



Book of Abstracts

DPISE 2022 Workshop

31st May 2022



Universidade do Minho
Escola de Engenharia



CENTROALGORITMI

Editors

Paula Ferreira, University of Minho, ALGORITMI Research Centre, Portugal
Filipe Alvelos, University of Minho, ALGORITMI Research Centre, Portugal
Ana Cristina Braga, University of Minho, ALGORITMI Research Centre, Portugal
Rui Lima, University of Minho, ALGORITMI Research Centre, Portugal
Mário Leite, University of Minho, ALGORITMI Research Centre, Portugal
Marina Matos, University of Minho, ALGORITMI Research Centre, Portugal
Carlos Costa, University of Minho, ALGORITMI Research Centre, Portugal
Inês Teixeira, University of Minho, ALGORITMI Research Centre, Portugal

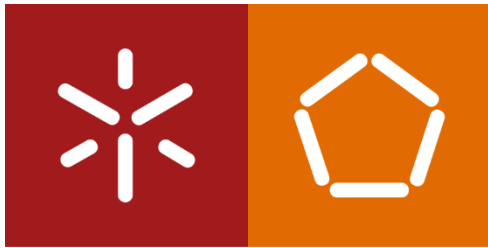
Copyright 2022 by University of Minho

Title: Book of Abstracts - DPISE 2022 Workshop

Publisher: University of Minho

Publisher address: Campus de Azurém, 4800-058, Guimarães, Portugal

Organization



Universidade do Minho
Escola de Engenharia

Steering Board of DPISE

Paula Ferreira, University of Minho, ALGORITMI Research Centre, Portugal
Organizing Committee Chair, Coordinator of DPISE

Filipe Alvelos (University of Minho, ALGORITMI Research Centre, Portugal)

Ana Cristina Braga (University of Minho, ALGORITMI Research Centre, Portugal)

Rui Lima (University of Minho, ALGORITMI Research Centre, Portugal)

Secretariat of the event

Alexandra Fernandes

(Department of Production and Systems Engineering – alex@dpes.uminho.pt)

Organizing Committee

Mário Leite (University of Minho, ALGORITMI Research Centre, Portugal - DPISE student)

Marina Matos (University of Minho, ALGORITMI Research Centre, Portugal - DPISE student)

Carlos Costa (University of Minho, ALGORITMI Research Centre, Portugal - DPISE student)

Inês Teixeira (University of Minho, ALGORITMI Research Centre, Portugal - DPISE student)

Cento ALGORITMI is supported by FCT – Fundação para a Ciência e Tecnologia within the Project Scope UIDB/00319/2020.

Preface

This book compiles the abstracts presented at the 2022 Doctoral Program in Industrial and Systems Engineering (DPISE/PDEIS) Workshop.

The workshop took place on May 31st of 2022 at Campus Azurém, Guimarães.

This meeting was created to promote the doctoral programs scientific research areas, by getting together students, supervisors, and researchers with a special interest in the research areas covered by the doctoral program. This was the 6th of a series of annual meetings engaging DPISE members.

The workshop was held in a single day devoted to the presentation of all the DPISE students' individual projects.

The Editors would like to thank all the authors/students of DPISE for their valuable contribution and for making DPISE 2022 Workshop such a big success.

Paula Ferreira
*Organizing Committee
Chair, Coordinator of DPISE*

Table of Contents

Program	9
Session A1	11
Development of a competence assessment model for Engineering Project Management	
Mariane Cásseres de Souza	11
Socio-economic assessment of development projects: A methodological contribution	
Thomaz Medeiros Raposo Fagá	11
A Scheduling Approach to Optimizing Forest Firefighting	
Marina Araújo de Matos	12
Ergonomics and Human Factors as a Requirement in Collaborative Robotic Systems	
André Cardoso	12
Intelligent System for occupational safety and well-being in the retail sector	
Inês Prudêncio Sena	13
The success of Industry 4.0: From hope to oblivion	
Pedro José de Araújo Pinheiro	13
Session A2	14
Literature review for identify sustainable criteria for decision model of Robotic Process Automation implementation	
Leonel Filipe Santos Patrício	14
An integrated vision of quality measurements	
Catarina Cubo	14
Linking sustainable development goals to electricity generation externalities	
Carlos Roberto de Sousa Costa	15
Multivariate Statistical Method to Detect Drowsiness on Drivers	
Ana Rita Oliveira Antunes	15
An exact approach based on a branch-and-price algorithm for an integrated production routing problem	
Mário Leite	16
Occupational exposure to incidental nanoparticles: a case study on additive manufacturing	
Marta Maia de Sousa	16

