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A Review on Applications of Computer Programme in Different Fields of Education and Their Co-Relation with E Learning and Academic Implementation

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Abstract: ***Computer programs have revolutionized various fields in education, enhancing learning experiences and academic implementations across different domains. Here's a breakdown of some key applications and their correlation with e-learning like Computer programs facilitate the development of interactive learning platforms that engage students through multimedia content, simulations, and gamification. These platforms enable personalized learning experiences, catering to individual learning styles and paces. E-learning platforms often incorporate features such as progress tracking, automated assessments, and instant feedback, enhancing academic implementation by providing educators with valuable insights into student performance. Computer programs power online course management systems (CMS) that streamline course delivery, communication, and assessment processes. CMS platforms like Moodle, Blackboard, and Canvas offer tools for content creation, discussion forums, assignment submission, and grading. Computer programs facilitate the development of virtual laboratories and simulations, especially in science and engineering fields. These tools allow students to conduct experiments and explore concepts in a safe and cost-effective virtual environment. Computer programs enable the collection, processing, and analysis of large volumes of data generated from e-learning activities. Overall, computer programs play a crucial role in transforming education across various fields by facilitating interactive learning experiences, supporting online course management, enabling virtual laboratories and simulations, promoting adaptive learning, and leveraging data analytics for informed decision-making. When integrated with e-learning methodologies, these applications enhance academic implementations by fostering student engagement, personalizing learning experiences, and improving learning outcomes.***
Keywords: online teaching, Web-based instruction,e-learning

I. ABSTRACT

Computer programs have revolutionized various fields in education, enhancing learning experiences and academic implementations across different domains. The development of innovative learning platforms that engage students through multimedia content which is a form of communication that uses a combination of different content forms, such as writing, audio, images, animations, or video, into a single interactive presentation, in contrast to traditional mass media, such as printed material or audio recordings, which feature little to no interaction between users, simulations which is a a process or system that could exist in the real world. In this broad sense, simulation can often be used interchangeably with model. Sometimes a clear distinction between the two terms is made, in which simulations require the use of models; the model represents the key characteristics or behaviors of the selected system or process , and gamification which is strategic attempt to enhance systems, services, organizations, and activities by creating similar experiences to those experienced when playing games in order to motivate and engage users. This is generally accomplished through the application of game design elements and game principles (dynamics and mechanics) in non-game contexts. These platforms icreases the student performance in all fields of education. Computer programs power online course management systems (CMS) that streamline course delivery, communication, and assessment processes. CMS platforms like Moodle, Blackboard, and Canvas offer tools for content creation, discussion forums, assignment submission, and grading. Computer programs facilitate the development of virtual laboratories and simulations, especially in science and engineering fields. These tools allow students to conduct experiments and explore concepts in a safe and cost-effective virtual environment. Computer programs enable the collection, processing, and analysis of large volumes of data generated from e-learning activities.

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Web-based education uses the Internet and communication technologies, ranging from the Internet as a research tool to taking online classes by using different applications. the Internet is also used to supplement instruction, as in the use of a website to communicate information to students who are in a face-to-face class. Online classes are courses that are delivered completely on the Internet.

Hybrid or blended courses are those that combine online components with traditional, face-to-face components. The term distance education is also used to describe any courses that are delivered to students who are not present in the same room. These might be delivered via interactive television, online courses, and courses using videotapes, television, or correspondence. E-learning may be used to describe any learning that is electronically mediated or facilitated by transactions software.

II. INTRODUCTION

The use of computer-mediated communication (CMC) in learning environments has demonstrated that the levels of student participation and achievement are consistently high when compared to more traditional learning environments. A computer program is a set of instructions that a computer follows to perform specific tasks. All the computer instructions are written in programming languages such as Python, Java, C++, and many others. Programs can range from simple scripts that automate repetitive tasks to complex systems that manage large-scale operations the applications desigened play a important role in academic e-learning.it provides the different tools which are necessary for content creation for research purpose and academic management. This study is important when supplementing face-to-face discussion with computer-mediated discussion (CMD) enhances the academic performance of undergraduate students in large lecture courses. students in the online course were positive about their experience. Student comments highlight the need to be aware of effectiveness of communication among faculty and students, the clarity of instructions, and the amount of information provided on course Web sites.

