EPPGEP
Encontro Científico da ANPEPRO 2023

VIII EPPGEP 2023
Encontro de Pesquisa e Pós-Graduação em Engenharia de Produção

27, 28 e 29 de Setembro de 2023

https://www.anpepro.org.br/eppgep2023/

BOOK OF ABSTRACTS

APOIO: Firjan SENAI
REALIZAÇÃO: Universidade Federal Fluminense
PATROCÍNIO: CAPES FAPERJ Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro

O EVENTO

EPPGEP é o Encontro Científico da ANPEPRO, que tem como objetivos: Foco em Pesquisa; Criação de um ambiente de aconselhamento aos alunos de Pós-Graduação; e, Reconhecimento dos alunos de Pós-Graduação em Engenharia de Produção com melhores resultados.

O processo seletivo dos artigos é realizado de forma descentralizada por meio dos Programas de Pós-Graduação (PPG's), para garantir a seleção dos melhores artigos pelos colegiados dos programas.

- Cada PPG pode selecionar até 2 artigos de Mestrado Acadêmico (MA), 3 de Doutorado (DO) e 1 de Mestrado Profissional (MP); além de 2 de Produto Tecnológico (PT), podendo ser MA, MP ou DO.
- Podem participar egressos, desde que tenham sido alunos até o ano anterior do evento.
- Todos os alunos que apresentam o trabalho no EPPGEP recebem um certificado da ANPEPRO de aluno destaque do PPG, visto que foram selecionados como os melhores do seu Programa e cada Programa Associado tem credenciamento da ANPEPRO.
- Há premiação para o melhor trabalho apresentado por alunos de DO, MA, MP e de PT (que pode ser aluno de qualquer modalidade).

LOCAL DO EVENTO

Em 2023, o EPPGEP e o ENPPEPRO ocorreram nas dependências da FIRJAN / SENAI Tijuca, no Rio de Janeiro (RJ), contou com o patrocínio da CAPES e FAPERJ e teve a Universidade Federal Fluminense (UFF) como Instituição Organizadora Local.

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QUARTA-FEIRA, 27/09/2023				
EVENTO	HORARIO	AUDITÓRIO	SALA 1	SALA 2
EPPGEP/ENPPEPRO	09:00-09:20	MESA DE ABERTURA		
EPPGEP	09:20-10:40		Sessão MA-A	Sessão MA-B
EPPGEP/ENPPEPRO	10:40-11:00	*Intervalo / Coffee-Break*		
EPPGEP	11:00-12:20		Sessão MA-C	Sessão MA-D
EPPGEP/ENPPEPRO	12:20-14:00	*Intervalo / Almoço*		
EPPGEP	14:00-15:40		Sessão DO-A	Sessão DO-B
EPPGEP/ENPPEPRO	15:40-16:00	*Intervalo / Coffee-Break*		
EPPGEP	16:00-17:40		Sessão DO-C	Sessão PT-A

QUINTA-FEIRA, 28/09/2023				
EVENTO	HORARIO	AUDITÓRIO	SALA 1	SALA 2
EPPGEP	09:00-10:40		Sessão MA-E	Sessão PT-B
EPPGEP/ENPPEPRO	10:40-11:00	*Intervalo / Coffee-Break*		
EPPGEP/ENPPEPRO	11:00-12:40	MESA PRÊMIO CAPES DE TESE Chair: Profa. Cristina Gomes de Souza (Cefet/RJ) Convidados: Prof. Adiel Teixeira (UFPE) - Coordenador da Mesa; Prof. Nei Soma (ITA); Prof. Helder Gomes Costa (UFF); Prof. Fernando Cyrino (PUC-Rio); Prof. Sérgio Eduardo Gouvêa da Costa (UTFPR)	Sessão DO-D	Sessão MP
EPPGEP	12:40-13:00	Reunião Fechada de Chairs de Sessão (MA; MP; PT) para deliberação sobre os prêmios	*Intervalo / Almoço*	
EPPGEP/ENPPEPRO	12:20-14:00			
EVENTO	HORARIO	AUDITÓRIO		
EPPGEP	14:00-15:40	PLENÁRIA FINALISTAS DO Chair: Nei Soma (ITA); Eduardo Uchoa Barboza (UFF); Helder Gomes Costa (UFF); Lizandra Garcia Lupi Vergara (UFSC); Sérgio Eduardo Gouvêa da Costa (UTFPR)		
EPPGEP/ENPPEPRO	15:40-16:00	*Intervalo / Coffee-Break*		
EPPGEP/ENPPEPRO	16:00-17:40	MESA DE COORDENADORES DE PROGRAMAS DE PÓS-GRADUAÇÃO 6 e 7 Chair: Profa. Ana Paula Cabral Seixas Costa (UFPE) Convidados: Prof. Michel Anzanello (UFRGS) - Coordenador da Mesa; Profa. Fernanda Baiao Amorim (PUC-Rio); Profa. Lizandra Vergara (UFSC); Profa. Luciana Hazin Alencar (UFPE)		
EPPGEP/ENPPEPRO	17:40-18:00	CERIMÔNIA DE ENTREGA DO PRÊMIO ANPEPRO Chair: Prof. Nei Soma (ITA) Comitê de Premiação: Prof. Nei Soma (ITA); Prof. Horácio Yanasse (UNIFESP); Profa. Ana Paula Cabral Seixas Costa (UFPE)		

SEXTA-FEIRA, 29/09/2023		
EVENTO	HORARIO	AUDITÓRIO
ENPPEPRO	09h00 - 10h00	ASSEMBLEIA ANPEPRO
EPPGEP/ENPPEPRO	10h00 - 11h20	MESA CNPq Chair: Helder Gomes Costa (UFF) Convidados: Membros do CA-EP do CNPq Prof. Mário Otávio Batalha (UFSCAR) e Profa. Caroline Maria de Miranda Mota (UFPE)
EPPGEP/ENPPEPRO	11h20 - 11h40	*Intervalo / Coffee-Break*
EPPGEP/ENPPEPRO	11h40 - 13h00	MESA CAPES Chair: Fernando Cyrino (Diretor Presidente da ANPEPRO / PUC-Rio) Convidado: Prof. Gherhardt Ribatski (Coordenador da Área das Engenharias III da Capes / USP)
EPPGEP/ENPPEPRO	13h00 - 14h30	PREMIAÇÃO DE TRABALHOS - ENCERRAMENTO CONFRATERNIZAÇÃO FINAL (BRUNCH)

SUMÁRIO

RESUMOS DE DOUTORADO

Doutorado (DO)

A HYBRID POLICY FOR PROTECTION SYSTEMS SUBJECT TO INTERNAL DEGRADATION AND EXTERNAL SHOCKS

Augusto José da Silva Rodrigues[1]
Cristiano Alexandre Virginio Cavalcante[1]

ABSTRACT

This paper aimed to develop an inspection and replacement policy for protection systems that can fail due to both internal degradation and external events (shocks), which accelerate their natural wear process. Our motivation was a circuit breaker whose function is to protect a distribution transformer against critical events (such as overload), to prevent disasters with exorbitant consequences. The modelling was conducted based on the delay time concept, in which the defective state precedes the failed state. In addition, the shock rate is directly influenced by the system state, following a non-homogeneous Poisson process. To approximate the model to real contexts, we consider that spares arrive from a heterogeneous population with items with distinct reliabilities. It is also assumed that there are conditions under which inspection errors (false positives and negatives) can occur. To validate the model, we performed a numerical application, which enabled us to identify the cost savings of the proposed policy compared to two other well-established policies. Moreover, insights are provided on which circumstances inspections should be intensified or not, in order to reduce the cost-rate. Finally, a web application was developed to allow the model to be widely accessible by any maintenance decision-maker without prior knowledge of mathematical modeling or programming languages.

Keywords: Reliability; Maintenance; Delay time model; Imperfect inspection; Shocks.

[1] Federal University of Pernambuco (UFPE)

Doutorado (DO)

A MACHINE LEARNING APPROACH TO PREDICT THE RELIABILITY OF WELL SAFETY BARRIERS UNDER DIFFERENT CONDITIONS

Danilo Colombo[1]
Marcos Cleison Silva Santana[2]
Leandro Aparecido Passos[3]
João Paulo Papa[2]
Gilson Brito Alves Lima[1]

ABSTRACT

This paper presents a new machine learning approach to analyze the reliability performance of safety barriers in offshore oil wells with different characteristics and under different operational or environmental conditions. Traditional statistical methods have been applied to this class of problem; however, these methods assume specific hypotheses about the underlying distributions and correlations and try to fit the data into these models. A combination of statistical and machine learning approaches can overcome this limitation, capturing complex behavior and non-linearities, thus improving the accuracy of the results. A new approach based on machine learning composed of two regression models and a nonparametric reliability estimator is presented. The proposed approach is intended to be applied in the scenario of safety barriers in offshore wells, using field data, limited and non-planned. It was considered its application for the reliability analysis of surface-controlled subsurface safety valves, one of the most important and must-have well barrier components, taking into account the performance of different manufacturers under different water depths of the wells. The results show that the proposed machine is competitive and can outperform classical approaches such as Cox regression, and even another widely employed machine learning model, the Random Survival Forests.

Keywords: Reliability, Machine Learning, Survival Analysis, Safety Barriers, Well Integrity

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Doutorado (DO)

A SOCIAL COGNITIVE PERSPECTIVE IN STARTUPS ECOSYSTEMS: FROM IDEATION TO CONSOLIDATION IN INDUSTRY 4.0 ERA

Dalton Alexandre Kai[1]
Edson Pinheiro de Lima[2]
Guilherme Brittes Benitez[1,*]

ABSTRACT

In recent years, emerging economies have invested in Industry 4.0 (I4.0) technologies to drive economic and technological development. In such a context, technology-based startups play a key role in developing I4.0 solutions that make the industry more efficient, productive, and competitive. However, these startups face various challenges when attempting to penetrate the market and deliver successful solutions. This research explores how I4.0 startups mature their concepts, products, and business across their evolutionary lifecycle in the ecosystem. We examine how startups mature their business through four stages: Ideation, MVP, Traction, and Consolidation, by collaborating with other actors in the ecosystem. We adopt a social cognitive perspective using its four core properties: intentionally, forethought, self-reactiveness, and self-reflectiveness to explain how I4.0 startups become self-effective in mastering skills and competencies required to develop their solutions. We employ a qualitative and longitudinal case study spanning five years within an innovation ecosystem, including more than 30 follow-up sessions, 27 semi-structured interviews, and a survey with 120 startups. Our findings reveal that I4.0 startups in their initial stages exhibit more open, transparent, and exploratory behavior towards ecosystem actors. As they evolve, they become more specific and formal throughout their lifecycle, interacting, co-creating, and adding value among various groups or stakeholders, ultimately reaching a multi-sided platform governance structure. We also present a framework illustrating how I4.0 startups typically relate to other ecosystem actors to mature their businesses. Our results can help entrepreneurs overcome the stages of a startup's lifecycle and achieve consolidation in the market.