Session B1	18
A model for project portfolio risk assessment considering impact on project portfolio success and risk factor interactions	
Camilo Andrés Micán Rincón	18
Consumer willingness to participate in demand-side management: An agent-based modeling approach	
Sara Sadat Golmaryami	18
Development of a framework and methodology for the deployment of a Performance Measurement System	
Flávio Avelino Vilaça da Cunha	19
Contributions to the Industrialization Process in the Construction Industry	
Sara Rego da Costa	19
A Lean approach for overcoming barriers in Data Science projects	
Natan Labarrère Mendes	20
Regulatory challenges and constraints for shale gas development in South America	
Andrea dos Santos Gomes	20
Resource Selection Model, in the Global Market, tools and criteria, in scope of Industry 4.0. America	
Miguel Ângelo	20
Session B2	22
Algorithms based on Deep Learning in the context of Agriculture 4.0	
João Carlos Sampaio Maldonado Costa Mendes	22
Machine Learning and Optimization: a Combinatory Study	
Beatriz Flávia Azevedo	22
Multi-objective Optimization for Distributed Production Scheduling in Industry 4.0, what has been studied, what is being studied and what can be studied?	
Francisco Álvaro dos Santos	23
Social dynamics in complex energy systems models	
Alaize Dall'Orsoletta	23
Digital web/app system for home health care service management	
Filipe Marcelo Ferreira Alves	23
Multi-Project Scheduling Under Uncertainty: an approach to exploit resource flexibility	
Marzieh Aghileh	24
Moderator List	25
Author List	26

Program

DPISE 2022 PROGRAM		
2:00	Opening Session (Room: 0.08/Ed.11)	
PM	President of the School of Engineering, Prof. Pedro Arezes Director of ALGORITMI Centre, Prof. José Machado Director of the Department of Production and Systems, Prof. Sameiro Carvalho Director of DPISE, Prof. Paula Ferreira Best Papers Awards Announcement	
PARALLEL SESSIONS #A		
	Session A1 Room: 0.08/Ed.11 Moderator: Jorge Cunha	Session A2 Room: 0.10/Ed.11 Moderator: Nelson Costa
2:30	Development of a competence assessment model for Engineering Project Management Mariane Cásseres de Souza	Literature review for identify sustainable criteria for decision model of Robotic Process Automation implementation Leonel Filipe Santos Patrício
PM		
2:45	Socio-economic assessment of development projects: A methodological contribution Thomaz Medeiros Raposo Fagá	An integrated vision of quality measurements Catarina Cubo
PM		
3:00	A Scheduling Approach to Optimizing Forest Firefighting Marina Araújo de Matos	Linking sustainable development goals to electricity generation externalities Carlos Roberto de Sousa Costa
PM		
3:15	Ergonomics and Human Factors as a Requirement in Collaborative Robotic Systems André Cardoso	Multivariate Statistical Method to Detect Drowsiness on Drivers Ana Rita Oliveira Antunes
PM		
3:30	Intelligent System for occupational safety and well-being in the retail sector Inês Prudêncio Sena	An exact approach based on a branch-and-price algorithm for an integrated production routing problem Mário Leite
PM		
3:45	The success of Industry 4.0: From hope to oblivion Pedro José de Araújo Pinheiro	Occupational exposure to incidental nanoparticles: a case study on additive manufacturing Marta Maia de Sousa
PM		
4:00	Break	
PM		

PARALLEL SESSIONS #B		
	Session B1 Room: 0.08/Ed.11 Moderator: Ana C. Braga	Session B2 Room: 0.10/Ed.11 Moderator: Ana Rocha
4:20 PM	A model for project portfolio risk assessment considering impact on project portfolio success and risk factor interactions Camilo Andrés Micán Rincón	Algorithms based on Deep Learning in the context of Agriculture 4.0 João Carlos Sampaio Maldonado Costa Mendes
4:35 PM	Consumer willingness to participate in demand-side management: An agent-based modeling approach Sara Sadat Golmaryami	Machine Learning and Optimization: a Combinatory Study Beatriz Flávia Azevedo
4:50 PM	Development of a framework and methodology for the deployment of a Performance Measurement System Flávio Avelino Vilaça da Cunha	Multi-objective Optimization for Distributed Production Scheduling in Industry 4.0, what has been studied, what is being studied and what can be studied? Francisco Álvaro dos Santos
5:05 PM	Contributions to the Industrialization Process in the Construction Industry Sara Rego da Costa	Social dynamics in complex energy systems models Alaize Dall'Orsoletta
5:20 PM	A Lean approach for overcoming barriers in Data Science projects Natan Labarrère Mendes	Digital web/app system for home health care service management Filipe Marcelo Ferreira Alves
5:35 PM	Regulatory challenges and constraints for shale gas development in South America Andrea dos Santos Gomes	Multi-Project Scheduling Under Uncertainty: an approach to exploit resource flexibility Marzieh Aghileh
5:50 PM	Resource Selection Model, in the Global Market, tools and criteria, in scope of Industry 4.0. America Miguel Ângelo	
6:05 PM	Closing Session (Room: 0.08/Ed.11) Best Posters Awards Announcement	

