ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN AVIATION INDUSTRY

AATIF KHAN

Student

School of Business

Galgotias University

Abstract: Aviation Industry is becoming technologically advanced and Industry in the world and with the increasing demand of air travel the industry has to ensure the efficient and effective operations. The purpose of this report is to highlight the new innovations in aviation industry i.e. the use of Artificial Intelligence and Machine learning to enhance safety, efficiency and customer experience. Aim of this thesis is to provide a comprehensive review of the application of Artificial Intelligence (AI) and Machine Learning (ML) in aviation Industry. The coming future will most probably be machine dominated, so in this thesis a hintof ML along with the AI will be provided in the study just to enhance the understanding perspective. Impacts of Machine learning in the aviation sector especially on the manufacturingsection as machine learning deals with the learning process of the machine and mines the required data in order to ensure the work done in effective and efficient manner.Also, there is few issues with AI i.e., though it is being made and developed by human but the future demand of it is frightening the aviation professionals and the potential ones. The analysis on this matter will also be done.

***Index Terms –*AIRLINE INDUSTRY, APPLICATION OF AI AND MACHINE LEARNING IN AIRLINE INDUSTRY**

I. INTRODUCTION

Artificial intelligence (AI) is a component responsible for the creation of intelligentmachines capable of performing tasks that minimizes human efforts. AI is a technology with many approaches, but advances in machine learning and in-depth learning create great demand in the current and current technology industry. It is a branch of computer science the act of duplicating human intelligence in machines. Machine Learning feeds computer data and statistical techniques are used to help you determine to continuously appeal to a task, unless specifically designed for thattask, eliminating the need for multiple lines of written code. The aviation industry has always been at the forefront of technological advancements, and the integrationof Artificial Intelligence (AI) and Machine Learning (ML) is no exception. In recentyears, AI and ML have shown great potential in revolutionizing the aviation industry, from improving safety and efficiency to enhancing customer experiences.In-depth learning can be a form of machine learning that uses inputs using health inspired neural specifications. Neural networks consist of various layers in which information is processed, allowing the machine to go deeper into its learning, making connections and adding weight to positive results.

II. LITERATURE REVIEW

Literature review is a critical analysis of existing research and publications related to a particular topic or research question. In the case of artificial intelligence (AI) and machine learning (ML) in aviation, the literature review would focus onsummarizing and synthesizing previous studies, articles, and reports that have explored the topic.

The literature review would begin with an overview of the history and evolution of AI and ML in aviation, including the earliest uses of these technologies in aviation and the milestones that have led to their current widespread adoption. This would include an examination of the various applications of AI and ML in aviation, including flight operations, aviation security, crew management, AI-Human collaboration and passenger experience.

The review of AI reveals all the dimensions used in the research that is being used in the aviation sector and other factors such as safety, production and operation of the aviation industry. Proper study of the textbooks confirms the success of the study and keeps in mind the textbooks and research paper used in the text are:

- Exploring the fundamentals threats and opportunities of artificial intelligence (AI)in the aviation industry- white paper IATA, June 2018.

- Artificial Intelligence and digitalization in Aviation- Working Paper of International Civil Aviation, October 2016
 AI systems in Aviation- Ram Gopal Kashyap, Artificial Intelligence in Aviation Industries, February 2019.

- Future perspective of the aviation industry- Kristina Schneider, ICAO Training Report, November 2017.

- Machine Learning perspectivein aviation- Machine Learning and Artificial Intelligence in Aerospace Industry, Axis Cades 2017.

III. AI AND MACHINE LEARNING APPLICATION IN AVIATION INDUSTRY

Artificial intelligence and associated technologies with it make a sense of data can streamline and automate analytical, maintenance, customer service, as well as manyother internal and external processes and tasks. So, AI and ML technologies are of foremost importance in airline operation management.

✓ **Self-Services at Airport:**

Post COVID-19 pandemic we have witness a surge in various contactless technologies. Self-service check-in kiosks are deployed at the airport and is the firststep of automating the passenger journey. Hence airlines and airport authorities areimplementing end-to-end solutions across terminals, Expediting, and expediting passenger flow at each and every touch point i.e. Check-in and boarding.

✓ **Installation Of ADC feature in Check-in system for internationaltravelers:**

All the airports check-in system are now equipped with ADC (Automated documentcheck) supported by AI and ML. This feature remains updated with the countries travel requirement and documentations.

Once the details of passport and visa is been entered into the system then the systempops up an OK TO BOARD message which means passenger is good to go and if not then it will pop-up NOT OK TO BOARD message which means there is some issue with the documents.

✓ **Fuel Efficiency Optimization:**

Ever Since aviation industry has adopted the concept of AI, Airlines has focused tobring on efficiency to their operations. Similarly, Airline uses Artificial Intelligencewith in-built machine learning algorithm to collect the flight data and anlalyze themregarding the distance that aircraft will cover, altitude, weight of the Aircraft, type and payload. After analyzing the data the system automatically estimate the optimalamount of fuel required for a smooth flight.

