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Enhancing Verification & Authenticity through Digital Certificate Generation with Facial Recognition for Educational Institutions: A Case Study of IndoAI app

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Abstract: ***In today's dynamic academic environment, millions of students seek various certificates while studying in academic institutions amplifying challenges for educators and administrators in manually handling academic records and certificates, particularly during employment processes and record maintenance. The persistent threat of counterfeiting adds to these challenges. This Case study of IndoAI 's Certification addresses the need for a robust authentication mechanism for academic certificates, proposing the utilization of digital certificate systems alongside cutting-edge facial recognition technology. This integration streamlines verification processes, reduces administrative burdens, ensures confidentiality, and enhances overall security. The integration of digital certificates and facial recognition emerges as a comprehensive solution, mitigating the risks associated with identity fraud and impersonation in academic settings and can be answer to blockchain technology in terms of scalability, ease of use and implementation. This system can very well be adopted by Organization's HR department for internal certifications with Dutypar App's robust feedback system.***

Keywords: Certificate Generation, IndoAI, EdTech, Facial Recognition Technology, Authentication, Verification, Skill India

I. INTRODUCTION

Traditional learning methods are being altered in the modern educational landscape by the incorporation of digital technologies, or EdTech. This revolutionary synergy acknowledges how students' requirements are changing in a world driven by technology. Digital technologies support a paradigm change in the distribution of knowledge by including a wide range of instruments, such as virtual classrooms and interactive learning software. Diverse learning styles are accommodated by digital platforms that enable personalised and interactive learning experiences. Learners now actively participate in their educational process rather as being passive recipients. Furthermore, digital tools empower educators with enhanced assessment capabilities, leveraging learning analytics for data-driven insights into student progress.

Educational Technology [1] is the field of study that investigates the process of analysing, designing, developing, implementing, and evaluating the instructional environment, learning materials, learners, and the learning process in order to improve teaching and learning. Education technology is primarily considered a combination of two interpretations, such as

1) Technology in Education / Hardware aspects of Education/ ICT based Education &
2) Technology of Education/ Software aspects of Education/ Programmed Learning.

Kelly et al [2] refers digital technology as tools, systems and devices that can generate, create, store or process data. The data processing and logic capabilities of digital technologies are enabled through microprocesses that are programmed to perform various functions. Digital technologies refer to devices such as personal computers and tablets, tools such as cameras, calculators and digital toys, systems such as software and apps, augmented and virtual reality, and less tangible forms of technology such as the Internet. Abid et al [3] defined digital technology in the classroom as encompassing software and gadgets tailored to address students' accessibility needs. Educational technology applications play a crucial role in automating tasks like attendance tracking and performance monitoring, freeing up educators to focus on instructional responsibilities. Additionally, technology instruction imparts valuable skills to students, teaching them responsible and strategic usage. This not only enhances their decision-making abilities but also cultivates self-discipline. The adoption of digital technology not only streamlines administrative processes but also contributes to the development of technologically literate students, fostering a more efficient and effective educational environment. The most efficient approach to alleviating the repetitive and time-consuming tasks burdening teachers is the strategic integration of technology.

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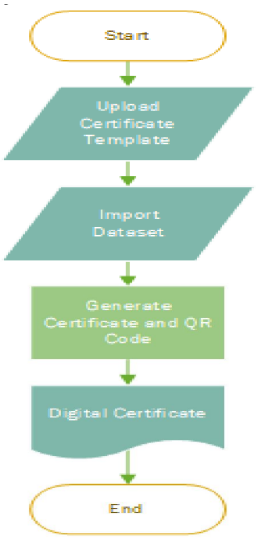
Participants of survey by Enrique et al [4] found success in implementing information and communication technologies, resulting in maintaining student interest and building trust in the online environment, participants recognized the relevance not only of learning management systems and communication platforms, as expected, but also hardware such as tablets, cameras, and headphones for the successful delivery of education in a digital environment. Technology Enhanced Learning transposes game-based, quizzing practices, and collaborative learning to digital environments.