Session A1

31st May 2022, 02:30 P.M. – 04:00 P.M. | Room: 0.08/Ed.11

Moderator: Jorge Cunha

Development of a competence assessment model for Engineering Project Management

Mariane Cásseres de Souza (marianecasseres@gmail.com)

Abstract. Projects begin and end with people and competent execution is at the heart of any successful project (ICB, 2015). In this regard, the International Project Management Association (IPMA) has developed a competence framework for individuals working in the field of project management, called the Individual Competence Baseline (ICB4, 2015). The ICB serves as a support tool for project management in a wide range of fields, including in Engineering. Based on the ICB it will be possible to develop reliable and valid methods in the assessment of competences. Being possible to verify the insufficiency of studies that analyze or develop the assessment models of project management competences in engineering, it becomes relevant to reduce this research gap in the area of competence assessment. In the area of project management it becomes particularly important, on the one hand because special attention is given to certifications, and on the other hand because organizations seek to obtain project teams that meet the needs in order to achieve the success required by the organization. Thus, to overcome this gap, the general objective of this work will be to develop a model of Project Management competence assessment, through scenarios. In methodological terms, the research is exploratory in nature, since it intends to develop an assessment model based on the MC Master model and from other disciplines, adapting it to the engineering area.

Socio-economic assessment of development projects: A methodological contribution

Thomaz Medeiros Raposo Fagá (thomazfaga1@gmail.com)

Abstract. In the context of public investments, focused on socioeconomic development projects, it is not uncommon to find gaps regarding the verification of physical and financial deviations between the values forecasted at the project proposal phase and the actual values inherent to the execution phase, and also in the measurement of the real benefits achieved. The absence of a parameterized analysis in the investment decision phase (ex ante) and in the post-execution phase (ex post), restricts the acquisition of useful experiences for the

improvement of similar projects to be implemented later. The objective of the investigation is to make an immersion in the international methodologies of analysis and evaluation of development projects financed with public resources, for the creation of systematized parameters that allow guiding intervention projects in all their phases. That is, from the idea conception stage, through the follow-up and monitoring of its execution and, finally, in the evaluation of the results. Through a flow of continuous improvement in the process, which will also make it possible to map and minimize the risks inherent to projects financed with public resources, in addition to subsidizing management decisions, through consistent information regarding the realization of new projects, or even, the continuity and expansion of existing ones.

A Scheduling Approach to Optimizing Forest Firefighting

Marina Araújo de Matos (mmatos@algoritmi.uminho.pt)

Abstract. A high number of fires have devastated the planet over the last few years. A forest fire is a natural occurrence that damages forested areas. Weather conditions, the increase in global warming and human action are factors that cause this phenomenon. Currently, there has a great deal of interest in preventing and reducing forest fires. The problem of forest firefighting has been widely studied, using optimization, allowing improvements in the effectiveness and speed of actions of combat resources. Therefore, the better and faster the firefighting team performs, the less damage is done. In this work, a resource scheduling approach is defined in order to obtain the ordered sequence of actions to be taken by a single resource in fighting multiple ignitions. The objective is to maximize the unburned area, that is to minimize the burned area, using the genetic algorithm. The results obtained demonstrate the usefulness and validity of this approach.

Ergonomics and Human Factors as a Requirement in Collaborative Robotic Systems

André Cardoso (andre.cardoso@dps.uminho.pt)

Abstract. Collaborative robots (Cobots) are advertised for ease of commissioning and the capacity to operate without fencing, and thus share the workspace with humans. For this reason, there is a worldwide interest in implementing Cobots to reduce work-related Musculoskeletal Disorders (WMSD) risk. Although prior work in this field has recognized the importance of considering Ergonomics & Human Factors (E&HF) in the design phase, most works tend to highlight workstations' improvements due to Human-Robot Collaboration (HRC). To sum up the current state of the art of collaborative robots in the manufacturing industry, a literature review was carried out. This review aimed at understanding the existing studies focused on Cobots' implementation with E&HF requirements. This review resulted in the inclusion of 20 articles. The focus was given to the segmentation between studies considering E&HF during the design phase of HRC systems and studies applying E&HF in real-time on HRC systems. The results showed the potential of this research field as a relevant input for reducing WMSD risk. This review sets the tone for the next steps, where a real-time ergonomic

assessment framework appropriate to HRC tasks will be created. The need for this framework is validated by the fact that there is a lack of a valid and sound ergonomics framework cognizant of the implications of HRC, as well as the inexistence of a correlation between risk assessment/prevention and complementary robot behaviors.