Web-based courses to increase access to programs, evaluation of all aspects of these courses, from student learning to effectiveness of the course and instructor, becomes important. As demands for deeper and more complex student learning have intensified, practitioners, researchers, and policymakers have begun to think more systematically about how to improve teachers' learning from recruitment, preparation, and support, to mentoring and other leadership opportunities. Sophisticated forms of teaching are needed to develop 21st century student competencies, such as deep mastery of challenging content, critical thinking, complex problemsolving, effective communication and collaboration, and self-direction. In turn, opportunities are needed for teachers to learn and refine the pedagogies required to teach these skills.

Educational assessment or educational evaluation is the systematic process of documenting and using empirical data on the knowledge, skill, attitudes, aptitude and beliefs to refine programs and improve student learning. Assessment data can be obtained from directly examining student work to assess the achievement of learning outcomes or can be based on data from which one can make inferences about learning.

Assessment is often used interchangeably with test, but not limited to tests. Assessment can focus on the individual learner, the learning community (class, workshop, or other organized group of learners), a course, an academic program, the institution, or whole the educational system .

III. COMPUTER PROGRAMS CO RELATION WITH E- LEARNING

The application of technology into education has significantly transformed the landscape of learning, giving rise to new paradigms such as Computer-Based Learning (CBL).

In the educational sector has witnessed a surge in the adoption of digital tools and platforms to enhance the teaching and learning experience.

This shift towards technology-mediated education has prompted a growing interest in understanding the impact of Computer-Based Learning on two crucial aspects of student development: engagement and achievement. The term Computer-Based Learning refers to the use of digital devices and software applications to deliver educational content, facilitate interactive experiences, and engage students in diverse learning activities.

1) *Delivery Platforms:* E-learning platforms are based on computer programs to deliver educational content. Computer based collaboration platforms are a global gathering of brilliant minds convening to discuss, debate, share, and collaborate in a virtual world. These platforms are fertile grounds that nurture academic growth, streamline collaboration, and enhance scholarly visibility. These platforms utilize software tools for content management, specific course delivery, and student interaction.

2) *Interactivity:* Interactive software includes commonly used programs, such as word processors or spreadsheet applications. By comparison, non-interactive programs operate without user intervention; examples of these include compilers and batch processing applications that are pre-programmed to run independently. These enhance interactivity within e-learning modules which is digital learning experience designed to cover a specific topic or skill in an interactive and engaging format. It's a self-contained unit of learning, usually a part of a larger course or training program, that learners can complete online at their own pace. These modules typically combine multimedia elements such as text, audio, video, animations, and quizzes to enhance learning and retention.
3) *Content Creation:* eLearning has become an essential tool for education and skill development. With availability of technology, more people are turning to online platforms to learn new things conveniently Engaging eLearning content is crucial for capturing learners' attention, fostering understanding, and promoting active participation in the learning process.Authoring tools and content management systems enable educators to create, customize, and distribute e-learning materials efficiently. Collecting demographic data done through surveys, interviews, or analytics tools.Once you have a clear picture of your target audience demographics, you can use this information to tailor your content to their specific needs and preferences.These tools often incorporate programming languages and frameworks to develop interactive multimedia content and assessments.
4) *Communication and Collaboration:* The students who interested in E-Learning content but had difficulty on some occasions preparing for and/or attending videoconferences due to teaching and other responsibilities. Faculty took on the role of "learners" in the faculty development program. Similar to the experiences of online students, some faculty expressed feelings of uncertainty, frustration and inadequacy in dealing with new educational technologies and social media used during the webinars. The students and faculty are more familiar with aspects of E-Learning that involve course development and design. Faculty employ a wide array of student-centered teaching/learning strategies designed to engage the learner. Faculty expressed less certainty around issues related to E-Learning dimensions of institutional, administrative, and management.

A. *Facilitating E-Learning Platforms*

When compared to the traditional classroom, ELearning requires the talents of many team members from a variety of departments as well as the use of different teaching and learning strategies. Pedagogy as well as team configurations must change when moving to the online environment.

As a result, collaboration is a key component in creating quality ELearning. This article describes the results of a faculty survey based on the Flexible Framework for ELearning. Computer programs provides content management systems, learning management systems (LMS), video conferencing tools, and communication channels. Popular e-learning platforms include Moodle, Canvas, Blackboard, Google Classroom, and edX, each offering a range of functionalities to support online education. Designing and delivering inclusive online courses requires attention to digital accessibility to ensure materials are usable by all students, including those with disabilities.

