Editor's Note

The term artificial inteligence (AI) basically refers to using machines to do things that we consider to be "intelligent", that is, being able to either simulate or do things that we describe people as doing with their cognitive faculties[1]. A more complete definition presents artificial intelligence as the ability of a machine to perform cognitive functions we associate with the human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, and even exercising creativity[2]. The concept is related to machines that process huge amounts of information, learn from the results of their actions and never rest. The concept of AI makes us think that human genius has managed to create something that seems to exceed its own capacity.

The term was introduced by Alan Turing in 1950[3], so it is actually a pretty well-known field. However, we have seen an acceleration lately in the use of the AI due to two main factors. First, computational power is rising with exponential growth, and second, the amount of available data has grown at an impressive rate in recent years. To a large extent, then, the exponential growth in data and in computational power has led to the hype of AI.

One of the remarkable aspects of AI is the degree to which it is an extension of the features that we have seen in data and analytics [4] [5] [6]. One of the enabling factors for machine learning to take hold is the large amounts of data. We have seen more and more data collected by companies and all kinds of organizations, be it transactional data, voice data, or data from the Internet of Things in the physical world. When you have all that data, you can extend the work you have done in analytics with AI techniques. Therefore, you will see methodologies about machine learning and deep learning with new neural networks that are applied to those vast amounts of data. In this sense, there are four technology systems of which machine learning is just part of and where some of the recent advancements and developments have been happening:

1. Physical AI, i.e., robotics and autonomous vehicles [7] [8].
2. Computer vision, i.e., image processing or video processing [9].
3. Natural-language processing, be it spoken language particularly, or written language. We are seeing a lot of natural-language work being done[10] [11].
4. Virtual agents or conversational interfaces; this is the ability of systems to roughly converse with you whether by voice or online through chats[12] [13].

To some extent, artificial intelligence is going through a bit of a hype cycle. There are a lot of applications, a lot of industries and activities, and a lot of value is at stake. But it can be said that today we are in a phase where we have applications which we would call narrow AI. Those are very specific tasks that machines today can do better than human beings. But there is that question about a general AI, where you have a broader spectrum of capabilities that can be managed by a machine[14] [15].

We are beginning to enter that phase. And we should not forget that the speed of development is exponential in those key technologies. It is coming much, much faster than we can imagine. As Peter Diamandis says, cumulative "intelligence" (both artificial and human) is the single greatest predictor of success for both a company or a nation[16].

Therefore, the suggestion for leaders of all types of organizations (companies, hospitals, government agencies, etc.) would be to start an analytics transformation now if have not done so already. This will require them to build capabilities, build technology and start the change in the organization, which will also be necessary to ultimately go into AI-enabled processes.

We can ask ourselves whether there is a case for a portfolio-of-initiatives approach, where one considers what can be done here and now [17].

In this sense, one possible suggestion would be to take the right use cases at the right point in time. Getting started now with the easier and simpler use cases also prepares us to take the more advanced use cases in the future. Empowering organizations to become analytics- or AI-driven is key to success in the future.

With these ideas in mind, we have prepared this special issue. It has been designed with the primary objective of demonstrating the diversity of fields where AI is used and, consequently, how it is gaining increasing importance as a tool for analysis and research. In this sense, there are works related to the following topics: the use of AI with the IoT, campaign management, topic models and fusion methods, sales forecasting, price forecasting for electricity market, NLP techniques in computational medicine, evaluation of patient triage in hospital emergency settings, algorithms for solving the assignment problem, scheduling strategy for scientific workflow, driver fatigue detection mechanisms, virtual reality and specialized training, image segmentation, web service selection, multimedia documents adaptation, 3D navigation in virtual environments, multi-criteria decision-making methods and emotional states classification.

The first paper of this special issue, "A Review of Artificial Intelligence in the Internet of Things", is written by Cristian González García, Edward Rolando Núñez-Valdez, Vicente García-Díaz, B. Cristina Pelayo G-Bustelo and Juan Manuel Cueva Lovelle, a group of researchers at the Universidad de Oviedo, in Spain. It presents some examples of the use of AI with the IoT and how this fusion can create very important and interesting applications. The paper touches on four of the most important parts of AI: Machine Learning, Computer Vision, Fuzzy Logic, and Natural Language Processing. These four subfields are very related to each other; mainly, by the algorithms that are used to process the different information or the techniques that are used to teach the information necessary to create the model that different techniques need. Furthermore, these subfields are used to create smarter machines or programs to help us in our daily life, like the Internet of Things is trying to do. For instance, Machine Learning could be used to create a better module with enough intelligence to automate and make decisions, Computer Vision to automate visual scenarios, Fuzzy Logic to give intelligence and make decisions to save money, electricity, and so on, and NLP to improve the understanding between machines and humankind.

