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Revolutionizing Passenger Experience: A.I.-Powered Waiting Time Reduction Service Proposal for BIAL International Airport.

Rahul Roddam

PES University

ABSTRACT:

This research paper examines inspiration and gives a new initiative to enhance the passenger experience at BIAL International Airport by way of enforcing an Artificial Intelligence (AI) powered Waiting Time Reduction Service. As airports around the sector try to satisfy the evolving expectancies of travellers, reducing waiting time period has emerged as an important component of enhancing every traveller experience at the airport. By leveraging superiority of AI technology, this proposed service ambitions to optimise and streamline various passenger touchpoint inside the airport, offering a seamless and great experience. The AI-powered Waiting Time Reduction Service makes use of predictive analytics, real-time records processing, and machine learning algorithms to accurately forecast and predict passenger flows. By reading historic records, flight schedules, and contemporary passenger dynamics, the A.I can proactively become aware and understanding the capabilities and assets strategically. This not only reduces waiting time at security checkpoints, check-in counters, and immigration but also improves operational efficiency for airport personnel. In addition, the notion introduces modern capabilities which include customised passenger notifications, finding help, and dynamic queue management. These factors contribute to a tailored and strain-free travel experience for passengers, transforming BIAL International Airport as a technologically advanced and passenger-centric hub. The A.I technology which is been used in the airport will increase the inflow and outflow of the travellers. As airports internationally continue to stand in demanding situations associated with growing passenger volumes, this positions BIAL International Airport as a pioneer in adopting cutting-edge AI solutions to revolutionise passenger adventure and set new standards for operational excellence in the aviation industry.

KEYWORDS: Customer services, Technology, App's, Customer Satisfaction, Premium services, A.I(Artificial intelligence).

INTRODUCTION:

The present-day air journey is an extraordinary feat of global connectivity and efficiency, enabling thousands and thousands of passengers to traverse the skies daily. Airports play a crucial position in this procedure, appearing as gateways to the arena and as pivotal hubs for seamless tours. One essential component that drastically influences a passenger's typical airport experience is the ready time encountered for the duration of the take a look at the check-in and check-out processes. Waiting times at airports can cause frustration, stress, and dissatisfaction, affecting passengers' perceptions of airport services.

Bangalore International Airport Limited (BIAL), commonly known as Kempe Gowda International Airport Bengaluru, is one of India's busiest and most significant airports, connecting travellers to various domestic and international destinations. As air travel becomes increasingly popular, the challenge of managing passenger waiting times and reducing wait times becomes more crucial to enhance customer satisfaction and improve airport performance.

The studies provided will talk in detail about the crucial place of making the finest waiting time reports all through a look at check-in and check-out at BIAL. The goal of this look is to discover and examine various provider techniques, technological answers, and operational changes that may be applied to streamline the take a look at check-in and check-out procedures, in the long run enhancing passenger pleasure and overall airport performance.

The waiting length in airports, whether in the course of test-in, security screening, or boarding, has emerged as an essential touchpoint influencing passengers' perceptions of airport efficiency and comfort. Prolonged waiting instances no longer best decrease the general travel revel however can also affect traveller well-being, productiveness, and the economic activities inside airport premises. Addressing this task requires revolutionary answers that blend era, operational performance, and a client-centric technique.

This study endeavours to discover and recommend strategies to reduce waiting times at BIAL, thereby elevating the passenger experience to new heights. By using modern technologies, optimizing current methods, and fostering collaboration amongst stakeholders, the Waiting Time Reduction Service ambitions to create an extra streamlined and exciting journey for tourists passing via BIAL. Through this initiative, the studies seek to contribute to the broader discourse on airport management, client experience enhancement, and the sustainable improvement of global tour infrastructure in a technology characterized by increasing mobility and connectivity.