A great way to tap into learner motivation is to promote the benefit of learning opportunities wherever and whenever possible. Highlight the "WIIFM" (what's in it for me?) value proposition—self-improvement, promotions, pay hikes, professional certifications, industry accreditation, recognition, peer respect, and brighter prospects. cutting-edge learning technology such as AI, VR, and AR provides the underlying basis for immersion, building an immersive learning environment should not be your only goal.

True immersive learning requires both overarching technical architecture as well as compelling and engaging content. Face-to-face training by itself might not provide students with the opportunity to communicate effectively with the instructor, especially in large groups. With only a limited time allotted for the in-person training session, a trainer only can entertain a few questions as they need to cover all aspects of the training module.

With blended learning, online platforms become a part of the learning process. At the same time, student can find plenty of opportunities to communicate with the instructor and their team members through the dashboard and other built-in communication tools.

Similarly, student and instructors can reach out to anyone more efficiently and assign different tasks, address problems, and discuss ideas more conveniently through the online platform.

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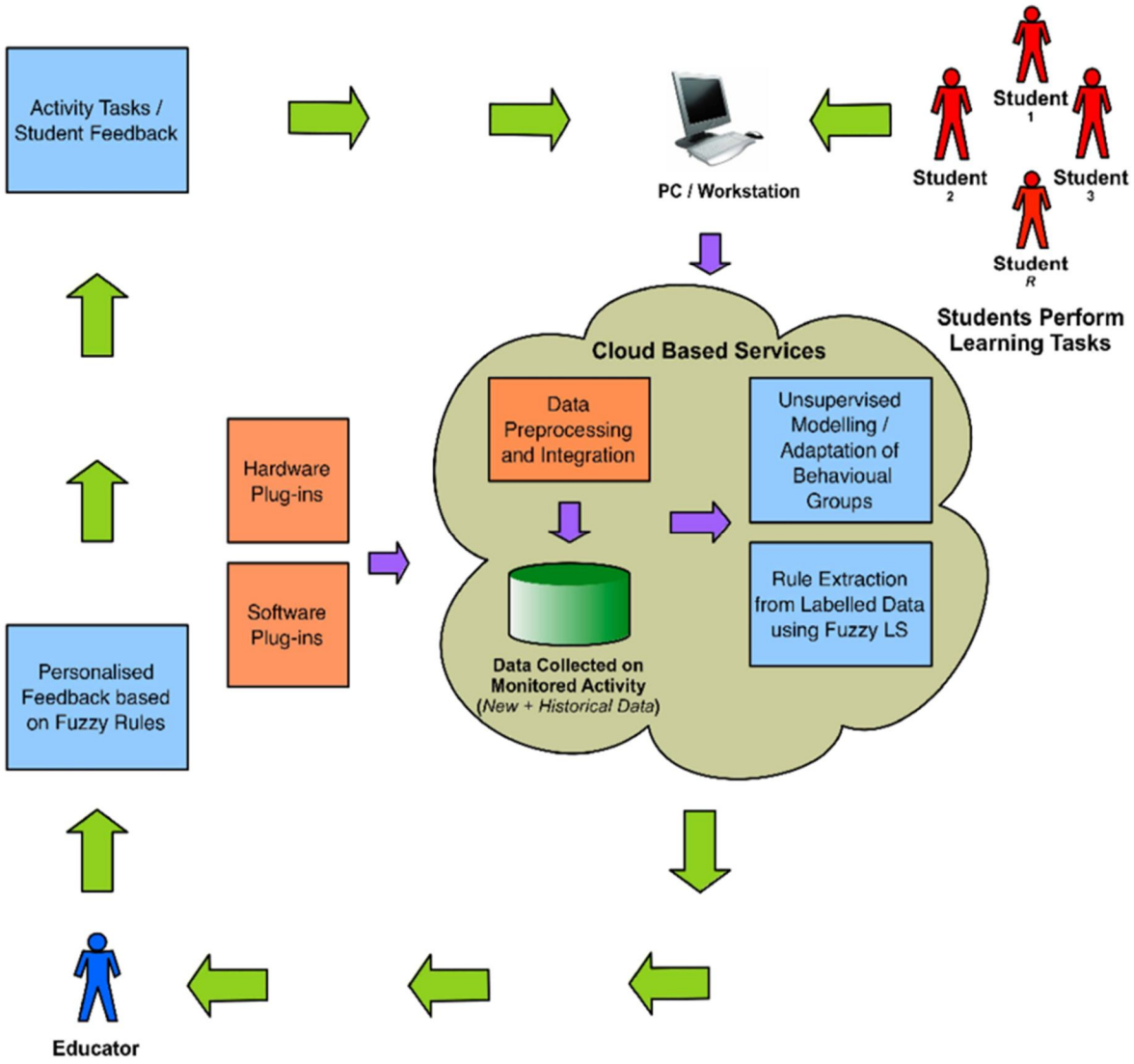


