Analyzing Articles Reviews Using Neural Network

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Abstract.

Artificial Intelligence (AI) can increase the efficiency of industrial production compared to human effort. There is a continual increase in artificial intelligence (AI), which is driven by the fact that this technology is increasing with "Industry 4.0" and the costs of it are decreasing. This paper deals with applying Natural Network to analyze data of (9) article reviews from January till June 2022 and focuses on the latest reviews for "industrial 4.0" for business & accounts .The objectives of this work is to understand the information contained in nine article reviews (723 study). Article reviews many conclusions. In this article, our model has the moderate ability to predict "industrial 4.0" articles in advance under the simulated situation with real-world data. This brief review estalish a model that can be used to analyze nonlinear behaviour in small datasets and identify causal relationships in this paper.

Keywords: Artificial Natural Network, article reviews, industrial 4.0, business and accounts.

1.1 Introduction

Now a day, Industry 4.0 is a new representation in the organization industrial control of the value chain. In recent years, artificial intelligence has been introduced into production lines. Nonetheless, companies from all industries and sizes around

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the world are already relying on smart technologies to automate and improve processes.

Many researchers have introduced the work of industrial 4.0, especially for dealing with business and accounting data and the vague relationships often faced in the research. Neural networks simulate the functioning of the human brain.

In this framework, Neural networks can assist us in identifying potential options for topics such as industrial 4.0. The work depend on 723 articles from nine article reviews , Forty-one (41) articles from [2011-2022] were reviewed by Iqbal H. Sarker et al. [1], and one hundred and two (102) articles from [1994-2020] were reviewed by Aghimien, D. et al as scientometric review. [2]. Prashar et al. [3] reviewed sixty-seven (67) papers [1992-2022] in their morphological analysis article. Tissir, S. et al [4] reviewed ninety-nine (99) papers of [2000-2022]as scoping review and perspectives and Deuse et al. [5] reviewed fifty-eight (58) papers of [1911-2022]. Broday, etc. E.E reviewed forty-two (42) in literature review [6]. Ninety-three (93) articles were reviewed by Herrmann, J.-P.[7]. Khan, S.A.R. also,revi papers 130 in systematic literature review[8].finally , Verma, A., Venkatesan, M. in a systematic review content ninety-one article[9]. There is a variety in the type of review, as show in table (2), Three reviews, one scientomet, systematic, literature, scoping and morphological. Building a neural model for researchers to use in their ability to forecast trends in research for industrial 4.0 is the article's novel contribution. Industrial 4.0 is a term that refers to the rapid change that will occur in technological fields, industries, and societal patterns and processes in the 21st century as a direct result of increased interconnectivity and intelligent automation. The Contribution to give a clear understanding of the comparison between the human brain and artificial intelligence by multilayer perceptron neural network, for forecasting.

Table 1. Article reviews from 1st January to 1st June2022

	Title	**Author**	**Journal**	**Ref.**
1	"Smart City Data Science: Towards data-driven smart cities with open research issues"	"Sarker, I.H."	"Internet of Things (Netherlands) 19,100528"	**41**
2	"Dynamic capabilities for digitalisation in the	"Aghimien, D., Aigbavboa, C.O., Oke,	"Engineering, Construction and	**102**

	AECO sector – a scientometric review"	A.E., (...), Thwala, W.D., Robert s, C.J."	Architectural Management 29(4), pp. 1585-1608"	
3	"Quality management in industry 4.0 environment: a morphological analysis and research agenda"	"Prashar, AAnupama Prashar."	"International Journal of Quality and Reliability Management Article in Press"	**67**
4	"Lean Six Sigma and Industry 4.0 combination: scoping review and perspectives"	"Tissir, S., Cherrafi, A., Chiarini, A., Elfezazi, S., Bag, S."	"Total Quality Management and Business Excellence Article in Press"	**99**
5	"Rediscovering Scientific Management - The Evolution from Industrial Engineering to Industrial Data Science Open Access"	"Deuse, J., West, N., Syberg, M."	"International Journal of Production Management and Engineering 10(1), pp. 1-12"	**58**
6	"The evolution of quality: from inspection to quality 4.0"	"Broday, E.E."	"International Journal of Quality and Service Sciences Article in Press"	**42**