Keywords: Startups; Industry 4.0; Innovation Ecosystems; Social Cognitive Theory; Technology development.

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Doutorado (DO)

AN INTEGRATED PRODUCTION PLANNING AND INVENTORY MANAGEMENT PROBLEM CONSIDERING TWO STORAGE LEVELS FOR A PERISHABLE PRODUCT: OPTIMIZATION AND MONTE CARLO SIMULATION AS A TOOL FOR PLANNING IN SCENARIOS WITH UNCERTAIN DEMANDS

Jeferson Auto da Cruza[1,2,3]
Luiz Leduino de Salles-Neto[2]
Cleder M. Schenekemberg[2,3]

ABSTRACT

This paper addresses a novel problem inspired by a practical situation faced by a Brazilian dairy company, which presents the integration of production and a two-level storage inventory control. In the supply chain (SC) analyzed, multiple production plants, warehouses, and distribution centers are considered. The problem also involves a set of constraints related to logistical capabilities and conditions of material flow throughout the SC. We developed a mathematical model and a Monte Carlo Simulation routine that aims to assist managers in establishing a production and inventory management plan for a perishable product, considering a stochastic and non-stationary demand. A numerical illustration of the results obtained by the mathematical model and a case study are carried out on the consideration of a First-Expired, First-Out inventory management policy. Results demonstrate that the proposed method allows the analysis of safety stock and the achievement of desired service levels while promoting a reduced rate of food waste over the considered planning horizon.

Keywords: Perishable Product, Optimization, Supply Chain Management, Monte Carlo Simulation, Joint Economic Lot Size Problem.

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Doutorado (DO)

AUTOMATED IDENTIFICATION OF HUMAN FACTORS IN AVIATION ACCIDENTS USING BERT-BASED CLASSIFIER AND TOPIC MODELING

July B. Macêdo[1]
Plinio M. S. Ramos[1]
Caio B. S. Maior[1]
Márcio J. C. Moura[1]
Isis D. Lins[1]

ABSTRACT

Aviation accidents are a significant concern due to the potential loss of life, and human factors have emerged as the primary underlying cause. The aviation industry maintains extensive records, including accident investigation reports, which offer valuable insights for decision-making. This research explores the application of Natural Language Processing (NLP) as a solution for analyzing these documents and conducting risk assessments, empowering experts to better manage accidents and devise effective preventive measures. In this study, we present a novel methodology for identifying the human factors contributing to aviation accidents. The approach leverages a BERT-based classifier, a state-of-the-art model in NLP, along with topic modeling techniques to label the accident dataset. This labeling process significantly reduces the need for manual analysis of each accident description, facilitating the training of a classifier capable of accurately identifying the factors responsible for aviation accidents. By applying the proposed methodology to the accident investigation reports performed by the National Transportation Safety Board (NTSB), we successfully trained a classifier capable of accurately identifying the human factors responsible for aviation accidents. This research contributes to the existing body of knowledge by introducing a distinctive approach that combines contextual embeddings and topic modeling, enhancing the accuracy and efficiency of human factor identification in aviation accidents. Moreover, this study is one of the results obtained from broader doctoral research that focused on developing NLP-based solutions for distinct RA issues. These findings highlight the potential of NLP techniques in analyzing accident investigation reports, thereby assisting experts in developing preventive measures and training plans to mitigate the risk of human error.

Keywords: aviation accidents, human factors, aviation safety, topic modeling, natural language processing, accident reports.

[1] Federal University of Pernambuco

Doutorado (DO)

CHALLENGES TO SCALE MIGRATION-RELATED HUMANITARIAN OPERATIONS

Luiza Ribeiro Alves Cunha[1,*]
Adriana Leiras [1]
Paulo Gonçalves [2]

ABSTRACT

Purpose – Considering the unprecedented impacts of migration in migrant-receiving countries worldwide, we analyse the scalability challenges of a Humanitarian Operation designed to assist vulnerable migrants in a destination country.

Design/methodology/approach – We develop qualitative and quantitative System Dynamics (SD) models. We analyse and validate the model results based on a case study of the Brazilian Operation responsible for receiving Venezuelan migrants (Operation Welcome).

Findings – Our analyses provide insightful results concerning scalability bottlenecks and interactions among the pillars of a migration-related humanitarian operation (i.e., border ordering, sheltering, and internalisation). Besides, our paper engages stakeholders to discuss the similarities and differences of diverse operations around the world and, consequently, provides a starting point from which other operations can be modelled and analysed.

Originality – The academic literature permeating migratory movements and SD is still scarce. Our paper addresses a research gap on the scalability of migrant-receiving countries' humanitarian operations.

Practical implications –The paper's contribution is justified given the challenges decision-makers face in migratory movement response operations, besides the strong social impact that the subject involves. Finally, despite the difficulty commonly seen in the academic literature in having accurate data, our research has been developed based on internal documents and monthly data since the beginning of Operation Welcome.

Keywords: Humanitarian Operations; Operation's Scalability; Migratory Movement; Case Study; System Dynamics.

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Doutorado (DO)

COLLABORATION FOR THE USAGE OF TECHNOLOGIES IN DISASTER AND HUMANITARIAN OPERATIONS

Renan Caldas Correia[1]
Amanda Fernandes Xavier Pedrosa[1]
Tharcisio Cotta Fontainha[1]

ABSTRACT

Stakeholder collaboration is fundamental to improve efficiency and effectiveness in humanitarian and disaster operations (DHO), reducing logistics costs and response time and minimizing the population's suffering. Technological advances are rapidly becoming widely accessible, thus enabling some technologies to be used to create and develop new opportunities to support and improve stakeholder collaboration in DHO. Thus, this research aims to analyze the collaborations for the use of technology in DHO, taking the Stakeholder Theory as an approach to the analysis and investigation of this application. The research develops a multiple case study of collaborations using DHO technologies. In this sense, it is observed that the presence of the volunteer stakeholder in all cases analyzed denotes the importance of volunteering in DHO. Likewise, the beneficiary stakeholder, the most affected in crisis scenarios, stands out in the four cases analyzed. Also, concerning the results, it is essential to highlight that technology needs to integrate the stakeholders among the cases observed. It is suggested as future research the deepening the analysis of the functioning of platforms that use collaborative technologies in the context of DHO, considering the Stakeholder Theory.

Keywords: Stakeholder Management, Stakeholder Collaboration, Technological collaboration.

[1] Universidade Federal do Rio de Janeiro (UFRJ)

Doutorado (DO)

DECISION ANALYSIS FRAMEWORK FOR PREDICTING NO-SHOWS TO APPOINTMENTS USING MACHINE LEARNING ALGORITHMS

Carolina Deina[1]
Flavio S. Fogliatto[1]
Giovani J. C. da Silveira[2]
Michel J. Anzanello[1]

ABSTRACT

No-show to medical appointments has significant adverse effects on healthcare systems and their clients. Using machine learning to predict no-shows allows managers to implement strategies such as overbooking and reminders targeting patients most likely to miss appointments, optimizing the use of resources. In this study, we proposed a detailed analytical framework for predicting no-shows while addressing imbalanced datasets. The framework includes a novel use of z-fold cross-validation performed twice during the modeling process to improve model robustness and generalization. We also introduce Symbolic Regression (SR) as a classification algorithm and Instance Hardness Threshold (IHT) as a resampling technique. We validated the framework using two attendance datasets from Brazilian hospitals with no-show rates of 6.65% and 19.03%. Our results outperformed sensitivity outcomes reported in the literature, with values above 0.94 for both datasets. This is the first study to use SR and IHT methods to predict patient no-shows and the first to propose performing z-fold cross-validation twice. Our study highlights the importance of avoiding relying on few validation runs for imbalanced datasets as it may lead to biased results and inadequate analysis of the generalization and stability of the models obtained during the training stage.

Keywords: Missed appointments; Healthcare environments; Imbalanced dataset; Classification algorithms; Resampling techniques; Machine learning.

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Doutorado (DO)

DECOMPOSITION METHODS FOR WASSERSTEIN-BASED DATA-DRIVEN DISTRIBUTIONALLY ROBUST PROBLEMS

Carlos Andrés Gamboa[1]
Davi Michel Valladão[1]
Alexandre Street[2]
Tito Homem-de-Mello[3]

ABSTRACT

We study decomposition methods for two-stage data-driven Wasserstein-based DROs with right-hand-sided uncertainty and rectangular support. We propose a novel finite reformulation that explores the rectangular uncertainty support to develop and test five new different decomposition schemes: Column-Constraint Generation, Single-cut and Multi-cut Benders, as well as Regularized Single-cut andMulti-cut Benders. We compare the efficiency of the proposed methods for a unit commitment problem with 14 and 54 thermal generators whose uncertainty vector differs from a 24 to 240-dimensional array.

Keywords: two-stage stochastic programming, decomposition methods, distributionally robust optimization

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Doutorado (DO)

DESIGN SCIENCE RESEARCH LABS: A RESEARCH MODEL PROPOSITION FOR INNOVATION LABS

Alan Felismino da Silva[1]
Tharcisio Cotta Fontainha[1]

ABSTRACT

The Innovation Labs appear as independent groups or functional areas of organizations to solve complex problems by building solutions recognized for their strategic role in the market and society. Despite the scientific literature on Innovation Labs continuously addressing topics such as resources and infrastructure, there is a gap related to understanding the management dynamics and principles that characterize the Innovation Labs from these two perspectives. Therefore, this research aims to propose a reference model for the structuring and operation of Innovation Labs. This research adopts the Design Science Research (DSR) methodology to build the reference model based on activities mapped in nine Innovation Labs. It is concluded that the model can guide organizations regarding the creation and measurement of performance by the partial processes proposed, providing best research practices using DSR for professionals who work with innovation projects and, finally, reducing the problem of asymmetry of knowledge, infrastructure, processes, strategic objectives, and resources between the Innovation Labs. Future research is suggested to discover and evaluate the adherence of the process model proposed to organizations with Innovations Labs.

Keywords: Innovation Laboratory; Design Science Research; Reference Model; BPMN.

