Artificial Intelligence (AI) and algorithms have become a fixture in our lives. Many organizations need to implement AI in order to stay competitive. In the brand-new AI book *"Data Science for Decision-Makers and Data Professionals"*, the author takes you through this field in ten chapters, covering the hallmarks of intelligent, data-driven organizations and the importance of AI Covered topics range from formulating an AI-first strategy to Big Data architecture, the many types of algorithms, privacy legislation, and ethics. A bright future for AI The author of this book envisions a bright future where artificial intelligence (AI) and business intelligence. (BI) can contribute to solving complex issues in business and society. He introduces the AI-first principle and describes how the latest developments in the field of data science and machine learning can benefit you, but not without casting a critical eye on them. This book also addresses the dark sides, pitfalls, and failure factors of this novel technology AI enables data-driven working Empower.

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AI enables data-driven working

Empowered by AI and many kinds of algorithms, organizations can now make essential improvement efforts and effectively innovate to stay ahead of the competition. The most essential algorithms and machine learning models are covered in this unique AI handbook, bringing data-driven working to life. From simple functions and business rules to regression models, random forests, cluster analyses, and Bayesian networks, including so-called genetic algorithms.

Artificial Intelligence book contributes to a better world

Entirely up-to-date and presented in beautiful hardcover, this edition of the AI book contains many practical examples. The author covers positive and inspiring AI stories that illustrate how AI can benefit people and society when it comes to health, safety, sustainability, and economics. Continuous improvement and innovation using data are two important themes that run through this essential book for ambitious (business) managers, project managers, executives, and their employees.

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Convolution Neural Network for Image processing and signal processing and its applications

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Abstract:

Image processing using artificial neuronal networks (ANN) has been successfully used in various fields of activity such as geotechnics, civil engineering, mechanics, industrial surveillance, defence department, automatics and transport. Image preprocessing, date reduction, segmentation and recognition are the processes used in managing images with ANN.An image can be represented as a matrix, each element of the matrix containing colour information for a pixel. The matrix is used as input data into the neuronal network. The small dimensions of the images, to easily and quickly help learning, establish the size of the vector and the number of input vectors. The transfer function used is a sigmoidal function. The learning rate includes values between [0,1] and the error it is recommended to be below 0.1.

Introduction

The image is a function defined on a spatial domain, it has a limited scale of numeric values (natural numbers – □, real numbers – ℝ, or complexnumbers – □), values which can be used to form a matrix (Fig. 1). images to be abstract (mathematical functions with two variables, continuous or discrete) , non-visible (unperceived by naked eye, which imply a sum of bidimensional fields of parameters such as temperature, pressure, density, etc.) and visible (perceived by naked eye and generated as distributions of light intensity).

Depending on the type of data that is the matrix, the images are divided into images of intensity scale and indexed (each component being a unique number, a scalar) and vector images (each component being a vector, vector number which in turn splits into several parts). Scalar image intensity is an image where each pixel value (real or natural numbers) is considered a measure of luminous intensity. Scalar indexed image is an image in which the value of a pixel is an index where information can be associated with the colour of the pixel in question.

An image can be represented as a matrix $M_{m \times n}$, each element of the array containing information of colour for a pixel

Each colour can be represented as a combination of three basic colours: red, green and blue (Fig. 3). The array is used as input to the neural networks that are aimed at identifying images or grading.Each input neuron represents colour information in the image, and each output neuron corresponds to an image. All images will be scaled to the same size (width and height) and small to be easy and quick to learn. On the sizes of the images shall be determined on the size of the input vector and the number ofneurons. The transfer function for this type of problem is called sigmoid function. The rate of learning has values in the range [0.1] and the error it is recommended to have less than 0.1.Processing of images with ANN involves different processes, such as:

Image preprocessing, an operation which shows a picture (contrast enhancement, noise reduction) with the same dimensions as the original image. The objective of images

preprocessing with ANN consists in improving, restoring or rebuilding images. The resolved issues are the cartographic types, to optimize a function, an approximation function for the reconstruction of an image.

Data reduction or feature extraction involves extracting a number of features smaller than the number of pixels in the input window. The operation consists in compressing the image followed by extracting geometric characteristics (edges, corners, joints), facial features, etc.