Intelligent System for occupational safety and well-being in the retail sector

Inês Prudêncio Sena (ines.sena@ipb.pt)

Abstract. Workplace accidents have multiple impacts on the functioning and costs of companies, workers, and society, decisively affecting the quality of life and the economic level. They have been the target of several studies over the years, through the development of theories that try to explain, prevent, and reduce them; the most used actions in other sectors are investigating accidents and implementing preventive measures. Nonetheless, digital technology solutions that have already been used to improve other factors are starting to be studied and implemented to improve safety in the workplace. Portugal is the fourth country with the most fatal accidents per 100,000 workers; despite that, no studies of solutions were found to reduce the number of accidents at work, which gives rise to motivation to create innovative strategies to reduce and prevent accidents at work. Of the economic activities existing, the wholesale and retail trade have a more significant number of work accidents, but no strategies were also found to minimize this number of casualties. Thus, this thesis aims to develop an intelligent system that supports the retail sector in reducing accidents at work and identifying potential risk situations. This proposal will be carried out in collaboration with Sonae MC - Serviços Partilhados, SA, a leading food retail company, in particular with the Occupational Health and Safety office (SST).

The success of Industry 4.0: From hope to oblivion

Pedro José de Araújo Pinheiro (pedro.tele9@gmail.com)

Abstract. Industry 4.0 brought together numerous technologies that fascinated politicians and managers. The dominant discourse has assumed industry 4.0 as a revolution. From sustainability to efficiency, intentions have emerged that have become trendy in organization theory. However, a decade has passed, and the promises remain. And meanwhile, we already have proposals for industry 5.0, industry 6.0 ... However, Industry 4.0, which aimed to place “Germany as the lead provider of Cyber-Physical Systems by 2020”, was heralded as the 4th industrial revolution. Two aspects stood out. Industry 4.0 was a failure, and technological knowledge relevant to the industry remains limited to a few countries. This thesis has opposition in the literature when they claim that the fourth industrial revolution is ongoing and that, at this moment, technological diffusion is superior. In this dialectic, it is not my intention to impose my convictions. Instead, I propose to analyze the objectives achieved by the supposed revolution in global terms. Disruptions in supply chains, the allure of the virtual to improve reality and social inequality reveal that advertising 4.0 that attributes the title of the industry to everything (education, tourism, entertainment, sports) has many shortcomings.

Session A2

31st May 2022, 02:30 P.M. – 04:00 P.M. | Room: 0.10/Ed.11

Moderator: Nelson Costa

Literature review for identify sustainable criteria for decision model of Robotic Process Automation implementation

Leonel Filipe Santos Patrício (leonelfilipepatricio@gmail.com)

Abstract. Robotic Process Automation (RPA) is a rules-based system for automating business processes by software bots that mimic human interactions to relieve employees from tedious work. It was verified in the literature that there are few works related to RPA decision support models. This technology is in great growth and, therefore, it becomes important to study the evaluation of the implementation of RPA. The objective of this work is centered on the identification of sustainable criteria that can serve as a basis to arrive at an adequate decision support model that sustainably evaluates the implementation of Robotic Process Automation. This work analyzes some models or studies available in the literature and identifies important criteria for the sustainable implementation of RPA. The Triple Bottom Line (TBL) related to environmental, social and economic effects is considered to guide selection and categorization of the identified criteria. Regarding the results obtained, it appears that there is still much room to improve research in this field, for example, with regard to the development of a robust assessment model based on the identified criteria, taking into account the TBL of the concept of sustainability.

An integrated vision of quality measurements

Catarina Cubo (id7274@alunos.uminho.pt)

Abstract. Quality can be considered as a multiscale concept as it is important as a strategic in a more and more globalized world and the quality concept can be defined according to different points of view, dimensions, and characteristics, which leads to the need of a better understanding of quality measurements. This project intends to develop a multidimensional model to assess and define quality through different dimensions in a holistic view to better understand the quality integration and its deployment in an organization. In a more specific view, it aims to characterize quality in micro, meso and macro levels and to understand the relationship between the different dimensions. Literature review showed that macro, meso and micro levels have been increasingly used in different fields of application and knowledge and these terms can be used to the comprehension and clarification of several terms related to

multiscale quality. An inductive approach is being followed in order to develop theory by a qualitative research where observations are made to describe and understand the relationship between the variables under study using case study methodology. Different measurement levels can be identified in organizations as well as different levels of aggregation of quality indicators in the different measurement levels. The development of a measurement system of quality is quite challenging to better understand this multidimensionality of quality and exploring deeper this concept.

Linking sustainable development goals to electricity generation externalities

Carlos Roberto de Sousa Costa (carlos.sousa@ifmg.edu.br)

Abstract. The Sustainable Development Goals (SDGs) were established by the United Nations and represent the desire of 193 countries around the world to stimulate actions for sustained, inclusive, and sustainable economic growth. The definition of indicators that integrate the SDGs in the electrical energy generation planning, as well as understanding how these indicators can be related to the externalities of the electricity system, is essential to ensure sustainable planning. This work seeks to better understand this topic and establish a relation between electricity generation externalities and SDGs. These relationships can then be included in generation expansion planning to ensure that sustainability concerns are incorporated into future electrical systems. Bibliographic research was carried out to identify the most relevant externalities of the electricity generation process addressing technical, economic, environmental, and social concerns and relating them to SDG. After this, a framework of indicators that can be attributed to these externalities was proposed. Ensuring electricity generation with enough quality and volume is the basis for meeting most of the goals of the SDGs and planning models should acknowledge and integrate these concerns.

