# ABSTRACTS

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## Innovations and Creativity

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# A Review of Business Information Systems Discipline: Still Toddling

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**Abstract**: Business Information Systems (BIS) is a professional discipline that combines Computer Science, Management, and Business Administration. In this article the researchers evaluate the evolution of BIS curriculum in terms of its past, present and future, considering its historical background, the existing strengths and weaknesses, and how it can be developed to meet market needs. The study reveals the skills required by a BIS graduate and highlights how the existing/existed BIS curricula have made their graduates weaker when compared with Computer Science and Business Administration specialists. The research further compares the existential crisis of BIS with Library and Information Science (LIS) discipline, which have also faced a similar controversial crisis concerning their disciplinary boundaries, whether it belong to Social and Behavioral Sciences or Computer Science and Engineering and yet succeeded in its growth and contributions. This research concludes that the BIS curriculum is still budding and needs to be re-evaluated and updated regularly to meet the changing demands of the market highlighting the need for collaboration between academia and industry to ensure that BIS graduates are equipped with the skills that employers require. The paper finally proposes a balanced model of BIS curriculum that incorporates the latest technology updates. The proposed curriculum model aims to address the current gaps in BIS education and meets the changing demands of the market.

**Keywords**: Business Information Systems, Computer Science, Business, Management, Academic Programs, Curriculum Development, Graduates, Competencies

# A Qualitative Comparison of the State-of-the-Art Next-Best View Planners for 3D Scanning

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**Abstract**: Next-best view planners are algorithms that are used to determine the optimal camera pose and orientation to observe an object. These planners aim to maximize information gain, minimize occlusion, or improve object recognition and reconstruction by selecting the next best perspective. In this paper, next-best view planners are reviewed with the focus on their application in solving autonomous 3D scanning task. The goal is to provide a qualitative comparison of the state-of-the-art next-best view planners for the 3D reconstruction application. To achieve it, a dataset of high-resolution 3D models is assembled. A comparison framework involving ROS and Gazebo is proposed. Of the six state-of-the-art methods evaluated, two apply machine learning. Using the 3D model dataset, a deep neural network is trained to solve the next-best-view planning problem. Deep neural network results, reinforcement learning results, volumetric information gain method results and a measurement-based approach to next-best view planning results are compared.

**Keywords**: Next-Best View, Gazebo, ROS, 3D Scanning, Deep Learning

# Digital Transformation and Dematerialization of Municipalities

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**Abstract**: Reducing paper use and increasing digital competencies is becoming increasingly important, especially in municipalities. Reducing the use of paper has significant benefits, including cost savings, increased efficiency and improved transparency. In addition, digitising processes and documents minimises the environmental impact and increases the availability of services, especially in remote municipalities.

As technology advances, everyday tasks and processes are increasingly made digitally. In the available digital public services field, Latvia took 11th place in the European Union in 2022, which is above the average level. However, for municipalities to fully implement a digital transformation, employees must be ready to take advantage of these opportunities.

In this study, a survey of 89 Liepaja municipality employees was conducted to determine their level of digital skills. Digital skills were assessed using a framework of 5 digital competencies.

**Keywords**: Paperless Management, Digital Skills, Circular Economy

# Design and Optimization of an Ultrasonic Cleaning Device for Sand Removal from Furcellaria lumbricalis

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**Abstract**: The macroalgae species Furcellaria lumbricalis can be cleaned with ultrasonic technology. The algae on sand particles are eliminated by ultrasound equipment by vibrating the water with sound waves. Furcellaria lumbricalis, a macroalga, contains sand and other contaminants that can harm subsequent processing machinery. These contaminants can clog equipment and hinder regular operation, which results in longer processing times and poorer efficiency. They may also shorten the equipment's lifespan and increase maintenance expenses by causing wear and tear on it. The product's quality can suffer, and its shelf life can be shortened by sand particles and other contaminants. To ensure safety, quality, and effectiveness during further processing, it is crucial to get rid of these contaminants first. The procedure for using an ultrasound device to clean the macroalgae Furcellaria lumbricalis is covered in this study, along with the benefits and drawbacks of this technology.

The ideal ultrasonic frequency for cleaning macroalgae of sand impurities would depend on the size of the impurities to be cleaned. For the removal of particles between 0.1 and 1 mm, frequencies between 20 kHz and 50 kHz are typically utilized. Sand particles can range in size significantly in the Baltic Sea, from very small ones (less than 0.063 mm in diameter) to large ones (up to 1 mm in diameter). A 50 MHz ultrasound equipment is required for research purposes. Experimental stand can be seen in **fig.1.**

Experimental stand was designed and produced to test different factor influence on algae washing quality. There are two stations on this stand, first station for operator to insert sandy algae into algae tray and to remove cleaned algae after washing, second station serves to insert algae tray in water tray and make washing in different regimes. It is possible to test different factor influence on algae cleaning amount and quality: algae density in algae tray, vertical movement influence, rotation movement influence, ultrasound influence, washing time influence. The stand operates cyclically, washing regimes programmed by PLC.
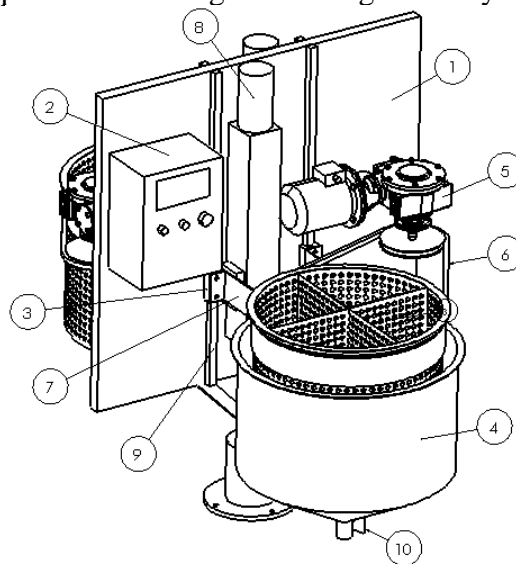


**Figure 1.** Experiental stand for algae washing: 1 – frame with option to rotate; 2 – electric PLC box to activate washing regime; 3 – carriage for algae tray vertical moving; 4 – water tray; 5 – electro drive with reducer to turn algae tray in water; 6 – belt to transmit motion; 7 – algae tray holding frame; 8 – electro drive for linear vertical algae tray movement; 9 – rails for vertical movement; 10 – tap to remove sand surplus;

**Keywords**: Ultrasonic Technology, Furcellaria Lumbricalis, Sand Particles, Experimental Stand

# The Importance of Standards in Software Testing

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**Abstract**: This article emphasizes the significance of software testing standards, where we discuss various standards' advantages and disadvantages, and their impact on software testing.