II. DIGITAL CERTIFICATE & SYSTEM: ADDRESSING THE AUTHENTICATION DILEMMA

The challenge of counterfeit certificates persists emphasizing the urgency for secure digital verification systems to authenticate academic credentials. Counterfeit certificates threaten the integrity of academic achievements in the era of EdTech, highlighting the crucial need for advanced technologies like blockchain and biometric authentication (here facial recognition technology) to safeguard educational credentials. In response to the problem of counterfeit academic certificates, a pressing need arises for a robust mechanism that assures document authenticity. This entails verifying the source's authority and preventing fraudulent tampering. Equally vital is the assurance of confidentiality, granting access to sensitive document contents only to authorized individuals. To confront these challenges, the implementation of digital certificate systems comes into play. However, despite their adoption, several security concerns persist that necessitate additional measures.

A digital certificate [5] is a file or electronic password that proves the authenticity of a device, server, or user through the use of cryptography and the public key infrastructure (PKI). Digital certificate authentication helps organizations ensure that only trusted devices and users can connect to their networks. PKI X.509 [6] defines a digital certificate as a document that binds user's information (such as name, address, organization, etc.) to his/her corresponding public key. Digital academic certificates [7]are digitized version of a credential or certification, and can take the form of digital badges that serve as a unique and portable representation of an academic certificate.

Research by Albar et al [8] is focused on designing an information system that supports the online digital certificate printing process. Albar et al referred other authors about making digital certificates that requires the use of QR-codes on electronic certificates to create the certificate verification process simpler supported by Erick's research, which concludes that QR-Code can be used as a certificate verification system. Their workflow of the Digital Certificate Issuance information system can be illustrated as shown in Figure below:



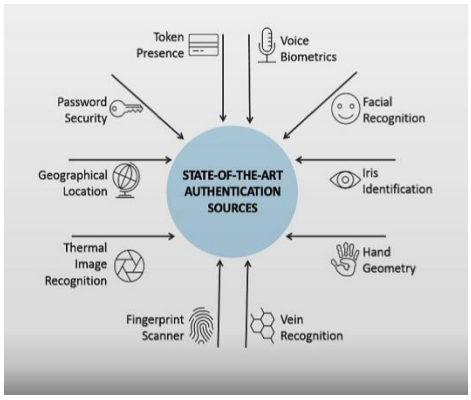
Digital Certificate Issuance Workflow

Keluskar et al [9] presents an e-certificate generation system with elegant template designs that contributes to organizational resources with concise planning and effective management of records. Their research work enables an end-user to choose their desired certificate template and template format without any prerequisite knowledge just by clicking a few buttons and typing from the system GUI & the system is called 'Certificate Generator ' make certificate generation a real advantage for course, webinar, or online school, as it reduce efforts. A certificate without authentication is resource wasted. Certificate-based authentication (CBA) uses a digital certificate [10] derived from cryptography to identify a user, device or machine, before granting access to an application, network or other resource. Robust personal authentication [11] is becoming ever more important in computer-based applications and biometric offers several advantages, mainly in embedded system applications. The authors used multimodal authentication system using encrypted biometrics for automatic certificate generation.

III. AUTHENTICATION TECHNIQUES [14]:

The techniques are:

1) *Retina Scanner:* Utilizing retinal patterns for identification, the retina's complex capillary network ensures unique identification, offering high precision and reliability. Risks include susceptibility to diseases affecting retinal patterns and high equipment costs.
2) *Iris Scanning:* Leveraging intricate iris details, this technology provides rapid and accurate identification, unaffected by glasses or contact lenses. Iris recognition excels in one-to-many identity scenarios, boasting stability and durability over a lifetime. However, its newness hampers integration with existing fingerprint recognition investments.
3) *Fingerprint Scanner:* Capitalizing on the unchanging nature of fingerprint ridges, fingerprint scanning serves as an attractive, cost-effective biometric identifier. Advanced systems capture 3D images, enhancing security and counterfeiting resilience.
4) *DNA Testing:* While not a traditional biometric method, DNA testing ensures unparalleled accuracy in identity verification. This method, showcased in a Russian singer's case, resolves paternity disputes with indisputable results.
5) *Facial Biometrics:* Every face holds unique features, enabling facial recognition systems to instantly identify individuals. This technology, highlighted by the Face Recognition System, ensures secure access based on bone structure and feature placement.
6) *Voice Recognition:* Unique voice patterns distinguish individuals, with voice recognition software noting subtle differences and enabling access to those with the correct pitch and voice level. Forensic applications employ speaker identification for conclusive matches.
7) *Keystroke Dynamics:* Identifying individuals based on typing behavior, keystroke dynamics offer a software-based solution, capturing unique typing techniques on a home computer.
8) *Hand/Palm Print Patterns:* Beyond fingerprints, hand and palm print patterns provide additional information, including touch, indents, and symbols. However, changes over time due to work activities pose a challenge.
9) *Signature Scanning:* Recognizing behavioral biometrics, signature scanning extracts unique data from signatures, serving as evidence of identity and consent. Advanced devices enhance accuracy and efficiency in signature recognition.



Biometric [12] is based on the individual and thus their characteristics are individual to the user offering a highly personalised and secure authentication mechanism. User's location information is also considered one of authentication usually uses Global Positioning System (GPS) systems, the user's IP address, or even a hive tower identifier. Facial recognition measures unique facial features like eye distance, nose breadth, and cheekbone distance and initially relying on landmark picture analysis, which could be easily duplicated with a photo. Over the last two decades, three-dimensional facial recognition techniques have significantly advanced, reaching a stage where it accurately identifies users' actual expressions.

IV. SEAMLESS INTEGRATION OF FACIAL RECOGNITION TECHNOLOGY

As IndoAI's developing a case study where it will use Dutypar's Facial Recognition Tech app which has liveness property, Kalaiselvi et al [13] proposed electronic certificate system which integrates deep learning-based facial recognition technology for robust and convenient verification as Certificates, crucial for validating educational or program completion, face increasing fraud risks. Their system employs a fast and versatile face detector, Deep Convolutional Neural Network, ensuring accurate detection even with variations. Utilizing facial acknowledgment for liveliness detection enhances security, facilitating secure user access. Each certificate has a unique hash for easy verification through a portal, minimizing the risk of loss or damage. This approach provides a swift, reliable, and secure verification process, making deep learning-based facial recognition technology an optimal solution for certificate verification.

As the demand for secure digital certificate systems grows, the integration of cutting-edge tools such as facial recognition technology further amplifies the overall security measures. Facial recognition, a biometric authentication technique, authenticates individuals by analyzing unique facial features. Integrating this technology with digital certificate systems provides an additional layer of protection against identity fraud and enhances overall document security. This is studied in following case study.

V. CASE STUDY

A. *Enhancing College's Innovative Certification Processes with Facial Recognition Tech: A Case Study of Authentication*

In the ever-evolving landscape of education, it becomes imperative for educators to adopt innovative approaches that not only enhance the learning experience but also provide students with tangible skills and certifications. Prof Mary, a dedicated faculty member at 'MABEngg' College, recognized this need and took the initiative to organize a paid training program for students. This case study delves into Prof Mary's journey, navigating through the complexities of organizing the program and implementing a seamless certification process using cutting-edge technology of Dutypar's platform of FRT.

1) *Setting the Stage: IndoAI and Certification Platform*

Prof Mary, armed with the vision to provide students with a holistic learning experience, decided to collaborate with IndoAI, a platform known for its advanced assessment and certification services. To kickstart the process, Prof Mary logged into the IndoAI certification portal at www.indoai.com/certificates using her official email address, mary@mabengg.edu. The platform served as the gateway for Prof Mary to seek permission, streamline the program, and initiate the certification process. Prof Mary's account will be duly verified by initial OTP/email system.

2) *Seeking Approvals: Communication with College Authorities*

Understanding the significance of official endorsements, Prof Prof Mary initiated communication with key college authorities. She sent emails to the Registrar requesting the college logo and the Director for signature. Similarly, Prof Prof Mary reached out to the Head of the Department (HOD) and the designated Trainer for their respective signatures, all of which would be prominently featured on the certificates.