Fig 1.Proposed student performance in academic monitoring

IV. COMPUTER APPLICATIONS IN DIFFERENT FIELDS.

Application of computer today is not limited within the ambit of data analysis and interpretation only. The ecology of social science research is comprehensively guided by computation, be it problem formulation, literature review, selection of sampling technique, or data mining. The Table 1 presents a summary of any social science research process. Evidently, starting with the research question in the exploration stage till the final stage of research report, computer applications have their role to play. Nonetheless, the descriptive and inferential tools of computers are used in the most prolific ways during the phase called *research execution*, viz. pilot testing, data collection and data analysis.

Digital technologies influence agricultural operations, and they will soon revolutionise how farming is done in developed countries, reducing our dependency on pesticides and substantially cutting water use. COVID-19 Pandemic, lockdown, and quarantine are three concepts that have recently entered our lexicon. People worldwide are aware of the catastrophe caused by the coronavirus epidemic. In this crisis, digital technologies are at least keeping the educational system afloat. Students are learning from the convenience of their own homes [10,11]. Integrating technology into education provides students with an engaging learning experience, allowing them to remain more interested in the subject without being distracted. The utilisation of projectors, computers, and other cutting-edge technical gear in the classroom may make studying fascinating and entertaining for students. Student learning can become more dynamic and engaging by establishing tasks in class that incorporate technology resources, oral presentations, and group participation. Participation can extend beyond verbal communication as well.

A. Educational Games and Simulations

Simulation-based education (SE) is the use of simulation software, tools, and serious games to enrich the teaching and learning processes. Advances in both computer hardware and software allow for employing innovative methodologies that make use of SE tools to enhance the learning experience. Programs designed for educational games and simulations engage students in interactive learning experiences, making complex concepts more understandable and enjoyable.

Moreover, thanks to the globalisation of e-learning practices, these educational experiences can be made available to students from different geographical regions and universities, which promotes the development of international and inter-university cooperation in education. This paper provides a review of recent works in the SE subject, with a focus on the areas of engineering, science, and management. It also discusses some experiences in SE involving different European universities and learning models. Finally, it also points out open challenges as well as noticeable trends.