Multivariate Statistical Method to Detect Drowsiness on Drivers

Ana Rita Oliveira Antunes (id9069@alunos.uminho.pt)

Abstract. Drowsiness at the wheel has been studied in different countries since it is important for road safety and its prevention. Since it is considered a public health problem, solutions must be found to avoid worse scenarios and to identify a low-cost system. Therefore, this research work intended to detect the drowsy state considering the heart rate variability from a wearable device, and driving simulations were conducted. Multivariate Statistical Process Control using Principal Components Analysis was implemented and some improvements were made when compared to a similar study. Thus, Hotelling T² and Squared Prediction Error statistics were estimated, to detect the drowsy state, for time, frequency, and non-linear domain, every two minutes. Using this methodology, promising results were achieved since it was possible to detect the drowsiness transactions. As future work, it is necessary to use awake data to subsequently determine the existence of out-of-control points during the information collected in the simulations. Besides that, machine learning algorithms can be implemented to classify drowsiness and optimization must be performed to identify the best

subset of features capable to detect the drowsy state. After this analysis, it is important to identify a method that is able to predict the state of drowsiness.

An exact approach based on a branch-and-price algorithm for an integrated production routing problem

Mário Leite (mario.leite@dps.uminho.pt)

Abstract. This work addresses the challenges and opportunities in the area of contemporary management of integrated logistics operations. The various processes that are part of the supply chains must be coordinated with each other so that more advantageous decisions are taken in relation to the costs involved, response times, quality of service, and, consequently, customer satisfaction. We propose an exact solution based on a branch-and-price algorithm for an Integrated Production Routing Problem (IPRP). The problem is inspired by the real operations of a Brazilian furniture manufacturer and takes into account a large number of important factors to manage the production and distribution activities. It considered multiple products (with different components/items, weights, and sizes), sequence-dependent setup times and costs, a heterogeneous fleet of vehicles, the possibility of routes extending over one or more periods, safety stock of each product component, customers with multiple time windows and deadlines, among others. The master problem is solved through column generation where the main purpose is to find the combinations from production and routes that minimize the global costs. The costs related to the production part are inherent to the setup exchanges between items, while the costs of routes are due to inventory and transport expenses. Evaluation of our approach will be performed by extensive computational experiments on benchmark instances proposed in the literature.

Occupational exposure to incidental nanoparticles: a case study on additive manufacturing

Marta Maia de Sousa (marta.maia.sousa@gmail.com)

Abstract. Metal dust exposure has been a long-time concern when it comes to occupational risk. Its potentially harmful effects can vary from a simple headache to serious respiratory diseases and lung function loss. Many studies have been conducted to assess the risk of occupational exposure to metal particles, usually involving measuring coarse and fine particles and most recently the characterization and quantification of ultrafine particles (with aerodynamic diameters of 100 nm or less). When focusing on the nanoscale, risk assessments are challenging tasks, considering the diversity of nanomaterials (NM) present in workplaces (engineered and incidental ones), the insufficiency of standardized methodologies, and the lack of occupational exposure limits. This challenge increases when studying emerging technologies, such as Metal Additive Manufacturing (AM), which can be responsible for releasing unintentional nanoparticles. This presentation intends to show the results of a case study conducted on a metal AM facility, focused on assessing the risk of exposure to incidental nanoparticles. The study was conducted using qualitative and quantitative approaches commonly used to study the exposure to engineered NM, including a

condensation particle counter, SEM, EDS, and the qualitative Control Banding Nanotool 2.0. Results show that during manual cleaning tasks the highest maximum particle number concentration was measured, and the highest risk level was qualitatively obtained.

Session B1

31st May 2022, 04:20 P.M. – 06:05 P.M. | Room: 0.08/Ed.11

Moderator: Ana C. Braga

A model for project portfolio risk assessment considering impact on project portfolio success and risk factor interactions

Camilo Andrés Micán Rincón (camilo.mican@correounivalle.edu.co)

Abstract. Project Portfolio Risk Assessment (PPRA) is oriented to provide information on the risk composition at the portfolio level in supporting of the risk response plan. However, a conceptualization of a comprehensive PPRA incorporating both risk factor interdependency and the impact on portfolio success remains scarcely explored. A PPRA model is proposed in this research, corresponding to the last Phase of the doctoral project. The PPRA model is based on Meta-Network Analysis (MNA). Output-related risk factors, outcome-related risk factors, projects within the portfolio, organizational capabilities, and portfolio success dimensions were defined as network entities. Three stages were defined to operationalize the PPRA model. The first stage is focused on modeling interdependencies between risk factors based on the ISM-MICMAC method. The second stage is associated with how the network conveys the risk through the connections between risk factors, projects, organizational capabilities, and success dimensions. The third stage aims to establish how the results could be represented according to the methods incorporated. The PPRA model was applied to a project portfolio case study belonging to a Colombian organization to evidence its practical use. The proposed model represents a strategy for operationalizing PPRA from a comprehensive view. It provides information about the relevance of each risk factor for achieving the project portfolio success in support of the risk response plans.