The study will also be looking into on how AI will have a greater impact on the service industry which will be more of the customer-centric approach and looking at the safety and security aspects while introducing AI into the system will take a step forward in reducing the time and comforting the customers travel experiences throughout the journey.

LITERATURE REVIEW:

The Bengaluru International Airport Limited (BIAL) has introduced a high-tech system in partnership with Xovis to manipulate queues and reduce waiting times at the Kempegowda International Airport. They installed 2 hundred 3-d sensors to track passenger motion at various factors like departure gates, take a look at check-in, immigration, protection maintenance areas, and visa on-arrival areas. The machine will show stay-ready instances on monitors, helping passengers and airport personnel to plot better and decrease pressure. BIAL pursues to make Bengaluru Airport the maximum digitally superior and efficient airport, enhancing passenger reports and creating an easy journey for vacationers. (Desk, 2020)

The Passengers traveling via Kempe Gowda International Airport Bengaluru (BLR Airport) now have a brand-new virtual travel companion referred to as 'BLR Pulse.' It is a customized app created by using Bangalore International Airport Limited (BIAL) in partnership with Gray Matter Software Services. The app enables passengers with their airport experience by means of providing real-time facts approximately protection queues, wait times, and different vital information. With BLR Pulse, tourists can navigate the airport effortlessly and take manipulate in their journey at departures and arrivals, making their journey extra handy and stress-loose. (Zee, 2021)

The Kempe Gowda International Airport has added an excessive-tech Queue Management System to lessen ready instances and manage passenger flow throughout busy hours. They are the usage of Xovis PTS, a contemporary passenger go with the flow machine that presentations real-time waiting instances on displays, making it much less stressful for passengers. Xovis makes use of three-D sensors to tune passenger movement at diverse airport areas like test-in, immigration, and security zones. The system helps the airport staff plan assets better with historical information, enhancing overall efficiency. Xovis is a Swiss employer that makes a specialty of 3-D sensors and software for measuring human's float. (Kappan, 2020)

The Bangalore International Airport (KIAB/BLR Airport) has introduced a excessive-tech Queue Management System in collaboration with Xovis, a Swiss organization focusing on three-D sensors. The gadget reduces ready instances and manages passenger glide all through busy hours. Xovis' passenger waft management system shows live ready times on displays at numerous processing points in the airport. This helps airport staff plan sources better by means of the use of historic information. The 3-D sensors tune passenger movement at departure gates, test-in regions, immigration, protection zones, and Visa sections. The intention is to make the airport extra efficient and improve the overall journey experience for passengers. (Now, 2020)

The international airline are predicting that over 20 years the airlines will be investing more in the technology which will be reducing the long waiting times which will reduce the frustrated passengers as one of the famous Edward W.Bauer, SITA's senior director airports, North America said "The future of air travel is moving towards the passengers desire to be more self-sufficient and informed" and according to the survey conducted by the international airlines is that Nearly 8 billion passengers are expected to fly in 2036 this very the numbers given are forecasted by the international air transport Assn. (MARTÍN, 2018)

The IATA airlines have done a survey which has given a precise closer look at the problem that is Payment, Travel Facilitation and Airport Process. The travelers want to book there tickets through online platforms and which will be easy to access(Digital Wallets) was the most preferred way by the travelers, The travelers want the digital online visa process, immigration process to be done online, convenient and faster so the airline have started to create a new technology by which all the ways to convenient can be more faster and safe to use (Yuri.A, 2023).

The look at handy addresses a crucial factor of the evolving panorama of airport offerings and passenger perceptions in the face of growing options. The proliferation of airport picks and the diversification of carrier offerings have caused a transformation in how passengers understand and examine their airport experiences. This literature assessment targets to contextualize and enrich the study's findings via exploring present research on related topics, which includes consumer experiences, expectancies, and the utility of topic modeling and sentiment analysis inside the realm of airport offerings (Sena Kiliç, 2022).