[1] Universidade Federal do Rio de Janeiro (UFRJ)

Doutorado (DO)

ENSEMBLE LEARNING MODEL FOR NUCLEAR POWER GENERATION FORECASTING USING DEEP NEURAL NETWORKS AND SUPPORT VECTOR REGRESSION

Jorge Gustavo Sandoval Simão[1]
Helon Vicente Hultmann Ayala[2]
Viviana Cocco Mariani[3,4]
Leandro dos Santos Coelho[1,3]

ABSTRACT

Forecasting nuclear power generation is essential for market operations, safety, economic efficiency, resource optimization, grid stability, and the integration of renewable energy sources. It allows nuclear power plants perform more efficiently and consistently and contributes to the overall reliability and long-term viability of the power system. On the other hand, researchers investigating energy systems have grown increasingly interested in machine learning models employed to address the time series forecasting challenge. This study evaluates a hybrid set of three forecasting models including Least-Squares Support-Vector Regression, Gate Recurrent Unit, and Long Short-Term Memory models applied to the nuclear power time series forecast in the French power plants dataset from 2009 to 2020. In addition, this research evaluated prediction results where approaches are channeled to the RreliefF algorithm optimized using a tree-structured Parzen estimator and after an ensemble learning approach, showing promising results in terms of performance metrics. The suggested ensemble learning model, which outperforms the other nine models in this study according to performance criteria such coefficient of determination of 75%, root mean squared error of 0.108, and mean absolute error of 0.080, is lastly compared with the others.

Index Terms: Time Series Forecasting, Feature Selection, Deep Neural Networks, Nuclear Energy

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Doutorado (DO)

EXPLORING ROBUST COVARIANCE ESTIMATORS ON FORECAST RECONCILIATION

Maurício Franca Lila[1,*]
Erick Meira[1,2]
Fernando Luiz Cyrino Oliveira[1]

ABSTRACT

Hierarchical Time Series (HTS) stand for a set of time series that can be aggregated at different levels, according to a well-defined hierarchical structure. Hierarchical forecasting methods take advantage of the hierarchical structure of the data through base forecast reconciliation, generating results that are usually unbiased and more accurate than those provided by benchmark methods. When combining base forecasts through reconciliation strategies based on regression models, the weighting system can be compromised when the covariance structures are not well estimated, causing distortions to the reconciliation process. This work introduces the concept of hierarchical forecast reconciliation using robust estimation of the covariance structure. To demonstrate the potential and validity of the proposed strategy, we set forth an application using hierarchical data on monthly electric energy consumption in Brazil and data on Australian tourism. We compare the performance of our strategy with that from traditional regression-based state-of-the-art methods in HTS. Overall, robust covariance estimates show promising forecasting results under multiple settings and through the lens of different evaluation metrics. Consequently, the new approach is shown to be suitable to support decision making in the energy sector. Furthermore, the methodology developed is flexible, in the sense that it can be readily applied to other sets of hierarchical time series.

Keywords: Forecasting, Hierarchical Time Series, Robust Covariance Estimation, Forecast Reconciliation

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Doutorado (DO)

GESTÃO DE RISCOS EM AMBIENTES HOSPITALARES SOB A PERSPECTIVA DE SISTEMAS RESILIENTES: UMA REVISÃO SISTEMÁTICA DA LITERATURA

Tamires Fernanda Barbosa Nunes[1]
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ABSTRACT

A gestão de riscos, gestão de segurança e sistemas resilientes voltados à área da saúde são elementos fundamentais na garantia de qualidade e continuidade dos serviços prestados, além de segurança dos pacientes e profissionais de saúde. Os sistemas resilientes são projetados para resistir e se adaptar a perturbações e eventos adversos, mantendo a continuidade dos serviços essenciais, que na área da saúde significa serem capazes de lidar com situações de crise, como desastres naturais, epidemias, emergências de saúde pública, entre outros, como a pandemia vivenciada recentemente pela população mundial. Neste sentido, a resiliência inclui a capacidade de resposta rápida, a coordenação eficiente, a comunicação efetiva e a capacidade de recuperação após um evento adverso. A presente pesquisa buscou compreender como o conceito de resiliência ou engenharia de resiliência tem sido abordado para gestão de riscos em ambientes hospitalares, por meio de uma revisão sistemática da literatura (RSL), que utilizou as bases de dados Medline/PubMed, Scopus e Web of Science, no período entre 2010 e 2021. A intenção foi caracterizar sistemas resilientes, identificar riscos ocupacionais e estratégias de gerenciamento e de adaptações organizacionais para desenvolvimento da resiliência organizacional. Os resultados indicaram a importância de se estabelecer uma cultura de segurança, promover a conscientização sobre os riscos, treinar e desenvolver os profissionais de saúde, assim como utilizar tecnologias adequadas para monitorar e mitigar riscos, e realizar avaliações de forma contínua para identificar pontos de melhoria.

Palavras-chave: Gestão de riscos; Gestão de segurança; Resiliência; Ambientes hospitalares.

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Doutorado (DO)

HYBRID MACHINE LEARNING MODELS APPLIED TO ACCURATE DAILY URBAN WATER CONSUMPTION PREDICTION

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ABSTRACT

This study proposes hybrid machine learning (ML) models to predict the daily urban water consumption scenario in a neighborhood Brazilian city. The framework evaluates various signals decomposition modes including empirical wavelet transform (EWT), complete ensemble empirical mode decomposition with adaptive noise (CEEMDAN), seasonal and trend decomposition (STL) using LOESS with locally estimated scatterplot smoothing, and variational mode decomposition (VMD), to preparing the dataset. The decomposed data is combined with different ML models such as Bayesian regularized neural networks (BRNN), extreme learning machine (ELM), k-nearest neighbor (KNN), multilayer perceptron neural network (MLP), support vector regression with linear kernel function (SVRL), and support vector regression with radial basis function kernel (SVRR), for daily short and long-term forecasting. The CEEMDAN-SVRL and VMD-SVRL hybrid models are found to have the best results in terms of statistical metrics and performance criteria, improving prediction accuracy and stability of results significantly. The study demonstrates the potential of ML frameworks to improve water resource planning and management by accurately predicting water consumption scenarios. Some results obtained suggested that VMD-SVRL model performed better in most scenarios.

Keywords: Empirical Wavelet Transform, Machine Learning, Time Series Forecasting, Variational Mode Decomposition, Water Consumption

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Doutorado (DO)

INTERCONNECTION BETWEEN THE FIELDS OF PRODUCTION AND DISTRIBUTION OF BRAZILIAN CINEMA THROUGH INTERACTION NETWORKS

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ABSTRACT

Some works identify in Brazilian cinema a distribution bottleneck. Considering this, the objective of the study is to identify, by mapping the networks and Multiple Correspondence Analysis formed by the interactions between production and distribution companies in recent decades, the relationship of dependence between the fields of production and distribution in Brazilian cinema. To this end, the production and distribution stages are understood as interconnected fields, immersed in the macro field of the film industry and, thus, holders of their own practices, values and rules that may or may not be shared with adjacent fields. Therefore, it is possible to reinforce the strategic role of the field of distribution in the macrofield of the Brazilian film industry, not only as an articulator between the fields of production and exhibition, but also as an important point of consolidation of the macrofield, expanding its internal dynamics and strengthening adjacent fields

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Doutorado (DO)

MNES, FDI AND REGIONAL INNOVATION INTENSITY: EVIDENCES FROM BRAZIL

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ABSTRACT

Foreign direct investment (FDI) has been seen by the literature as an influential factor in the technological evolution of host-countries innovation ecosystems, with several developing nations such as Brazil aiming to attract FDI as a way to potentialize their development through innovative output. However, the evidence on whether FDI configures a source of positive or negative influence on regional innovation capabilities is definitely mixed. Furthermore, despite the existence of studies regarding emerging economies, there is a gap when it comes to the regional level in Brazil. We intend to contribute to the literature by examining whether regional MNEs are inducing high or low-intensity innovations in this last context. Thus, this study aims to complement academic investigations by analyzing the influence of multinational enterprises (MNEs) on regional innovation intensity in Brazil in the state of São Paulo using a unique regional-level FDI database in a panel ranging from 2010 to 2016. The results indicate that the presence of MNEs boosts the production of high and low-intensity inventions, slightly more for the latter than the former. In other words, FDI is better for the production of inventions in general, which can later become innovation, but even more so for utility models and certificates of addition. These findings corroborate with various regression specifications and alternative estimation methods explored throughout the academic literature.

Keywords: MNEs, invention intensity, patents, Brazil.

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Doutorado (DO)

OPTIMIZATION MODEL AND MIP-BASED HEURISTICS FOR AIRCRAFT ROUTING WITH CREW ASSIGNMENT IN THE ON-DEMAND AIR TRANSPORTATION

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ABSTRACT

The fractional ownership service is one of the fastest-growing segments within the business aircraft industry in recent decades. This market is related to the context of on-demand air transportation, presenting problems that encompass complex decisions in a highly dynamic environment that must respect various civilian aviation rules, where detailed representations need to be made efficiently, as they imply high operating costs. A task of great relevance in this service sector involves aircraft routing with crew assignment. The aim is to de ne in the most efficient way possible what routes each aircraft must perform, considering the fleet characteristics and its different costs and aircraft qualities, as well as the crew legislation, such as working hours limit, minimum rest time, breaks, overtime payments, among others. Despite its practical relevance, this subject has been barely explored in the literature. We propose a mixed-integer programming (MIP) model to appropriately represent the addressed problem, and MIP-based heuristics developed from two classical methods known as relax-and-fix and fix-and-optimize to cope with larger real-life instances. Computational experiments were carried out with real-life data provided by a company belonging to this modality. Using a general-purpose MIP solver, we were able to obtain optimal solutions in most analyzed instances for the proposed model, and even greater cost reductions in all instances with open optimality gap for the best heuristic method, which indicates the high potential for application of these approaches in the decision-making processes.

Keywords: Dial-a-flight problem, Crew assignment, Aircraft routing, Mixed-integer programming, MIP-based heuristics.

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Doutorado (DO)

PORTFOLIO-BASED MULTICRITERIA MODEL TO SUPPORT RISK MANAGEMENT IN NATURAL GAS PIPELINES

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ABSTRACT

Natural gas plays an essential role as a source of energy transition. The development of natural gas transportation systems, particularly pipelines, is associated with the use of natural gas. In this regard, carriers face significant infrastructure, risk management, and operational efficiency challenges. Therefore, this paper contributes to the decision-making process regarding risk management for natural gas pipelines, making it more explicit, rational, and structured. In other words, it is appropriate to consider an evaluation involving multiple dimensions of consequence to which pipelines are subjected. To this end, this paper explores a multidimensional risk assessment (based on Utility Theory and Decision Theory) capable of aggregating the probabilities, consequence values, and preferences of the gas carrier manager in the face of this multiple-dimension scenario. In addition, this work efficiently directs the focus of risk mitigation. A portfolio approach is used to support the strategic selection of the most critical sections of the pipeline. In this sense, the new model allows carriers to deal with the dilemma of investing in risk mitigation along the pipeline without exceeding organizational resources, ensuring the continuity of natural gas supply and the safety of their operations. Some studies recommend using additive models and mathematical programming (considering interval scale transformation) to solve such problems (portfolio). However, such an approach is inadequate when the modeling is based on Utility Theory (due to the axiomatic structure). As a result of this impasse, this paper introduces an implicit enumeration algorithm to deal with portfolio selection when the interval scale is the only form of measurement. A numerical application was performed to validate the proposed model and a robust and comprehensive investigation of the model's sensitivity. The results show the proposed model's credibility in identifying the pipeline's most critical sections. Consequently, managers can benefit from the model's information to guide strategic decision-making, contributing to cost reduction, increased safety, improved operational efficiency, minimized social and environmental impacts, and strengthened company reputation.

