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COMPUTATIONAL MODEL, BASED ON MACHINE LEARNING, TO  
PREDICT THE LEVEL OF SUCCESS IN LEGAL CASES

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**ABSTRACT**

With the development of information and communication technologies, new opportunities and applications of many technologies are emerging that before could not be thought to be used, in this sense artificial intelligence is the technology that has gained greater strength, accompanied by the development of hardware that makes its execution possible and of software tools that make its implementation possible. The neural network is one of the most used techniques in the field of artificial intelligence. This work is based on

analyzing possible cases of labor judicial problems, when workers who have suffered an abuse by employers are faced with. The success of the case according to the model presented, is based on being able to have the majority of documentation that evidences both the employment relationship, responsibilities of the employees, documents that support the payment of remuneration, documents that evidence any fault committed by the employee between others, a computational model was developed with a graphical user interface to make its application more practical. The model presents an effectiveness level of 93%, analyzed with 400 cases between positive and negative. For the training process, 100 cases corresponding to positive cases and 100 cases corresponding to negative cases were used. The model is practical in its use and can be scalable to different areas in the legal field.

## Introduction

Artificial intelligence is one of the techniques that has been used more frequently in recent years, so first they worked on methods to be able to classify, detect and forecast certain phenomena, based on the analysis of historical data. But with the maturation of techniques and the availability of computational tools are being used in areas where at first, it was not used to think that they could be applied, the legal area is one of them where most of the processes are carried out through analysis. of very subjective data, which depends on the judges to be able to solve.

This incursion is presented in works with very great challenges that are being developed and applied, in China a computational solution based on Artificial Intelligence is presented that simulated judges through algorithms capable of making decisions and providing solutions to trials, based on the information that can be made available and can be loaded as inputs in the system [1].

In this line, many solutions are presented that try to represent from the point of view of being able to replace the judges in the future, these mechanisms based on the experiences of the judges in positive and negative cases according to their experience and the way they they solve their cases [2] [3].

Applications are found not only in matters of lawsuits, but also in the signing of commercial contracts, where we try to work in the best way to agree on commercial matters, using artificial intelligence in the mechanism for drafting commercial agreements [4]. At present information related to legal issues is being published, with which we can create computational models and be able to test certain algorithms with the intention of being able to supplant the judges by the algorithms developed [5].

In the development of these applications the idea always arises, that at some point the computer systems will be able to replace the judges, in this sense many solutions are presented trying to be able to verify the degree of sensitivity of the algorithms in these legal issues [6].

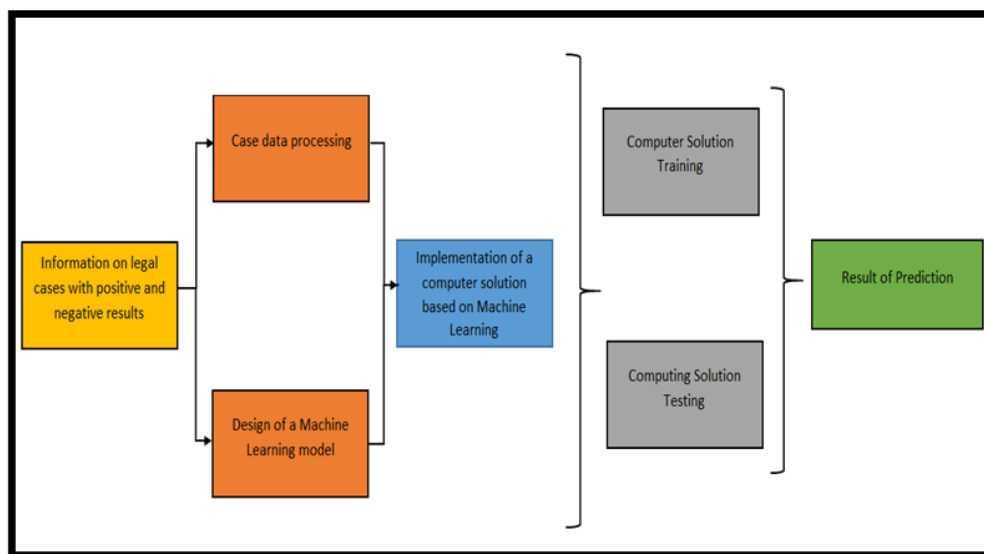
Artificial intelligence is causing certain changes in the ways to face certain challenges, one of them is the issue of Civil Law, based on the use

of intelligent systems based on the use of robotic applications, these issues generate an ethical debate that is what can be automated and applied artificial intelligence, with respect to the classic ways of being able to work on legal issues, societies are changing and even more so with the effect of COVID-19, most of the processes that were exclusively face-to-face are being digitizing, in this process they are considering applying artificial intelligence issues, in order to improve processes based on the use of historical information to forecast results, these processes are issues of compliance with legal requirements, compliance with technical standards among others [7] [8].