This paper examine affords a comprehensive assessment of the literature on passenger experience at international airports. The authors become aware of key factors that affect passenger enjoy, consisting of airport centers, provider quality, and protection methods. They additionally speak the use of era to improve passenger experience (Zhang, 2021).

This paper gives steerage for airport operators, airways, and stakeholders to improve the air journey revel in by enforcing a comprehensive Integrated Passenger Self-Service Program (IPSSP). It provides a streamlined approach to setting up an IPSSP on the airport level, addressing passenger processing challenges, and reading passenger offerings throughout all airport manner regions. The advantages of an IPSSP include a enormous development inside the common passenger revel in, better passenger float, and new industrial opportunities (Frank Barich, 2015).

This paper evaluates factors affecting passengers' experience at Cairo International Airport (CIA). The study identifies four dimensions that contribute to passengers' perception, with services and facilities playing the most influential role. Socio-demographic factors and key factors such as customer care, environment, design, dining areas, and staff performance also impact passengers' overall experience. Passenger ratings for CIA were below average in the most influential aspects. The study concludes with recommendations for enhancing the passenger experience at Cairo International Airport (Ahmed, 2017).

OBJECTIVES:

- Analysing the passenger's behaviour and Expectation.
- Identifying the applicability of AI technology.
- Assess the current waiting time challenges.
- Coming up with the premium services which can be provided to travellers so that the check-in and check-out of the airport.
- Understanding the customer-centric approach in reducing the waiting time in the airport.
- How will can AI easy the work of the airport and can reduce the waiting time in the international airport.
- Contribute to the best use and practices of the findings.

The Gaps found are

1. Real-time data analytics and predictive modelling.
2. Smart Queue management system.
3. Biometric identification and Authentication.
4. Personalized passenger profiling and recommendation.

Challenges faced by the BIAL and other international airports;

1. Increasing Passengers traffic.
2. Operational Efficiency.
3. Seasonal Variation.
4. Balancing the security and Efficiency.
5. Manpower Shortage.
6. Technology Challenges.
7. Coordination Challenges.

Discussion:

Looking at the top international airports using A.I and effectively increasing the passenger's satisfaction towards the waiting period at the Airport.

The first International Airport which has managed their passenger's waiting period and controlling the heavy traffic which was at the month of June and July on the accusation of Eid Al Adha was Dubai Airport (DXB). The airport has used A.I to personalize the passenger's experiences, assist with meal selection, schedule a taxi pick-up and even transform luggage carts into autonomous robots which was a step closer in Implementation of A.I in international airports and it's safe to have a A.I giving the premium services to the passengers.

The Airport has even used a futuristic approach in brining on the AT135 a self-driving baggage tractor into the real time usage at the Dubai Airport which made it easier for the staff and passengers to handle the baggage. The airport has done a good approach to handle the peak traffic of the season at the Dubai International Airport.

The Airport was able to have a good flow of communication throughout the heavy traffic season at the international airport on the special occasion by customizing the passenger's preferences with the data what the airport has with combining it with A.I so that all the passengers who were waiting for the connecting flight was also taken care by the presences of A.I for preferred kind of food which was given by the passenger's them self and turning there frustrated and boring waiting period into more exciting way to make a passengers feel good and taken care at the Dubai International Airport.

The Amsterdam Schiphol Airport (AMS) has implemented a Smart Path A.I tech in the year 2016 for predicting the waiting times and directing the passengers to have a shortest security queue and the results after using the tech it has improved the passengers flow and has successfully reduced the waiting time at the international Airports.

Seattle-Tacoma international Airport (SEA) has implemented a Spot Saver A.I tech to reserve spots in security lines with the help of mobile application in the year 2017 and the airport made sure it is offering the passengers a greater control over their airport experience.

Hong Kong international airport (HKG) used a Facial Recognition A.I tech for speeding up the immigration processing time at the immigration check points in the year 2018 and has enhance security and improve passenger experience. Which has given a good travel experience to the passengers at the international airport.