Keywords: Natural gas pipeline; Multidimensional risk assessment; Portfolio selection; Implicit enumeration; Sensitivity analysis.

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Doutorado (DO)

PUBLIC BIDDING IN GOVERNMENT PROCUREMENT - A NEW METHODOLOGY FOR RANKING PROPOSALS USING FULL DIMENSIONAL EFFICIENT FACETS OF DEA FRONTIER

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ABSTRACT

This work proposes a new methodology to evaluate bids for government procurement, in compliance with the European Union procurement directives. It allows a bidder to seek a better match between price and quality of the bid product, by assigning appropriate weights, while ensuring transparency in the government procurement. The theoretical foundation is based on a Data Envelopment Analysis (DEA) frontier composed of full-dimensional efficient faces (FDEFs) as a framework for measuring performance and ranking proposals. It applies a non-radial non-oriented performance measurement which is a modification of the Enhanced Russell Graph Measure (ERGM) to search for the closest target. The methodology combines the use of FDEFs and Enhanced Russel Graph Measure (ERGM) in two phases. In the first phase, a team of specialists identifies all outputs and inputs that determine the performance of the bidding object. They also research for object alternatives, seeking to explore a wide range of outputs that meet the technical requirements, regardless of whether or not they are available at the place and time of the bidding. These data are processed to identify extreme efficient DMUs that determine the productivity frontier, composing the, herein called, referential database. The first phase concludes with the identification of all the supporting hyperplanes for the full-dimensional efficient faces (FDEFs) which will necessarily be defined by strictly positive weights. The second phase then proceeds with the use of a new database consisting of the proposals submitted to the bidding notice. These are evaluated through their projections onto the FDEFs of the efficient frontier. We apply the proposed methodology to a realistic problem from the Brazilian navy, with the support of concept mapping to direct the evaluation process.

Keywords: Data Envelopment Analysis, Government Procurement, Full Dimensional Efficient Facets.

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Doutorado (DO)

RANKING OF CANDIDATES FOR THE FUNCTION OF INSTRUCTOR OF THE BRAZILIAN AIR FORCE: AN ANALYSIS FROM THE SWARA MOORA-3NAG METHOD

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ABSTRACT

There are opportunities for improvements in the selection process of instructors for the Air Force Officers Improvement School (EAOAR) in order to advise its Commander. In addition, historically, the decision-making process was cognitively exhausting and time-consuming. The objective of this article is to improve the process of selecting new EAOAR instructors, making it faster, less subjective and more reliable for the decision maker. The Step-Wise Weight Assessment Ratio Analysis (SWARA) method was applied to elicitate the decision criteria weights. The ordering of alternatives, or candidates, was implemented by the Multi-Objective Optimization on the Basis of Ratio Analysis (MOORA) method. In order to obtain greater robustness in the decision, the computational tool SWARA-MOORA-3NAG (SM-3NAG) For Decision Making (v1) was used, which simplified the calculations. The robustness of the final result was observed by the use of three normalization procedures. In addition, it was confirmed that the best absolute solution corresponds to the greatest distance, calculated from the extreme points of each ordination obtained in the different normalization processes. The global absolute ordering reduced the cognitive effort of the decision maker, giving greater reliability and quickness in the obtention of the final result.

keywords: Brazilian Air Force. Personnel Selection. SWARA-MOORA-3NAG.

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Doutorado (DO)

TALKING WITH THE DOCTOR: UNDERSTANDING AND COMMUNICATING MODELS PERFORMANCE IN A HEALTH SCENARIO

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ABSTRACT

Effectively communicating the results of predictive models and insights to doctors remains challenging. This study focuses on improving communication between data scientists and doctors by analyzing the classification of COVID-19 patients into severe and non-severe groups. By measuring instance hardness and examining meta-features, we identified key patterns for classification. Severe patients were easily classified when aged 64+ with low lymphocyte percentage (LYM%), while non-severe patients exhibited high LYM% or low LYM% with low Urea values. Meta-features provided additional insights into model decision-making. These findings enhance communication, enabling doctors to better interpret model's outputs. By simplifying features and meta-feature presentation and emphasizing interpretability, collaboration between data scientists and doctors is facilitated, opening a pathway to build data-centered models.

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Doutorado (DO)

THE ROLE OF DIGITAL TRANSFORMATION TO SUPPORT SOCIAL ENGAGEMENT INITIATIVES IN SUPPLY CHAIN MANAGEMENT: AN INSTITUTIONAL PERSPECTIVE

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ABSTRACT

Purpose – Supply chains face growing pressure to take responsibility for societal needs. We argue that social engagement initiatives in supply chain management are a response to this pressure, but it is unclear whether these initiatives can improve firm performance. We also propose that digital transformation in supply chains (Smart Supply Chain) can support social engagement initiatives, enabling better responses to societal pressures. Therefore, we aim to analyze the association between digital transformation, social engagement in SCM, and firm performance.
Design/methodology/approach – We employed institutional theory to analyze these relationships. We surveyed 473 companies in Brazil, a country where social needs create high pressures on companies to respond to the country's challenges. The collected data were tested using OLS regression and bootstrapping techniques to examine mediation effects between Smart Supply Chain (digital transformation strategy and digital front-end technologies), social engagement initiatives, and firm performance.
Findings – Digital transformation supports social engagement initiatives, creating new ways to meet societal requirements. Moreover, the adoption of social engagement initiatives helps to increase firm performance in the context of an emerging economy, while social engagement initiatives mediate between digital transformation and firm performance.
Originality/value – We provide a novel perspective on the social side of sustainable supply chains by demonstrating the close relationship between digital transformation and social engagement initiatives. We argue that aligning digital transformation strategies and technologies with social engagement initiatives is crucial for companies to respond to institutional pressures and establish stronger connections with stakeholders.

Keywords: Digital transformation, Smart Supply Chain, Social supply chain, Institutional Theory

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Mestrado Acadêmico (MA)

A CONTROL CHART FOR THE JOINT MONITORING OF MEAN AND VARIANCE WITH KLEIN'S SUPPLEMENTARY RULE

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ABSTRACT

The $\bar{X}$ control chart and the $S2$ control chart have been used since the 1950s to control the mean and variance of a process. When we desire to control the mean and variance of a process simultaneously, one of the most used control charts in the industrial environment is the $\bar{X} - S2$ control chart, due to its simplicity and ease of use. However, both the $\bar{X}$ and the $S2$ control charts lack sensitivity in detecting small sustained shifts in the mean or variance. One of the most common ways of improving a control chart are run rules, such as a procedure known as Klein's 2-of-2, a simple and efficient supplementary rule that signals that the process is out-of-control only when two sequential sample averages are observed above the upper control limit or below the lower control limit. The use of this rule for the $\bar{X} - S2$ control chart results in a substantial reduction of the average run length (ARL) in detecting small process shifts when compared to the traditional $\bar{X} - S2$ control chart, being very important in high quality processes. In this paper we propose an improvement to the $\bar{X} - S2$ control chart using Kleint's 2-of-2 rule. The proposed improvement presented a better performance, in terms of ARL, for small shifts in the mean and/or variance, while maintaining a similar level of applicability in relation to the $\bar{X} - S2$ control chart.

Keywords: Control charts, Run rules, ARL, Markov chain.

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Mestrado Acadêmico (MA)

A NON-PARAMETRIC PROBABILISTIC COUNTERFACTUAL APPROACH TO ASSESS A RETAILER'S TRANSACTIONAL POTENTIAL

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ABSTRACT

In the payment industry context, a merchant acquirer is a firm that facilitates communication between a retailer (online or brick–and–mortar store) and the issuing banks. For an acquirer, it is crucial to determine the transactional potential of each retailer to guide proper pricing and risk management strategies. In this work, we propose a framework to properly assess the transactional potential of any retailer using the transactions of its peers. The proposed framework is based on the construction of a probabilistic counterfactual that uses non-parametric Nadaraya-Watson kernel regression to model differing seasonal patterns, trends and business cycles. We propose an integrated data processing methodology to separate and validate the data not affected by interventions to construct our non-parametric probabilistic counterfactual model. The proposed framework is a powerful decision support system for a merchant acquirer revenue management, with direct applications to pricing, churn detection and, more generally, revenue management. Empirical results corroborate the effectiveness of the method against relevant benchmarks.

Keywords: Data Analytics, Machine Learning, Merchant Acquirer, Revenue Management Analysis

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Mestrado Acadêmico (MA)

A QUANTITATIVE MODEL TO MEASURE A COMPANY'S ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) FOOTPRINT CONSIDERING THE SUPPLY CHAIN AND THE OPERATIONS

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ABSTRACT

Sustainability and Environmental, Social & Governance (ESG) aspects have a growing relevance in the corporate world. The Supply Chain (SC) is the responsibility of the buyer and accounts for a large part of their ESG footprint. Therefore, Anchor Companies (AC), the buyer, need to go through a complex, expensive, and time-consuming process to assess their SC. The objective of this work is to develop a weighted ESG assessment model for companies to receive a quantitative score of their footprint considering both their operations and the SC. The model uses an international taxonomy (SASB – Sustainability Accounting Standards Board) as a reference for the evaluated topics and definition of weight based on the economic sector and presents formulas to calculate the ESG score (0-10) for AC, the SC and the consolidated ESG score. Finally, from the development of the method, scenarios were designed by testing two different scenarios with different interactions between two AC and two SC with different ESG maturity levels. The results from the analysis show that the SC has a significant impact on the final ESG score of the AC, proving that it is not possible to evolve in ESG aspects without working together with the SC.

