is the Social Security Administration (9%). While the proportion of the States Patent and Trademark Office is 8% and represents eighth position, the Bureau of Labour Statistics and that of Customs and Border Protection is 6% and 5% to represent ninth and tenth position respectively. Evidently, AI has gained presence in a number US agencies.

******

***Figure 2: Artificial Intelligence use by Policy Area***

**Source: David et al. 2020**

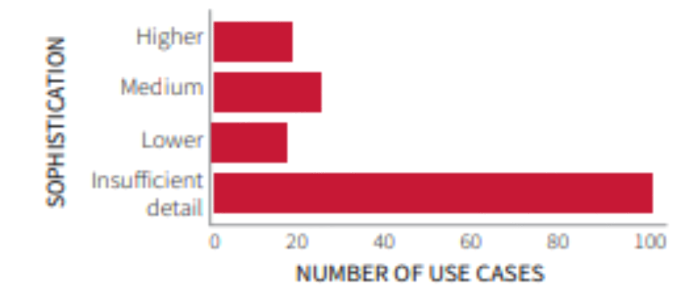
The figure shows the use case of Artificial intelligence by Policy Areas. Each of the bar represent the number of use case according to policy. The use of artificial intelligence is spread across the sectors. The highest three policy areas which artificial intelligence is applied is Law enforcement, Health sector and the financial regulation sectors. In the fourth place is social welfare. The fifth is Commerce, sixth is environment, seventh is science and energy, eighth is communications. Agriculture takes the ninth position while tenth is labour and employment. The eleventh position is transportation, housing is twelfth while education is thirteenth. Evidently, the presence of Artificial Intelligence is evident in many policy areas.

****

***Figure 3: Artificial use by Government Task***

***Source: David et al. 2020***

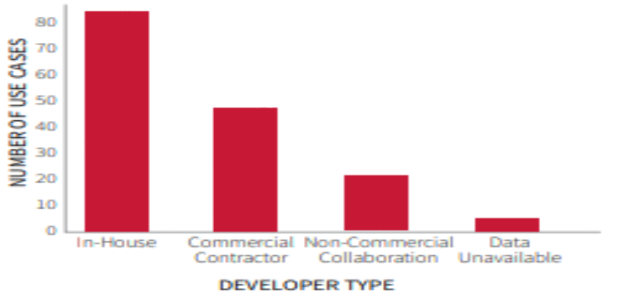
Figure 3: Each bar stands for the number of each task which the government agencies put AI into. The analysis, and monitoring, Regulatory research, category are the tools (or research) which entails collecting and analyzing information to direct and guide agency policymaking. The ‘Enforcement’ class are those that complements or lead to actions of enforcement, such as monitoring responsibilities for identification and tracking violations and defaulters. The ‘Public services and engagement’ class are the tools that enhances the provision of responsibilities to or communication with the public for the purpose of regulatory. All internal agency duties, strategies and management responsibilities such as, employee procurement and management, internal management are all the internal management task. The ‘Adjudication task involve tools that help in formal or informal adjudication. Evidently, regulatory, research, analysis and monitoring task is the major task while adjudication task is the least.



***Figure 4: Artificial Intelligence Use Cases by Developer Type***

**Source: David et al. 2020**

Figure 4 shows the artificial intelligence use cases by developer type. Evidently, majority of the artificial intelligence have been designed for in-house use. Commercial contractor is the next, non-commercial collaboration while the least developer type is data unavailable



**Figure 5: *Artificial Intelligence Use Cases by Sophistication Level***

**Source: David et al. 2020**

In terms of sophistication, a greater number of artificial intelligence are built with sufficient details,

**5.0 Conclusion**

In sum, benefits and interest are huge. Managed properly, algorithmic governance tools can re-modernize public agency administration, advance more effective, efficient, equitable and accurate forms of state action. Managed poorly, government deployment of Artificial Intelligence tools can reduce the human expertise in the agencies while allowing for just a few compensating gains, stretching father the public-private technology limitations, surges opacity that are not needed in public decision-making, and increasing concerns on arbitrary power and actions of government. Given these interest, legislators, judges, agency administrators, technologists, and academics should reason properly on how to increase and motivate government innovation consisting of the appropriate application and use of Artificial Intelligence tools while allowing room for accountability in their use and acquisition. Therefore, government can create an environment where skills of the employees can be develop to promote the artificial intelligence in future. Secondly, Government need to support the Artificial intelligence driven strategies for development of the organization. Finally, it need to cultivate a mindset of the policymakers to encourage soft skills, such as: expertise, integration, collaboration and innovation,

**Reference**

Bajandas, F.F. & Ray, G.K. (2018). Admin. Conference of the U.S., Implementation and Use of Electronic Case Management Systems in Federal Agency Adjudication.