Los Angeles international Airport (LAX) used a Virtual queuing system A.I tech which allows the passengers to reserve spots in the security lines remotely in the year 2020 which ha reduced the congestion and improve the predictability of the waiting period in the airport and has a good data base to analysis the passengers patterns to understand the that at what time they book and collecting the reason why they can't come before the time, this data will help to known the gap so that the airport can find a best solutions for the gaps.

Singapore Changi Airport (SIN) used a AI-powered baggage handling system in the year 2017 which will be optimizing the processing and reducing the deliver times to the passengers and they have enhance baggage efficiency and improve passengers satisfaction at the international airport.

Frankfurt Airport (FRA) has implemented A.I-powered passengers flow management in the year 2021 which will be optimizing the passengers routing and reduces the congestion which used to occur and it will get the passengers throughout the airport and it has given a good efficiency in improving the on-time performance which gave the passengers a good experience through reducing the waiting time at the airports.

Munich Airport (MUC) has come up with A.I-powered baggage tracking system in the year 2022 which will help the passengers to track the baggage in real-time and provides personalized updates to passengers and this has improved the transparency in the passenger's mind and has reduced the anxiety about the baggage been lost in the international airport.

Zurich Airport (ZRH) has implemented the A.I virtual assistants in the year 2020 the A.I can answer the passenger's questions about the flight's information and Airports available services and this has reduced the waiting time at information desks and the A.I assistant provided 24/7 support without the help of a employee at the night shift.

London Heathrow Airport (LHR) uses the A.I-powered cameras and sensors for passenger's flow optimization and baggage handling in the year 2020 and the airport was able to increase the operational efficiency and improve passenger flow at the international airport.

Pittsburgh International Airport (PIT) uses the A.I-powered cameras and neural networks for security wait time estimation in the year 2021 which has provided a accurate waiting time information to the passengers and to reduce the anxiety which was carried by the passengers until they reach the Airport this has been working very effectively from past two years and the international airports have planned to increase the potential of the A.I based technology usage in the international and be a good example for futuristic Airports.

The Delhi International Airport (DIAL) is utilizing the potential of artificial intelligence to improve its operations and passenger experience. Predictive analytics based on historical data will be used by the airport to optimize resource allocation and staff deployment, particularly at entrance gates, check-in counters, and security checkpoints. AI-powered cameras will watch passenger movement and predict wait times, perhaps allowing people to discover shorter lines. These efforts aim to reduce congestion, improve efficiency, and, eventually, improve the entire airport experience for passengers. This step places Delhi International Airport at the forefront of AI use in India, allowing for more efficient airport operations.

Technology:

The company named NAVYA has innovated a Self-driving baggage tractor, which was founded in the year 2019 and the testing in real time was done on November of the same year. So, the company was a one step closer in creating the smart airport of the future.

The first baggage tractor which was tested in the real time situation was AT135 baggage tractor and it was a successful mission done by the company and they have done this by integrating its operation and infrastructure into the AT132 tractor.

Futuristic approach of Smart Airports.

The Self-serve Kiosk is the new tech used in the international airports which is a robot that has an interactive touchscreen device that allows customers to buy products or services without the help of a staff member. This Airports have placed these devices at the entry and exit ports for check-in, print a boarding pass, check their bags and request seating changes and few of the essential aspects of the airports can be taken care at the same time. The airports have also used this device inside the airports for the passenger interaction model which will guide them anywhere in the airport and will have a good experience which a passenger and this will lead to reduction of the waiting time at the Airport.

Interactive A.I devices.

The few Top tech company's which are providing such a innovative A.I tech in implementation at the Airports are

1. Societe Internationale de Broadcast communications Aeronautiques (SITA) this organization gives an extensive variety of simulated intelligence answers for Air terminals including the travelers stream the board, stuff taking care of and biometric recognizable proof and their remarkable clients are Amsterdam Schiphol Air terminal, Hong Kong Worldwide Air terminal, Los Angeles Global Air terminal and Singapore Changi Air terminal. The present market value of the organization in 2023 is 1.9 billion Bucks (as of October 27, 2023).

