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Engineering challenges in modern society

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IV CONGRESO LATINOAMERICANO DE CIENCIA, TECNOLOGÍA E INNOVACIÓN

20 de abril de 2023

Engineering challenges in modern society

9:30am Conferencia Magistral

Dr. Óscar Dam
The importance of data analysis on decision making in Science and engineering

10:30am Conferencia Magistral

Dra. Franyelit Suárez-Carreño
Gestión universitaria desde una comparativa con el modelo empresarial tipo startup

11:00am

Ernesto Patricio Feijoo Calle, Bernardo Andrés Feijoo Guevara
Resistencia a compresión e índice de carga puntual de andesita: análisis teórico-práctico

11:30am

Yajaira Lizeth Carrasco Vega, Yelka Martina López-Cuadra, Rómulo Mori Zavaleta, Juan Carlos Alvarado Ibáñez, Benjamín David Carril Verastegui, Manuel Morales Alberto
Desafíos de la formación integral en las escuelas de ingeniería

Se usa como referencia la hora de Ecuador

IV CONGRESO LATINOAMERICANO DE CIENCIA, TECNOLOGÍA E INNOVACIÓN

21 de abril de 2023

9:30am Conferencia Magistral

Dr. Alfredo Campos

Cuando el dispositivo nos desafía. Reflexiones y perspectivas sobre el uso de la Inteligencia Artificial en los espacios de investigación.

10:30am Conferencia Magistral

MSc. Luis González

Fuzzy Modeling of MIMO-nonlinear systems without defined operating points

11:15am

Benjamín David Carril Verastegui, Daniel Jesús Castro Vargas, Julio Machaca-Mamani, Julio César Lujan Minaya, Katherine Elizabeth Yenque Guerrero, Alvaro Larry Luis Felipe Mendoza Castillo

Rediseño industrial en los procesos de curtido de pieles

11:45am

José Calizaya López, Hilda Pinto Pomareda, Miguel Pacheco Quico, Merly Lazo Manrique, Yaneth Alemán Vilca, Aldo Paul Lazo Manrique

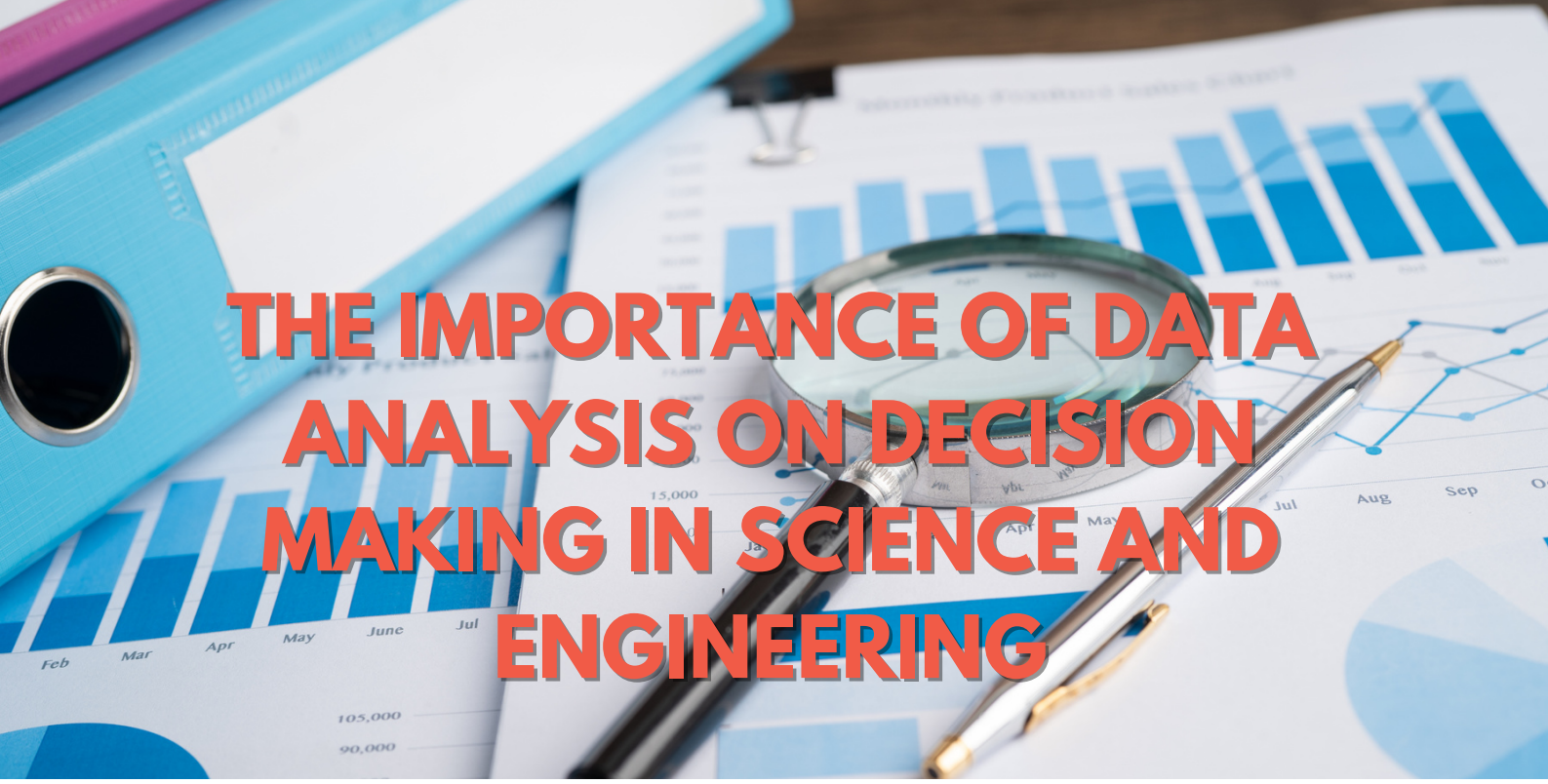
Actitudes hacia la investigación: análisis afectivo, cognitivo y conductual en estudiantes de universidades del Perú