3) *The Digital Signature process*

Upon receiving the necessary approvals and signatures, Prof Prof Mary seamlessly uploaded the digital assets, including the college logo and signatures of the Director, HOD, Trainer, and herself, onto the IndoAI certification platform. This digitized signature process not only saved time but also ensured the authenticity of the certificates.

4) *Bridging the Training- Certification Gap: QR Code Integration*

To bridge the gap between training completion and certification issuance, Prof Prof Mary leveraged the Learning Management System (LMS). After the completion of the training program, each student received a personalized QR code or link through the LMS, connecting them to the next phase of the certification process.

5) *Facial Recognition: The Future of Certificate Authentication*

Prof Mary envisioned a cutting-edge certification process that involved facial recognition technology. When students clicked on the provided link or scanned the QR code, they were directed to a dedicated app, Dutypar's Facial Recognition app, designed to authenticate and personalize their certification journey.

The app prompted students to take a selfie and input their name, email ID, and mobile number. This data, combined with the facial recognition scan, ensured the certificate was uniquely tied to each student. A preview of the certificate was generated, allowing students to verify the accuracy of their information before proceeding to the final step.

6) *Secure and Convenient: Online Payment*

The last leg of the certification process involved an online payment gateway. After reviewing the certificate preview, students were directed to an integrated payment portal where they could securely complete the transaction. The seamless integration of the payment process added a layer of convenience, ensuring that only validated users could access and receive the certification.

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7) Confirmation and Distribution: The Grand Finale

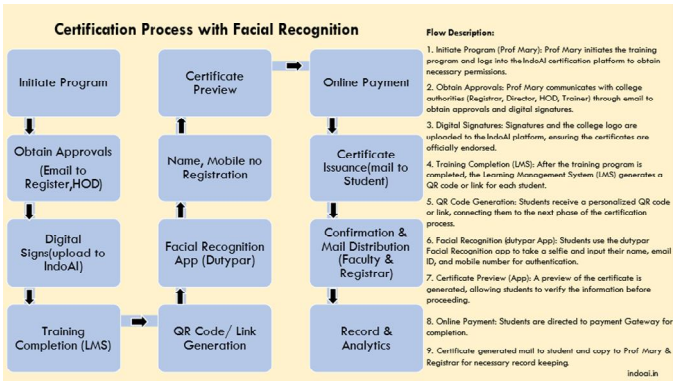
Upon successful payment, students received their certificates via email, with a copy sent to Prof Mary and the Registrar's email address for necessary record maintenance with certificate's unique identity (hash code). This final step not only marked the completion of the certification process but also served as a comprehensive confirmation of the students' achievements.

VI. RESULTS AND IMPACT

Prof Mary's innovative approach to certification significantly enhanced the overall learning experience for MBAEngg students. The integration of digital signatures, QR codes, facial recognition, hash code and online payments streamlined the traditionally cumbersome certification process. The following outcomes highlight the success of this approach:

1) *Efficiency and Time Savings*: The digitization of signatures and the streamlined online process significantly reduced the time required for certification issuance.
2) *Enhanced Security*: The integration of facial recognition added an extra layer of security, ensuring the certificates were uniquely tied to each student.
3) *User-Friendly Experience*: The seamless user experience, from QR code generation to facial recognition and online payment, made the entire process convenient and user-friendly.
4) *Cost Savings*: The elimination of manual processes, such as physical signatures and printing, resulted in cost savings for both the college and students.
5) *Real-time Tracking*: The certification platform allowed for real-time tracking of student progress, completion, and certification issuance, providing valuable insights for future programs.

A. Certification Process Flow for Students of Prof Mary's MBAEngg Training Program



1) Initiation and Permission

Step 1: Prof Mary logs into www.indoai.com/certificates using her email (Prof Mary@mabengg.edu).
Step 2: Prof Mary seeks permission for the training program through the IndoAI platform.

2) Communication with College Authorities

Step 3: Prof Mary emails the Registrar for the college logo.
Step 4: Prof Mary emails the Director for their signature.
Step 5: Prof Mary emails the HOD and Trainer for their respective signatures.