Segmentation is a division of an image into regions.Recognition involves the determination of objects in an image and their classification.Image processing with ANN is used in various domains, such as:

industrial inspection (quality control) in order to detect the defective products in the production of steel, textiles, fruits, vegetables, plants and food; medicine for detection of tumours and the establishment of a medicaldiagnosis; defence system to identify targets for various navigation systems, orientation, recognition; service of documents, namely automatic processing of forms, sortingemails, the possibility of learning a handwritten text, etc.; identification and authentication for registration number recognition, fingerprint analysis in order to identify persons;optimization problems; geotechnical engineering, in order to classify the hazardous areas with possible landslides, to determine the characteristics of the soils;civil engineering, for the study of the rubberized concrete`shomogeneity, to identify the fissures/cracks in different structures.

The Current Status of Artificial Neural Networks Used for ImageProcessing

Issues Resolved with ANN in Civil Engineering

At the moment, the Civil Engineering is the most poorly developed in terms of image processing with ANN. A branch of Civil Engineering which has used artificial intelligence to solve the problems of cracks' identification is the composite structures.

Composites are increasingly being used in aerospace, naval and cars due to increased strength and rigidity in relation to its weight. Composite materials could be damaged in the presence of fissures. Seed (2014) proposed the use of neural networks to classify the images obtained by scanning. These pictures include characteristics of ultrasounds.

In 2015, Pandelea A. et al. studied homogeneity of concrete samples with added rubber using ANN by analysing the sample surface images.

Issues Solved Using ANN in Geotechnical Engineering

Regarding to the determination of soil moisture in a manner as practical, rapid, non-destructive, given the relatively low costs there have been several studies that have been evaluated the effectiveness of ANN (Arsoy *et al*., 2013; Namdar-Khojasteh *et al*., 2010; Elshorbagy & Parasuraman, 2008; Persson *et al*., 2001, 2002; Persson, 2005).

Relying on the fact that the soil changes its colour depending on the amount of water, ANN were used to estimate the soils moisture using colour

Landslides is due to the interaction of several factors such as earthquakes, rainfall, snow melt, weather, human activities (construction of roads and buildings) etc. Starting from the idea of satellite images classification (Civco, 1993, Atkinson and Tatnall, 1997, Bandibas and Kohyama, 2001), the recognition of forms and texture of the soil (Khotanzad and Lu, 1991), Melchiorre have used artificial neural networks for classification of areas prone to landslides.

In order to reduce the number of casualties, Chauhan et al. (2010), Kawabata and Bandibas (2015) have created a network that generate maps concerning the susceptibility of lands from landslides. To get this map, there are necessary two stages: the first stage consists of gathering images ASTER and GIS and the second phase intend to train the network with these images. Chooseto study an area where there have been landslides in the aftermath of an earthquake. Data entry of the network are images relating to landslides, the slope of

the terrain, elevation, aspect, distance from the nearest geological boundary and density of geologic boundaries. The obtained images from satellite are slope, elevation, aspect and the rest are images of GIS. The output consists of a network map that shows whether they have or not landslides.

Issues resolved with ANN in transportation

Mackeown et al. (1994) proposed a method for the recognition of rural roads and urban colour images through the involvement of a network which to classify objects in the image. The performance of the network lies in the recognition of 70% of the region and to 90% of the image area.

Ahmadi (2008) processed satellite images with high resolution for the purpose of road extraction and vectorization.

The problem of detecting a vehicle from an area in real time has been resolved by the Gader (1995). The network was trained initially with images in infrared with tanks in their purpose of detecting in real time. Another set of data which has been coached network includes images of cars from a parking lot. Forthese set of images, the network can detect a specific type of vehicle.

Issues Resolved with ANN in the Field of Mechanics

Based on an intelligent system that uses infrared thermal imaging, diagnosis can be established for cooling radiators (Taheri-Garavand, 2015). The radiator also met under the name of heat exchanger is a very important element in the cooling system of vehicles. The procedures underlying this system are: the acquisition of thermal images, the images preprocessing and processing, the wavelet for decomposition of thermal images, extracting features of an original image to a thermal one, selection features using genetic algorithms and their classification using ANN. It was used a network having 16 inputs (images) and 6 output (defects of cooling radiators). After analysing the image, the ANN produces a diagnostic for the radiator.

Conclusion

The field of Artificial Intelligence has a rich set of literature for modeling of technical systems that implement Machine Learning and Deep Learning methods. This thesis attempts to connect the literature for business and technology and for evolution and adoption of technology to the emergent properties of Artificial Intelligence systems. The aim of this research is to identify high and low value market segments and use cases within the industries, prognosticate the evolution of different Al technologies and begin to outline the implications of commercialization of such technologies for various stakeholders. This thesis also provides a framework to better prepare business owners to commercialize Artificial Intelligence technologies to satisfy their strategic goals

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