12:15am

Ferdinand Ceballos Bejarano, Rildo Bellido Medina, Liliana Rosario Alvarez Salinas, Ana Rosario Miaury Vilca, Deyvin Herlin Cabana Mamani, Fiorella Candelaria Sue Helen Jara Rosales

Actitudes y hábitos de estudio asociados al rendimiento académico en estudiantes universitarios peruanos

Se usa como referencia la hora de Ecuador



THE IMPORTANCE OF DATA ANALYSIS ON DECISION MAKING IN SCIENCE AND ENGINEERING

Author

Oscar Dam G.

ISince ancient times Engineering has been a necessity in practice to turn ideas as well as dreams in a reality. Therefore, engineering started in a manual and mechanical root from levelers and pullies, requiring mathematics for its understanding in the ancient world, travelling through steam generation for the industrial revolution thus encouraging more science for its application. Nevertheless, as more understanding as well as more science was required to enter in the modern world via developing simulation, electricity, modeling and finally computer sciences. During these developments, libraries were at the development saga but compiling data accordingly with authors, historians and curators ever since the Alexandria library in Egypt. The word library steel is the icon for data in the actual computing simulation world, including ChatGPT and similar.

Present world based on Big Data it nothing else but a computer library that can write, edit, review and resume our final work, as an auxiliary, powerful and a necessary digital au pair. In spite of this, the necessary identification of logic data, its interpretation, organization, revealing confident resulting data still will require the deep thinking of evidence on the applied skills and personal knowledge of the scientist and engineer field. The day will come apparently in a very short term when the AI will cope with these aspects as foresaw in the film 2001 Space Odyssey. Consequently, for the present times and the foreseeable future, education of new breads of scientists and engineers will need the embracing, in their minds and attitudes, the roles of data engineering, data analysis, and data analysts into a unique role and personal interrelation skills to communicate with Alexa or its future modern ChatGPT peer. The new bread then will belong to the “deep thinkers” whom will not yet have poured the relevant and personal interpretation of their result and reveal it to the digital library to feed advanced simulation programs. This is why the most reliable and sound data will require the a profound data analysis by humans, nevertheless this must be addressed as such by the academia, to finally fully understand that it is not the software but the person to us and generates new useful information and sound data, after been carefully, professionally and responsible discerned.

keywords: Engineering, big data, data engineering, data analysis, data interpretation, software, deep thinking, artificial intelligence (AI), ChatGPT.