1) *Data Analysis and Research:* Computer intelligence has revolutionized the field of social science research in the last quarter of a century.wide ranging use of computer software has given rise to smart and sophisticated accumulation, collation and presentation of dense data structure in social and behavioural research. Analysis and interpretation have achieved new heights as social scientists and researchers now often operationalise their theoretical concepts through tangible and testable empirical evidence. Deprecation of numerical presentation, as a result, has given way to understanding and adaptation of statistical tools and methods. The question 'how is it' is getting organically connected with the answer to 'why is it'. In academic research, computer programs are utilized for data collection, statistical analysis, and visualization, aiding researchers in drawing insights and conclusions from large datasets.
2) *Language Learning Applications:* There are two major branches in the field of language learning, the empirical and theoretical, and these have almost completely separate histories, with each gaining ground over the other at one time or another. Examples of researchers on the empiricist side are Jesperson, Palmer, and Leonard Bloomfield, who promote mimicry and memorization with pattern drills. These methods follow from the basic empiricist position that language acquisition results from habits formed by conditioning and drilling. In its most extreme form, language learning is seen as much the same as any other learning in any other species, human language being essentially the same as communication behaviors seen in other species. omputer programs facilitate language learning through multimedia content platforms.
3) *Virtual Laboratories:* Virtual laboratories (or virtual labs for short) are a great way for learners to practice in a safe, online environment. Through virtual science lab games and engineering simulation software, learners can interact with elements, machines, and interfaces before or instead of trying them out in real life.Virtual training labs have many applications in educational as well as business environments. In this article, we will shed light on them and help you determine when and how to use virtual laboratories in your eLearning courses.Programming courses often use simulation tools to teach learners how to code. In this case, virtual training labs have compilers and code editors embedded in HTML pages, which enable learners to write, edit, and run code easily, all within an eLearning course.Web designers and developers can also benefit from such tools. They can apply major changes or create new features in a safe web environment, test them out, share feedback, and then move to the live version of their product or website. This way, they avoid disruptions to clients and product performance.
4) *Teacher Professional Development:* Teacher professional learning is of increasing interest as one way to support the increasingly complex skills students need to learn in preparation for further education and work in the 21st century. Sophisticated forms of teaching are needed to develop student competencies such as deep mastery of challenging content, critical thinking, complex problem-solving, effective communication and collaboration, and self-direction. In turn, effective professional development (PD) is needed to help teachers learn and refine the pedagogies required to teach these skills. However, research has shown that many PD initiatives appear ineffective in supporting changes in teacher practices and student learning. Accordingly, we set out to discover the features of effective PD. This paper reviews 35 methodologically rigorous studies that have demonstrated a positive link between teacher professional development, teaching practices, and student outcomes. We identify the features of these approaches and offer rich descriptions of these models to inform those seeking to understand the nature of the initiatives. Active learning engages teachers directly in designing and trying out teaching strategies, providing them an opportunity to engage in the same style of learning they are designing for their students. Such PD uses authentic artifacts, interactive activities, and other strategies to provide deeply embedded, highly contextualized professional learning. This approach moves away from traditional learning models and environments that are lecture based and have no direct connection to teachers' classrooms and students.

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5) *Assessment and Evaluation Tools:* Evaluation, as you know, is an integral part of teaching-learning process. It enables you to evaluate the instructional activities and learning achievement of children. The paper and pencil tests, unit and term end examinations, oral questioning techniques are some of the traditional evaluation methods. But the emergence of Tools has influenced evaluation methods. A simple example would be recording the marks of children in an excel sheet. Earlier the marks of children were recorded in paper sheets but today application softwares such as Microsoft excel are used to record it. It is to be noted here that the use of new tools in evaluation would be viewed on two dimensions; technology as a tool and technology as an assisting medium. Let us discuss two simple examples. A student using a video camera to record the teaching session would be an example of using technology as a tool while analysing the recorded video would be a case of using technology as assisting evaluation. Before moving further, you may go through the graphic, which will help you to differentiate the different types of evaluation. Computer programs automate assessment processes, including quizzes, tests, and grading, providing timely feedback to students and educators.

6) *Precision Agriculture:* Agriculture plays a vital role in the economic growth of any country. With the increase of population, frequent changes in climatic conditions and limited resources, it becomes a challenging task to fulfil the food requirement of the present population. Precision agriculture also known as smart farming have emerged as an innovative tool to address current challenges in agricultural sustainability.