7	"Approaches of Production Planning and Control under Industry 4.0: A Literature Review *Open Access*"	"Herrmann, J.-P., Tackenberg, S., Padoano, E., Gamber, T."	"Journal of Industrial Engineering and Management 15(1), pp. 4-30"	**93**
8	"A systematic literature review on circular economy practices: challenges, opportunities and future trends"	"Khan, S.A.R., Shah, A.S.A., Yu, Z., Tanveer, M."	"Journal of Entrepreneurship in Emerging Economies Article in Press"	**130**
9	"HR factors for the successful implementation of Industry 4.0: A systematic literature review"	"Verma, A., Venkatesan, M."	"Journal of General Management 47(2), pp. 73-85"	**91**
S	**Summation**			**723**

1.2 Methods

Multilayer perceptrons, more often known as MLPs, are complementary components of feed-forward neural networks(seeTable2.). The input layer, the output layer, and the hidden layer are the three separate types of layers that make up the whole thing. The signal that is going to be processed is going to be delivered through the input layer, and it is going to be received there. The output layer is accountable for carrying out necessary tasks such as prediction and categorization in order to fulfill its duties. In a multilayer perceptron (MLP), the "actual" computational engine is made of an arbitrary number of hidden layers that are

located between the input and output levels (see Table5.). In a multilayer perceptron case processing (MLP), the data flow that occurs between the input layer and the output layer is comparable to that of a feed forward network(seeTable4.). An MLP employs a back propagation learning technique for the purpose of training its neurons. MLP was developed to approximate any continuous function and to handle issues that cannot be linearly separated into several parts. The primary applications of MLP are pattern classification, pattern recognition, pattern prediction, and pattern approximation.

The Multilayer Perceptron (MLP) scenarios procedure: Nine researchers covariates at searching in " industural4.0"article in Scopus database for six month. We need to be able to identify the traits that are indicative of researchers who are likely to default on research keyword, and then we need to be able to utilize those characteristics to determine how close or how far we are from the company and account field (see Table 1.). Case Processing Summary show the percent of training sample(N=9) was 88.9% while Testing was 11.1% there was no excluded value (see Table 2.)

Table 2. MLP, Case Processing Summary

		N	Percent
Sample	Training	8	88.9%
	Testing	1	11.1%
Valid		9	100.0%
Excluded		0	
Total		9	

Data considerations in model as dependent variables (class) ordinal, its values represent categories with some intrinsic ranking (see Table3.). The frequent distribution of articles across the years, also known as the quantity of repeated articles for each individual year, was determined to fall into the twenty-one different categories. According to the importance ranked by respondents on likert scale, the categories were reorganized into the five groups presented in (see Table 3.).

Table 3. articles frequency over years (class variable)

Article frequency	**Scale**
21,20,19,18,17	5
16,15,14,13	4
12,11,10,9	3
8,7,6,5	2
4,3,2,1,0	1

Every single article complied with one of the prerequisites for the approach, which was to contain a list of keywords. These keywords reflect the content of the study direction for each article. Table 3. displays in the first field (see Sum of keys) the total number of keywords for each article. In the second field (see None), it displays the number of none common words between each article and another. In the next field(yes), it displays the number of common keywords. Finally, the last field (class) displays a percentage of the amount of the common field to the total. From this, it is apparent that the fourth and sixth articles are the articles that are distinguished by the sharing of all of their words with the other articles, which necessitates the inclusion of all of their value later was (0) in the neural network data table.

Table 3. article keys for each article review

article no.	Sum of keys	None	yes	Class
1				
2	6	5	1	0.17
3	3	1	2	0.67
4	3	0	3	1.00
5	7	5	2	0.29
6	4	0	4	1.00
7	4	2	2	0.50
8	4	2	2	0.50
9	5	2	3	0.60

The procedure recodes categorical predicators using one-of-c coding for years from 2012-2022. Scale dependent variables and covariates to improve the network training.