**Keywords**: Standards, Software Testing

# Enabling How Digitalization for Facilitating the Circular Economy: Digital Tools and Mechanisms

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**Abstract**: The circular economy model is actively implementing in Europe at the current stage of economic development, taking into account the Sustainable Development Goals 2030 and the emergence of new digital opportunities. Potential benefits of decoupling and implementing the circular economy are saving energy and resources, reducing carbon emissions, creating new jobs, modernizing economic structures, evolving business models, and increasing global competitiveness. (Tapio, 2005). The externalities of traditional production and consumption patterns are changing the way people, companies, and even countries achieve sustainable development.

Today, sustainability receives attention in social, economic, and environmental discussions (Nasiri and others, 2017). The dilemma of environmental damage and resource depletion is an urgent problem we must face which creates new challenges for economies (Ghisellini and others, 2016). At the same time, new trends are changing the way companies work, allowing innovative business models and value creation.

Digital technologies can help to improve resource efficiency by enabling better tracking, monitoring, and control of material flows, as well as optimizing production processes and logistics. By collecting and analyzing data on material flows and usage patterns, businesses can identify areas for improvement and implement more effective circular strategies. Digital platforms can facilitate resources exchange, enable businesses to reduce waste and costs, increase productivity. Also, digitalization enables greater transparency and traceability throughout the value chain, improving accountability and supporting more sustainable practices.

The aim of the study is to understand the main opportunities and challenges of using digital tools for implementing the circular economy strategies. Thus, we formulate two research questions:
1. What is the main role of digitalization in functioning of the circular economy?
2. What are main opportunities and challenges of the using digital tools for the functioning of circular economy strategies?

This research study uses a systematic literature review approach to answer these two questions and proposes a framework to digitalization and circular economy integration and underscore mechanism disclosure. Furthermore, the results identify future research needs and highlight directions that can be used to explore specific digital opportunities for specific circular economy strategies.

**Keywords**: Circular Economy, Digitalization, Strategy, Sustainable Development

# Digital Learning Platforms: Advancements and Effectiveness in Education

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**Abstract**: The integration of technology in education has resulted in the widespread use of digital learning platforms. Online courses, virtual classrooms, and webinars are one of the ways technologies can be used in education. One of the most advanced technologies in education is tools like virtual and augmented reality (Elmqaddem N., 2019), which can provide an immersive and interactive learning experience. Digital media, game-like elements, online quizzes, and tests are among the technological advancements in education.

Developed countries have seen a rise in the use of technology in education, with a growing number of schools and universities incorporating digital learning platforms, online courses, and educational software into their curriculum (Haleem A. et al., 2022). There has been a growing emphasis on Science, Technology, Engineering, and Mathematics (STEM) education in developed countries, with a focus on preparing students for careers in these fields. Furthermore, there has been a shift towards personalized learning in education, where students receive instruction that is tailored to their individual needs and learning styles.

The pandemic has accelerated the expansion of online education, with more schools and universities offering online courses and programs to meet the needs of students who are unable to attend in-person classes. That has opened opportunities for blended learning where many schools and universities are combining traditional in-person learning with online learning through blended learning models, which offer the benefits of both approaches (Rasheed R. et al., 2020).

Despite the digital learning platform's popularity, there remains a need to better understand the effectiveness of these platforms in facilitating student learning. For example, a lot of data is available on every digital learning platform and this data can be studied for a better understanding of the learner's behavior on the platform. Furthermore, the data can help not only develop the usability of the platform but also identify strengths and weaknesses of a course, and monitor individual student progress and data can be used to refine teaching strategies in the digital learning platform (Abuhassna H. et al., 2020).

**Keywords**: E-learning, Technology in Education, Digital Learning Platforms, Online Education, Big Data

# Digitalization of Investments and Economic Security: Modern Challenges

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**Abstract**: The digitalization of investments is the use of information technology for investment activities, can have both positive and negative consequences for economic security. On the one hand, the digitalization of investments can help increase the transparency and efficiency of investment operations, speed up decision-making processes and improve the availability of investment tools for a wide audience of investors. This can lead to increased investment, the development of the financial market and the strengthening of economic stability. On the other hand, the digitalization of investments may increase the risks to economic security, since with the growth of the use of digital technologies, the likelihood of cyber-attacks and fraud increases. In addition, increased automation of investment processes can lead to increased vulnerability to technological failures and cybersecurity situations, which can lead to the loss of investor funds and reduce confidence in the financial market as a whole. To ensure economic security in the context of digitalization of investments, it is necessary to take measures to strengthen cybersecurity and increase the protection of investors' personal data, as well as conduct regular monitoring activities and develop tools for early detection of potential threats. In addition, it is important to develop the competencies and training of employees working in the field of digital investment in order to minimize the risks of the human factor. The digitalization of investments has a direct impact on cybersecurity, since the use of digital technologies leads to an increase in the volume of digital data, its transmission and processing, which can create new vulnerabilities and risks for cybersecurity. To ensure cybersecurity in the context of digitalization of investments, it is necessary to conduct regular monitoring and audit of the security system, provide qualified personnel, use modern methods and technologies for protecting information, and comply with international standards and requirements in the field of cybersecurity. There are several ways to improve the security of digital investment processes:

- Multi-Factor Authentication: Using multiple authentication factors (such as a password and biometrics) can reduce the chance of unauthorized access to investor data.
- Data Encryption: The use of data encryption in transit and at rest can reduce the possibility of unauthorized access to data and prevent theft of an investor's identity.
- Regular software updates: Software and operating system updates can reduce the chances of vulnerabilities being exploited by attackers to gain access to an investor's system.
- Security Monitoring: Regular security monitoring can help detect potential threats before they become real threats and take timely action to prevent them.
- Staff training: Training of staff who have access to investment data can help prevent errors that could lead to the leakage of confidential information.
- Use of modern technologies: The use of modern security technologies such as DDoS protection, intrusion detection, and user behavior analysis can help improve the security of digital investment processes.