Consumer willingness to participate in demand-side management: An agent-based modeling approach

Sara Sadat Golmaryami (sara.golmaryamii@gmail.com)

Abstract. Today, the growth of population, the cities' expansion, and the continuous quest for economic growth worldwide have brought a set of new problems associated with the increasing use and depletion of resources. Society faces fundamental challenges in reaching a sustainable energy supply, which should ensure a clean and affordable energy provision. Therefore, the consumers' behavior and their willingness to actively participate in the energy market will have a fundamental role in attaining a sustainable future. Solutions to mitigate global climate change should be grounded in a rigorous understanding of energy demand, particularly the factors that drive energy demand. This research is aimed to evaluate consumers' willingness to participate in demand-side management (DSM). For this purpose, agent-based modeling (ABM) was used. Data on DSM acceptance and consumers' flexibility was available based on a survey conducted in Portugal including the socio-economic characterization of the respondents and the assessment of their willingness to participate in

DSM programs. According to this methodology, the consumer is defined as an agent. For consumer agents, effective factors were defined and assessed. In this paper, simulation was run with NetLogo software, and the result showed the importance of the agents' social networks on their willingness to participate.

Development of a framework and methodology for the deployment of a Performance Measurement System

Flávio Avelino Vilaça da Cunha (favcunha21@gmail.com)

Abstract. In many organizations, it is common to find Performance Measurement Systems (PMS) whose practical utility is very limited due to several factors/barriers. The purpose of this investigation is to identify and categorize the main barriers to the effectiveness of PMS, and to explore how they can be eliminated or mitigated. A systematic literature review is carried out to identify which factors are most frequently referred to as barriers to the effectiveness of PMS, due to their negative influence in terms of implementation, continued use or maintenance of these systems. Those barriers are grouped and classified into categories according with their similarities. The initial findings point out to around 45 barriers divided into six categories: culture, method, measure, people, equipment and material. Then, cause-effect relationships between barriers are explored and investigated, in order to identify interdependencies that can further affect the effectiveness of the PMS. From a perspective of continuous improvement, after identifying the most common barriers, solutions and methodologies will be suggested, aiming to mitigate or eliminate the impact on the effectiveness of organizations' PMS. Those solutions and methodologies will be combined to create a procedural model; a script to successfully implement, use and maintain a PMS. This model will be implemented in an organization to assess its utility in eliminating or mitigating the barriers to the effectiveness of a PMS.

Contributions to the Industrialization Process in the Construction Industry

Sara Rego da Costa (regodacosta.sara@gmail.com)

Abstract. Construction Industrialization (CI) is a worldwide topical issue, of major importance for the Architecture, Engineering, and Construction (AEC) Industry, proposing a new way to design, manufacture, build, operate and manage. Despite its growing relevance both in academia and in companies in the last decades, the CI field has, however, been considered fragmented, with a high level of misunderstandings, and its process unclear. "What Industrialization really is" and "How can construction companies implement a CI transformation process" are questions that are still poorly explored in the literature; yet decisive for a transformation of the industry. To fill these knowledge gaps, our Ph.D. project aims to help researchers, practitioners and decision-makers understand the essential aspects to be considered during their company's transformation journey by (1) presenting a definition of the concept and (2) developing a transformational model toward CI. To achieve these goals, a (1) systematic literature review and a (2) case research in one of the largest Construction groups in Portugal, are employed. A multiple case study is adopted to qualitatively test the transformation model and see how CI has been implemented in the real world. This research provides targeted decision support to construction managers that are desperately needed to drive the development of the Industrialization paradigm in the Industry.

A Lean approach for overcoming barriers in Data Science projects

Natan Labarrère Mendes (natan.labarrere@gmail.com)

Abstract. The rise of big data came with a series of challenges and opportunities. To cope with this new technology arose the field of data science (DS), mixing traditional statistics with computer science and machine learning techniques. However, DS projects have a high probability of failing its expectations. Although there is an array of different methods for managing a DS project, they lack connection to change management for sustainable solutions. The aim of this thesis is to identify and evaluate the barriers for the success of DS projects which involve process improvement and propose a Lean approach for overcoming these barriers. To better understand which are the barriers for the success of these projects, a systematic literature review was conducted. With the help of DS experts, the resulting barriers will be carried through a multi-criteria decision-making model to understand their importance and how they interact with each other. Lastly, the proposed Lean approach will be tested in one or more case studies. At the end of the project, it is expected that the barriers for the success of DS projects involving process improvements are identified and evaluated. It is also expected that the proposed approach is improved after the case studies. This thesis adds new knowledge for understanding the barriers which afflict DS projects involving process improvements in the organization and provides a framework for managing and dealing with these barriers.