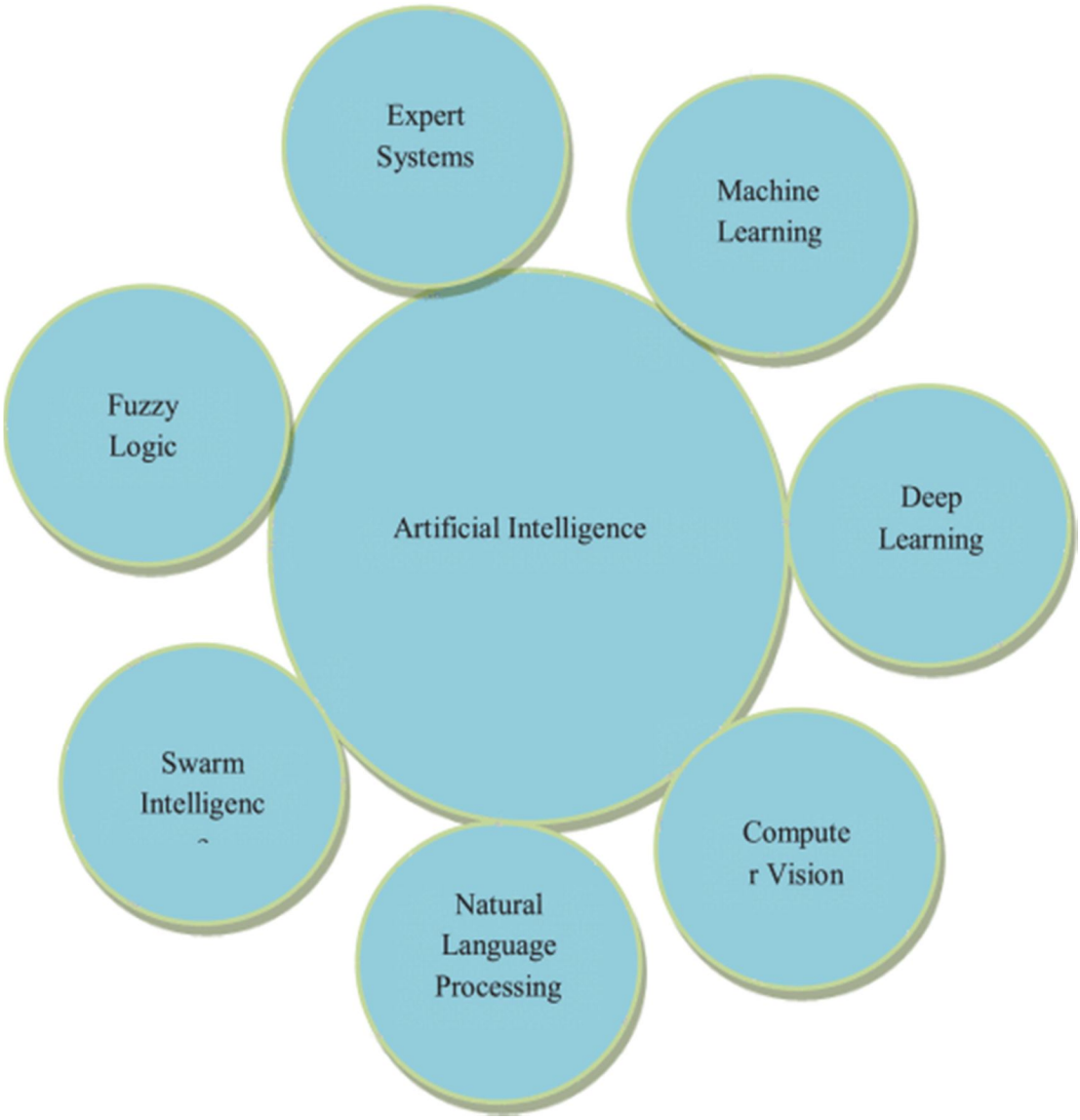


FIGURE 2.

B. Artificial intelligence techniques used in agriculture field.

Grain production plays an important role in the global economy. In this sense, the demand for efficient and safe methods of food production is increasing. Information Technology is one of the tools to that end. Among the available tools, we highlight computer vision solutions combined with artificial intelligence algorithms that achieved important results in the detection of patterns in images.

In this context, this work presents a systematic review that aims to identify the applicability of computer vision in precision agriculture for the production of the five most produced grains in the world: maize, rice, wheat, soybean, and barley. Computer vision systems are already widely employed in different segments of agricultural production and industrial food production. They can be used in grading systems for orange, papaya, almond, potato, lemon, wheat, corn, rice, and soybean. Its use is justifiable due to the benefits obtained. The use of such systems provides a simple and objective analysis of the samples, producing accurate descriptive data.Geographic Information Systems (GIS) and Global Positioning Systems (GPS) technologies are used to map fields, analyze soil variability, and create prescription maps for precise application of inputs.Remote sensing techniques, including satellite imagery and drones, provide real-time data on crop health, pest infestations, and environmental conditions, allowing farmers to make informed decisions and maximize yields while minimizing resource use.