- Compliance with international standards: Compliance with international standards and cybersecurity requirements can help improve the security of digital investment processes and protect the investor from potential threats.

However, the digitalization of investment may also exacerbate global conflicts and lead to more dangerous forms of warfare. For example, the use of cyber-attacks and cyber espionage can have a significant impact on the outcome of military conflicts, including electronic combat support, command and control systems and communications.

**Keywords**: Economic Security, Digital Economy, Transformation, Investments

# Digital Technology Solutions for Future Education in Action

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**Abstract**: Higher Education Institutions should do what will be important in 20 years.
- Should know how to learn at least 10 times faster.
- Must create a set of knowledge that would lead to an increase in productivity above the EU average.
- Should consider that the production of more complex products leads to faster accelerated growth.
- Should remind more and more often that with a good education people can avoid the middle-income trap.
- Various barriers must be removed to ensure that everyone has access to the world's best e-learning content and e-learning methods.
- The technology must be scalable so that it fits well into the traditional culture of Latvia.
Responding to the challenge, 5 Latvian universities combine their previous 20-year experience and implement an ambitious digital education project – EduAim:
- Knowledge acquisition monitoring technology created at the Distance Learning Study Center of Riga Technical University;
- Vidzeme University of Applied Sciences - virtual and augmented reality technology;
- Rēzekne Academy of Technologies – facial recognition technology;
- University of Liepāja - personalized scaling technology;
- Daugavpils University - educational methodology;
- Latvian Maritime Academy - a vision of modern education in complicated conditions.
Five Latvian universities are creating a new education model for the digital era - EduAim. EduAim uses all learning process data and their visualizations to determine the relevance of the new content to the learner's needs. It allows to make timely changes to the learning content if necessary. In the EduAim project, we cooperate with World leaders in e-learning - Coursera and EdX. The results of the trials show that modern education can become particularly attractive and inspiring.

**Keywords**: Digital Technology, Solutions, Education

# Digitalization – A Highway to Added Value

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**Abstract**: Theme will include practical examples how heavy, dangerous, routine or administrational tasks can be handled by automated or digitalized solutions. Such approach provides opportunity to dedicate time, energy and potential to added value activities, such like communication, building and implementing strategy and tactics, data based decision making and sustainable operations

**Keywords**: Digitalization, Added Value

# Integrating Sustainable Development Goals in Curricular Units through Innovative Teaching Methods at HEIs

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Abstract: The paper presents a theoretical discussion on the practical possibilities of integrating Sustainable Development Goals into the curricula at the Higher Education Level. The SDGs set by the United Nations in 2015 outline the world's acute problems. Higher education is one of the components of the fourth goal, oriented toward ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. However, Higher Education has broader potential to unite the goals under one umbrella through implementing the SDGs in curricular units, not just being one of the components of the SDG itself. Meanwhile, considering the two critical questions arising in the OECD project, which orient on the knowledge, skills, attitudes and values that the students will need in the future, also stay prominent. Implementing the SDG aspects combined with the 21$^{st}$-century skills, which are tightly connected to the lifelong learning concept, remain challenging. Bringing real-life connected aspects to the classroom becomes possible through innovative teaching methods. According to the backward design principles, *how* we teach becomes more crucial and prominent than *What* we teach (Wiggins and McTighe: 2005). The Value and Knowledge Education method, as a didactical approach orients on moral issues and the moments of improving value associated aspects through a dilemma-based teaching style. The method combines several steps to establish dilemma-based communication (Patry: 2017) and tries to bring the real-life connected moments to the classroom and the classroom to life. The method can be considered as an integrative teaching approach since it can be freely tailored to teach the SDGs with the moral and dilemma connected aspects. The method provides the learners with the elements of reflecting on values and their implementation diversity in specific situations, critical thinking, the possibility to work in groups and autonomously, the questions to discuss and the possibility to get the knowledge relevant to the topic through bringing real-life aspects into the classroom.

**Keywords**: SDGs at HEIs, Lifelong Learning, Values and Knowledge Education

# Object Continuous Counting Device Based on IR Technology

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**Abstract**: An object counter is a device that helps read objects using sensors. This device is mainly used on conveyor belts to find out how many items were delivered on the belt. The number of objects is displayed on a digital scoreboard or computer program. The work describes the principle of operation of the device, its scheme, device development and error correction. A list of components was made to supply, build and solder to the circuit board. The paper analyzes the performance of the developed device, including the quality of the obtained data, the quality of object recognition and the influence of shape on recognition.

**Keywords**: Object Continuous Counting Device, IR Technology

# The New Curriculum And its Impact on The Content of Competitions in Mathematics and Physics

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**Abstract**: Since 2016 the National Centre for Education of the Republic of Latvia (NCE) develops and introduces the project "Competence approach to curriculum" (Skola2030). The goal of the project is to develop, approve, and successively introduce in Latvia such a curriculum and approach to education, which would develop value-based knowledge, skills and attitudes necessary in the 21st century.

For the first time the curriculum is reviewed as a whole by introducing a competence-based approach, in a uniform system and successively at all levels of education, starting from the age of one and a half and up to grade 12.