2. Amadeus IT Group provides a A.I-powered solutions for Airports operation system, revenue managing and customer services and their notable clients are in Dubai International Airport, Frankfurt Airport, Munich Airport and Zurich Airport. The present market value of the company is 5.79 billion Euros (as of October 27, 2023).

3. IBM Provides a range of AI solutions for airports, including computer vision, natural language processing, and predictive analytics and there major clients are London Heathrow Airport, Toronto Pearson International Airport, Pittsburgh International Airport. The current market value is 124.4 billion Dollars (as of October 27, 2023).

4. Microsoft Offers AI solutions for airports focused on security, operations, and customer experience and their clients are Delhi International Airport, Gatwick Airport, Paris-Charles de Gaulle Airport. The current market values of the company is at 2.14 trillion dollars (as of October 27, 2023).

5. Amazon Web Services (AWS) Provides cloud-based AI services for airports to handle data analytics, machine learning, and deep learning tasks Notable clients are Seattle-Tacoma International Airport, Dallas/Fort Worth International Airport, Miami International Airport. The current market value of the company is 1.54 trillion dollars (as of October 27, 2023).

And few other companies are there such as **NEC corporation, Hikvision, Siemens AG, Hitachi Vantara**.

Problem Statement:

Long waiting times at the airport due to excessive queues at security and immigration checkpoints, inefficient baggage claiming processes, limited access to information is causing passengers to miss their flights and leading to frustration, anxiety, and a poor customer experience at Bangalore International Airport (BIAL). The airport has to work on Innovative solutions which needs to improve passenger flow management and should enhance the overall airport experience and Implementing A.I in the system of airport.

Solution:

BIAL should create a number of offerings to assist passengers manipulate their waiting time on the airport. These offerings may want to include:

Real-time wait time facts: Passengers may be capable of see the predicted wait time for test-in, protection, and different airport approaches. These statistics may be displayed on digital signs at some stage in the airport, or it can be available thru a cell app.

Queue control: BIAL ought to use era to control the waft of passengers through the airport. This may want to contain the use of sensors to music the variety of passengers in every queue, after which the usage of this records to alter the quantity of body of workers at each station.

Self-carrier alternatives: BIAL ought to offer more self-service options for test-in and security. This would permit passengers to pass the strains and process their very own paperwork.

Benefits:

Passengers Benefits:

- Reduced Waiting Time.
- Enhanced Security.
- Personalized experience.
- Greater Convenience.
- Improved Information access.

Airport Benefits:

- Increased efficiency.
- Enhanced Safety.
- Greater sustainability.
- Improved passenger satisfaction.
- Competitive advantage.

Implementation:

The implementation of those services could require a vast investment in A.I. However, the implementation could likely outweigh the financial aspect but BIAL could accomplice with different groups, consisting of airlines or A.I corporations, to share the price of development and implementation at the Airport.

Creating services for BIAL waiting time at test-in and take a look at-out might be a worthwhile funding. These services might improve the enjoy of passengers and make the airport more efficient.

Priority lanes: Passengers who are willing to pay a top class could be able to use precedence lanes at take a look at check-in and safety.

Mobile test-in: Passengers can be capable to test in for his or her flights and print their boarding passes from their mobile gadgets.

Baggage drop-off kiosks: Passengers can be able to drop off their baggage at self-service kiosks.

The BIAL should improve their UI of the application and Website where the travellers can easily understand the check-in and check-out timing which will make a traveller feel a bite relaxed towards the rush of running to the Airport.

The Travellers can pay a premium for hassle free check-in at the airport with the help of application and make sure that all the baggage's are taken care by the services provider.