Table 4. showcases the network information model with all of its specifics, including the layers (input, hidden, and output) and sequential variables from (y 2012, up to y 2022) It also describes that the rescaling method was standard, including one hidden layer consisting of four units, and that the Activation Function was from The type is Hyperbolic tangent, while the output layer is based on Softmax.

Table 4. Network Information model, a. Excluding the bias unit

Input Layer	Covariates	1	y_2012
		2	y_2013
		3	y_2014
		4	y_2015
		5	y_2016
		6	y_2017
		7	y_2018
		8	y_2019
		9	y_2020
		10	y_2021
		11	y_2022
	Number of Units[a]		11
	Rescaling Method for Covariates		Standardized
Hidden Layer(s)	Number of Hidden Layers		1
	Number of Units in Hidden Layer 1[a]		و 4
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables	1	Class
	Number of Units		2

	Activation Function	Softmax
	Error Function	Cross-entropy

The mean, standard deviation, and range of the covariate variable were all calculated using the training data; however, the frequency weights were disregarded during this process. The procedure uses random number generation while it is randomly assigning partitions, random sub-sampling while it is initializing synaptic weights, random sub-sampling while it is selecting an automatic architecture, and the simulated annealing algorithm while it is initializing weights and selecting an automatic architecture. In addition to that, the technique utilizes random sub sampling for the purpose of automatically selecting the architecture.

variables rescaling covariates method change was first standardized (see Eq 1.) that (x-mean)/s. Normalized, (values fall between 0&1), by minimum and divide by the range, (x-min)/max-min(see Figure 1.).

$$s=\sqrt{1n-1}\sum ni=1(xi-\bar{x})2 \quad \ldots. \quad (1)$$

s = Sample standard deviation
$\bar{x}$ = Arithmetic mean of the observations

Adjusted normalized the minimum and dividing by the range

$$[2*(x-min)/(max-min)]-1 \quad \ldots \quad (2)$$

Reads data set lists all var. from [y_2012,y_2013,y_2014……y_2022], measurement level in data editor's variable has been pane. In partitions dataset the active dataset partitioning in training , testing and holdout sample. In training cases comprises the data records used to train the neural network in order to obtain a model . In testing sample cases is an independent set of data (y_2022 to y_2012) to track errors during training. Holdout cases in the model used to assess the final neural network. During holdout stage cases were not to build the model ,otherwise randomly assign cases based on relative number of cases ,assign cases.

The structure of the network builds with one hidden layer. The architecture use the activity function for output layers , from hidden and output expert control and results has been selected, network nodes from hidden layer is function of the weighted sum of inputs (see x.). in activation function the weighted sums of No. of articles for each year in a layer to the values of succeeding layer.

Where: Hyperbolic tangent (f(x) , range (–1, 1))

$$f(x) = \tanh x = \frac{e^x - e^{-x}}{e^x + e^{-x}} \qquad \text{.....(3)}$$

$$S(x) = \frac{1}{1+e^{-x}} = \frac{e^x}{e^x+1} = 1 - S(-x). \qquad \text{.....(4)}$$

output layer contain (class var.) which was dependent .The identity function has the form (see eq. 5). Softmax function has the formula (see eq.6) , it takes a vector of real elements fall in the range(0,1). Hyperbolic tangent form (see eq.3) range (-1,1) while sigmoid function form (see eq.4) with range (0,1).