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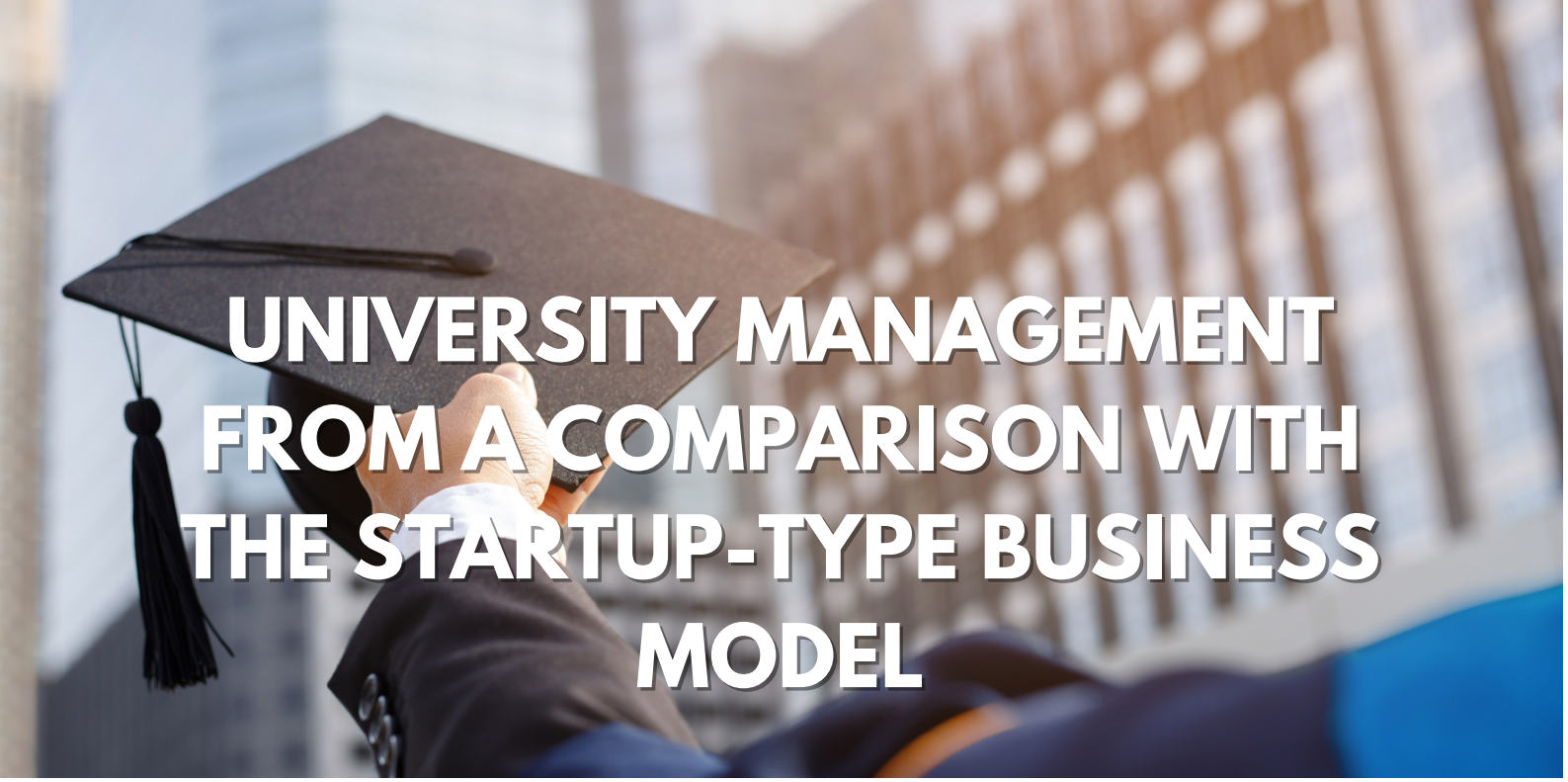
Author

Oscar Dam G.
https://orcid.org/ 0000-0002-0594-6757
oscar.curmetals@gmail.com
UNEXPO Puerto Ordaz
Venezuela



UNIVERSITY MANAGEMENT FROM A COMPARISON WITH THE STARTUP-TYPE BUSINESS MODEL

Authors

Franyelit Suárez

The technologies that are shaping the emergence of Industry 4.0 are maturing in such a way that, by the third decade of the twenty-first century, the convergence of these technologies is expected to completely change the most important industrial sectors of the world economy, among which are the manufacturing sector, transport, the agricultural sector, the sectors associated with health and the energy sector [1]. This has important social and economic implications. For this research, the focus is on the societal implications that include the ways in which people acquire skills and abilities for work and the role of universities in doing so.

In the face of a significant change in the way goods and services are produced, consumed and exchanged, the educational needs of the population will change accordingly, in fact, they are already changing [2]. This situation becomes increasingly evident when, for example, the number of qualified professionals for vacant positions in cybersecurity in companies fail to be filled with the available offer. These gaps in professional supply and labor market needs have not been addressed with the necessary diligence on the part of higher education institutions[3] .

Universities are in a moment of necessary transformation, where they must rethink both their educational models and their organizational models in order to maintain their social relevance [5] [6]. To this end, it is necessary to identify those aspects linked to universities that must be updated or even eliminated to achieve the objectives of social relevance and institutional survival. Some of the most promising ideas for university updating in terms of its management do not come from the academic field but rather from the business field [7]. It is likely that academic orthodoxy may disagree with agile methodologies and Lean approaches to academic management that, due to their multiple interests, do not focus on a certain target audience [8]. The universities carry out research, teaching and extension work towards society, these are in general lines their fields of action. However, management policies such as those implemented at the University of Arizona or the University of Idaho, both in the United States, are a clear reference that a paradigm shift in academic management can allow universities to adapt to major social changes [9]. This work is structured from the description of the problems of university management, developing both the approaches of university management deployed from the traditionalist models and the difficulties they face to compare them with the agile methodologies, which include the development of network teams where activities of academic relevance are carried out from the points of view of the agile approaches of business management through the guidelines