Chouldechova, A., & Roth, A. (2018), The Frontiers of Fairness in Machine Learning, Cornell U. https://arxiv.org/ abs/1810.08810.

CIRA. (2016). Cira was developed within the Office of Risk Assessment at the Division of Economic and Risk Analysis (DERA). See DERA - Office of Risk Assessment, Sec. & Exch. Comm’n, https://www.sec.gov/page/dera\_ora\_page. “Corporate issuers” develop and sell securities to finance their operations.

Dep’t of Homeland Sec (2016), Biometric Pathway: Transforming Air Travel, Version 3.0 1 (Dec. 1, 2016), https://epic.org/foia/dhs/cbp/ biometric-entry-exit/Biometric-Pathway.pdf.

Desai, R.D. & Kroll, J.A. (2017), Trust But Verify: A Guide to Algorithms and the Law, 31 Harv. J.L. & Tech. 21 (noting that systems require “ongoing monitoring and evaluation to ensure the model remains accurate given that the real world changes”)

Donepudi, P. K. (2015). Crossing point of artificial intelligence in cybersecurity. American journal of trade and policy, 2 (3), 121-128. <https://doi.org/10.18034/ajtp.v2i3.493>

Donepudi, P. K. (2018b). Application of artificial intelligence in automation industry. Asian journal of applied sciences and engineering, 7 (1), 7-20. <http://doi.org/10.5281/zenodo.4146232>

FCC. (2017). The foundation’s DearFCC tool used custom, automatically generated text to allow human users to “craft a unique comment” on the FCC’s net neutrality proposal with “just two clicks.” Rainey Reitman, Electronic Government by Algorithm: Artificial Intelligence in Federal Administrative Agencies 112 Frontier Foundation, Launching DearFCC: The Best Way to Submit Comments to the FCC about Net Neutrality (May 8, 2017), https://www.eff. org/deeplinks/2017/05/launching-dearfcc-best-way-submit-commentsfcc-about-net-neutrality

Fingas, J. (2018). Chinese Facial Recognition System Confuses Bus Ad with a Jaywalker, Engadget (Nov. 22, 2018), https://www.engadget. com/2018/11/22/chinese-facial-recognition-confuses-bus-ad-withjaywalker/

Form, 10-K, Sec. & Exch. Comm’n, https://www.sec.gov/ fast-answers/answers-form10khtm. html (last modified Nov. 2, 2016); Fast Answers: Form 10-Q, Sec. & Exch. Comm’n, https://www.sec.gov/fastanswers/answersform10qhtm.html (last modified Sept. 2, 2011).

Garvie, C., Bedoya, A. & Frankle, J. (2016), The Perpetual Line-Up: Unregulated Police Face Recognition in America, Geo. L. Ctr. on Privacy & Tech. (Oct. 18, 2016), <https://www.perpetuallineup.org>.

Serenko, A. (2010). [The development of an AI journal ranking based on the revealed preference approach](http://www.aserenko.com/papers/JOI_Serenko_AI_Journal_Ranking_Published.pdf). Journal of Informetrics. 4 (4): 447-459. [doi](https://en.wikipedia.org/wiki/Doi_(identifier)):[10.1016/j.joi.2010.04.001](https://doi.org/10.1016%2Fj.joi.2010.04.001).

Shapiro, S.C. (1992). Artificial Intelligence. In Shapiro, Stuart C. (ed.). [Encyclopedia of Artificial Intelligence](http://www.cse.buffalo.edu/~shapiro/Papers/ai.pdf) (2nd ed.). New York: John Wiley. pp. 54–57. [ISBN](https://en.wikipedia.org/wiki/ISBN_(identifier)) [978-0-471-50306-4](https://en.wikipedia.org/wiki/Special:BookSources/978-0-471-50306-4). [Archived](https://web.archive.org/web/20160201014644/http:/www.cse.buffalo.edu/~shapiro/Papers/ai.pdf) from the original on 1 February 2016. Retrieved 29 May 2009.