With the help of AI, the traveller can verify all the information and get the passport verified and will be able to guid them to lounge with all the needed amenities and the baggage's will be safely transferred to the boarding airplane.

The traveller can get a VIP treatment if he is paying a premium to the services that the traveller is gone take which will have a good service provided and will be taken care of the customer at the check-in and the check-out of the airports at any given time.

Bengaluru International Airport (BIAL), the third busiest airport in India, is preparing to embark on a transformative journey powered by artificial intelligence (AI). The organization is committed to creating a seamless, efficient, and personalized passenger experience by strategically integrating AI into its operations. BIAL aims to deliver enhanced customer service and optimized operational efficiency, thereby ensuring a smoother take-off for travellers.

To achieve this goal, BIAL is planning to implement AI-powered cameras and sensors to analyze passenger flow and predict peak times. This will enable the airport to dynamically deploy security personnel and open additional lanes, reducing congestion and wait times. Advanced baggage scanners utilizing AI will further expedite security checks and ensure both speed and safety.

Facial recognition technology, already trailed for boarding gate verification, will likely expand its reach. This could potentially eliminate immigration queues, as passengers' breeze through checkpoints with facial scans. Integration with Aadhaar cards or other digital IDs could streamline document verification, further speeding up the entry and exit processes.

BIAL envisions AI-powered chatbots and virtual assistants, available in multiple languages, to offer real-time flight updates, personalized recommendations for amenities and shopping, and even assist with boarding procedures. The organization is also exploring the use of robots powered by AI algorithms to transport luggage within the airport, freeing up staff for other tasks and reducing passenger wait times.

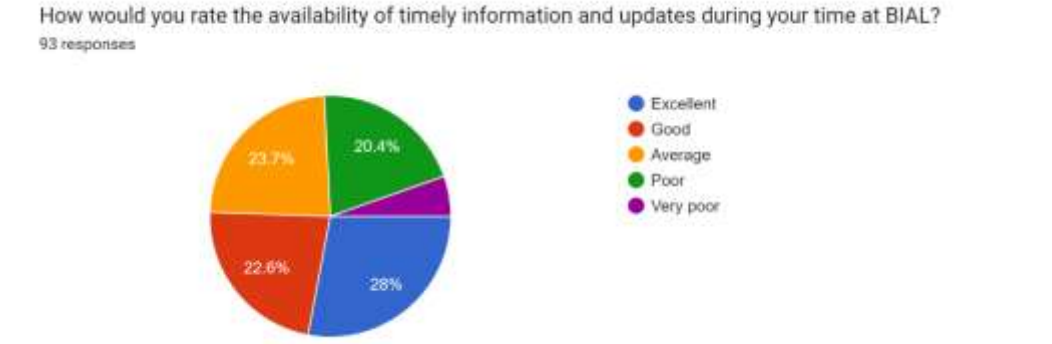
Predictive maintenance is another area where AI will help BIAL to maintain smooth operations. AI-powered sensors and data analysis will predict potential equipment failures and maintenance needs, ensuring proactive repairs and minimizing downtime of the airplane. This will enable passengers to travel through the airport with ease, knowing that AI is silently ensuring a seamless journey.