Keywords: startups, educational dynamics, university management

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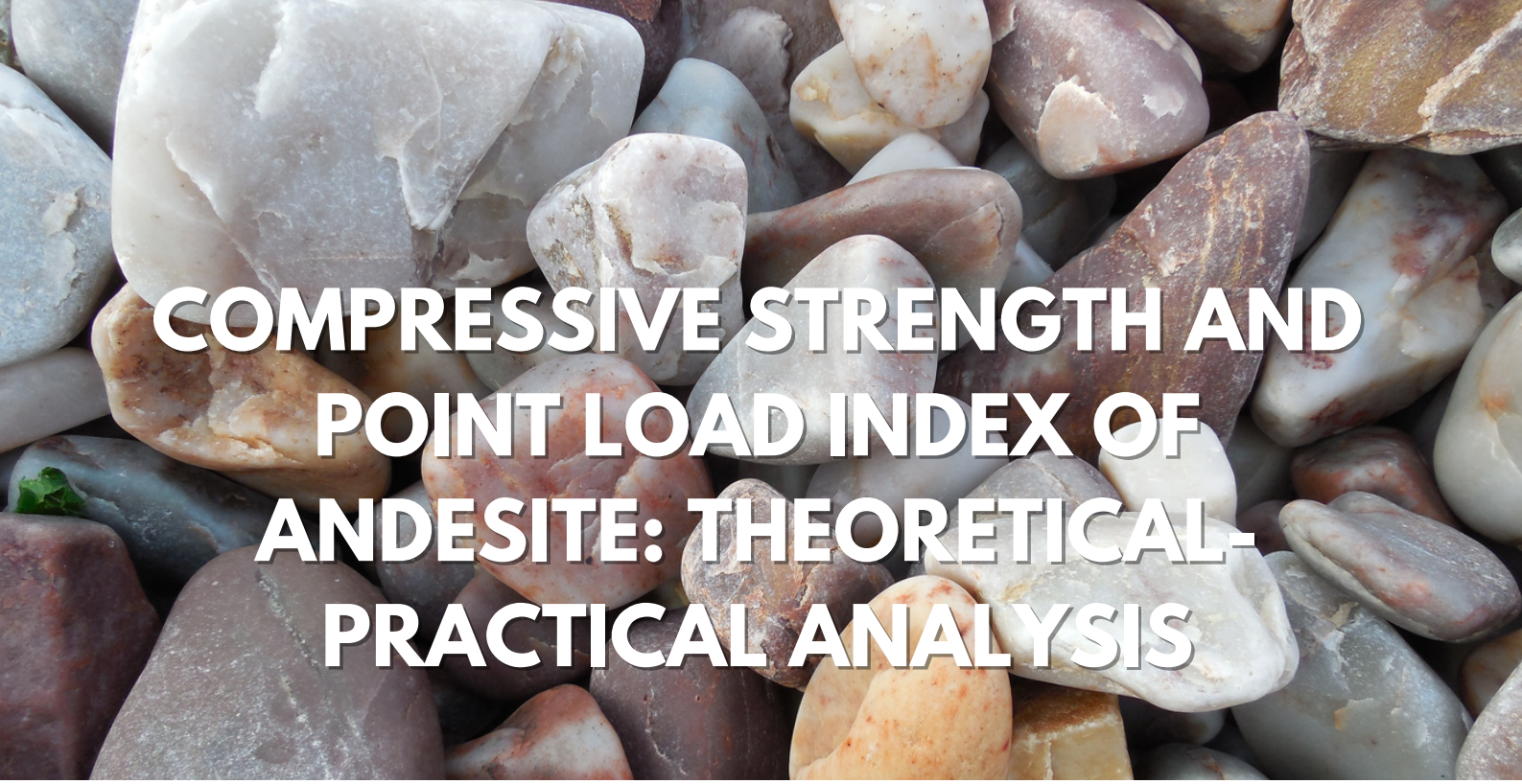
Authors

Franyelit Suárez-Carreño
Universidad de las Américas, Facultad de Ingeniería y Ciencias Aplicadas,
Carrera de Ingeniería Industrial
Quito-Ecuador
http://orcid.org/0000-0002-8763-5513
Franyelit.suarez@udla.edu.ec



COMPRESSIVE STRENGTH AND POINT LOAD INDEX OF ANDESITE: THEORETICAL-PRACTICAL ANALYSIS

Authors

Ernesto Patricio Feijoo Calle
Bernardo Andrés Feijoo Guevara

In mining activities, the stability of the structures is substantial, for this reason it is important to establish the properties or characteristics of the rock, to carry out the analyzes and evaluate the stability, by obtaining numerical factors [1]. Anisotropic rocks, specifically, are difficult to perform tests due to the variation in their resistance, which is why numerous laboratory tests are necessary to obtain representative parameters of the entire range of resistances [2]. A fundamental property is the uniaxial compressive strength (UCS).