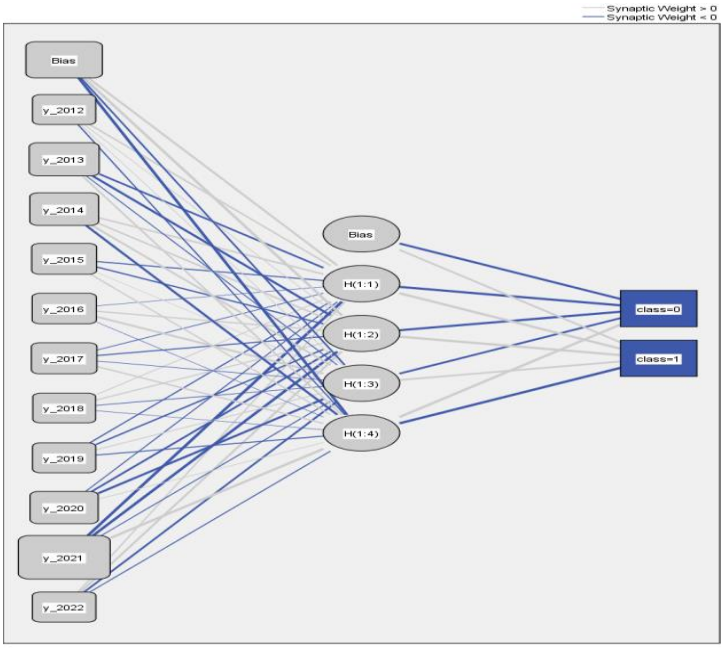

Figure 1. Hidden layer activation function : hyperbolic tangent output layer activation function softmax

Rescaling of scale dependent var. is standardized, normalized with the option of correction specifies a small number ε ensure that all rescaled dependent var. values in the range(0,1) . correction formula (see eq.7) range greater than or equal 0. Adjusted normalized (see eq.2) values fall between (-1,1), the corrected formula (see eq.8)range number greater than 0r equal to 0.

$$\Gamma = c \tag{5}$$

$$\gamma(c\ k\ ) = \exp(c\ k\ )/\Sigma\ j\ \exp(c\ j) \tag{6}$$

$$[x-(\min-\varepsilon)]/[(\max+\varepsilon)-(\min-\varepsilon)] \tag{7}$$

$$\{2*[(x-(\min-\varepsilon))/((\max+\varepsilon)-(\min-\varepsilon))]\}-1 \tag{8}$$

1.3 Results

The results of the dependent variable, class, in both the training and testing stages are presented in Table 5.The percentage of incorrect predictions made throughout the stage of selection was 0.0 percent.

Table 5. Model Summary Dependent Variable: class.

Training	Cross Entropy Error	.000
	Percent Incorrect Predictions	0.0%

	Stopping Rule Used	Training error ratio criterion (.001) achieved
	Training Time	0:00:00.02
Testing	Cross Entropy Error	9.499E-006
	Percent Incorrect Predictions	0.0%

In Table (6.a and 6.b), the Estimated Parameter Model shows the number of articles referenced based on the subject of the reference article and the distribution of years, in Table (a) for the years 2012 to 2017 and in Table (b) for the years 2018 to 2022, with the sum of the percentages in each row (perc. %).

Table 6.(a)**.** Estimated Parameter Model

Articles	2012	2013	2014	2015	2016	2017
1	2	0	1	2	0	4
2	2	4	1	1	13	4
3	0	1	2	2	1	2
4	0	1	2	2	1	2
5	1	5	1	2	0	2
6	0	0	2	2	3	2
7	2	0	3	10	16	14
8	0	0	0	0	2	21
9	0	1	0	1	5	11

Sum	7	12	12	22	41	**62**
perc. %	1%	2%	2%	4%	8%	**12%**

The reference articles chose the years from 2018 to 2020 as the most important compared to the two years from 2021 to 2022. This was determined by 1% in the first six months of this year.

Table 6.(a)**.** Estimated Parameter Model

2018	2019	2020	2021	2022	Until
5	8	6	5	3	2011
13	4	9	0	0	1994
13	12	13	11	1	1992
13	12	13	11	1	2000
2	5	9	7	1	1911
6	7	14	5	0	2004
14	17	6	5	0	1996
17	21	21	18	0	2016

12	11	18	1	0	1997
95	97	109	63	6	526
18%	18%	21%	12%	1%	

Dependent Variable: class Classification in training stage depend (0,1,overall percent) for predicted values (see table 7.) .

