

## **Application Of Artificial Intelligence In Conducting Remote Proctored Open Book Online University Examinations During Covid-19 Pandemic; A Study Of Biju Patnaik University Of Technology, Odisha.**

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### **Abstract**

*Covid-19 has impacted life never before. The most impacted class of people is the students after the vulnerable class. Universities and Educational Institutions were closed bringing down a halt to the education planning, delivery and evaluation process. Technology, especially ICT came to the rescue of the whole education system.*

*This project is a unique case where efforts of a smallest group of officers in a state-run university have worked in tandem with technology enabling company and other stakeholders to implement an online examination system in no time. The challenge was huge due to number of affiliated colleges, geographical location of students, availability of laptop, android mobile, adequate internet connectivity and the time available to initiate, build, operate and implement an entirely new examination system in an online platform. More than the technology implementation, being a public institution, it was also important to have buy in from respective stakeholders including students, parents and teacher community. The whole online evaluation system was based on application of Artificial Intelligence System (AIS) along with Facial Recognition Technology (FRT) and use of Online Proctoring Methods (OPM).*

### **Introduction**

The implementation started late June by developing process flow charts for examinations, selection of vendor for technology implementation. The university's Board of Management (BOM) approved the initiative for implementation after state government instruction. A committee was constituted for deciding the modalities of the examinations which include (a) duration of examination (b) type of devices (c) types and number of questions for each examination including open book, innovative and outcome-based questions (d) deciding identification of proctoring method and metrics to map into examination conduct. The committee created the blue print of the examination.

Once the comprehensive plan was drawn, two strategic interventions were done (1) identification of the competency of the existing vendor to execute the project and mapping its technical capabilities through sprint model. The vendor under guidance of Director Examinations, developed the operational blue print and Enterprise Information System (EIS) connecting all the stakeholders (2) associating and motivating the key stakeholders for participating in the online transformation of examination system. Training programs were conducted for principals, lectures and other staff members involved with examination operations across the affiliated colleges. This trickle-down model helped in winning the confidence and motivating the stakeholders in turn to influence the students to participate in the online examination system. The students appeared the mock test through a simulated

approach to solve the technical problems and remove any mental/ psychological barrier involved in the examination system.

The university announced the examination dates through notification fortnight before the examination. The university also conducted 08 numbers of online counselling sessions of 180 minutes about online examination, evaluation system, maintenance of integrity and sanctity, online proctoring for building familiarity with pre- and post-facto examination systems. The student support was provided by a chatbot and self- help videos in multiple languages available in the university portal. The online proctoring system was built into a robust system by using artificial intelligence tool applicable on web-based application and android based applications. This took care of universal acceptability of the examination system by all the stakeholders and made it possible to be used across platforms. Post- examination, by using customized algorithm for evaluation of answers, the system generated multiple choice questions by randomized method. The results were published within seven days.

### **Specific objectives:**

Application of Artificial Intelligence in University Examination System: The University using AI conducted on-line remote proctored open book examinations through Laptop or Android Mobile during Covid-19 pandemic when there was complete lock down and closure of universities and educational institutions.

⊗ To protect the academic interest including career gap of continuing learners: The University publishing results in time could not only protect the academic interest, but also saved the gap in career.

⊗ To maintain sanctity in on-line open book examinations: Using AI, could proctor on-line examinations and thereby maintained integrity and sanctity.

⊗ To identify internet disrupted locations and suggest alternate Internet Service Provider or carrier to appear in examinations: Analyzing complaints received, advised learners to change the Internet Service Providers.

⊗ To devise strategy for a change from traditional examinations to AI based remote proctored online open book examinations understanding the vulnerability of certain section of learners.

### **Context and problem definition**

On account of COVID-19 pandemic, Government declared lock down, closure of universities, used university's infrastructures as Covid Care Centre. During this transit period, the university decided to conduct final and intermediate semester examination on on-line mode using time relevant ICT that is Artificial Intelligence supported Remote Proctoring. The AI Proctoring maintained integrity and sanctity in examinations.

On time conduct of examination and publication of results saved and protected the academic interest of the students. Although it was an entirely new exercise, the decision to go online is the bravest decisions in higher education in Odisha. The theme is relevant from both temporal and spatial point of view. The time window available to decide and execute, through AI based proctored examination was very small (temporal challenge) which needed a detailed planning and evaluation of acceptability of the new mode of examination among stakeholders.

Designed AI-based solution

Following are the features of the platform.

1. Content creation: Content including probable question papers obtained from the question setters were processed and stored in encrypted format to make the process highly secure. Rechecking and cross checking were a part to make the content ‘fool proof’ as the questions and options were randomized. The content was only accessible to authorized users, and within the pre decided scheduled time.

2. Platform: The University developed a robust examination platform after due diligence to cater to the needs of university and students. This platform is highly secure and scalable deployed on AWS cloud environment. This platform supports desktop-based web browsers and BPUT android app, with high level of ease of use and helped the proctors to control the examination remotely.