For the UCS, an alternate test has been developed, the point load test index (Is 50), since the implementation of the press can be used in situ or in the laboratory, in addition to requiring little or no preparation of the samples for the test [3]. The samples that will later be placed between these tips can be of any shape, but it is recommended that their diameter should not be less than 50 mm, since the volume of said test tube influences its resistance [4].

However, there are correlations for rocks in the literature such as, for example, in 1972, Franklin, J. A. and Bosh, E., propose a correlation factor of 24. Chau, K. T., and Wong, R. H. C., in 1996 a factor of 12.5. Rusnak, J., and Mark, C., in 2000, a factor of 21. Thuro and Plinninger, R. J., in 2001, a factor of 18.7. Mark, C., in 2002, a factor of 21. Akram, M., and Bakar, M. Z. A., in 2007, a factor of 13,295. Cobanoglu, I., and Celik, S. B., in 2008, a relationship RCS=8.66 Is 50 + 10.85 [5]. Andesites are fine-grained volcanic rocks, they are common as lava flows in orogenic regions and occasionally form small intrusions. They are compact, sometimes vesicular and commonly chestnut in color and in total extent are second only to basalt [6]. Thus, in the rock cutting process, the equipment or cutting saw, the diamond tool and the material to be cut all intervene [7]. The rocks present linear and/or non-linear relationships between the applied forces and the deformations produced, obtaining different models of stress vs. deformation curves for different types of rocks [8]. A relationship between the UCS and the Is 50 was determined, it allows to characterize the rock material, Is 50 values have been obtained from 2.99 MPa to 4.2 MPa and UCS between 46.25 MPa and 64.85 MPa. This work shows that there is no approximation of the equation with the correlations in the literature, so for specific materials it is recommended to carry out tests and thus obtain a proper relationship for the rock.

keywords: andesite, compression, resistance, rock.

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Authors

Ernesto Patricio Feijoo Calle
https://orcid.org/0000-0001-6901-7933
pfeijoo@uazuay.edu.ec
Universidad del Azuay
Cuenca-Ecuador

Feijoo Guevara Bernardo Andrés
https://orcid.org/0000-0002-1089-1332
bernardofeijoo@uazuay.edu.ec
Universidad del Azuay
Cuenca-Ecuador

CHALLENGES OF COMPREHENSIVE TRAINING IN ENGINEERING SCHOOLS

Authors

Yajaira Lizeth Carrasco Vega,
Yelka Martina López-Cuadra,
Rómulo Mori Zavaleta,
Juan Carlos Alvarado Ibáñez,
Benjamín David Carril Verastegui,
Manuel Morales Alberto

UNESCO has focused its sustainable development goals on engineering, arguing that this discipline is crucial for the development of new technologies and social resilience following the COVID-19 pandemic. This new perspective of engineering leads to the restructuring of training for engineers, prompting universities to reformulate the vision of the engineering graduate. New professionals must have a multidisciplinary training, with skills to face the challenges of industry 4.0 and the challenges in environmental proposals. Information technologies (ICT) play a fundamental role in the training of engineers, not only for the development of new technological proposals, but also for the integration of global knowledge, data management, effective and immediate communication, and permanent training and training. Engineering has been the main source of innovation in recent years and offers tools to improve processes, systems and products in all professions, thus contributing to social improvements on a permanent basis.

Engineering has the function of making scientific discoveries possible, its main task is to use science for innovative and technological developments. This fusion of engineering with science is critical for new inputs to be successful and effective and deliver the solutions they expect. To train engineers capable of facing the technological advances of today's society, a conceptual framework is needed that allows taking into account the nature of the knowledge that responds to patterns of development of science, technology and its impact on society. Social studies of science, technology and society (STS) provide the theoretical framework necessary to consider this aspect. The inclusion of STS studies in curricula can improve the training of engineers. Universities must discover in depth the opportunities offered by industry 4.0 and how the new professional should assume this responsibility in their participation within the digitized industry. The future is glimpsed with a high automation of processes and systems, with the participation of artificial intelligence in much of industry and everyday life.

Reinforcing the training of engineers with high-impact simulations and advanced programming can mean the development of skills for innovation, the generation of ideas, leadership, creation of systems that seek effective social solutions that improve the quality of life of people, that aim to improve the global conditions of the environment and the environment. Virtual reality, robotics, intelligent tutoring systems and online learning will feature prominently in basic science and engineering training. As for employment opportunities, it is expected that the new professional can be collaborative with other professions, communicative and proactive in technological development proposals. The training of engineers must include teamwork, decision making, soft skills, negotiation, interpersonal relationships, ethics and creativity.

This work seeks to analyze the skills that an engineer must possess to face the current challenges of the labor market and to contribute to technological progress. In summary, the current approach to engineering training focuses on the acquisition of interpersonal, technical and creative skills that allow them to be competitive in the labor market and contribute to technological progress.