Keywords: Sustainability; Supply chain; ESG; Corporate Management; Evaluation ESG model; ESG Ratings

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Mestrado Acadêmico (MA)

APPLICATION OF DATA ENVELOPMENT ANALYSIS IN THE EVALUATION OF PUBLIC SECURITY EFFICIENCY: STUDY LOCATED IN THE CENTRAL AGRESTE REGION OF THE STATE OF PERNAMBUCO

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ABSTRACT

One of the most relevant topics, which is increasingly debated in society, is the fight against crime. In Brazil, many indicators related to public safety reach negative percentages compared to other neighboring countries, in some parts of the country the indices are equal to those of countries that suffer from wars. The 1988 federal constitution establishes that it is the responsibility of the public power to build security policy strategies, this work aims to measure the efficiency and potential points of improvement of Pernambuco police units that make up a specific Integrated Security Areas - AIS that comprises the Agreste Central region of the state where its headquarters are located in the city of Caruaru. The definition of clearances and the potential for improvements in terms of police numbers is investigated to propose an empirical redistribution over units operating at full capacity. This work uses the advances of Data Envelopment Analysis (DEA) with non-discretionary inputs. For the evaluation of efficiency, 2 models were built that relate the numbers referring to public safety. Model 1 is composed of 2 inputs (Military Police Staff and Number of Vehicles) and 2 outputs (Number of arrests and Number of gun seizures) and model 2 is composed of 1 input (Civil Police Staff) and 1 output (Resolution of Intentional Lethal Violent Crimes) both referring to the period between the years 2018 and 2021 with a monthly cut. The results bring attractive perspectives for public security in countries with contexts and social structures similar to Brazil, obtaining results from production capacity (technical efficiency), benchmarks (units operating at full capacity), and police officers who can be dismissed and reallocated from inefficiency units for units working at full capacity.

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Mestrado Acadêmico (MA)

BUSINESS PROCESSES FOR DATA MONETIZATION: AN EXPLORATORY ANALYSIS AND PROPOSITION OF DESIGN PATTERNS

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ABSTRACT

Data Monetization is a recent phenomenon that empowers companies to extract value from data. However, there is a scarcity of comprehensive and consolidated empirical evidence on this subject, with relevant studies scattered across scientific literature. To enhance our understanding of Data Monetization, further research is required. Design patterns can play a crucial role in both consolidating findings and providing a framework for critical analysis. This study proposes specific design patterns, based on a systematic literature review of existing empirical studies, to support the structuring of business processes for Data Monetization. We evaluate the effectiveness of these patterns through an exploratory case study in a leading Brazilian academic institution, that has Data Monetization in the core of its business model. Our contribution to the field is manyfold. Methodologically, we synthetize empirical findings utilizing design patterns. From a managerial perspective, the results provide insights for organizations that want to leverage data and structure their resources and capabilities through well-defined business processes. Overall, we advance the research field providing a comprehensive understanding of the Data Monetization phenomenon.

Keywords: Data Monetization; Design patterns; Business Processes; Value-Added Chain

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Mestrado Acadêmico (MA)

COMPARAÇÃO DE CONCEITOS DE DESIGN EM ESTRUTURAS DE APRENDIZADO DE MÁQUINA BASEADOS EM ÁRVORE DE DECISÃO

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ABSTRACT

Os modelos de aprendizado de máquina têm ganhado muito espaço nas grandes corporações, atuando como ferramenta de análise para selecionar as melhores decisões, gerando vantagem competitiva por meio da antecipação das ações. Por esse motivo desenvolver modelos eficientes e confiáveis são essenciais para o sucesso de qualquer projeto. Nesse artigo iremos propor uma alternativa para avaliar modelos de classificação baseadas em árvores de decisão através de decisão multicritério e análise de conceitos de design. Para isso utilizaremos três objetivos conflitantes, precisão, recall e quantidade de vareáveis, que serão analisadas de forma conjunta. Utilizaremos algoritmos de aprendizado de máquina com características estruturais diferentes com objetivo de ressaltar as variações de comportamento conforme inserimos variáveis novas. Acreditamos que seja possível encontrar o melhor modelo com as melhores variáveis olhando não só para métricas já conhecidas de forma individualizada e sim para uma metodologia que consiga mesclar esses objetivos do ponto de vista multicritério, que irão contribuir para o sucesso de um bom modelo.

Keywords: Tomador de decisão, aprendizado de máquina, seleção de características, análise multicritério

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Mestrado Acadêmico (MA)

CONTINGENCY PLANS FOR TECHNOLOGICAL DISASTERS IN THE OIL AND GAS SECTOR: A LITERATURE REVIEW

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ABSTRACT

The oil and gas (O&G) sector involves high-risky activities and, therefore, needs to adopt strict preparedness measures to face various situations, a context in which contingency plans become essential tools. Therefore, the herein study aims to analyze the state of the art of the scientific discussion on contingency plans for technological disasters in the O&G sector. A systematic literature review was conducted, and after analyzing 187 abstracts, 46 articles were classified according to contingency plan scenarios, structured models in place and simulations approaches. The bibliometric analysis reveals the concentration of studies in the offshore context, especially in oil spill scenarios and a topic dispersion in the more recent publications. The content analysis, in turn, summarizes the papers concerning the structuring of contingency plans while emphasizing whether these are based on conceptual proposals, visual models or bibliographic reviews. Additionally, this research indicates the applications of simulations – whether computational or practical – in developing contingency plans, although these are still insufficiently explored resources. Regarding contributions, this study indicates the need to expand the scenarios covered by contingency plans, develop more comprehensive plans, expand the use of simulation exercises and learn based on past events. As a perspective for future research, further analysis of the onshore context and scenarios involving fire/explosions is suggested, as well as the importance of stakeholder coordination and workforce training for the success of a contingency plan.

Keywords: Contingency plans; offshore; onshore; oil and gas

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DIAGNOSIS OF ROTATING MACHINERY FAILURE MODES IN THE O&G INDUSTRY VIA QUANTUM MACHINE LEARNING

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ABSTRACT

Rotating machines are crucial equipment in the Oil and Gas (O&G) industry that operate in challenging environments subjected to high temperatures, fatigue, and heavy loads. Vibrational analysis is now the industry standard for evaluating the conditions of these types of equipment. Traditional Prognostic and Health Management (PHM) methods for diagnosing failure modes involve feature extraction using signal processing techniques and defect classification utilizing Machine Learning (ML) and Deep Learning approaches. However, Quantum Computing (QC) has recently gained significant attention in the literature for promoting problem-solving improvements. Quantum Machine Learning (QML) combines QC techniques with classical ML models, with qubits or quantum bits being the smallest quantum units. Qubits can be in states "0", "1", or a linear combination of the two called superposition. Moreover, entanglement operations allow strong correlations to be established between qubits, irrespective of their distance. Therefore, this study aims to investigate and adapt QML models to perform PHM, particularly in diagnosing the failure modes of equipment components in the O&G industry. We present models that employ combinations of the Variational Quantum Eigensolver framework with three distinct entanglement gates (CNOT, CZ, and iSWAP), as well as varying the number of quantum circuit layers. In addition to the intricate analyses conducted by the authors in a previous study, this paper aims to compare two distinct data preprocessing approaches. Specifically, the first approach involves processing the data in the time domain, while the second approach utilizes the frequency domain via a Fast Fourier Transform. Furthermore, an alternative encoding method, known as amplitude encoding, will be tested. Lastly, the impact of quantum noise will be evaluated to ascertain the viability of the proposed models on quantum computing hardware. We use two datasets, named Case Western Reserve University and Jiangnan University that contain information on 10 and 12 failure modes, respectively. The results demonstrate that quantum approaches have higher accuracy than classical models, indicating the potential of QML in the O&G industry. As quantum technologies advance, the O&G industry can benefit significantly from QML, potentially leading to a more efficient diagnosis than those currently performed through classical ML models. This study in Production Engineering contributes to improved failure diagnosis, predictive maintenance, equipment lifespan optimization, and advanced data analysis techniques. These developments enhance operational efficiency, reduce costs, increase production system reliability, and improve service safety and environmental sustainability.

Keywords: Quantum Machine Learning; Prognostic and Health Management; Failure mode diagnosis, Vibration Signal; Rotating Machinery.

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Mestrado Acadêmico (MA)

EFEITO PLACEBO EM EMBALAGENS DE SUCO DE FRUTAS E O NÍVEL DE ATENÇÃO DO CONSUMIDOR: UM ESTUDO EXPERIMENTAL UTILIZANDO EYE-TRACKING

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ABSTRACT

Este estudo teve como objetivo investigar o efeito placebo de embalagens de suco de fruta na percepção da quantidade do produto, assim como avaliar a relação entre a atenção e o efeito placebo. Além disso, foi analisada também, se a decisão de compra, do consumidor, está relacionada com a atenção, a percepção de qualidade e o efeito placebo. Para tal, foi realizado um experimento utilizando a ferramenta de rastreamento ocular, o Eye-tracking, a fim de analisar o comportamento ocular e inferir sobre a atenção dos consumidores. Como estímulos foram desenvolvidos um total de quatro embalagens que variaram em função do formato da embalagem (retangular e triangular) e do sabor (laranja e maçã). Esses estímulos foram desenvolvidos de forma que, variações na forma das embalagens causassem uma impressão de tamanhos diferentes (volumes diferentes), porém possuíam o mesmo volume do produto (300ml). Esse experimento foi realizado com 105 voluntários, maiores de 18 anos, no Laboratório NSID (Laboratory for Neuroscience and Behavioral Studies in Decision. Para responder ao objetivo do estudo, três hipóteses foram levantadas. Quanto a primeira, espera-se que, a forma da embalagem tenha influência no efeito placebo, para tal análise, foi utilizado o teste godness-of-fit. Em relação à segunda, espera-se que a atenção na forma da embalagem influencie o efeito placebo, na qual foi utilizada a regressão logística. E na terceira, espera-se que tanto a atenção na forma da embalagem quanto a percepção de qualidade e quantidade da mesma, influenciem a decisão de compra, portanto para tal, também foi utilizado uma regressão logística. De modo geral, os resultados obtidos indicam que as diferentes formas das embalagens influenciaram a percepção de quantidade/volume diferentes dos produtos, sugerindo haver o efeito placebo. Com maior intensidade para a embalagem retangular em ambos os sabores. Além disso, as análises sugerem que existe uma relação entre atenção e efeito placebo, observada em termos da variável forma da embalagem. Por fim, o resultado da terceira análise sugere que, para ambos os sabores, a atenção e a percepção de quantidade não foram variáveis significativas neste modelo, porém a percepção de qualidade influencia a decisão de compra. Portanto, de maneira geral, este estudo traz contribuições para a engenharia de produção, dado que seus resultados podem melhorar a tomada de decisão dos gestores e empresários, podendo impactar em algumas grandes áreas, como a Engenharia de Operações e Processos da Produção, Cadeia de suprimento, Engenharia da Qualidade e Engenharia do Produto. Nesse sentido, espera-se que esta pesquisa contribua para estabelecer estratégias para o desenvolvimento de embalagens que atraiam a atenção dos consumidores e influenciem a decisão do consumidor. Além disso, os resultados obtidos podem ter impacto econômico nas decisões na indústria, já que pode otimizar as demandas e promover uma maior competitividade entre as empresas e como resultado as empresas poderão melhorar o nível de procura dos seus produtos. Ademais, de uma perspectiva ambiental, a otimização de recursos pode ser um meio de conseguir uma produção mais sustentável, desde a redução de desperdício à concentração da produção de embalagens visualmente mais atrativas.