Within the project "Skola2030" is renewed curriculum and developed samples of subject programs. It contains more or less changes in various subjects compared to the previous syllabus. This also affects the content of subject Olympiads.

In the report will be analyzed changes in physics and mathematics curriculums and their impact on the development of problems for Liepaja University Olympiad in mathematics and physics and will be analyzed results of this Olympiad in 2023.

**Keywords:** Changes in Curriculum, Competence Approach in Education, Mathematics and Physics Competitions

# Visual Search in Interface Perception Process

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**Abstract**: Although the relation between the features, their number and search time, has been intensively studied (for an overview see: Wolfe, 2010, 2020), there are very few experiments demonstrating the characteristics of eye movements in the process of different types of visual search. The aim of the current study is to examine how the sequence of properties describing an element affects gaze path and fixation time in a search task. According to our results, the order in which properties were described was not a determining factor and did not affect the results. However, search time significantly (from 0.32 to 0.69 seconds) increased as more conjunctive properties were introduced in the search task, specifically when the color of the target element was added to the distractor elements. In contrast, search time increased and search paths became more complex guiding the fixations through the distractor elements with the same color as the target. Additionally, we were able to observe that the sex was an important factor: males, on average, found the target element slower than females. In one stimulus, this difference reached 25%. The distance between the target element and the center of stimuli also affected the search time. Finally, our results indicate that the stimuli order was important, as participants showed a learning effect with consecutive stimuli. Search time decreased by 0.1 second with each consecutive stimuli, while introducing more difficult search task by adding another conjunctive property increased search time on average by 0.56 seconds.

**Keywords**: Visual Search, Visual Perception, Search Time, Distractors, Learning Effect

# An Automated E-material Formatting Tool Prototype and Recommendation Testing

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**Abstract**: Methodologies with recommendations and an automated e-material formatting tool based on fundamental principles of visual science and with a user-oriented approach developed as an answer to the global problem of social health issues that comes from vision fatigue from digital screens and a big near work load.

There have been created testing strategies of developed technical solutions and conducted testing. During the testing process, users' journeys have been tested from the start as app opening till the end as closing the app with several alternative ways in the journey. Strategies and testing were successful.

There have been developed experimental testing plans and strategies for recommendations and methodologies testing. Based on that, preliminary research is conducted. New recommendations show improvement according to the primary goal of reading digital materials based on results of reading time, memorization capacity and eye-movement recordings.

**Keywords**: App Prototype, E-material, Formatting Application, User-oriented, Testing

# Development of an Application for Determining the Valence and Intensity of Affective Voice Signals

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**Abstract**: Happiness and anger represent opposite valence affective emotions. The message conveyed in emotional or angry prosody can impact communication outcomes. Verbal communication is essential to education and work environments, where the human voice plays a crucial role. The Speech and Voice Research Laboratory at Liepaja University has launched a new interdisciplinary research project "Affective and disordered vocal stimuli neural processing during mobile task: an EEG study". This study investigates the impact of emotional prosody and disordered voice on the neural processing of verbal instructions during motor task performance. Thirty-two age-matched listeners (16 males, 16 females, age range 18-59 years) listened to 270 voice samples (120 words, 120 phrases, 30 paragraphs) produced in neutral, happy, and angry intonation by ten professional actors (5 males, 5 females). All voice stimuli had neutral content. The respondents were requested to choose one of three emotions after listening to the stimuli and determine the level of expression of the emotion by using a Visual Analog Scale. The vocal stimuli most representing the target emotion according to the participants' ratings were included in the second part of the study.

The application was developed for the data processing with aim to discriminate voice signals of different emotional valence and detect level of arousal. The application requirement specification, user interface design, and quality dimensions were defined during the application design process. The approach used to evaluate the quality of the data collected and utilized in the project consisted of three components: the data object, quality requirements, and quality evaluation process. The application was developed using the programming language Python.

The application design description and the data quality evaluation will be presented at a conference.

**Keywords**: Voice, Affective Emotions, Data Quality, Application Design, User Interface Design

# Methodology of Industrial Enterprise Environmental Security Assessment

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**Abstract**. The industrial enterprises environmental security management system is built in the article. It will ensure the implementation of enterprise socio-environmental and economic goals. The process of indicators system building of industrial enterprise environmental security was improved. It made possible to diagnose the industrial enterprise environmental security state and to form indicators system. The industrial enterprise environmental security level as an integrated indicator is determined. This indicator is based on a set of social and economic, technical and technological, scientific and innovative, organizational and management indicators.

**Keywords**: Environmental Security, Socio-ecological and Economic Security, Environmental Security Management Process

# Development of Artificial Intelligence-Enhanced Competency Framework on Digital Skills

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**Abstract**: Data is constantly produced and consumed, so need exists to understand and analyze relevant data flows . Introduction of modern digital technologies requires improvement of quality of human capital . Utilisation of disruptive digitally enabled technologies requires certain skills, knowledge, and attitudes. Skills', knowledge, and attitude development is core in professional development of any specialist. In current research, civil protection personnel are considered as a target auditorium for whom a competency framework will be developed. Scoping review did not reveal any digital skills competency frameworks for these specialists, so the research will create added value. A competency framework facilitates the identification of training needs and guides the design of a professional development program . In current research, identified competencies will not just shape a static framework, but will be used as a basis for creation of an updatable (living) digital competency framework for civil protection personnel. Updatability shall be ensured by means of feeding the manually identified competencies from the framework to an artificial intelligence algorithm, that would be able to conduct further text mining to identify new competencies related to previous ones already included in the framework. New, highly relevant competencies identified by means of text mining will become a part of an automatically updated framework. Main research question is whether it is per se possible to create an automatically updatable digital competency framework for civil protection personnel that would cover all levels of responsibilities, all areas of activities, and all currently existing digital technologies. To answer the question, a use-case will be developed around digital skills required to utilise Sentinel satellite data. When framework part related to area of competencies relevant to Sentinel programme will be populated with keywords, the automation part of the study may begin. A machine learning model shall be developed to further perform independent text-mining and keywords' identification. Output shall be evaluated using the classification accuracy of the model that was trained on previously collected data. Evaluation shall be based on creation of misclassification table for the practical group (actual group) and the prediction group (classification group).