Keywords: engineering education, industry 4.0, educational strategies

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Authors

Yajaira Lizeth Carrasco Vega
https://orcid.org/0000-0003-4337-6684
Universidad Nacional de Cañete
ycarrasco@undc.edu.pe
Cañete-Perú

Yelka Martina López-Cuadra
https://orcid.org/0000-0002-3522-0658
Universidad Nacional Intercultural Fabiola Salazar Leguía de Bagua
ylopez@unibagua.edu.pe
Bagua-Perú

Rómulo Mori Zavaleta
https://orcid.org/0000-0003-4969-7593
Universidad Nacional Intercultural Fabiola Salazar Leguía de Bagua
rmori@unibagua.edu.pe
Bagua-Perú

Benjamín David Carril Verastegui
https://orcid.org/. 0000-0001-6010-0175
Universidad Nacional de Trujillo
bcarril@unitru.edu.pe
Trujillo-Perú

Juan Carlos Alvarado Ibáñez
https://orcid.org/0000-0002-6413-3457
Universidad Nacional Intercultural Fabiola Salazar Leguía de Bagua
jalvarado@unibagua.edu.pe
Bagua-Perú

Manuel Morales Alberto
https://orcid.org/0000-0001-9983-6956
Universidad Nacional de Cañete
mmorales@undc.edu.pe
Cañete-Perú

WHEN THE DEVICE CHALLENGES US. REFLECTIONS AND PERSPECTIVES ON THE USE OF ARTIFICIAL INTELLIGENCE IN RESEARCH SPACES

Author

Alfredo Campos

The digitization of all spaces of society, generated in and from frontier research, does not happen overnight. It is a collective, business and cultural dynamic, with contributions from multiple actors. Innovation processes wrapped in economic logics and that are evident in our daily lives; Electric vehicles, computers, telephones, electronic circuits, home automation and various devices that we use daily or that are used for industrial processes that impact the quality of life of society, are spaces where pure and applied research occurs in companies, research centers, public bodies and universities. A dizzying race to develop, on an ongoing basis, every element of this whole process that even has geopolitical features when negotiations and tensions are observed over the management and access to deposits of lithium, critical minerals and other rare earths. This dynamic, with economic, geopolitical and profoundly cultural overtones, rebukes us to consider some elements and questions related to the necessary reflection on the future, not necessarily linear, of these issues. How are frontier research processes approached in universities?

How many researchers, or research groups, have been considering the systemic approach of their exploratory processes in terms of research, basic, applied research, qualitative research and quantitative research? Thinking and rethinking the eternal dilemma between qualitative and quantitative research, seems a necessary and vital task in these days of ChatBot, AI and the inveterate overinformation that is generated about Artificial Intelligence and the infinite worlds where it can be applied. Any process of knowledge generation should be preceded, not only by the technical elements to which it is tied, but also by the necessary reflection on the impact of this corpus cognitio in our society. We intend to share these elements of reflection without ceasing to think that the world around us, the real one, is not binary and no longer opts for analysis where it deprives only one or the other, the real or the opposite, the white or the black. We intend, in an eternal Moebius film, to address the different shades of gray that coexist today.

keywords:Artificial intelligence. Research. Society

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Author

Alfredo Campos
acampos@unexpo.edu.ve
https://orcid.org/0009-0007-2671-9004
UNEXPO, Puerto Ordaz
Venezuela

FUZZY MODELING OF MIMO-NONLINEAR SYSTEMS WITHOUT DEFINED OPERATING POINTS

Author

Luis J. González Lugo

To control a system, it is necessary that it exhibit a "reasonably predictable" causal behavior, that is, that it be deterministic or at least stochastic. Classical control algorithms start from the hypothesis that the system to be controlled is deterministic, but this is not true in a broad sense, and although the classical control techniques work very well for a wide variety of physical systems -respecting certain restrictions- and have been used successfully for more than a century, most of the physical systems in which there is a greater interest in controlling at present, are essentially non-linear and stochastic, so they are difficult to model and control with conventional techniques. One of the ways to model non-linear and stochastic behavior mathematically is by using models based on fuzzy logic. In particular, the fuzzy modeling algorithm developed by Takagi-Sugeno-Kang (TSK fuzzy model), has given good results. Especially if it is considered that this model allows the use of equations in State Spaces, thus being able to obtain a fuzzy model for a Nonlinear System (SNL) with multiple inputs and outputs (MIMO), which allows expanding the use of modern control algorithms based on State Space models such as Optimal Control, H∞, Genetic Algorithms, Predictive Control.

TSK modeling of SNL MIMO can be successfully used in applications where the plant has more than one operation point; however, as the number of operation points increases, the accuracy of the model to describe the behavior of the system improves, but at the expense of an increase in its complexity. This is where the great dilemma arises between keeping the complexity of the fuzzy model low –few rules- and guaranteeing that it represents the dynamics of SNL as faithfully as possible. So, its use becomes more complex when the design of fuzzy servo controllers is required, for example, since there are no defined operating points that dictate the regions around which the linear subspaces will be defined. To solve this issue was devised an algorithm to synthesize Discrete TSK fuzzy models in linear state subspaces for SNL MIMO systems starting from its dynamic model in differential equations, without the SNL operation points having been previously defined.