3) Uploading Digital Assets

Step 6: Prof Mary receives logo and signatures.
Step 7: Prof Mary uploads the college logo, Director's, HOD's, Trainer's, and her own digital signatures on the IndoAI platform.

4) QR Code Integration via LMS

Step 8: Training completion triggers the generation of personalized QR codes/links for each student through the LMS.

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5) Facial Recognition and Data Input

Step 9: Students click on the QR code/link, redirecting them to dutypar's Facial Recognition app.
Step 10: Students take a selfie and input their name, email ID, and mobile number.

6) Certificate Preview

Step 11: The app generates a preview of the certificate based on the facial recognition data and inputted information.
Step 12: Students review and verify the accuracy of the certificate details.

7) Online Payment

Step 13: Students are directed to an integrated online payment gateway.
Step 14: After successful payment, a transaction confirmation is generated.

8) Certificate Issuance

Step 15: Certificates are automatically generated with the integrated digital signatures, hash code, college logo, and unique student details.
Step 16: Certificates are emailed to students, with a copy sent to Prof Mary and the Registrar for record and analytics.
Step 17: Prof Mary and the college authorities analyze the data and make adjustments for future programs.
Prof Mary's case study showcases the transformative power of innovative certification processes in the realm of education. By leveraging IndoAI's certification platform and integrating advanced technologies, Prof Mary not only streamlined the certification process but also enhanced the overall learning experience for MBAEngg students. The seamless integration of IndoAI's platform, facial recognition, and online payment gateways creates a robust and efficient system that can be replicated and adapted for various training programs, ensuring a future-ready and technology-driven approach to certification in education. The success of this initiative serves as a blueprint for educators looking to embrace technology to make education more accessible, efficient, and secure. As the landscape of education continues to evolve, Prof Mary's case study stands as a testament to the importance of adapting and innovating for the benefit of both educators and students alike.

B. Benefits of Digital Certificates and Facial Recognition Integration

The integration of digital certificates and facial recognition technology has numerous advantages. Firstly, the integration streamlines the verification process, reducing the burden on educators and administrators. Secondly, it reinforces the confidentiality of digital certificates, ensuring that only authorized individuals can access sensitive information. Lastly, the utilization of facial recognition enhances the overall security of the process, mitigating the risk of identity theft and impersonation.

VII. CONCLUSION

As educational institutions and organizations worldwide seek more efficient and secure means to authenticate academic credentials, digital certificate generation and verification play a pivotal role. By adopting digital certificate systems and incorporating facial recognition technology, educational institutions can establish a highly secure and tamper-proof environment. This innovative approach redefines the authenticity and reliability of digital certificates, ultimately bolstering the credibility of academic achievements in the digital age. In conclusion, Prof Mary's certification process emerges as a affordable alternative to Blockchain technology in the educational context. Its ease of implementation, cost-effectiveness, scalability, and seamless integration with MBAEngg's LMS position it as a pragmatic solution for colleges and universities seeking to modernize their certification processes. While Blockchain remains influential in the broader tech landscape, Prof Mary's approach highlights the importance of tailored solutions that prioritize the specific needs of educational frameworks. Thus, Prof Mary's certification process at MBAEngg College forms a compelling case for alternate certification methodologies within educational institutions. Its advantages over Blockchain technology: ease of implementation, cost-effectiveness, user-friendly integration with MBAEngg's Learning Management System (LMS), and scalability that underscore its potential as a pragmatic and efficient solution. Furthermore, the versatility of this certification process extends beyond academia. Its adaptability makes it a viable solution for organizations, particularly in their training departments. Implementing this streamlined and cost-effective certification process can significantly enhance the efficiency of employee training programs with Dutypar’s feature of Feedback system. The ease of integration with existing systems ensures a smooth transition for both educators and learners, aligning with the growing demand for innovative and practical solutions in the broader landscape of professional development. As educational and corporate landscapes evolve, the emphasis on efficient, cost-effective, and user-friendly certification processes becomes increasingly imperative for fostering growth and success.