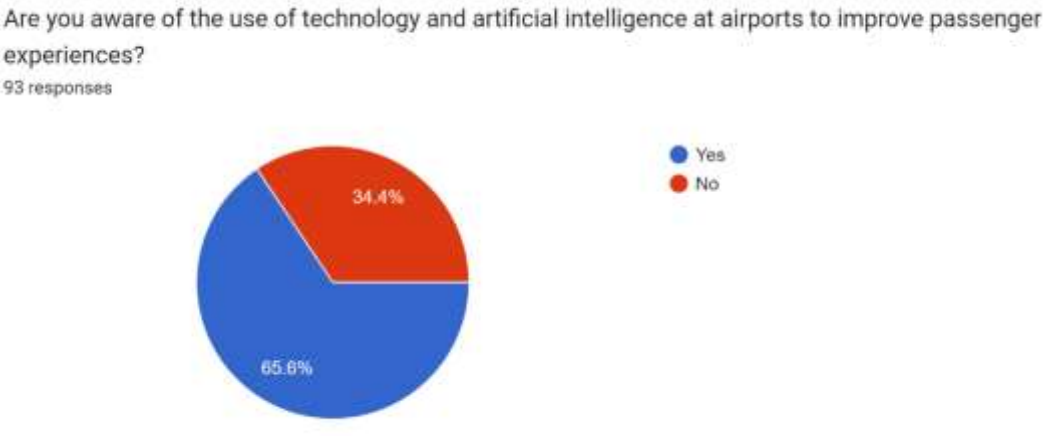
BIAL is also committed to sustainability, and AI will play a crucial role in achieving this goal. The organization plans to optimize energy consumption and resource allocation based on real-time data, reducing the airport's carbon footprint. AI-controlled lighting systems will adjust brightness based on passenger flow and natural light, while intelligent air conditioning systems will adapt to occupancy levels.

Behind this AI revolution lies a powerful arsenal of technologies. Computer vision analyses video feeds to track passenger flow and predict wait times. Machine learning algorithms learn from data to make smarter decisions about resource allocation and maintenance. Natural language processing powers chatbots and virtual assistants, while deep learning enables facial recognition and baggage tracking.

BIAL has already made significant progress in incorporating AI into its operations, with initiatives such as self-service kiosks and AI-powered robots. While specific timelines are not yet public, BIAL's commitment to AI is evident. The organization is poised to become a global leader in AI-powered airport operations, making every journey a delight for passengers.

BIAL's AI-powered journey is set to transform the airport experience. By leveraging AI to improve customer service, optimize operational efficiency, and enhance sustainability, BIAL is soaring towards a future where the skies are not the limit, but the beginning of a seamless, efficient, and personalized travel experience.





CONCLUSION:

Bengaluru International Airport is undergoing a revolutionary transformation, incorporating artificial intelligence (AI) to enhance the travel experience for its passengers. The integration of AI promises to provide a smoother, faster, and personalized journey for every passenger, a significant upgrade from traditional methods. AI has made it possible for passengers to glide through security queues with ease, guided by AI to the shortest lane. Document checks can be replaced by facial recognition, and robot assistants will transport luggage, leaving passengers free to explore the duty-free aisles, with tailored offers based on their travel preferences. The airport has woven AI into the very fabric of the experience, with AI-powered cameras and sensors predicting peak times and deploying staff accordingly to manage passenger flow. Chatbots in multiple languages offer support, guiding passengers to their gates and recommending the perfect souvenir.

A.I benefits extend beyond convenience, and it can improve safety at the airport. Advanced baggage scanners keep threats at bay, and facial recognition ensures that only authorized personnel roam the terminal. AI can predict equipment failures, enabling timely repairs before they can disrupt flights. The airport is committed to creating an environment where every detail, from lighting to air conditioning, adapts to passengers' needs while minimizing environmental impact.

BIAL's A.I vision is not just about keeping up with the times; it's about leading the way. The airport is embracing a future where sustainability meets seamless travel, and where robots become silent partners in passengers' journeys. BIAL's commitment to AI serves as a blueprint for airports worldwide, illuminating a path towards a future where air travel is a smooth, personalized, and delightful experience. BIAL is laying the foundation for a future where passengers can use their phones as boarding passes, their faces as passports, and AI as their invisible travel companion.

As Bengaluru International Airport undergoes a transformation, it is clear that the incorporation of AI is a significant step towards improving the efficiency and safety of air travel. The use of AI in airports is a groundbreaking technological advancement, and its integration into Bengaluru International Airport promises a unique and exceptional experience for its passengers.

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