At this conference, the algorithm was explained and the case study of the modeling of a Thermoelectric Plant using it was presented, having obtained satisfactory values in the chosen performance indices (VAF and RMSE). It is expected that this methodology will serve to promote the application of modern path-tracking control algorithms based on State Space models such as Optimal Control, H∞, Genetic Algorithms, Predictive Control, among others.

Keywords: Takagi-Sugeno, Sistemas No Lineales, Servocontroladores Difusos

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Author

Luis J. González Lugo
https://orcid.org/0000-0001-9933-4147
INGENIERIA L.A.
lgonzalez@ingenieriala.com
Chile

INDUSTRIAL REDESIGN IN LEATHER TANNING PROCESSES

Authors

Benjamín David Carril Verastegui, Daniel Jesús Castro Vargas, Julio Machaca-Mamani, Julio César Lujan Minaya, Katherine Elizabeth Yenque Guerrero, Alvaro Larry Luis Felipe Mendoza Castillo

The treatment of the skin of animals such as cattle and goats has been a practice used since prehistoric times. The technique involves applying plant substances, such as tannins, to increase the durability and flexibility of the material. Although leather production remains popular and increasing, the introduction of chromium treatment has had negative consequences for the environment. It is necessary to find new sustainable practices for leather production that contribute to the economy of producing countries. There are solutions such as the elimination of the use of chromium and the use of bio-solvents for the treatment of contaminated water. Although emerging countries are the largest producers of leather, many of them have low levels of automation and staff training, which affects production efficiency and increases pollution. These competitive disadvantages include lack of financing, training and quality control in the supply chain.

Another aspect to consider in leather production is animal welfare. Many animal rights organizations have expressed concern about the living and slaughtering conditions of animals used in leather production. Some of these organizations promote the use of synthetic alternatives to leather, which do not involve animal slaughter and are more environmentally friendly. In addition, regulations and practices have been implemented to ensure ethical treatment of animals used in leather production, such as the Leather Working Group certification, which sets standards for the production of leather in a sustainable and ethical manner.

On the other hand, leather production can also have a positive impact on the local economy. In many countries, leather production is an important source of employment and generates income for local communities. In addition, the production of high-quality leather can be a profitable industry for producing countries, which can export their products internationally. To foster the growth of the leather industry, government policies and training programs for workers need to be established. In addition, sustainable and ethical practices should be promoted in leather production, to ensure product quality and protect the environment. In short, leather production is an important and growing industry, but its environmental and social challenges need to be addressed to ensure its long-term sustainability.

According to the Food and Agriculture Organization of the United Nations (FAO) [1], global leather production has increased in recent years. In 2020, more than 23 billion square feet of leather were produced worldwide, representing a 3% increase over the previous year. The main leather producing countries are China, India and Brazil, which together account for more than 70% of world production. However, the increase in leather production has also raised concerns about its environmental impact. According to a report by the United Nations Environment Organization (UNEP) [2], leather production is responsible for 5% of global greenhouse gas emissions and 20% of water pollution globally. In addition, it is estimated that around 20,000 liters of water are needed to produce one kilogram of leather and that the production of leather from a single cow can generate up to 200 kilograms of waste. These data highlight the importance of adopting more sustainable practices and reducing the environmental impact of leather production[1][2].

keywords: leather treatment, industrial redesign, industrial processes.

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Authors

Benjamín David Carril Verastegui
https://orcid.org/. 0000-0001-6010-0175
bcarril@unitru.edu.pe
Universidad Nacional de Trujillo
Trujillo - Perú

Daniel Jesús Castro Vargas
https://orcid.org/0000-0003-0618-6013
Email: djcastrov@unach.edu.pe
Universidad Nacional Autónoma de Chota
Chota - Perú

Julio Machaca-Mamani
https://orcid.org/0000-0003-4866-3885
jcmachaca@unajma.edu.pe
Universidad Nacional José María Arguedas
Andahuaylas - Perú

Julio César Lujan Minaya
https://orcid.org/0000-0003-3752-824X
jlujan@undc.edu.pe
Universidad Nacional de Cañete
Cañete - Perú

Katherine Elizabeth Yenque Guerrero
https://orcid.org/0000-0002-2645-8883
kyenque@unajma.edu.pe
Universidad Nacional José María Arguedas
Andahuaylas - Perú

Alvaro Larry Luis Felipe Mendoza Castillo
https://orcid.org/0000-0002-2877-2622
alvaro.mendoza@upn.pe
Universidad privada del Norte
Trujillo - Perú

ATTITUDES TOWARDS RESEARCH: AFFECTIVE, COGNITIVE, AND BEHAVIORAL ANALYSIS IN STUDENTS FROM UNIVERSITIES IN PERU

Authors

José Calizaya López, Hilda Pinto Pomareda, Miguel Pacheco Quico, Merly Lazo Manrique, Yaneth Alemán Vilca, Aldo Paul Lazo Manrique

Universities aim to train professionals with a sense of social responsibility and ethical values [2]. However, they must also promote research, this second point has not been developed in the best way [3], because in some cases students enter the university with the purpose of training in a profession, but not to function as a researcher. [4]. In this sense, the new Peruvian university law [5] was intended to strengthen scientific research in academics to increase scientific production and the visibility of institutions [6], however, in the current context no results have yet been obtained. favorable due to the low production of research in undergraduate students [1].