Palavras-chave: Neurociência; Eye-Tracking; Neuromarketing; Embalagens; Efeito Placebo.

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Mestrado Acadêmico (MA)

INDUSTRY 4.0 AND SMART CONSUMPTION: HOW DIGITAL TRANSFORMATION CAN ENHANCE THE USE OF INDUSTRIAL RESOURCES

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ABSTRACT

The industry 4.0 literature has recently focused the attention on the role of digital technologies for sustainable operations. However, sustainability has not been addressed as a clear dimension of the industry 4.0 technological structure. This research aims to broaden such a view by proposing the concept of Smart Consumption. To this aim, we consider three main types of resource consumption: material, energy, and water consumption. The study adopts a Systematic Literature Review to consolidate the main technologies adopted within these three Smart Consumption dimensions. The study analyzes 148 articles in this field and investigates which digital technologies have been adopted and how they are applied in each of the dimensions of Smart Consumption. Based on the analyzed articles, it was possible to present a structured concept of Smart Consumption.

Keywords: Industry 4.0; Smart Consumption; Sustainable Consumption; digital technology

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Mestrado Acadêmico (MA)

OPTIMIZATION OF BATTERY SWAPPING STATIONS WITH HETEROGENEITY, CHARGING DEGRADATION AND PV-OPTION

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ABSTRACT

Greenhouse gas emissions-related issues have been extensively discussed in the past years, with over 70 countries already committed to a carbon-neutral economy by 2050. The electrification of transportation modals has increased following these goals, where Electric Vehicles (EVs) are starting to take Internal Combustion Engine Vehicles (ICEV) market share all over the globe. Besides the particular complexity in comparing EVs and ICEVs, challenges involving the nature of EVs and their integration with cities, such as the lack of public locals for charging, are also critical and interfere with their development. In this context, this work aims at studying the problem of a Battery Swapping Station (BSS), a structure where the EVs users swap their depleted batteries for fully or partially charged ones. In order to simulate the BSS daily operations and battery charging schedule, a novel Mixed Integer Linear Programming (MILP) model is proposed, taking into account battery heterogeneity, the use of local photovoltaic (PV) production, and battery degradation based on charging profile. A collection of BSS operation metrics are designed to evaluate the solution quality of the proposed scheduling model. A numerical experiment comprising four case studies based on real data from the US power and transportation systems is presented, with insights and analyses on the PV and grid power use, as well as a BSS financial comparison against close-related benchmark scheduling approaches, together with sensitivity analyses on BSS sizing plan and costumers service. Results highlight the importance of battery degradation in the optimization model, since its consideration as an operational cost brought a reduction of 16%.

Keywords: Battery Swapping Station; Electric Vehicles; Photovoltaic Power Production; Mixed-Integer Linear Programs; Distributed Energy Sources; Battery Heterogeneity.

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Mestrado Acadêmico (MA)

PORK MEAT PRODUCTION: PROPOSAL FOR MONITORING INDICATORS BASED ON LIFE CYCLE ASSESSMENT

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ABSTRACT

This study carried out a Life Cycle Assessment (LCA) of the pork production process based on a detailed Life Cycle Inventory (LCI) of inputs and outputs of 3 years of the process, from the entrance of the live animal to the final packaged products. The Life Cycle Impact Analysis (LCIA) was carried out using the CML-IA and Impact 2002+ methods to observe which impact categories are most relevant in environmental terms in the medium and long term, excluding impacts related to production of the living animal. The results of the LCIA made it possible to identify the most relevant impact categories, such as Abiotic Depletion (fossil fuels), Global Warming, Marine Ecotoxicity, Acidification and Eutrophication. The impacts detected supported the definition of critical Key Performance Indicators (KPI) and Process Performance Indicators (PPIs) in environmental aspects, establishing a cause-and-effect relationship with the organization's strategic objectives. Future studies should focus on monitoring and controlling processes based on Social Life Cycle Assessment, proposing solutions involving the entire meat production chain, and research on implementing solutions focused on sustainable development and the perspective of Triple Bottom Line (TBL) in slaughterhouses.

Keywords: Life Cycle Assessment; Slaughterhouse; Environmental impacts.

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Mestrado Acadêmico (MA)

PREDIÇÃO DO RENDIMENTO DO COURO ATRAVÉS DE MODELOS DE MACHINE LEARNING

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ABSTRACT

Devido à variabilidade da qualidade dos couros e parâmetros do processo de curtimento se faz necessário aproveitar ao máximo a matéria prima para evitar desperdícios e prejuízo aos curtumes. As operações físicas e químicas que o couro sofre no seu processo de curtimento produzem alterações em sua área, reduzindo ou aumentando o rendimento. Assim, este trabalho teve a finalidade de gerar e avaliar modelos de predição do rendimento do couro. Para isso, foram identificados e coletados dados históricos do processo de curtimento de um curtume. Através do software Orange Data Mining buscou gerar e avaliar modelos de Machine Learning (ML) para a predição do rendimento do couro. Para a avaliação dos modelos de predição foram utilizadas métricas como Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), Mean Squared Error (MSE) e Coeficiente de Determinação (R2). Os resultados mostram que o modelo de ML empregando o algoritmo AdaBoost é o mais apropriado, com desempenho de MAE (0,042), MSE (0,003), RMSE (0,057) e R2 (0,331) utilizando o método de Cross Validation. Os modelos Random Forest e Gradient Boosting mostraram desempenho semelhante, mas inferior ao apresentado pelo AdaBoost.

Keywords: curtume, machine learning, couro, rendimento, indústria 4.0.

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PROPOSAL FOR A PRODUCT DEVELOPMENT MODEL APPLIED TO PACKAGING

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ABSTRACT

The adoption of the Circular Economy can lead to cultural and organizational changes capable of generating essential benefits such as stimulating cost reduction, fostering innovation, opportunities for new markets, improving quality, health and safety, market acceptance, and meeting legal requirements. Organizations worldwide have been exploring ways to operationalize and replicate circular practices and initiatives through systemic processes. A widely used strategy is to enable its integration into organizations through the Product Development Process. The present work proposes a circular product development model specifically for packaging. To this end, it seeks to identify Circular Economy guidelines, strategies, practices, and initiatives that can be integrated into the stages of the traditional product development process. For data collection, a systematic literature review and qualitative documentary research were used on circular product development models and documents such as the Guide Circ It Nord for Product Design and Development, the European Action Plan for Circular Economy, and the ABNT ISO/TR14062 standard. Through the content analysis technique, as presented by the models, documents, and standards discussed, these data as circular strategy and practices were integrated into the stages of the traditional product development model, giving rise to the circular product development model proposed in this research. Finally, through a case study in the packaging industry, the model was evaluated. Subsequently, the results and discussions are presented. It is expected that the present work can contribute to the packaging market from its application by supporting the circular development of products.

Keywords: Circular economy, EC, Product development model, Package.

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Mestrado Acadêmico (MA)

REVISÃO SISTEMÁTICA DA LITERATURA SOBRE A RELAÇÃO ENTRE SISTEMAS PRODUTO-SERVIÇO E O TRIPÉ DA SUSTENTABILIDADE: BIBLIOMETRIA, TENDÊNCIAS E OPORTUNIDADES DE PESQUISA

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ABSTRACT

Apesar de as discussões acadêmicas acerca do tripé da sustentabilidade (Triple Bottom Line – TBL) e dos sistemas produto-serviço (PSS) terem caminhado para uma consolidação teórica, há uma inconsistência na literatura quanto a sua inter-relação. Estes temas ainda trazem discussões, visto que há debate na literatura quanto ao potencial sustentável de um PSS. Visando contribuir com essa discussão, o objetivo deste trabalho é analisar a relação entre PSS e as dimensões do TBL (ambiental, social e econômico), por meio de uma revisão sistemática da literatura. Para alcançar os resultados foram empregadas análise bibliométrica e de conteúdo, de modo que 43 artigos foram considerados, no período de 2013 a 2022. Os resultados são apresentados através de representação gráfica e confirmam a existência da inter-relação entre PSS e o TBL, destacando o potencial sustentável de propostas associadas aos PSS. Entretanto, essa relação é desigual entre as dimensões do TBL, onde há um maior enfoque nas perspectivas ambiental e econômica. Na verdade, constata-se que a dimensão social continua a ser menos abordada na literatura com base no período e portfólio de artigos analisados. Nesse contexto, o presente trabalho oferece as seguintes contribuições: (i) consolidação da literatura nos últimos 10 anos, representado pelo seu progresso e tendências; (ii) contribuição para o corpo bibliográfico quanto a inter-relação entre o PSS e o TBL; (iii) proposição de uma síntese do conhecimento bibliográfico; e (iv) identificação de oportunidades de pesquisas futuras. Tópicos mais recentes (e.g., Upgradable PSS, Lean PSS, e Circular PSS) na relação entre PSS e TBL representam oportunidades de novos estudos, estendendo e aprofundando os trabalhos de pesquisa sob o ponto de vista teórico e empírico.

Palavras-chave: Sistemas Produto-Serviço, Tripé da Sustentabilidade, Ambiental, Social, Econômico.

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Mestrado Acadêmico (MA)

THE LINK BETWEEN LEAN MANUFACTURING AND INDUSTRY 4.0 FOR PRODUCT DEVELOPMENT PROCESS: A SYSTEMIC APPROACH

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ABSTRACT

Purpose – Many organizations have the Product Development Process (PDP) intending to support the operations department, although PDP decisions and mistakes have a considerable impact on Market Performance (MP). This is critical in organizations from a manufacturing point of view, where bad habits and practices in PDP can lead to big losses. Therefore, this research aims to investigate, from the systemic approach perspective, the effects of implementing and using I4.0 technologies and LM tools, in an integrated way with the PDP, to improve the MP of manufacturing companies in southern Brazil.

Design/methodology/approach – This research presents a quantitative analysis using Confirmatory Factor Analysis (CFA) and Ordinary Least Squares (OLS) hierarchical regression of data obtained from a survey of 110 managers in the product development department from manufacturing companies.

Results – Our results show that LM and I4.0 support PDP-leading managers in the product development of manufacturing companies to obtain MP. In addition, we concluded that I4.0 partially mediates LM and PDP and that LM partially mediates I4.0 and PDP.