1) *Farm Management Software:* Farm management software applications help farmers streamline day-to-day operations, including crop planning, inventory management, and financial record-keeping. These programs provide tools for tracking expenses, monitoring crop growth, scheduling activities, and analyzing profitability, facilitating efficient farm management and decision-making. Integration of farm management software with mobile devices enables farmers to access critical information and manage operations remotely, increasing productivity and responsiveness.
2) *Crop Monitoring and Decision Support Systems:* Computer-based crop monitoring systems collect and analyze data on plant growth, soil moisture levels, weather patterns, and pest populations. Decision support systems (DSS) use algorithms and models to interpret this data and provide recommendations to farmers regarding irrigation scheduling, pest management strategies, and crop rotation plans. Integration of DSS with sensor networks and automated equipment allows for real-time monitoring and adaptive management, improving crop yields and resource efficiency.
3) *Research and Development:* Computer applications support agricultural research and development efforts by facilitating data collection, analysis, and collaboration among scientists. Bioinformatics tools aid in genome sequencing, gene mapping, and genetic engineering of crops for improved traits such as yield, disease resistance, and nutrient content. Simulation models and computer-aided design (CAD) software assist researchers in studying crop growth dynamics, optimizing agricultural practices, and developing innovative technologies. Computer applications have greatly impacted food technology, revolutionizing various aspects of food production, processing, safety, quality control, and distribution. Here are some key areas where computer applications are utilized in food technology:
4) *Food Processing and Manufacturing:* Computer-aided design (CAD) and computer-aided manufacturing (CAM) software are used in the design and optimization of food processing equipment and production lines.Automation software controls and monitors food processing machinery, ensuring precise temperature, pressure, and ingredient ratios for consistent product quality.Process simulation software enables food manufacturers to model and optimize production processes, reducing waste and energy consumption while maximizing efficiency.
5) *Quality Control and Assurance:* Statistical process control (SPC) software monitors and analyzes production data in real-time, identifying deviations from quality standards and facilitating corrective actions.Computer vision systems inspect food products for defects, contamination, and adherence to specifications, improving quality control and ensuring consumer safety.Laboratory information management systems (LIMS) track sample analysis, test results, and regulatory compliance documentation, streamlining quality assurance processes.
6) *Food Safety and Traceability:* Food safety management software helps food companies comply with regulations and standards such as Hazard Analysis and Critical Control Points (HACCP) and Good Manufacturing Practices

V. CASE STUDIES OF ACADEMIC IMPLEMENTATION

A. Flipped Classroom Model

Instructors use LMS and online course platforms to provide lecture materials and readings that students review before class. Class time is then dedicated to interactive discussions, problem-solving, and hands-on activities.This model maximizes classroom interaction, encourages active learning, and allows for more personalized instruction.

B. *Blended Learning*

Blended learning combines traditional face-to-face instruction with online learning components. Students might attend in-person classes a few days a week and complete online modules on other days. This approach offers flexibility in learning, enhanced resource accessibility, and opportunities for self-paced study.

C. *Research Collaboration*

Researchers use tools like Google Drive, Zotero, and project management software to collaborate on research projects across institutions and countries. Facilitates global collaboration, improves project management, and ensures seamless sharing of data and resources.

VI. FUTURE TRENDS IN ACADEMIC IMPLEMENTATION

1) *Artificial Intelligence (AI) and Machine Learning:* AI-driven systems will enhance personalization in learning, predictive analytics for student performance, and automation of administrative tasks. These technologies can lead to more tailored educational experiences and improved efficiency in educational institutions.
2) *Virtual and Augmented Reality (VR/AR):* VR and AR technologies will provide immersive learning experiences, allowing students to engage in hands-on practice in simulated environments. These immersive technologies can significantly enhance understanding and retention of complex concepts.
3) *Blockchain Technology:* Blockchain can offer secure credentialing and record-keeping, ensuring the authenticity of academic qualifications. This technology can streamline administrative processes and enhance the security and transparency of academic records.

VII. CONCLUSION

The applications of computer programs in different fields of education are diverse and transformative. They enhance learning experiences through interactive tools, personalized learning paths, and efficient administrative processes. Computer programs facilitate virtual labs, simulations, and digital libraries, which enrich traditional education methods. In fields like STEM, humanities, and arts, they provide innovative ways to engage students and support deeper understanding of complex concepts. E-learning leverages these computer programs to deliver education beyond physical classrooms. It enables flexible, accessible, and self-paced learning environments. Platforms like Learning Management Systems (LMS), online courses, and virtual classrooms integrate multimedia resources, assessments, and communication tools, making learning more dynamic and student-centered. The correlation between computer programs and e-learning lies in their shared goal of enhancing educational outcomes. Computer programs serve as the backbone of e-learning, offering the necessary infrastructure and tools. The implementation of these technologies in academics promotes a more inclusive, engaging, and efficient educational ecosystem, preparing students for a technologically driven world.