Table 7**.** Dependent Variable: class Classification

Sample	Observed	Predicted		
		0	1	Percent Correct
Training	0	2	0	100.0%
	1	0	6	100.0%
	Overall Percent	25.0%	75.0%	100.0%
Testing	0	0	0	0.0%
	1	0	1	100.0%
	Overall Percent	0.0%	100.0%	100.0%

Batch Training model was type of training the network processes, updates the synaptic weights, minimizes the total error for smaller datasets (see table 8). for initial Lambda number greater than 0 and less than 0.000001 while the initial sigma value greater than 0and less than 0.0001(see figure 1.).

Table 8. Estimated Parameter Model.

Predictor		Predicted					
		Hidden Layer 1				Output Layer	
		H(1:1)	H(1:2)	H(1:3)	H(1:4)	[class=0]	[class=1]
Input Layer	(Bias)	.554	.734	-.339-	-.733-		
	y_2012	.376	.121	.069	-.201-		
	y_2013	-.446-	-.619-	-.163-	.367		
	y_2014	.514	.409	.545	-.561-		
	y_2015	-.278-	-.358-	.066	.313		
	y_2016	-.062-	.381	.636	-.016-		
	y_2017	-.130-	-.281-	-.084-	.384		
	y_2018	.200	.318	-.126-	-.034-		
	y_2019	-.242-	-.365-	.216	-.243-		
	y_2020	-.172-	-.417-	-.658-	.122		
	y_2021	-1.211-	-1.147-	-.169-	1.265		
	y_2022	.260	.510	-.384-	-.190-		
Hidden Layer 1	(Bias)					-.998-	.559
	H(1:1)					-1.654-	1.719
	H(1:2)					-1.595-	2.286

	H(1:3)					-.619-	.608
	H(1:4)					1.640	-1.972-

Lifted models have many more variables but a much more explicit structure than the original, which makes it possible for training algorithms to employ efficient standard machine learning libraries in critical phases. Lifted models feature (see figure 2.) a lot more variables than the original. The block-coordinate descent approach presented here consists of steps that can be parallelized either across data points or layers; each step is a straightforward convex optimization problem (see figure 3.).