Regulatory challenges and constraints for shale gas development in South America

Andrea dos Santos Gomes (andreasgomes@gmail.com)

Abstract. Shale gas development in South America is directly linked to the development of the activity in Argentina and Brazil. Both countries are included in the Top 10 of the world ranking of countries with estimated technically recoverable wet shale gas resources from the U.S. Energy Information Administration - EIA report. Despite this important position in the ranking, a gap was noticed in the literature on the development of shale gas in South America. We identified 141 relevant papers from Web of Science databases published from 2009 to 2022 and addressing shale gas development. Of these articles, 1.62% refer to Brazil and 0.54% to Argentina. This research is based on the results of the literature review, and paper aims to contribute to filling the identified gap by presenting a critical assessment of policies, regulation, barriers, incentives to shale gas development in South America. The results of the research show that both Brazil and Argentina are updating their legislation to advance the exploitation of shale gas. In Brazil there are still controversies about the legal instrument that regulates the activity and in Argentina there is still uncertainty about State interference in the companies' assets.

Resource Selection Model, in the Global Market, tools and criteria, in scope of Industry 4.0. America

Miguel Ângelo (miguelangelo@valeriusub.com)

Abstract. Faced with the high dynamics of the market, companies progressively assume a collaborative attitude, cooperating with each other. Indeed, and not infrequently, they close in on themselves, becoming isolated entities, incapable of responding quickly to variations. This relationship between the different entities allows an almost infinite number of possible

configurations of the value chain of a given product, through distributed production systems. These are, therefore, based on a network of resources, in a global market, for which it is necessary to prepare a selection model, which allows the identification of eligible resources, in view of the definition of criteria and/or specific requirements among the different resources available. After its selection, it is necessary to integrate the different systems, through a broker, allowing them to communicate, guaranteeing the flow of information, and from these with others. All this data will serve as a basis for performance evaluation, defining and redefining criteria, requirements and adjusting the companies' collaborative network, by increasing the response level of model selection, by defining artificial intelligence algorithms.

Session B2

31st May 2022, 04:20 P.M. – 06:05 P.M. | Room: 0.10/Ed.11

Moderator: Ana Rocha

Algorithms based on Deep Learning in the context of Agriculture 4.0

João Carlos Sampaio Maldonado Costa Mendes (joao.cmendes@ipb.pt)

Abstract. Contributing not only economically, but also culturally, agriculture is part of the Portuguese essence. This is an extremely important sector for the country and for those who depend directly and indirectly on it. However, this sector is facing a worrying aging of the main actors in these processes. Similarly, a decline in agricultural producers tends to accompany this trend, thus causing some concerns about the sector's sustainability. Since this is an important sector of the country's wealth, it is necessary to solve the problems that affect it, problems such as lack of manpower, and weather unpredictability, among others, have a strong impact on both maintenance and collection of products. A solution that has proved to be effective in solving this type of problem is the automation of agriculture, a process that has been highly stimulated over the last few years with the implementation of technologies such as IoT, cloud computing, and machine learning. With the implementation of this type of system, an exponential increase in data obtained through sensors and other devices is expected. Data that need to be analyzed, predicted, and classified to ensure the success of operations. With the elaboration of this thesis, it is intended to portray these themes and difficulties, optimizing the behavior of the algorithms, with a special focus on a particular approach to artificial intelligence, deep learning.

Machine Learning and Optimization: a Combinatory Study

Beatriz Flâmia Azevedo (beatrizflamia@ipb.pt)

Abstract. Real problems are increasingly complex, demanding the development of more sophisticated models and algorithms. There is no perfect method, all of them have some limitations that can be mitigated or eliminated through combinations of complementary methodologies, which may take advantage of the different potentialities of each method, whether optimization or machine learning. Due to the wide variety of algorithms and the practical importance of both areas, many algorithms to tackle optimization or machine learning problems have been developed. Nevertheless, numerous limitations are listed in the literature for both optimization and machine learning algorithms, being the most common relation to the problem of optimization algorithms getting stuck in local optima, and difficulties in initial parameters estimation of some machine learning algorithms. This work aims to explore in-depth non-linear optimization and machine learning models and algorithms, to identify the difficulties and potentialities of each of the methodologies to develop a hybrid algorithm and apply it to solve a real-world problem.

Multi-objective Optimization for Distributed Production Scheduling in Industry 4.0, what has been studied, what is being studied and what can be studied?

Francisco Álvaro dos Santos (francisco_dos_santos@outlook.pt)

Abstract. Multi-objective optimization (MOO) problems are frequent in many engineering problems, namely in distributed manufacturing scheduling. In the current Industry 4.0 these kinds of problems are becoming even more complex, due to the increase in data sets arising from the industry, thus requiring appropriate methods to solve them, in real time. To identify the main research opportunities in this research field in the age of digitization, a systematic review of the literature was developed. The results obtained allow to realize the importance of the multi-objective optimization approaches. Typically, when addressing large scale real problems, the existence of many objectives usually benefits with the establishment of some level of trade-off between objectives. A summarized description and analysis is presented, related to several main issues arising currently in companies requiring the application of multi-objective optimization based distributed scheduling, for enabling them to fulfill requisites imposed by the Industry 4.0. In this context, issues related to energy consumption, among other customer-oriented objectives are focused to enable properly support decision-making through the analysis of a set of 33 main publications.