The paper by Ramón Alberto Carrasco, María Francisca Blasco, Jesús García-Madariaga and Enrique Herrera-Viedma, "A Fuzzy Linguistic RFM Model Applied to Campaign Management", states that in the literature there are some proposals for integrated schemes for campaign management based on segmentation from the results of the RFM model. RFM is a technique used to analyze customer behavior by means of three variables: Recency, Frequency and Monetary Value. It is very much in use in the business world because of its simplicity of use, implementation and interpretability of its results. However, RFM applications to campaign management present limitations like lack of precision because the scores of these variables are expressed by an ordinal scale. In this paper, the authors propose to link customer segmentation methods with campaign activities in a more effective way by incorporating the 2–tuple model to both the RFM calculation

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process and its subsequent exploitation by means of segmentation algorithms, specifically, k-means. This yields greater interpretability of these results and also allows computing these values without loss of information. Therefore, marketers can effectively develop more effective marketing strategies.

The paper, "Topic Models and Fusion Methods: a Union to Improve Text Clustering and Cluster Labeling", written by Mohsen Pourvali, Salvatore Orlando and Hosna Omidvarborna, focuses on modeling algorithms. Topic modeling algorithms are statistical methods that aim to discover the topics running through the text documents. Using topic models in machine learning and text mining is popular due to its applicability in inferring the latent topic structure of a corpus. This paper presents an enriching document approach, using state-of-the-art topic models and data fusion methods, to enrich documents of a collection with the aim of improving the quality of text clustering and cluster labeling. The authors propose a bi-vector space model in which every document of the corpus is represented by two vectors: one is generated based on the fusion-based topic modeling approach, and one simply is the traditional vector model. The experiments carried out in on various datasets show that using a combination of topic modeling and fusion methods to create documents' vectors can significantly improve the quality of the results in clustering the documents.

The next paper, "Sales Prediction through Neural Networks for a Small Dataset", written by Rosa María Cantón Croda, Damián Emilio Gibaja Romero, Santiago Omar and Caballero Morales, all of them researchers from the Universidad Popular Autónoma del Estado de Puebla (UPAEP), in Mexico, is also related to digital marketing. Sales forecasting allows firms to plan their production outputs, which contributes to optimizing firms' inventory management via a cost reduction. However, not all firms have the same capacity to store all the necessary information over time. Therefore, time-series with a short length are common within industries, and problems arise because small time series do not fully capture sales' behavior. This paper shows the applicability of neural networks in a case where a company reports a short time-series given the changes in its warehouse structure. Given neural networks' independence from statistical assumptions, this paper uses a multilayer-perceptron to get the sales forecasting of the company. The authors found that learning rates variations do not significantly increase the computing time, and the validation fails with an error less than five percent.

The paper "Day-ahead price forecasting for Spanish electricity market" is written by Álvaro Romero, José Ramón Dorronsoro, and Julia Díaz from the Universidad Autónoma de Madrid and the "Instituto de Ingeniería del Conocimiento", in Madrid, Spain. In recent years, electrical systems around the world and in particular the Spanish electric sector have undergone great changes with the focus of making them more liberalized and competitive markets. For this reason, in many countries like Spain, there have appeared electric markets where producers sell and electricity retailers buy the power we consume. All agents involved in this market need predictions of generation, demand and especially prices to be able to participate in them in a more efficient way and obtain a greater profit. The present work explores the development of a tool that allows us to predict the price of electricity for the next day in the most precise way possible. For such a target, this document analyzes the electric market to understand the calculation of prices and identify the agents that can make prices vary. Traditional proposals in the literature range from the use of Game Theory to the use of Machine Learning, Time Series Analysis or Simulation Models. In this project it was proposed a normalization of the target variable on an hourly and daily basis because of a strong seasonal component in order later to benchmark several models of Machine Learning: Ridge Regression, K-Nearest Neighbors, Support Vector Machines, Neural Networks and Random Forest. After observing that the best model is Random Forest, a discussion was carried out on the appropriateness of the normalization for this algorithm. From this analysis, it was obtained that the model that gives the best results without applying the normalization function is Random Forest. This is because of the loss of the close relationship between the objective variable and electricity demand, which obtains an Average Absolute Error of 3.92€ for the whole period of 2016.