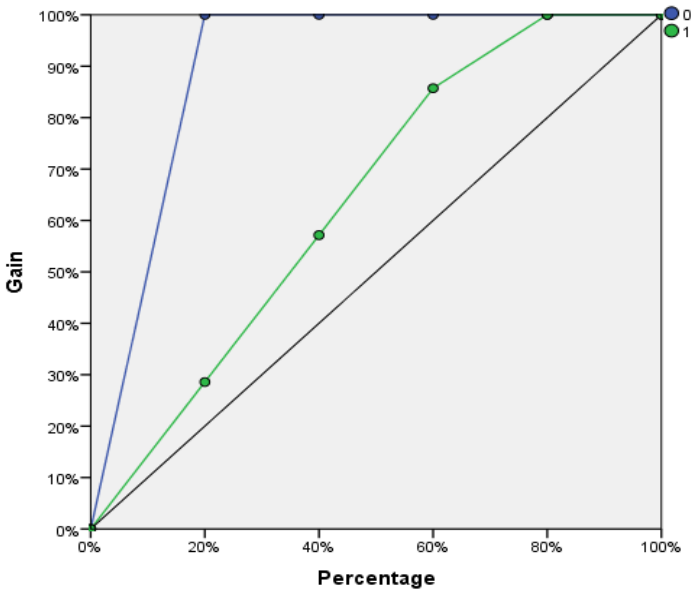

Figure 2. Gain percentage for dependent variable class

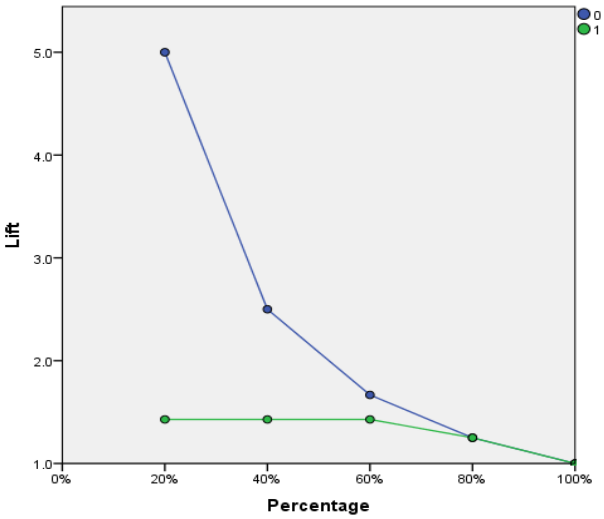

Figure 3. Lift for depend variable class

Table 9. displays nine reviews case processing summary table, these cases included and executed in the analysis , in total and by training, testing, and holdout samples. It Performs a sensitivity analysis, which computes the importance of each predictor in determining the neural network. And it is based on the combined training and testing cases.

Table 9. Normalized Importance for articles review

	Importance	Normalized Importance
y_2012	.006	1.4%
y_2013	.200	48.1%
y_2014	.025	5.9%
y_2015	.006	1.5%
y_2016	.048	11.6%
y_2017	.092	22.2%
y_2018	.020	4.8%
y_2019	.063	15.2%
y_2020	.096	23.1%
y_2021	.416	100.0%
y_2022	.027	6.4%

Figure 4. displaying importance and normalized importance for each predictor for model . According to the normalized importance scale, the years are listed in the correct order, and it is now apparent that the study conducted in the year 2021 was the most significant, followed by the research conducted in the year 2013.

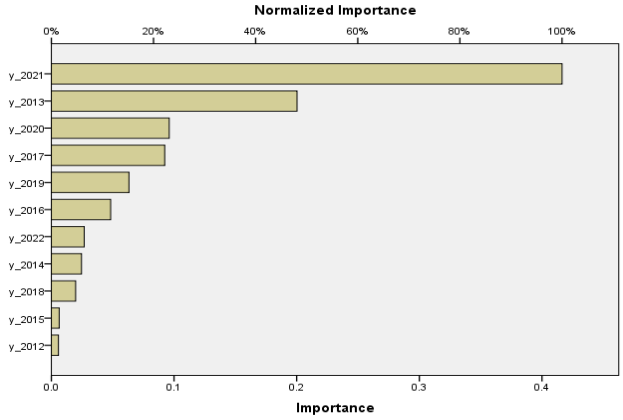

Figure 4. importance and normalized importance

1.4 Conclusion

1- This brief review will encourage some business and accounting researchers to consider neural networks as a powerful tool for deciphering the complexities of their subjects, and to establish a model that can be used to analyze nonlinear behaviour in small datasets and identify causal relationships in this paper.
2- Our model has the moderate ability to predict "industrial 4.0" articles in advance under the simulated situation with real-world data.

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تحليل مقالات المراجعة باستخدام الشبكات العصبية

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المستخلص:

تناولت هذه الدراسة موضوع الذكاء الاصطناعي (AI) حيث يزيد من كفاءة الإنتاج الصناعي مقارنة بالجهد البشري. هناك زيادة مستمرة في الذكاء الاصطناعي (AI)، مدفوعة بحقيقة أن هذه التكنولوجيا تتزايد مع "الصناعة 4.0" وأن تكاليفها تتناقص.وطبقت الشبكة العصبية لتحليل بيانات (9) مراجعات مقالات من يناير حتى يونيو 2022 ويركز على أحدث المراجعات لـ "industrial 4.0" للأعمال والحسابات. أهداف هذا العمل هي فهم المعلومات الواردة في تسعة مقالات. مراجعات المقالات (723 دراسة). المادة تستعرض العديد من الاستنتاجات. في هذه المقالة، يتمتع نموذجنا بقدرة معتدلة على التنبؤ بمقالات "الجيل الرابع الصناعي" مقدمًا في ظل الوضع المحاكى مع بيانات العالم الحقيقي. تمثل هذه المراجعة الموجزة نموذجًا يمكن استخدامه لتحليل السلوك غير الخطي في مجموعات البيانات الصغيرة وتحديد العلاقات السببية في هذه الورقة.

الكلمات المفتاحية: الشبكة العصبية الذكية ، مقالات تقنية industrial 4.0، الحسابات والاعمال.

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