Structure/Originality/Value – Our study indicated that there must be integrated coordinated efforts in manufacturing companies for the adoption and management of LM practices and 4.0 technologies, to direct both to contribute positively in the PDP phases. The study also demonstrates that this contribution to the PDP is reflected in the MP of these companies.

Keywords: Lean manufacturing, Industry 4.0, Product Development Process, Market Performance, Systemic approach.

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Mestrado Profissional (MP)

INDUSTRY 4.0 IN THE CONTEXT OF PASSENGER RAILWAY COMPANIES

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ABSTRACT

Industry 4.0 has been a growing research topic and has drawn the attention of developed and emerging countries that seek a prominent position in this new industrial scenario. The railway sector is a relevant segment for transporting people and goods. However, the literature joining the theme of Industry 4.0 and railways still needs to be explored. In practice, there are more studies from a determined technology in evidence. Thus, this paper raises an important question: How can the Industry 4.0 concepts be holistically applied to passenger railway companies? We used an exploratory and qualitative approach to study this important sector, considering the scarcity of studies with the intended embracing vision. We interviewed experts from eight transport operators and four technology providers in the Brazilian railway segment. The results indicate that companies are moving towards an operational intelligence center to implement robust and efficient train offers, prescriptive maintenance, strong supply chain management, and improved passenger experience and worker performance. We developed and tested an Industry 4.0 maturity model for passenger railway companies based on our empirical findings and the Brazilian companies' main KPIs (Key Performance Indicators). The practical contribution of the research is to help passenger railway companies plan the Industry 4.0 journey in their segment, both in the design of new railway lines and in the search for more sustainable systems in operation. The paper delivers a relevant and significant academic contribution as the frameworks with this holistic view of the Fourth Industrial Revolution in the passenger railway are unprecedented.

Keywords: ScaleIndustry 4.0, passenger railway companies, rail transport, digital transformation.

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Mestrado Profissional (MP)

LEAN TRANSPORTATION TOOLS TOWARDS WASTE REDUCTION AND DIGITAL TRANSFORMATION IN THE OFFSHORE INDUSTRY: AN ACTION-RESEARCH

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ABSTRACT

Purpose – The offshore industry is currently experiencing the fourth industrial revolution that brings new challenges to the supply chain and requires the implementation of classical paradigms such as Lean philosophy in order to increase efficiency and improve processes, obtaining sustainable competitive advantages that are basic requirements for digital transformation. However, the application of Lean in the trucking industry is still limited, and there is a shortage of practical studies on how Lean Transportation (LT) can support the improvement of offshore operations. The purpose of this study is to investigate how LT tools can reduce wastes and enable digital transformation of dedicated road transportation in an offshore industry.
Design/methodology/approach – This research design is guided by the research question: How can LT's continuous improvement tools reduce current offshore industry waste in the context of digital transformation? The authors adopt action research with a multimethod approach through scoping review, focus groups, and participant observation and application in the offshore supply chain of a large oil and gas company.
Findings – Drawing on emergent insights from the organizational learning theories, it was found that people involved in the VSM mapping, and the focus groups were faced with the problem (the wastes), invited to reflect upon solutions (developing an action plan) and the success of this learning cycle leverage digital transformation in transportation processes, leading to a leaner process, with less wastes. The waste reduction, mainly in the waiting stages of loading and unloading in dedicated road transport, resulted in the implementation of control actions, automation and improvement of activities with a significant reduction in downtime of the process, a monetary gain of BRL 6,300,000.00 per year for the operation, and products such as a benchmarking questionnaire, action research protocol, and PDCA cycle that can be applied to other companies in the same segment. We also qualitatively identified waste associated with human effort and digital resources misused or not implemented.
Originality/value – The study contributes to theory and practice by adopting action research and LT techniques through a real intervention case for enabling digital transformation and providing a set of conditions for developing a continuous improvement environment. Furthermore, the study reveals that there is a convergence between the reduction of wastes through Lean tools and the use of Industry 4.0 technologies in offshore supply chain, since an efficient use of VSM can lead to the learning of actions to effectively manage human resource skills and data.

Keywords: Industry 4.0, Lean transportation, Value Stream Mapping, waste reduction, Action research, Organizational learning

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Mestrado Profissional (MP)

METALWORK UNION LEADERS & AUTOMOTIVE MANAGERS PERSPECTIVE ABOUT INDUSTRY 4.0: CASE FROM BRAZILIAN COMMERCIAL VEHICLE

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ABSTRACT

Industry and academia have devoted attention to implementing Industry 4.0 (I4.0) in the production of goods and services. The literature in the area addresses difficulties associated with the implementation of I4.0 in emerging economies, including national culture and worker training. This study aims to discuss the impacts of I4.0 on the Brazilian automotive workers in the Union Leaders and Managers perspective. Investigating how assembly lines are adjusting to I4.0 is relevant for industrial sectors wishing to act efficiently in this new technological context. The automotive sector in Brazil is representative for research, providing cultural and institutional conditions that support the proposed discussions. A case study on Brazilian commercial vehicles companies is conducted by applying semi-structured interviews to union representatives and senior managers responsible for I4.0 implementation, and the responses were treated via content analysis. The findings highlight work and human factors as important for I4.0 implementation, which include workers tasks, skills, nature of work, human resource development, hiring process and company strategies. It was also found that knowledge sharing poses a huge challenge. The findings contribute with academic interest on work, production and knowledge impacts on assembly lines, and with practitioners on issues related to I4.0 implementation. It is noteworthy that this research is in line with the Sustainable Development Goals (SDGs) proposed by the United Nations (UN): Quality Education (SDG-4); Decent Work and Economic Growth (SDG-8); and Industry, Innovation, and Infrastructure (ODS-9) which seeks to promote inclusive and sustainable industrialization and foster innovation. This research proposal aims to contribute to sustainable organizational practices; formulation of public policies that alleviate social problems; and guidance of professional curricula affected by I4.0.

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Mestrado Profissional (MP)

MODELO MULTICRITÉRIO DE CLASSIFICAÇÃO PARA AVALIAÇÃO DA MATURIDADE DE GESTÃO DE EMPRESAS SCALE-UPS

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ABSTRACT

Scale-up é o termo adotado para categorizar algumas organizações que possuem um alto crescimento - negócios com crescimento maior ou igual a 20% ao ano, por, pelo menos, três anos consecutivos, seja em número de funcionários ou em faturamento. Estas são organizações inovadoras, com alto potencial de escalabilidade e que possuem um modelo de negócios que almeja o alto (e rápido) crescimento em meio a cenários de grande incerteza. Um modelo de maturidade de gestão fornece uma ferramenta para apoiar uma organização em seu alinhamento estratégico, permitindo um melhor planejamento nos mais diferentes níveis organizacionais. Face às particularidades dos modelos de negócio das scale-ups, este estudo discorre sobre a aplicação de um novo modelo de avaliação de maturidade de gestão para organizações scale-ups, baseando-se no método ELECTRE-TRI aplicado em uma scale-up do Nordeste brasileiro com crescimento que supera a média de 178% ao ano. Os resultados obtidos após aplicação do modelo impactaram efetivamente para a construção de um ciclo de governança, donde inclui-se a criação de um indicador de maturidade de gestão. Ao classificar cada área funcional em um nível de maturidade, a organização pôde gerenciar melhor os recursos e desenvolver ações mais particularizadas, considerando as competências e habilidades de cada área funcional. A alta gestão reconheceu que o estudo fortaleceu a comunicação com os stakeholders e uma melhor disseminação da cultura organizacional. Observa-se que apesar de ter sido desenvolvido para organizações scale-ups, qualquer organização cujo modelo de negócio se assemelhe às características de organizações scale-ups podem se beneficiar do modelo proposto.

Keywords: Scale-up, maturidade de gestão, MCDM/A, ELECTRE TRI.

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Produto Tecnológico (PT)

A DECISION SUPPORT SYSTEM FOR PREDICTIVE CRIME ANALYTICS AND PATROL SYSTEM

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ABSTRACT

Crime analysis plays a crucial role in ensuring safety and security for the civilian population. This study aims to develop a web-based decision support system for predicting crime hotspots and optimizing police patrol routes. Leveraging real historical crime data obtained through a partnership with the Secretary of State for Planning and Management (SEPLAG), we employed multiple machine learning algorithms to train various models. The model with the lowest root mean square error (RMSE) was selected as the optimal predictor. Additionally, we incorporated socio-economic variables from the Brazilian Institute of Geography and Statistics (IBGE) corresponding to the state's census tracts. Non-hierarchical supervised machine learning, using the k-means algorithm, was utilized to analyze the clustering of crimes. The system features heat maps, crime hotspot forecasting, and an interactive map that allows users to select the number of vehicles and the departure point and area for analysis. To calculate the distance matrix between cluster centroids, considering traffic, obstructions, and peak times, we employed the Google Maps API. The multiple traveling salesman methodology was employed to suggest routes that minimize the distance traveled by police vehicles, prioritizing hotspots identified by the k-means algorithm and machine learning outputs. The web-based decision support system created in this study is a valuable tool for public managers and law enforcement agencies in detecting and predicting crime hotspots and critical areas. This innovative approach has the potential to reduce crime rates, enhance safety, and optimize the efficiency of police patrolling

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AUTOMATED SOFTWARE FOR SEGMENTATION AND COUNTING OF WOODEN LOGS

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ABSTRACT

This article presents a new software solution for object counting, aiming to simplify the object quantification process in several domains. Accurate and efficient object counting plays a crucial role in various applications such as Inventory Management, Crowd Monitoring, Quality Control, Resource Planning, Statistical Analysis and Operational Efficiency. The proposed software uses advanced image generation algorithms that employ CGANs as the main machine learning tool of computer vision and image processing techniques to automate the counting process, offering a reliable and time-saving alternative to manual counting methods. The proposed approach harnesses the power of CGANs to generate accurate segmentation of the objects in the images. CGAN is trained using a large data-set of labeled images, and the generated images are compared with real images to ensure accuracy. The proposed software has great potential to assist with object quantification tasks in several domains, leading to greater efficiency, economy and data accuracy.