**Keywords**: Artificial Intelligence, Competency Framework, Digital Skills

# The Emerging Field of Sports Supervision as an Approach to Reflective Learning and its Extension to Novel Technical Affordances such as Virtual Reality

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**Abstract**: The research proposes to apply emotional intelligence theory to existing methods and techniques in the practice of supervision and counseling in order to better understand how to support supervisees in professional football to notice, recognize, understand, and manage their emotions, and develop reflective learning, using cinematic virtual reality.

The author proposes that it would improve results in the development of emotional intelligence by using cinematic virtual reality combined with a real human supervisor in a variety of scenarios which are investigated in the author's research prototypes. Approach uses non-representational virtual reality content such as color, artworks, metaphorical imagery, and musical sounds. At this stage, the author's approach includes the author's self-reflection by studying content in virtual reality and analyzing emotions.

In the course of the work, it was found that supervision in sports is a new area. The author of the research sees several significant reasons why it can be valuable to use virtual reality in sports supervision.

Being relatively new, the field of sports supervision is continually developing and has already experimented with the use of audio-visual tools in supervisory practice. Nowadays, in professional sports, new technologies are used specifically for physical development. High achievements in professional sports depend on a high level of reflective ability and on the mental development of football players, coaches, and referees. Therefore, it is important to start introducing and using new creative technologies for mental development in sports.

**Keywords**: Sports Supervision, Reflection, Virtual Reality, Emotional Intelligence, Football, Mental Health

# Heuristic Evaluation of AI-Powered Web Accessibility Assistants

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**Abstract**: Web-based services occupy an increasingly large place in the life of people around the world. Users with disabilities may find it difficult to use many websites and platforms due to technical barriers. To improve access to websites, the international organizations like International Organization for Standardization (ISO), European Telecommunications Standards Institute (ETSI), or World Wide Web Consortium (W3C) develop web accessibility standards and guidelines, which provide an introduction to accessibility issues. By following some basic recommendations, any website and platforms can become a good environment for exchanging information and to digitally include people with disabilities. Due to rapid development of artificial intelligence (AI) recent 5 years and its application in various sectors (e.g., game industry, e-commerce, facial recognition systems, agriculture, financial and economic sectors, cyber security, education, etc.), this also implies its application to help people with special needs to ensure digital accessibility. In this regard, the aim of this paper is related to proposing an evaluation method for heuristic evaluation of AI-powered web accessibility assistants. The method was tested using AI-powered accessibility assistants. The paper's objectives are: (1) literature review of accessibility evaluation heuristics and decision-making methods to determine the weight of evaluation criteria; (2) literature review of artificial intelligence application in web accessibility practices; (3) evaluation of selected tools based on the proposed method to prove its applicability. The method has been tested by heuristic evaluation of AI-powered accessibility assistants for websites. Web accessibility, measured in number of errors and alerts by applying WAVE tool, was compared before and after accessibility assistants were enabled.

**Keywords**: Accessibility Automation, AI Accessibility Support, Digital Inclusion, Heuristic Evaluation, Decision Making Methods

# Influence of Educational Policy Decisions on Education of Mathematically Gifted Children: Analysis of Lithuanian Case

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**Abstract**: The aim of the article is to present the results of research on influence of decisions of educational policy on education of mathematically gifted children. Scientists had created models of giftedness where environmental factors have influence on realisation of potential of gifted children (Gagne, 2004, 2021; Heller, 2001). In Recommendations 1248 on education for gifted children (Assembly debate on 7 October 1994) is stated: gifted children have special needs and in educational system special arrangements have to be made. This shows the necessity of gifted children educational system. The demand to create such system is especially intense in countries that have suffered restrictions of ideological nature. In Soviet Union ambivalent attitude towards gifted children existed (Babaeva, 1999) – on one hand, enough numerous olympiads, competitions (in different subjects, musical, sport, and others) were organised, on the other hand, total overall ideology of equality obtained. One of the elements of a theoretically based model of a system of education for gifted children, which includes all levels of educational reality, is the legal framework, which needs to be properly arranged (Narkevičienė, 2000). Empirical data were collected periodically, and the study of the situation of education of mathematically gifted pupils was carried out using the same research methods. The first empirical data were collected in 2004, during the preparation of the "Strategy for the education of gifted children and youth". In December 2005, the Lithuanian Minister of Education and Science approved this strategy by law. Subsequently, other education policy documents on the education of gifted pupils were approved by the Minister of Education and Science by means of orders of the Minister of Education and Science: the Programme for Gifted and Talented Children and Young People, 2006; the Programme for Gifted and Talented Children, 2009; the Action Plan for the period 2014-2016 for the Development of a System for the Search and Identification of Gifted Children, and for the Increase of Access to Schools for these Children, 2014. This paper presents the changes in Lithuanian education policy towards gifted education and in this context provides comparative analyses of changes in the education of mathematically gifted children. Methods used: document analysis, analysis of scientific literature, comparative analysis

**Keywords**: Mathematically Gifted Child, Educational Policy, Change

# The Effect of Biostimulant Derived from Fermented Furcellaria lumbricalis Algae Extracts on Seed Germination

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**Abstract**: Biostimulants include a diverse range of items that include compost, chitin-containing goods, microbiological agents, blends of these agents, and extracts from seaweed. To make plants more resistant to abiotic conditions including high winds, cold, drought, heat, and an abundance of salt in the soil, plant growth enhancers are used. The Baltic Sea shore is where the seaweed needed to produce biostimulants is found. Algal constituents have a direct impact on the metabolism of plant cells that have been treated. The scientific literature describes the beneficial benefits of algal extracts on plants, including better germination, higher yields, improved resilience to cold and diseases, increased mineral intake from the soil, and longer fruit storage times. Biostimulant production through anaerobic fermentation process also results in the production of biogas that can be used for energy generation. This is useful in the processing of algae, creating a closed loop system for energy utilization. The developed biostimulant can be used in organic farming what is particularly important in a future perspective.