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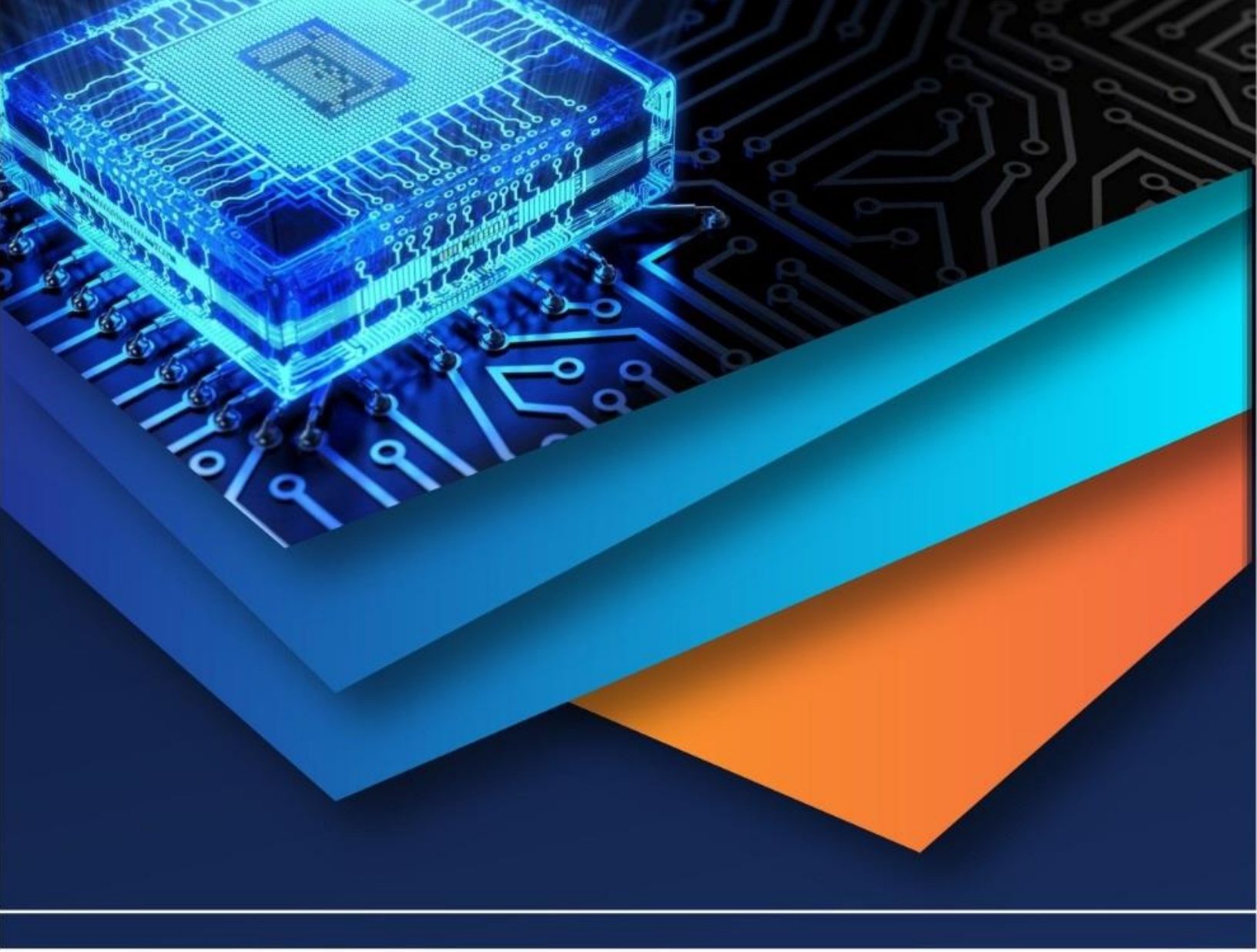
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ANNEXURE/S

Indoai's Real time Certificate generated by Dutypar App for the participants of G20 with their photo, in collaboration with NSDC & Skill India
https://www.linkedin.com/company/72983900/admin/feed/posts/





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