The article presented by Antonio Moreno Sandoval, Julia Díaz, Leonardo Campillos Llanos and Teófilo Redondo, "Biomedical Term Extraction: NLP techniques in Computational Medicine" shows a completely different approach. Artificial Intelligence and its Natural Language Processing branch are chief contributors to recent advances in classifying documentation and extracting information from assorted fields. Medicine is one that has received a lot of attention because of the amount of information generated in public professional journals and other means of communication within the medical profession. The typical information extraction task from technical texts is performed via an automatic term recognition extractor. Automatic Term Recognition (ATR) from technical texts is applied for the identification of key concepts for information retrieval and, secondarily, for machine translation. Term recognition depends on the subject domain and the lexical patterns of a given language, in our case, Spanish, Arabic and Japanese. This article presents the methods and techniques for creating a biomedical corpus of validated terms, with several tools for optimal exploitation of the information therewith contained in said corpus. This paper also shows how these techniques and tools have been used in a prototype.

The paper "Evaluation of a Diagnostic Decision Support System for the Triage of Patients in a Hospital Emergency Department", written by J.C. Nazario Arancibia, F.J. Martín Sánchez, A.L. Del Rey Mejías, J. González del Castillo, J. Cháfer Vilaplana, M.A. García Briñón, M.M. Suárez-Cadenas, J. Mayol Martínez and G. Seara Aguilar, is another example of the important AI applications in the field of healthcare, specifically, evaluating a computer-aided diagnosis decision support system. In developed countries, there has been a significant increase in the use of hospital emergency services. Triage is the first evaluation and classification process used to prioritize patients who arrive at the emergency department (ED). One of the greatest challenges for the management of the service is to provide tools that make it possible to expedite the management of patients in the shortest time possible from the moment of their arrival, especially for those who present pathologies that are not selected as a high priority by the classification systems, and thus generate unnecessary overcrowding of the ED. Diagnostic decision support systems can be a powerful tool for guiding diagnosis, facilitating correct classification and ultimately improving patient safety. With an observational criterion and without interfering with the emergency process, the authors use in parallel the Mediktor, the brand registered by Teckel Medical (Mediktor Corp.) system, which uses a sequence of questions guided by its algorithm, to obtain the most frequent expected diagnostic possibilities. The researchers compare the results obtained by the system with the final diagnosis of the usual emergency procedure. The level of accuracy of Mediktor as a support tool for establishing the final diagnosis of patients was 76.5%, higher than that published in similar programs.

The paper "Hybrid Algorithm for Solving the Quadratic Assignment Problem," written by Mohammed Essaid Riffi and Fatima Sayoti, both from the University of Chouaib Doukkali, El Jadida (Morocco), focuses on an optimization problem that has multiple applications. The Quadratic Assignment Problem (QAP) is a combinatorial optimization problem; it belongs to the class of NP-hard problems. This approach is applied in various fields such as hospital layout, scheduling parallel production lines and analyzing chemical reactions for organic compounds. This paper describes an application of the Golden Ball

algorithm mixed with Simulated Annealing (GBSA) to solve QAP. The simulated annealing search can be blocked in a local optimum because of the unacceptable movements. The strategy proposed in this paper guides the simulated annealing search to escape from the local optima and to explore the search space in an efficient way. To validate the proposed approach, numerous simulations were conducted on 64 instances of QAPLIB to compare GBSA with existing algorithms in the literature of QAP. The numerical results obtained show that the GBSA produces optimal solutions in reasonable time; it has a better computational time. This work demonstrates that the solution proposed is effective in solving the quadratic assignment problem.