In the biostimulant preparation process, 25 L of purified algae material was placed in a small 30 L biogas anaerobic fermentation device equipped with electric heating and a thermostat (precision ± 0.5°C) on February 6, 2023. The working temperature was set at 50°C, and the biostimulant was prepared at concentrations of 12%, 6%, and 3% After the biostimulant preparation nitrogen content and exchange acidity level were determined. The primary evaluation was performed in an automatic greenhouse that supplies controlled conditions for plant growth - the necessary light intensity, temperature, humidity, and air exchange. Observation data were recorded using photo fixation method and simple mathematical calculations.

The 12% biostimulant-treated seed trays showed the fastest seed germination at the beginning of the evaluation and the highest number of germinated seeds at the end, with a germination rate of 78.7%. Seed trays treated only with water, without the addition of biostimulant, showed the second-best results for germinated seeds at the end of the evaluation. The germination rate was consistent throughout the evaluation period, but the percentage was 1.25% lower. It should be noted that the evaluation was conducted on a small scale, and scaling up the experiment may result in greater percentage differences.

The data obtained from seed trays treated with 6% biostimulant concentration were lower than the results of reference seed trays, but seed germination was consistent.

In the seed trays treated with 3% biostimulant concentration, the final evaluation result showed the least number of germinated seeds compared to higher concentrations, but an interesting growth pattern was observed where the seeds germinated later than in trays treated with 6% and 12% biostimulant concentrations.

Based on the obtained data, conclusions were made about the effects of biostimulant concentration on seed germination in substrate. The first evaluation showed that the use of the biostimulant 12% concentration accelerates seed germination at its initial stage, which cannot be said for the use of 3% and 6% concentrations. This means that the visible effect of the biostimulant, according to data, begins with the use of the 12% concentration. It is positive that plants treated with

biostimulant concentrations of 3%, 6%, and 12% show greater visual stress resistance to drought before watering. The treated plants with biostimulant are not heavily dry, unlike the reference plants, where plants are significantly dried.

# Forms of Electronic Identification and Impact Assessment of the Risks Associated with Them

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**Abstract**: Integrating digitization into all economic sectors and society's life, among other things, gives people the opportunity to request and receive electronic services in the digital environment, which in turn increases the welfare of society by saving personal time and material resources. However, at the same time, electronic identification, which provides a person with the opportunity to request or receive an electronic service, is associated with risks that can create potential threats to the security of personal data and cause material losses. In addition, certain groups of the population, especially senior citizens, face a problem regarding the availability of the service, i.e. in cases where the provision of the service is completely transferred from face-to-face to the digital environment. It was concluded that not every member of the society has access to all types of electronic identification, which are comparable to checking the identity of a natural person in person, as well as a part of the population lacks skills and understanding of the use and use of electronic identification means to meet their needs, which in turn exposes certain groups of the population to social exclusion at risk.

In view of this problem, this article deals with the issue of the forms of electronic identification in Latvia, assessing the level of risks associated with them and the impact on the protection and welfare of personal data.

The aim of the study is to promote the development of public knowledge. The results of the scientific study can be useful for professionals associated with risk management in the digital environment, as well as for national and local government staff implementing the Digital Transformation Guidelines.

**Keywords**: Personal Electronic Identification Data, Electronic Identification, Electronic Identification Tool, Electronic Service, Digital Environment

# Comparative Analysis of Robustness of Bayes Neural Nets and Monte Carlo Dropout Methods

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**Abstract**: This paper compares three Bayesian algorithms, Bayes by Backprop, Variational Inference, and Monte Carlo Dropout, in terms of uncertainty measures and robustness to noisy data. Research aims to identify the strengths and weaknesses of each method in order to guide practitioners in selecting the most suitable algorithm for various applications. The paper reviews the theoretical foundations of each algorithm and describes the experimental setup, which involves mixing labels for the mushroom classification data set from 0 to 40% of the training data. The algorithms' performance is evaluated based on their uncertainty estimates, predictive accuracy, and robustness. The Experimental results reveal that the Variational Inference algorithm maintains a very stable 94% accuracy even with up to 30% mislabeled data. However, the Bayes of backprop and Monte Carlo dropout algorithms experience a greater fluctuation of accuracy with increasing noise, and the Monte Carlo dropout algorithm being able to maintain a high 90.5% accuracy even in a 40% mislabeled training data scenario.

**Keywords**: Bayes by Backprop, Variational Inference, Monte Carlo Dropout, Bayes Neural Network, Deep Learning

# Selecting Most Suitable Options for Grading Laboratory Exercises Automatically

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**Abstract**: In this study different environments for automatic grading of laboratory work are compared by certain criteria such as registration in learning environment, tutorials, ease of use, grading, feedback, etc. Authors made several examples of how the three grading models can be adapted using a test activity, h5p or similar options in moodle, google classroom, live worksheets, MS excel. These environments were chosen because they are often used in high schools and universities. Based on the comparison of different environments educators can choose which leaning environment is best or more suitable for specific needs. The results show that there does not exist a perfect environment for automatic grading because answers or descriptions that are written in free form cannot be graded without teacher interaction. Authors give examples how each part of a laboratory work can be adjusted so it could be automatically graded therefore educators can adjust laboratory worksheets and choose which parts grade automatically. An online worksheet – laboratory protocol is necessary because often students are learning remotely, and it is more comfortable for both teachers and students to use virtual learning environment.