✓ **Crew Management:**

Thousands of flights are been operated on daily basis and assigning crew for each and every flight would be a difficult task. However, after the deputation of ArtificialIntelligence In the system it has become much easier to assign crew for different flight considering the legal constraint such as Licensing, SEP card, FDTL.

✓ **Message Automation:**

Now a days all systems are equipped with Artificial Intelligence and ML, in case ofany disruption such as flight delay, cancellation passengers receive a quick mail regarding the same with all the necessary information about the revised timings andthe introduction of Chatbots on the website has also helped to passengers to get a quick response for their queries.

✓ **ACARS:**

Aircraft Communicating Addressing and reporting system is also an automated system equipped in the Aircrafts supported by Artificial Intelligence which allow toCrew and pilot to pass on any information to the ground and vice versa. ACARS is a digital system for the transmission of messages between airplane and ground. FewAirlines has stopped the manual trim sheet and using ACARS for the same.

✓ **Passenger Identification using Biometrics and Facial recognition:**

Most of the Airports are equipped with biometric and facial recognition technologies supported by Artificial Intelligence which helps the extract to complete data of the passengers and their previous record using their finger print and retina scan.

IV. METHODOLOGY

This research paper aims to study the use and application of Artificial Intelligence and Machine Learning airline industry. The study utilizes a qualitative research design, using secondary data sources such as academic literature, industry reports, and news articles.

Exploratory Research is a type of research methodology that helps the researcher to gain in sight or investigates the research questions that has not yet been studied in depth and this research can be carried using several methods like survey, focus group, interviews, qualitative method etc.

In this research **Interview method** has been used to collect the primary data, Interview was conducted with key stakeholders in the aviation industry, including airport employees, pilots, passengers, security officials, engineers and policy makers to gain a deeper understanding of the potential benefits and challenges of using AI and ML in the aviation industry.

DATA AND SOURCES OF DATA

Total 150 people were interviewed for this study including Pilots, engineers, ground staffs, security officials and passengers to analyze and answer the research questionbecause they were the people who had been indulge with the application of AI in aviation.

LIMITATIONS

This research paper has several limitations.

- ✓ In this research Interview method was used which was quite difficult and timetaking also it requires lot of effort to identify and recruit the participants.

- ✓ It was difficult to coordinate with the staffs and passengers

- ✓ The participants may be inconvenienced by the Interview as a result they maynot provide much assistance and be unwilling to cooperate.

- ✓ The responses we received while conducting the interview is qualitative in nature and can be difficult to measure. So this makes it challenging to compare the response of different participants

- ✓ Risk of interviewer or participant being bias.

- ✓ Interview only provides limited perspective of people based on their personalexperience.

V. RESULTS AND DISCUSSION

Artificial Intelligence and Machine learning has been a boon for aviation industry. This section discusses the results of the study. The study found that application of AI and ML in aviation has helped the key stakeholders of the Industry to perform their task more efficiently and effectively.

- ✓ As per the ground staffs' and passengers' current challenges faced by passengers include long lines, confusing processes, and time-consumingsecurity checks. AI and machine learning has improved these processes by automating repetitive tasks, providing real-time assistance, and analyzing data to optimize operations and the implementation of self-service kiosk has beena boon specially for those passengers who are with nil baggage.

- ✓ According to pilots' current challenges faced by pilots and other aviation professionals in the cockpit include fatigue, stress, and information overload.Autonomous systems like auto-pilot have helped mitigate these challenges byreducing workload, improving accuracy, and providing real-time assistance. However potential risks of using autonomous systems in aviation include technical failures, errors in programming, and lack of situational awareness.

✓ As per the security official's current security measures in place at airports include metal detectors, baggage scanners, and manual checks by security personnel. However, AI and machine learning has enhanced aviation security by analysing data to detect anomalies, providing real-time threat assessments, and improving screening processes. Also, AI technology has already been deployed in the Baggage makeup area to detect the restricted items in check-in baggage which can jeopardize the safety of aircraft.

CONCLUSION

The importance of AI and ML in the aviation industry cannot be overstated. These technologies have revolutionized the way airlines operate, from improving safety and efficiency to enhancing the passenger experience. Self-service technologies have enhanced the passenger experience, but proper implementation and regulation is needed to ensure privacy and security.

Also autonomous systems has improved safety and efficiency in aviation, but propertraining and regulation is needed to ensure their safe use.AI and machine learning can enhance aviation security, but ethical considerations and responsible deployment is needed to avoid potential biases and privacy concerns. Human-AI collaboration has also enhance decision-making in aviation, but proper training and trust-building is needed to ensure their effective use.

VI. ACKNOWLEDGMENT

REFERENCES:

1.https://www.frontiersin.org/research-topics/19880/ai-in-aviation
2.https://www.longdom.org/open-access-pdfs/artificial-intelligence-in- aviation.pdf
3.https://www.researchgate.net/publication/330573828_Artificial_Intelligence
4.https://www.altexsoft.com/blog/engineering/ai-airlines/
5.https://library.acadlore.com/JEMSE/2023/2/1/JEMSE_02.01_05.pdf