Examination platform was developed over a period of time based on artificial intelligence (AI) algorithms by applying machine and deep learning with higher order of AI implementation. This was developed using SOA Architecture by using Webservice API and encrypted data transfer. The platform has inbuilt security features such as Face id recognition, auto proctoring, in-built two-way chat facility for communication between student and proctors. The AI system uses Image capturing algorithm among others to help a proctor make a decision regarding any examination. The platform has not used any of the open source, free software.

The university has used a custom platform which was designed to conduct university exams developed in .Net Platform using Service Oriented Architecture (SOA) along with Web Services API; using XML over SOAP protocol. Data was encrypted by using 128-bit encryption methods. Artificial intelligence is the mainstay of this platform with a high degree of security mechanisms being implemented to avoid any data hacking or malpractices during the exam.

3. Value Added Services: - The university has launched a Chatbot to familiarize the students with frequent asked questions by applying machine learning and robotics. The university has too uploaded self-help videos in English, Hindi, and Local languages as well.

4. Application of Artificial Intelligence: - Artificial intelligence application in the examination system is developed by using both deep learning and machine learning. University used deep learning algorithms to understand and forecast a student’s behaviour during the examination and signal the proctor of potential violations. Combined with human verification and authentication, the university was able to develop an effective monitoring system for the examination. Though AI has its own limitations, but the university had relied on the effective application of AI and combined it with human intervention to make it more effective. The system can analyze a picture frame to detect multiple persons, identify use of other gadgets, impersonations and facial emotions that augmented university’s decision making.

Remote proctoring was conducted by the selected and trained university faculties to monitor students. The AI embedded platform could provide alerts to the proctors if students indulge in any unacceptable behaviour. Proctors can warn the students on real time to follow examination code of conduct and failing which can suspend students who were indulged in malpractices.

## **Key features**

Trust on a system for reliable AI proctoring was to be set up to ensure the validity and acceptability of the results. Biju Patnaik University of Technology, Odisha decided to go ahead with the online examination system, and set a series of steps to ensure success of the same. Multiple Stakeholders: The students, parents, affiliated institutions, university administration and moreover the state government were the key stakeholders. Community: Inclusive decision-making process warrants assuring various communities, often in conflict of each other that the said technology intervention shall fructify in giving meaningful result. The university formed a committee and organized frequent online meetings to implement the plan quickly and with higher probability of success.

Technology: Technology as an entity was customized by collecting inputs received from the stakeholders, views from social media interactions so that the university can build a user friendly and highly effective technology enabled learning system.

Operational Plan: Regular Online meetings were conducted with College Principals and Trial On-line Tests were facilitated for Principal, Examination In-charges and Teachers of the College on Desktop / Laptops and Mobiles. Explanatory videos in English and Odia were uploaded and a Chatbot was developed to answer Frequently Asked Questions (FAQs) to appear on-line proctored examinations.

Key instructions and examination credentials were shared with students through email to their registered email id and mobile numbers. Written examination instructions and video format were provided. An online student service for retrieving the password through OTP based system was sent to the registered mobiles. A help line with about 20 support executives was set up to support students during the examination.

A customized BPUT app was developed and deployed for exclusive use. The app had an Artificial Intelligence (AI) based Remote Proctored Online Examination System which was highly secure and scalable. The AI features helped to detect impersonation, use of any additional device and capture face emotions of the student while writing the examinations. This solution works on Laptops/desktops and on android OS based mobile devices.

Enabling Teachers with new method of supervision: Training programs were conducted to train the teachers on on-line proctoring. Nominations were invited from affiliated colleges, and the university decided the list of proctors. Each proctor was given training on how to access the platform; how to identify the list of students to whom he/she has to proctor. The proctors were given an outline and a standard operating procedure on the conduct of student including the behavior during the examinations. The proctors were empowered to allow students for temporary absence during the examination with a pre-decided list of reasons. The proctors were permitted to submit the examination conduct report along including misconduct if any through the platform to the university authorities.

## **Achievements and evidence of impact**

It is observed from data analysis that a large number of students preferred to appear examinations using smart phones which suited the purpose of the University. Security during online exams is one of the critical success factors for management of academic examinations.

AI proctoring, Facial Recognition Technology (FRT), and student identification in the form of water mark on the screen is found to be effective for success of online examination system. Overall, the online intervention to conduct such a complex and tiresome examination was found to be successful. The AI system helped in activating the dashboard and following tables show the amount of task, result obtained and a detailed analysis of the AI proctored online open book examination system of Biju Patnaik University of Technology, Odisha. The geographic scope of coverage of the university indicates the upheaval task at hand. The dashboard indicates the presence of students across the nation during the break down making the online examination system a national phenomenon than a state-wide activity. The examinations were conducted for 13 programs across all five years of examinations and a total of 630 examinations were conducted online during this period. The domain wise distribution of examinations indicates that predominantly the examinations cover engineering domain. Success of online examination and to maintain sanctity was fully dependent upon an effective proctoring. Remote proctoring is done by using artificial intelligence so that the proctor can identify if there is any anomaly including impersonation in the student's way of appearing examination.