**Keywords**: Grading Laboratory Exercises

# Using Large Language Models to Improve Sentiment Analysis in Latvian Language

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**Abstract**: This study explores the use of large language models (LLMs) in sentiment analysis and presents a new approach for creating a Latvian language dataset using Reddit data. By engineering prompts for the GPT-3.5-turbo model, we achieved over 80% accuracy that surpasses previous research on this data set by 50% in three-class sentiment analysis. We demonstrate that LLMs can partially replace human labelers, making dataset creation more cost-effective, especially for larger datasets. Our findings confirm the LLM's deeper understanding of language. However, LLMs occasionally deviate from response templates, making parsing challenging. Future research should investigate alternative models for sentiment analysis in Latvian, analyze language patterns, and explore LLM-generated datasets to fine-tune existing models. This work contributes to advancing sentiment analysis in non-English languages, leveraging the power of LLMs. The created dataset contains over 90000 samples making it the largest available sentiment data set for Latvian language.

**Keywords**: Large Language Models, Sentiment Analysis, Dataset Creation, Latvian Language

# Investment and Innovation Policy Role in the Context of the Formation of a Circular Economy

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**Abstract**: In conditions of limited resources and unlimited needs of mankind, the formation of a circular economy, which is aimed at energy saving and economically clean production and consumption, is relevant. Unlike the generally accepted, traditional linear economy, a circular economy is a tool for saving resources and materials and, as a result, is a path to sustainable economic growth. The latter is one of the main tasks both nationally and internationally. The aim of the study was the development of theoretical and methodological support for the formation of a circular economy, taking into account the investment and innovation policy of the state. The study is based on the study of the essence of a circular economy based on investment and innovation policy. The main tasks of the circular economy are systematized. The relationship between the tasks and priorities of the circular economy is presented. This will direct the strategy of the circular economy to sustainable development, maintaining the quality of life, promoting environmental safety, health care, and demographic conditions, as well as deepening cooperation with the world community in solving environmental problems. The article contains a graph analytical analysis of the dynamics of capital investments by type of economic activity; dynamics of the structure of capital investments by sources of financing. An algorithm for the introduction of a circular economy on an innovative basis has been developed, which involves the development of an active or passive environmental strategy, balanced between the economic goals of enterprise development and the negative consequences of its impact on the environment and society, depending on socio-ecological and economic goals. This will optimize the socio-ecological and economic policy of the enterprise. The developed recommendations for the introduction of a circular economy, taking into account the investment and innovation policy, will improve the quality of management decisions and ensure their direction to improve the market positioning of the enterprise.

# Portable Lithographic Press: A Current Device Producing Contemporary Prints in Situ

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**Abstract**: The printing process of lithography, developed in the nineteenth century, was an innovation, forever changing the nature of visual culture. We explore the advantages of this method responding to the needs in urgent situations. Presented with a sense of urgency, the portable press represents a political device in a changing scenario. The use of lithography in battle fields, enabled multiple copies of orders, maps, and forms to be reproduced quickly and cheaply. It also enabled the dissemination of propaganda, encouraging the warring nation and its allies and appealing or attempting to frighten enemies. The expansion of lithography had its important role in the global context simultaneously in Europe, Russia, and Southeast Asia. Through the investigation and analyses of existing publications, this article brings historical and updated technical information, while considering the practicability of the portable design. Although it has been done before in different dimensions that facilitate transportability, the project brings viable innovations, through the technological reconstruction and adaption of devices to expand the practice of lithography in situ. It forces us to develop and construct a current version, which becomes the epicenter of a workshop using established best practice to explore the various stages of designing, processing and printing. This actual version is essential in order to present the portable press as a tool of intervention with poetic action.

**Keywords**: Technological Reconstruction, Portable Lithographic Device, Use in Situ

# The Third Dimension of Art

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**Abstract**: People learn about the world through art as new realities and identities emerge. As a result, art may become a reflection of the society of spectacle as well as a portrayal of one's personality. It plays a significant role in everyone's life since they connect us to our past by reminding us of people, places, emotions, and experiences through photographs, drawings etc. Art and technology have been more linked than ever before in the last several decades, whether it's through new ways to blend different sorts of material, allowing more human connection, or simply making the process of generating it easier. The digital experience alters the memory experience and are inextricably linked. This method examines 360-degree VR art based on aesthetic experience and creativity while also building a conceptual framework from pertinent theories.

**Keywords**: Virtual Reality, Digital Art, 3D, Aesthetic Experience, Creativity

# Comparative Analysis of Time Series Models for Student Data in the Moodle Platform

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**Abstract**: Online learning platforms can benefit from predicting student grades and behavior as they can help improve teaching and learning outcomes. However, most existing methods do not take into account the temporal dynamics of student activity and the specifics of small universities. The purpose of this research is to develop a machine learning time-series model to predict student grades and behavior using the Moodle database. The specifics of small universities are taken into account, where the university has a few thousand students, where there may be only a few dozen students per course. The dataset used in this research consists of over one million records of student activity logs. The primary objective of this research is to create an accurate model that can predict student grades and behavior with a high degree of precision. The first version of the model achieved a precision rate of 88%.

**Keywords**: Time Series Modelsm Student Data, Moodle Platform

# Evaluating the Acceptance Probability of Consumer Loan Offers in the Online Loan Platform

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**Abstract**: Recognizing the crucial importance of predicting conversion probability, also known as acceptance probability, for e-commerce businesses in today's competitive landscape, there has been extensive analysis in the scientific literature on conversion prediction using browsing data from various e-commerce websites. However, there is a notable research gap in studying this topic, specifically in the context of online loan comparison and brokerage (OLCB) platforms.

Considering the inherent connection between the operation of OLCB platforms and credit risk, it can be argued that consumer behavior in making loan decisions differs from their typical choices of non-risk-related products. Therefore, this study aims to address this gap by developing and proposing statistical models for predicting the acceptance of loan offers within the OLCB platform. To construct these models, diverse data from the functioning OLCB platform is utilized, including customer-related variables such as borrower behavior, demographic information, financial indicators, and the characteristics of the loan offers presented to the borrower customers. Various classifiers, including logistic regression, random forest, XGBoost, artificial neural networks, and support vector machines, are employed in the modeling process. Computational experiments demonstrate that the proposed models perform well in predicting conversion, as measured by the area under the curve (AUC) score. These models are well-suited for implementation within a loan comparison and brokerage platform, enabling real-time process optimization. Overall, this research addresses the need for accurate acceptance prediction models within OLCB platforms and highlights their potential for enhancing operational efficiency in the loan comparison and brokerage process.