The paper, "Data-Aware Scheduling Strategy for Scientific Workflow Applications in IaaS Cloud Computing", written by Sid Ahmed Makhlouf and Belabbas Yagoubi focuses on the optimization of scientific workflows. Scientific workflows benefit from the cloud computing paradigm, which offers access to virtual resources provisioned on pay-as-you-go and on-demand basis. Minimizing resources costs to meet user's budget is very important in a cloud environment. Several optimization approaches have been proposed to improve the performance and the cost of data-intensive scientific Workflow Scheduling (DiSWS) in cloud computing. However, in the literature, the majority of the DiSWS approaches focused on the use of heuristic and metaheuristic as an optimization method. Furthermore, the tasks hierarchy in data-intensive scientific workflows has not been extensively explored in the current literature. Specifically, in this paper, a data-intensive scientific workflow is represented as a hierarchy, which specifies hierarchical relations between workflow tasks, and an approach for data-intensive workflow scheduling applications is proposed. In this approach, first, the datasets and workflow tasks are modeled as a conditional probability matrix (CPM). Second, several data transformation and hierarchical clustering are applied to the CPM structure to determine the minimum number of virtual machines needed for the workflow execution. In this approach, the hierarchical clustering is done with respect to the budget imposed by the user. After data transformation and hierarchical clustering, the amount of data transmitted between clusters can be reduced, which can improve cost and makespan of the workflow by optimizing the use of virtual resources and network bandwidth. The performance and cost are analyzed using an extension of Cloudsim simulation tool and compared with existing multi-objective approaches. The results demonstrate that the approach presented in this paper reduce resources cost with respect to the user budgets.

"Driver Fatigue Detection using Mean Intensity, SVM, and SIFT" is the title of the paper written by Saima Naz, Sheikh Ziauddin and Ahmad R. Shahid from the COMSATS Institute of Information Technology, Islamabad (Pakistan). Driver fatigue is one of the major causes of accidents. This has increased the need for driver fatigue detection mechanisms in vehicles to reduce human and vehicle loss during accidents. In the proposed scheme, the authors capture videos from a camera mounted inside the vehicle. From the captured video, they localize the eyes using the Viola-Jones algorithm. Once the eyes have been localized, they are classified as open or closed by using three different techniques, namely, mean intensity, SVM, and SIFT. If the eyes are closed for a considerable amount of time, it indicates fatigue and, consequently, an alarm is generated to alert the driver. The experiments show that SIFT outperforms both mean intensity and SVM, achieving an average accuracy of 97.45% on a dataset of five videos, each of which are two minutes long.

The article "PRACTICA. A Virtual Reality Platform for Specialized Training Oriented to Improve the Productivity", written by Juan Manuel Lombardo, Miguel Ángel López, Vicente M. García, Mabel López, Francisco Fernandez Muela, Rubén Cañadas, Ismael Medina, Susana Velasco, Mónica León and Felipe Mirón, all members of the R & D Open Source Foundation (FIDESOL), analyzes the possibility of using virtual reality to increase productivity.The growth of virtual reality glasses that are coming to a market mostly oriented to the purchase of video games is opening new possibilities of virtual reality (VR) exploitation. Therefore, the PRACTICA project is defined as a new service which offers specialized training companies a system for creating courses based on a VR simulator that brings students an experience close to reality. The issue in creating these virtual courses is the need for programmers that can generate them. To overcome this obstacle, PRACTICA allows the creation of courses without the need to program source codes. In addition, elements of virtual interaction that cannot be used in a real environment because of risks for staff, have been incorporated, such as the introduction of fictitious characters or obstacles that interact with the environment. To do this, artificial intelligence techniques have also been incorporated so that environment elements can interact with the user in the stage. This feature offers the opportunity to create situations and scenarios that are even more complex and realistic. This project aims to release a service to bring virtual reality technologies and artificial intelligence to non-technological companies, so that they can generate (or acquire) their own content and give them the desired use for their purposes.

The research, "Multilevel Thresholding for Image Segmentation Using an Improved Electromagnetism Optimization Algorithm" presented by Ashraf M. Hemeida, Radwa Mansour and M. E. Hussein, focuses on image processing. Image segmentation is considered one of the most important tasks in image processing, which has several applications in different areas such as; industry agriculture, medicine, etc. In this paper, the authors develop an electromagnetic optimization (EMO) algorithm based on levy function, EMO-levy, to enhance the EMO performance for determining the optimal multi-level thresholding of image segmentation. In general, EMO simulates the mechanism of attraction and repulsion between charges to develop the individuals of a population. EMO takes random samples from search space within the histogram of image, where, each sample represents each particle in EMO. The quality of each particle is assessed based on Otsu's or Kapur objective function value. The solutions are updated using EMO operators until determine the optimal objective functions. Finally, this approach produces segmented images with optimal values for the threshold and a few number of iterations. The proposed technique is validated using different standard test images. Experimental results prove the effectiveness and superiority of the proposed algorithm for image segmentation compared with well-known optimization methods.