Social dynamics in complex energy systems models

Alaize Dall'Orsoletta (alaize.orsoletta@gmail.com)

Abstract. Energy systems modeling is a complex task per se and has become especially important for capturing the impacts of energy transition pathways. Against energy systems complexity, system dynamics is recommended as a powerful modeling tool. Because feedback loops contrast the linearity of traditional models, they may showcase unintended consequences of technology choices concerning market dynamics, social and environmental impacts. Nevertheless, there is a well-grounded concern that the energy transition can widen socio-economic gaps and inequalities both at regional and international levels. From this background, the ability to capture the social impacts of energy systems into models becomes crucial for decision-making aid when envisioning an inclusive and equitable energy transition. System dynamics have been recently used to model the relationship between rural electricity access and socio-economic development, the water-energy-food nexus, which becomes so important in face of climate change, and the development of alternative fuel vehicles market in the transport sector, for instance. As countries raise concerns over energy access, justice, and ways to build resilience in a world affected by climate change, identifying and documenting how social interlinkages have been represented in energy models and actually incorporating them is critical for addressing these concerns.

Digital web/app system for home health care service management

Filipe Marcelo Ferreira Alves (id7541@alunos.uminho.pt)

Abstract. The aging of the world population has been a constant, which leads to increasing demand for Home Health Care (HHC), especially in interior regions of Portugal, such as Bragança. The intervention of HHC has been an asset. However, health and social entities need innovative solutions that have an impact on improving the efficiency of the HHC service, essentially due to the high level of complexity and requirements or even resulting from the gap between the increase in demand and the decrease in capacity, accentuated by the COVID-19

pandemic. This work aims to promote a digital web/app system that integrates software tools, optimization algorithms, and artificial intelligence to support HHC routing and scheduling, given the tactical, strategic, and operational needs. The system has a web interface and mobile app, which will support a database for information management, monitoring, as well as the optimization of routes in real-time. HHC entities will be empowered with intelligent coordination that helps decision-making, cost reduction, improves process quality, workload balancing, and response times. The results inherent to this system applied to an HHC entity in Bragança made it possible to make the information portable, with a user-friendly interface, and enhance digital maturity between technological platforms and data connectivity. In addition, it will support the responsiveness in the allocation of professionals, operational routes, and guidelines in emergency events.

Multi-Project Scheduling Under Uncertainty: an approach to exploit resource flexibility

Marzieh Aghileh (aghileh70@gmail.com)

Abstract. In a fast-changing environment, many factors contribute to budget overruns/delays that occur in many large projects. Systematic research evolved from techniques like Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT), where resources are considered unlimited, to current research that aims to accommodate more complex variables concerning limited resources and activity durations. In-between, the ""Resource-Constrained Project Scheduling Problem"" (RCPSP) and solutions are worth to be mentioned. Companies typically have a multi-project environment, so they need help to determine the right mix of projects, their prioritization, and control in a dynamic way. This is known as the Resource-Constrained Multi-Project Scheduling Problem (RCMPSP). Perceiving this, researchers increased their efforts, in modeling the basic Project Management variables: time and resources not as deterministic ones but being affected by uncertainty. In the sequel, several models/solutions were developed for the optimization of resource allocation in projects, considering stochastic work contents, proactive/reactive project scheduling techniques to deal with uncertainty, and several approaches to explore resource flexibility. Therefore, it is the researcher's challenge to propose a new model resulting from the previous ideas to be applied to multi-project settings, for effective multi-project management under uncertainty, and considering resource flexibility.

Moderator List

B

Braga, Ana C.	18
--------------------	----

C

Costa, Nelson	14
Cunha, Jorge	11

R

Rocha, Ana	22
------------------	----

Author List

A

Aghileh, Marzieh	24
Alves, Filipe	23
Ângelo, Miguel	20
Antunes, Ana	15
Azevedo, Beatriz	22

C

Cardoso, André	12
Costa, Carlos	15
Costa, Sara	19
Cubo, Catarina	14
Cunha, Flávio	19

D

Dall'Orsoletta, Alaize	23
------------------------------	----

F

Fagá, Thomaz	11
--------------------	----

G

Golmaryami, Sara	18
Gomes, Andrea	20

L

Leite, Mário	16
--------------------	----

M

Matos, Marina	12
Mendes, João	22
Mendes, Natan	20

P

Patrício, Leonel	14
Pinheiro, Pedro	13

R

Rincón, Camilo	18
----------------------	----

S

Santos, Francisco	23
Sena, Inês	13
Sousa, Marta	16
Souza, Mariane	11