**Keywords**: Evaluation, Consumer Loan Offers, Online Loan Platform

# Novelties in Software Engineering Education at Liepaja University

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**Abstract**: Liepāja University provide full-cycle higher education in Information Technology including Bachelor (4 years), Master (2 years), and doctoral (4 years) study programs. Recently, the curriculum of the programs was revised and upgraded significantly. The structure of the curriculum is split by several learning modules (15 ECTS each). Their content is related with Software Engineering, Computer Networking, Artificial Intelligence, Smart Technologies, and Computer Applications in School. The impact of data analysis and project-based learning has been increased in the scope of the curriculum. The content of the learning modules and their adjustment will be discussed in the report.

**Keywords**: Software Engineering, Training of Software Developers, Higher Education

# Model of a Conceptual Information System for Testing and Training Visual-Motor Skills

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**Abstract**: Today's educational environment can no longer be looked at in isolation from various electronic technologies for the educational system to respond to the trends of the electronic age, which also corresponds to the 'electronic' everyday life of modern people.

Teaching and learning processes need to be assessed using various electronic technologies to engage today's youth in the learning process and make the learning process more accessible.

The visual process is the dominant process in everyone's perception and interpretation of the world. Visual perception and cognition are active and coordinated.

The conceptual, information system model of results processing greatly speeds up the process of collecting and obtaining results - as we all know, time today is a vital resource that everyone needs to save.

The purpose of this paper is to develop a conceptual, information model for the processing and analysis of data obtained for psychophysiological tests. The research involves theoretical analysis, conceptualization, and analysis of the data obtained. As a result of the work, a new information system conceptual model for processing and analysis of psychophysiological test data was developed.

The developed version of the new model provides an idea of the work schemes implemented, the relationship between the database and the information system.

This model will allow faster data processing and obtaining data for further analysis. The main feature of modern society is modern technology, in the shortest possible time and at the lowest possible cost. The conceptual, technical model will allow these advantages to be fully realized.

**Keywords**: Information Systems, Data Analysis, Conceptual Model

# Being Chinese Online – Discursive (Re)production of Internet-Mediated Chinese National Identity

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**Abstract**: Much emphasis has been placed on the political dimension of digitized Chinese national(ist) discourses and their embodied national identities, which neglects other equally important dimensions constitutive of their more discursive nature. A further investigation into how Chinese national(ist) discourses are daily (re)shaped online by diverse socio-political actors (especially ordinary users) can contribute to not only deeper understandings of Chinese national sentiments on the Chinese Internet but also richer insights into the socio-technical ecology of the contemporary Chinese digital (and physical) world. I propose an ethnographic methodology, with Sina Weibo (a Twitter-like microblogging site) and bilibili (a YouTube-like video-streaming platform) as 'fieldsites'. The data collection method is virtual ethnographic observation on everyday national(ist) discussions on both platforms. On each 'fieldsite', I observe how different socio-political actors contribute to the discursive (re)generation of Chinese national identity on a day-to-day basis with attention to forms and content of national(ist) accounts that they publicise on each 'fieldsite', contextual factors of their posting and reposting of and commenting on national(ist) narratives and their interactions with other users about certain national(ist) discourses on each platform. Critical discourse analysis is employed to analyze data. From November 2021 to December 2022, I have conducted 36 weeks' digital ethnographic observations with 36 sets of fieldnotes obtained. The strategy adopted for online observations was keyword searching. For 36 weeks' observations, I concentrated much upon textual content created by ordinary users. Based on the fieldnotes of the first week's observations, I found multifarious national(ist) discourses on Sina Weibo and bilibili, targeted both at national 'Others' and 'Us', both on the historical and real-world dimension, both aligning with and differing from or even conflicting with official discourses, both direct national(ist) expressions and articulations of sentiments in the name of presentation of national(ist) attachments but for other purposes. Second, Sina Weibo and bilibili users have agency in interpreting and deploying concrete national(ist) discourses despite the leading role played by the government and the two platforms in deciding on the basic framework of national expressions. Besides, there are also disputes and even quarrels between users in terms of explanations for concrete components of 'nation-ness' and (in)direct dissent to officially defined 'mainstream' discourses to some extent, though often expressed much more mundanely, discursively and playfully. Third, the (re)production process of national(ist) discourses on Sina Weibo and bilibili depends upon not only technical affordances and limitations of the two sites but also, to a larger degree, some established socio-political mechanisms and conventions in offline China.

# Predicting Coastal Erosion Patterns with the Lattice Boltzmann Method

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**Abstract**: The Lattice Boltzmann method is a suitable technique for studying coastal erosion. This method involves calculating the dynamics of an incompressible fluid element in a selected 2D or 3D reference system, considering its position, speed, and direction of movement. High relative velocities are associated with erosion, while low velocities or slow circulation led to sediment deposition on the bed of the water body.

The study of coastal erosion is approached from two perspectives: plan view (looking from above) and cross-section view. In the plan view, the focus is on the influence of flows on the coast, particularly near hydrotechnical structures, under the influence of prevailing winds blowing obliquely. The flow speed is greater before these structures, which increases the risk of erosion, and lower behind them, which decreases the risk.

In the cross-section view, water movement towards the shore in the upper layers of the water and outflow in the lower layers are observed. The angle of the bed to the horizon affects the flow velocities, which in turn affects the risk of erosion. Differences in flow velocities are visible in the cross-section view, providing valuable insight into erosion risk assessment.

**Keywords**: Prediction, Coastal Erosion Patterns, Lattice Boltzmann Method