The exams were conducted successfully with over 20,000 students in the first phase, 30,000 in the second phase and 40,000 in the third phase. More students are likely to be taking the exams this academic year. The AI based dashboard generated huge amount of data on real time basis which will help the university in future to make technology adaptation more inclusive and student friendly. The university could manage its academic calendar and published results on time due to online examination and above all it protected the academic interest of all. The students developed a new way of learning and appearing online examination which will create a new paradigm for students of the future.

Application of AI and other FRT tools was one of the biggest achievements in creating a reliable and scalable process of proctoring online examinations. Given the current growth of online education, it is likely that such a need for online proctoring will not go away with the relaxation of Covid-19 related guidelines. Biju Patnaik University of Technology and similar universities across the nation can build on the technology currently being used; make improvements and customize them same to further requirements. Equally important has been the integration of the other processes and human resources that enable the smooth functioning of the AI tools. It's the human-machine interface and interaction that made this humongous task a success.

## 1.

### **BPUT in News:**

1. <https://epaper.thestatesman.com/2756074/Bhubaneswar-The-Statesman/20-July-2020#clip/53609483/f461dc9c-013d-4025-9b16-71010cd0090a/589.3333333333334:495.67741935483883>
2. <https://epaper.thestatesman.com/2785550/Bhubaneswar-The-Statesman/14th-August-2020#page/3/1>
3. <https://timesofindia.indiatimes.com/home/education/news/bput-publishes-results-of-final-year-online-exams/articleshowprint/77796095.cms>

## **Sustainability**

Online open book examination is a sustainable system during a pandemic, and epidemic condition. However, internet connectivity and alternative natural energy are two pre-requisites to go ahead in deciding for a continuous on-line examination.

It is important to have a blue print that consists of IT Devices, Alternative Energy Network, Wi-Fi Connectivity with adequate bandwidth particularly suitable in low band width environment that can facilitate smoother, faster and more comfortable functioning of education system.

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The project can be used in the long term as well as can be implemented in multiple universities due to rapid adoption and scaling up through technology intervention. The project has both short term and long-term impact. In short term, it allows the universities to conduct examinations through online platform, and face any on toward incident like Covid-19. In long term the project builds convenience, personalization, and technology enabled interactivity leading to more proximity between university and students.

The project has the potential to automate majority of academic and examination operating processes so that results can be published in real time. This will allow students to prepare well for repeat examinations and focus on learning. The platform allows multiple stakeholders to work together e.g. bringing university administration, affiliated colleges, question setters, proctors and students into a common platform for deeper engagement.

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## **Scaling up**

With any volume of learners in universities, autonomous technical and non-technical professional educational institutions, it is possible to develop and bring out a uniform course wise AI supported customized platform that is user-friendly. The platform should fit in and function in all types of lap tops and smart phones so that utmost security and hi-integrity in examinations maintained. Universities with skeleton work personnel can discharge its duties and responsibilities without spending additional resources on developing robust platform can make use of same and conduct examinations as per pre-decided schedule to protect the

academic interest of students and thereby learners of the country shall not stand far behind of others.

Availability of resources for all: In many developing (and even developed) countries, all student might not have a suitable device or adequate internet connectivity for taking an online examination from home. Students living in overcrowded households or in slums find it difficult to afford, and thereby run contrary to the statement of education for all. Local governments and non-governmental agencies to come forward for extending support to the test-takers who are not able to take online examinations at home.

Technology to strengthen the remote proctoring: Geofencing /Geotagging, VGP monitor, Y Splitter, Window swapping, screen sharing, mirroring, image capturing, video streaming, Data encryption, Audit logging, IP Based authentication and authorization, IP Binding, Secure browser technology, voice proctoring should be used to enforce complete 360 degree of examination ecosystem. Access to keyboard shortcuts for copy, paste and screen capture should be completely prevented.

Adaptability: With the changes in the examination delivery format, items need to be piloted, evaluated, and adjusted accordingly to meet the content and psychometric standards.

Portability: The at-home online versions of examinations also need to ensure that all students can be provided with necessary accommodations; therefore, online proctoring needs to consider adaptations to the individual needs of students with disabilities, such as extended time to take the exam, the use of assistive technologies, and the live presence of professionals that can support students to read the questions and record their answers if needed, among others.

### Web links

1. [www.bput.ac.in](http://www.bput.ac.in)
2. [www.bputevaluation.com](http://www.bputevaluation.com)
3. <https://epaper.thestatesman.com/2756074/Bhubaneswar-The-Statesman/20-July-2020#clip/53609483/f461dc9c-013d-4025-9b16-71010cd0090a/589.33333333333334:495.67741935483883>
4. <https://epaper.thestatesman.com/2785550/Bhubaneswar-The-Statesman/14th-August-2020#page/3/1>
5. <https://timesofindia.indiatimes.com/home/education/news/bput-publishes-results-of-final-year-online-exams/articleshowprint/77796095.cms>