The work "QoS based Web Service Selection and Multi-Criteria Decision Making Methods" is presented by Pallavi Bagga, Aarchit Joshi and Rahul Hans, a group of researchers at Lovely Professional University and DAV University, both in Punjab (India). With the continuing proliferation of web services that offer similar efficacies, around the globe, it has become a challenge for a user to select the best web service. In literature, this challenge is exhibited as a 0-1 knapsack problem of multiple dimensions and multiple choices, known as an NP-hard problem. The Multi-Criteria Decision Making (MCDM) method is one way to solve this problem and helps users to select the best service based on his/her preferences. In this regard, this paper assists researchers in two ways: firstly, to witness the performance of different MCDM methods for a large number of alternatives and attributes, and secondly, to perceive the possible deviation in the ranking obtained from these methods. To carry out the experimental evaluation, in this paper, five different well-known MCDM methods are implemented and compared over two different scenarios of 50 as well as 100 web services, where their ranking is defined on an account of several Quality of Service (QoS) parameters. Additionally, a Spearman's Rank Correlation Coefficient has been calculated for different pairs of MCDM methods in order to provide a

clear depiction of MCDM methods which show the least deviation in their ranking. The experimental results aid web service users in making an appropriate decision about the selection of a suitable service.

The paper, "Multimodal Generic Framework for Multimedia Documents Adaptation", written by Hajar Khallouki and Mohamed Bahaj, focuses on multimedia documents adaptation. Nowadays, people are increasingly capable of creating and sharing documents (which generally are multimedia oriented) via the internet. These multimedia documents can be accessed at anytime and anywhere on a wide variety of devices, such as laptops, tablets and smartphones. The heterogeneity of devices and user preferences has raised a serious issue for multimedia contents adaptation. The research focuses on multimedia documents adaptation and more specifically on interaction with users and exploration of multimodality. The authors propose a multimodal framework for adapting multimedia documents based on a distributed implementation of W3C's Multimodal Architecture and Interfaces applied to ubiquitous computing. The core of the proposed architecture is the presence of a smart interaction manager that accepts context related information from sensors in the environment as well as from other sources, including information available on the web and multimodal user inputs. The interaction manager integrates and reasons over this information to predict the user's situation and service use. A key to realizing this framework is the use of an ontology that braces up the communication and representation, and the use of the cloud to insure the service continuity on heterogeneous mobile devices. Smart city is assumed as the reference scenario.

The reaserch, "Two Hand Gesture Based 3D Navigation in Virtual Environments", carried out by I. Rehman, S. Ullah and M. Raees focuses on natural interaction. This issue is gaining popularity due to its simple, attractive, and realistic nature, which realizes direct Human Computer Interaction (HCI). In this paper, the authors present a novel two hand gesture based interaction technique for 3 dimensional (3D) navigation in Virtual Environments (VEs). The system uses computer vision techniques for the detection of hand gestures (colored thumbs) from real scene and performs different navigation (forward, backward, up, down, left, and right) tasks in the VE. The proposed technique also allows users to efficiently control speed during navigation. The proposed technique is implemented via a VE for experimental purposes. Forty participants performed the experimental study. Experiments revealed that the proposed technique is feasible, easy to learn and use, having less cognitive load on users. Finally gesture recognition engines were used to assess the accuracy and performance of the proposed gestures.

The last paper of this special issue, "Are instructed emotional states suitable for classification? Demonstration of how they can significantly influence the classification results in an automated recognition system", was written by M. Magdin and F. Prikler, from Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Department of Computer Science, Nitra, Slovakia. At the present time, various freely available or commercial solutions are used to classify a subject's emotional state. Classification of the emotional state helps us to understand how the subject feels and what they are experiencing in a particular situation. Classification of the emotional state can thus be used in various areas of our life such as neuromarketing, the automotive industry (determining how emotions affect driving), and implementing such a system into the learning process. The learning process, which is the (mutual) interaction between the teacher and the learner, is an interesting area in which individual emotional states can be explored. Several research studies were carried out in this pedagogical-pyschological area. These studies in some cases demonstrated the important impact of the emotional state on the results of the students. However, for comparison and unambiguous classification of the emotional state, most of these studies used the instructed (even constructed) stereotypical facial expressions of the most well-known test databases (Jaffe is a typical example). Such facial expressions are highly standardized, and the software can recognize them with a fairly high degree of accuracy, but this does not necessarily point to the actual success rate of the subject's emotional classification in such a test because the similarity to real emotional expression remains unknown. Therefore, the authors examined facial expressions in real situations and subsequently compared these facial expressions with the instructed expressions of the same emotions (the Jaffe database).

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