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CONSTRUÇÃO DE UM SISTEMA PRODUTIVO UTILIZANDO A TÉCNICA DO DFMA

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ABSTRACT

Com o aumento da competitividade no mercado nacional e internacional, as empresas necessitam de novas formas de agilizar seus processos e reduzir os custos industriais buscando por melhoria constante da produtividade. Com o surgimento da manufatura enxuta, muitas ferramentas foram desenvolvidas e colocadas à disposição dos pesquisadores e profissionais. Compreender o processo aliado ao domínio das ferramentas, proporciona melhores condições para elaborar um projeto de manufatura enxuta integrado ao projeto do produto, análise do processo de produção e desenvolvimento de um modelo de manufatura que proporcione a redução do tempo de reparo dos terminais, permitindo seu retorno aos clientes no menor prazo frente a concorrência. O objetivo geral desta pesquisa de abordagem quantitativa é projetar um processo de manufatura para terminais de pagamento para melhoria da produtividade e competitividade em um operador logístico por meio da técnica do Design For Manufacturing And Assembly – DFMA. Em relação a abordagem, este estudo trata-se de uma pesquisa quantitativa, quanto aos objetivos é classificado como uma pesquisa exploratória. Dentro da pesquisa exploratória foi utilizado o método da pesquisa-ação, com a coleta de informações e análise do relatório mensal de produção, extraído automaticamente do sistema Enterprise Resource Planning (ERP). Foi analisado todo o processo produtivo, incluindo as movimentações de componentes por meio das ferramentas Design For Manufacturing and Assembly (DFMA). A análise e interpretação dos dados obtidos possibilitou a elaboração de um projeto de manufatura enxuta compatível com os níveis de demanda e capacidade instalada, assegurando o cumprimento das demandas e redução gradativa dos atrasos, até sua completa eliminação após decorridos dois meses. Incorporado aos ganhos operacionais, destaca-se o aumento de 28% do índice de valor agregado ao processo e o aumento do volume mensal de produção de 50 mil unidades para 138 mil unidades, solidificando a capacidade produtiva da empresa perante o mercado concorrente.

Keywords: DFMA; Gestão da Produção e Operações; Melhoria contínua; Projeto de processo

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Produto Tecnológico (PT)

COSTS OF INCONSISTENT DONATIONS - ANALYSIS AND PROJECTIONS IN THE DISASTER RESPONSE

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ABSTRACT

Supplying resources to victims of disasters at the right time and quantity is essential, and donations play an important role in alleviating their suffering. Still, inadequate or excessive donations can generate several problems that harm the humanitarian service, such as vehicle congestion that delays the arrival of critical items or carbon emissions from the incineration of donations in excess. This article aims to expose the problems of inadequate or excessive donations from a sustainable perspective of financial, socio, and environmental dimensions. The research adopts a quali-quanti methodology involving a case study discussing the disaster caused by rains and floods in Petrópolis, RJ, Brazil, in February 2022, followed by a framework modeling and simulation of donations for such disaster response considering a combination of economic costs (e.g., transportation), social costs (e.g., deprivation) and environmental costs (e.g., incineration). The simulation considers the Monte Carlo approach to identify the appropriate donation policy to reduce the overall costs. The results emphasize that inadequate donations generate more than six times above the minimum obtained by the best policy. Results also highlight significant problems and opportunities, including the lack of data and communication. The model is available to the audience to simulate other donation management scenarios.

Keywords: Deprivation cost, Donations Management, Humanitarian Logistics, Triple Bottom Line.

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DESENVOLVIMENTO DE PRODUTO TECNOLÓGICO PARA ANÁLISE DE INCERTEZA E RISCO NA PREVISÃO DE PRODUÇÃO DE ÓLEO

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ABSTRACT

A arbitrariedade dos reservatórios e a complexidade de equipamentos de uma plataforma provocam alta variabilidade para a previsão de produção de óleo, impactando em importantes decisões estratégicas que são dependentes da previsão de produção e sua meta estabelecida. A alta proporção da produção de óleo marítima destaca a relevância nacional e mundial da atividade. Este estudo avalia a produção na Petrobrás, empresa nacional de energia, com escopo específico no desafiador cenário de amadurecimento da bacia geográfica de Campos, a bacia pioneira brasileira, a qual contempla maior número de dados históricos, e serve como benchmarking para as demais. Foi proposto um aplicativo, desenvolvido produto tecnológico, com implementação através de linguagem de programação R, cujo objetivo é melhorar a análise de risco associada ao atingimento da meta de produção de óleo. Faz-se uso de métodos de séries temporais e simulação para alcançar maior acurácia aos modelos de previsão, e para inferir as incertezas inerentes às atividades, possibilitando prever a distribuição de probabilidade dos volumes a produzir, a fim de avaliar as chances de atingir ou superar as metas previstas. O produto é elaborado com base em modelagem orientada a dados, sendo detalhada sua estrutura e transformações realizadas durante o processo. No modelo proposto, primeiramente os objetivos do domínio são entendidos, para em seguida serem definidas as atividades necessárias para o pré-processamento dos dados. O plano do experimento engloba a definição dos modelos e o plano a ser aplicado para cada dimensão de entidade de entrada, envolvendo seus dados de entrada, simulação e saída. É aplicada simulação Monte Carlo para todas as entidades de entrada, agregando as simulações para efetuar o calcula da produção. O erro da previsão é comparado entre os modelos que se distinguem devido ao uso entre quatro métodos de séries temporais. A aplicação permite visualizar a previsão mensal da produção em um ano e sua distribuição em relação a meta, comparar o erro entre os métodos de séries temporais, e identificar os principais riscos associados à cada entidade dos dados de entrada.

Keywords: Simulação. Séries Temporais. Produção de óleo.

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Produto Tecnológico (PT)

FLOOD MATTERS: DECISION SUPPORT SYSTEM FOR FLOOD DECISION MODELING AND ANALYSIS TOWARDS TEMPORAL RISK EVALUATION IN SUSTAINABLE CITIES

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ABSTRACT

Urban adaptation implies combating the multifaceted effects of the climate and requires public managers to propose a broad agenda between public and private technical-scientific institutions, in order to take preventive, efficient, and innovative decisions concerning floods. Given this back-drop, presents a novel Decision Support System (DSS) for enhancing flood risk prioritization in urban areas under the multicriteria approach. Therefore, this DSS explores multidimensional models to support the decision-making process, thereby inserting the decision-maker's (DM's) preferences, in terms of expected utility (EU), by using the Multi-Attribute Utility Theory (MAUT), Decision Analysis and other important methodological advances in this field. Comprising environmental, financial, human, mobility, and social issues simultaneously, the models deal with risk assessment by combining the sources of hazard and its consequences with EUs under a stationary perspective, in short- and long- term decisions. On the other hand, a new multicriteria method was structured to introduce time dependence into the EU-based modeling in traditional MAUT. The Non-Stationary MAUT (NSMAUT) method inserts the increasing impatience by the DM when judging, in terms of utilities, his/her preference for receiving outcomes in the future, with the aid of climatic and demographic forecasting techniques. Numerical applications with these models can be performed by FlooD MATTERS DSS, from which statistical tools with sensitivity analysis, georeferencing, and graphical visualization provide the DM with a wide range of information so that he/she justifies their strategic decisions under credibility. Consequently, the contributions explored in this DSS have the potential to promote financial, social, and environmental. This sense, our findings share important evidence that supports policymakers in allocating financial resources to fund adaptation measures, promoting environmental preservation, and combating social inequalities and pessimistic climate projections from integrated urban adaptation planning under climate and urbanization effects. Although the models outlined in this DSS have different perspectives regarding the same problem, the models are complementary, they share useful insights and can be used in a practical context based on local needs and limitations, being replicable to any urban space.

Keywords: flood risk; climate change; multi-criteria decision making/aiding; MAUT; NSMAUT; decision analysis.

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Produto Tecnológico (PT)

REDE REFUGIA: COLLABORATIVE SERVICE AMONG REFUGEES AND HUMANITARIAN ORGANIZATIONS

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ABSTRACT

The refugee crisis is one of humanity's significant contemporary challenges, aggravated by the COVID-19 pandemic. Moreover, in any humanitarian operation, stakeholders with diverse interests and objectives interact when providing assistance, sometimes neglecting the power of the beneficiaries to help themselves. In this context, this research aims to investigate the challenges faced by the main stakeholders in a refugee crisis and propose a solution to strengthen the stakeholders' collaboration. The research combined a Systematic Literature Review (SLR) to overview the state of the art on the problem and Design Thinking (DT) to propose and develop a solution to strengthen the stakeholders' collaboration in the refugee environment. The SLR identified 68 documents discussing the insertion of refugees into the labor market, also involving entrepreneurship to encourage self-sufficiency. However, only 4 of them have practical proposals for the refugee crisis on this topic. Thus, based on the DT approach – involving observation of social innovation processes, interviews, and other data collection and analysis techniques – this research presents the collaborative service Rede Refugia. The Rede Refugia platform represents a pragmatic service that facilitates collaboration among refugees and other stakeholders while contributing to the theoretical discussions of social services and technologies for humanitarian operations. The research considered mostly the perspective of Venezuelan and Congolese refugees in urban areas. Future research involves the consideration of the suitability of the Rede Refugia to other refugee crises perspectives as well as its usability for the collaboration of beneficiaries and other stakeholders in different disaster contexts.

Keywords: Disasters and Humanitarian Operations, Stakeholder Theory, Disaster Response, Multimethodology.

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Produto Tecnológico (PT)

UMA PROPOSTA DE GESTÃO E DESTINAÇÃO FINAL DE PNEUS AGRÍCOLAS: UM ESTUDO APLICADO À FAZENDA LAGOA DO SINO, CAMPUS DA UNIVERSIDADE FEDERAL DE SÃO CARLOS

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ABSTRACT

Este trabalho propõe um sistema de gestão de pneus agrícolas até a disposição final dos itens inteiros e suas partes, voltado a propriedades rurais de pequeno porte. A pesquisa foca na gestão dos pneus agrícolas da Fazenda Lagoa do Sino, campus da Universidade Federal de São Carlos no município de Buri/SP, bem como os procedimentos de destinação dos pneus inservíveis. Justifica-se a relevância do trabalho pela exigência de destinação final adequada dos pneus, expressa na Política Nacional de Resíduos Sólidos (PNRS) – Lei 12.305/2010, quanto à necessidade de se estabelecer procedimentos adequados relacionados à logística reversa. Propõe-se um sistema de gestão com suporte de planilhas eletrônicas, que possa auxiliar os gestores em relação ao uso e à destinação dos pneus agrícolas, diminuindo os impactos ambientais. A pesquisa foi desenvolvida a partir de entrevistas com a equipe gestora da fazenda. Foram levantadas oportunidades para o uso dos pneus agrícolas inservíveis que vão desde a compostagem até a formação de muros de arrimo. Essas ações têm baixo investimento inicial, são adequadas em relação ao meio ambiente e constituem uma alternativa interessante de extensão de uso dos pneus em comparação ao descarte dos itens inservíveis, afetado por sua dimensão física e pela distância em relação aos pontos de descarte.

Keywords: gestão, pneus agrícolas, logística reversa, reaproveitamento.

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