Objective: it was proposed to analyze the attitudes towards scientific research: affective, cognitive and behavioral in students of public and private universities in Peru, according to socio-academic variables. Method: 2448 university students from a public university and 4 private universities participated, intentional sampling was used, in addition, the study was descriptive-comparative, quantitative and non-experimental. A duly validated measurement instrument was applied to determine the attitudes of the students. Results: a moderate level was found in attitudes towards research in university students (mean=77.06, standard deviation=12.32, median=77, ranges from 0 to 140), both for the affective and cognitive attitudes it was found at a moderate level, observing a certain evaluation of favorable attitude, however, in the behavioral attitude the average was low, being valued as an unfavorable attitude towards the investigation. It is concluded that university students according to the area of health sciences present better attitudes towards research than students of social sciences and engineering, in addition, students from public universities present better cognitive attitudes than private students, likewise, they are the female students who present better clarity in the behavioral and cognitive attitude than the male students and it is the students of the last cycles of study who value and present better attitudes for research than the students of the first cycles.

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keywords: keywords: attitudes towards research, affective, cognitive, behavioral, university

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Authors

José Calizaya López
https://orcid.org/0000-0001-6221-0909
jcalizayal@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
País: Arequipa-Perú

Hilda Pinto Pomareda
https://orcid.org/0000-0002-1719-4863
hpintop@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Miguel Pacheco Quico
https://orcid.org/0000-0001-9317-8518
mpachecoq@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Merly Clariza Lazo Manrique
https://orcid.org/0000-0002-9451-8710
mlazom@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Yaneth Alemán Vilca
https://orcid.org/0000-0002-9820-6036
yalemanv@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Aldo Paul Lazo Manrique
https://orcid.org/0000-0001-9882-5956
alazom@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

STUDY ATTITUDES AND HABITS ASSOCIATED WITH ACADEMIC PERFORMANCE IN PERUVIAN UNIVERSITY STUDENTS

Authors

Ferdinand Ceballos Bejarano, Rildo Bellido Medina, Liliana Rosario Alvarez Salinas, Ana Rosario Miaury Vilca, Deyvin Herlin Cabana Mamani, Fiorella Candelaria Sue Helen Jara Rosales

Poor academic performance is a frequent problem faced by all students in the world for many years [1], especially Latin Americans at different educational levels, including Peru [2], therefore, concern for student academic performance university is a constant of educational authorities and researchers [3]. In this sense, attitudes and habits towards study and learning are a very important factor in determining academic performance [4].

Objective: To analyze the correlation between attitude and study habits with academic performance in university students. Methodology: 1150 university students from a public university and two private universities participated, intentional sampling was used, in addition, the study was descriptive-comparative, quantitative and non-experimental, cross-sectional. A duly validated measurement instrument was applied to determine attitudes, study habits in students, as well as the record of notes of participating students. Results: a moderate level of academic performance was found, with a general average of 13. Regarding study habits, 66.4% obtained adequate scores, only 25.2% presented positive attitudes towards study; In addition, a highly significant association (p=0.001) was obtained between habits and attitudes towards the study using a chi-square test. The correlation between study habits and attitudes towards studying was moderate but significant (r=0.461, p<0.05); logistic regression analysis revealed positive associations between attitudes and academic performance. It is concluded that attitudes and study habits have a strong impact on academic performance.

keywords: attitudes towards research, affective, cognitive, behavioral, university

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Authors

Ferdinand Ceballos Bejarano
https://orcid.org/0000-0003-2867-2397
fceballosb@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Rildo Bellido Medina
https://orcid.org/0000-0002-8699-3490
rbellidome@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Liliana Rosario Alvarez Salinas
https://orcid.org/0000-0002-9160-7451
lalvarezs@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Ana Rosario Miaury Vilca
https://orcid.org/0000-0002-2992-1239
amiauryv@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Deyvin Herlin Cabana Mamani
https://orcid.org/0000-0003-2094-8387
dcabanam@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú

Fiorella Candelaria Sue Helen Jara Rosales
https://orcid.org/0000-0001-6541-6267
fjarar@unsa.ede.pe
Universidad Nacional de San Agustín de Arequipa
Arequipa-Perú


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