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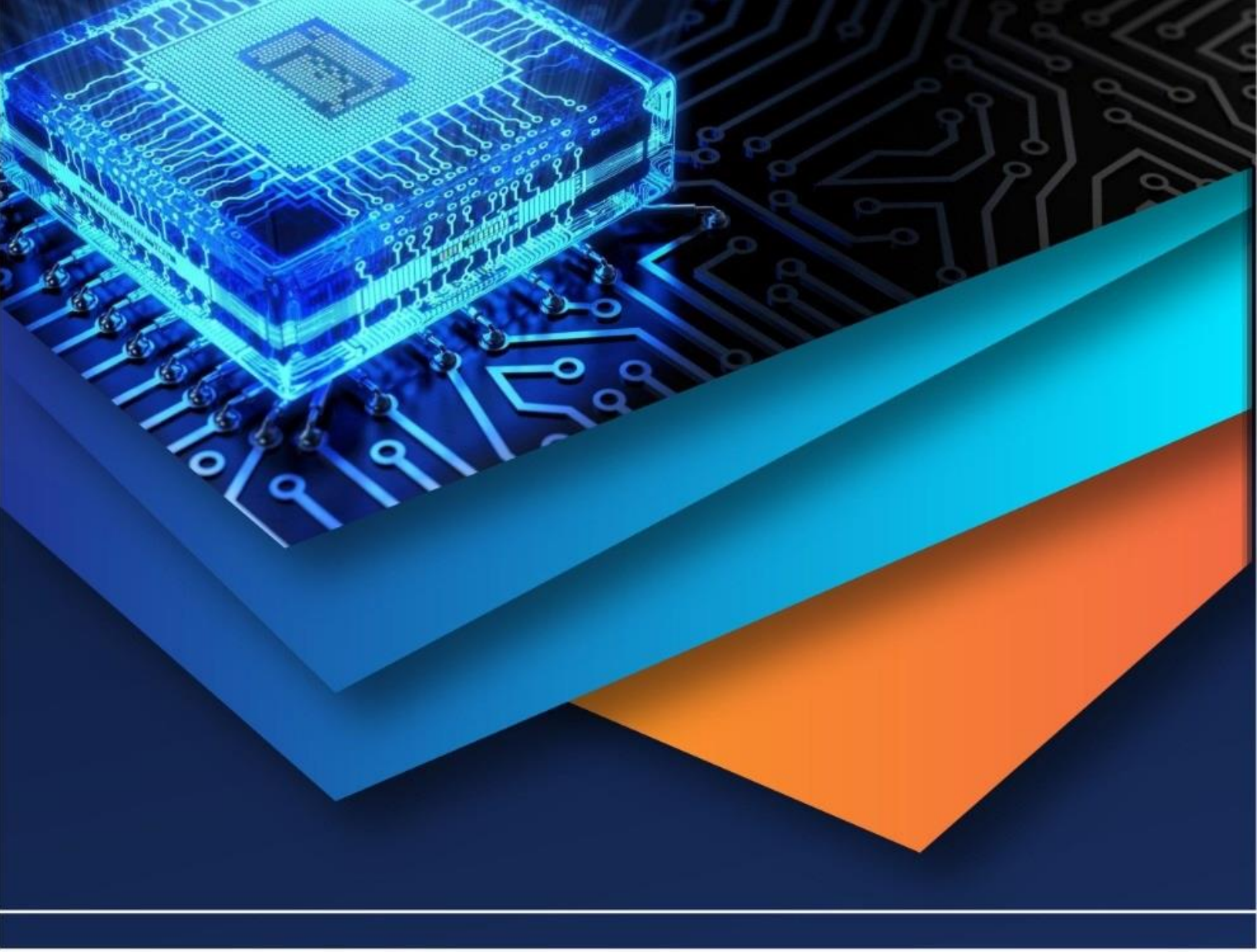
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