In the present work, a mechanism based on artificial intelligence is developed, from the perspective of legal cases in labor matters, based on being able to determine the level of being able to win the process, this model is related to the legal requirements to be able to support the case and to be able to predict whether future conflicts between a worker and a company can be successful.

**Materials and methods**

The methodology presented is made up of procedures, where each of them is explained in detail, in order to be able to explain their characteristics and particularities. The legal case that was taken as a reference in this work is related to legal cases



**Image 1. Methodology of the proposal**

Image 1 presents the block diagram of the proposal, where the stages of the methodology are detailed, with each of the processes, grouped into three blocks, the first is the data analysis stage, the second is the stage of the computational model and the third stage corresponds to the results of the prediction. Each of the processes is developed below:

**Information on legal cases with positive and negative results:** The legal data collection process is very important, because it will be the starting point of the methodology, at this stage all the necessary information is

collected to be able to model the data that will be necessary in the computational application.

**Case data processing:** In this process, the information of most cases is collected, with their respective results, classifying them into positive cases and negative cases, in our case we proceeded to obtain 400 cases, of which 200 are cases with positive results and 200 cases with negative results, to obtain the same number of cases.

**Design of a Machine Learning model:** The computational model is characterized by the characteristics obtained in the positive and negative cases, of which the main characteristics that we consider essential in the cases were obtained, in order to obtain the positive and negative results.

**Implementation of a Computer Solution based on Machine Learning:** the solution is characterized by the definition of the vector of characteristics, composed of 9 important and determining characteristics at the time of making a prediction, if the result will be positive or negative.

Features – Documents and evidence								
laws	Dismissal documents	Sanctions documents	Fee receipts issued to the company	Work attendance record	Responsibility position documents	Documents issued in work activity	Retirement documents	Work accident documents

**Image 2. Characteristic vector of the computational model**

In image 2, it is represented by the vector of characteristics, where it corresponds to legal cases of a labor nature, from the worker's side, each one of them will be part of the input in the computational model, below the characteristics and their description:

- 1. Laws:** legal considerations of work.
- 2. Dismissal:** documents about retirement from work.
- 3. Sanctions documents:** documents on possible sanctions received.
- 4. Fee receipts issued to the company:** record of all payment receipts received.
- 5. Work attendance record:** records of income to the company to work.
- 6. Responsibility position documents:** Documents proving responsibility at work.
- 7. Documents issued in work activity:** list of documents issued in the work activity, signed by the applicant.
- 8. Retirement documents:** documents that prove the termination of the employment relationship, such as dismissal or retirement..
- 9. Work accident documents:** list of documents that prove any accident or work incident.

**Computer Solution Training:** Having the 300 records, the cases that will be used in the training stage were divided, so 200 cases were taken, made up of 100 positive cases and 100 negative cases, which will be used for the training of the computational model.

**Computer Solution Testing:** Similarly, for the stage of the computational model tests, we proceed to have 200 cases of which 100 cases with positive results and 100 cases with negative results, with this both in training and tests are carried out with balanced data.

### **Result of Prediction:**

The results of the prediction are characterized by presenting a value within "0" and "1" where the "0" corresponds to the fact that the result obtained corresponds to a possible case to lose. When the result of the prediction is "1" it corresponds to a possible case to win. Values between "0.11" to "0.99" correspond to probabilistic values, the higher the result, the better the probability of winning the case..

### **Results**

The results that are presented are related to the implementation of a computational solution, where there is a graphical interface, from where you can enter the data that correspond to the characteristics that correspond to a new case to be evaluated by the computational solution..

The computational processes that must be executed so that the solution can make the prediction are also presented, among the processes we have the data load, in which the 400 cases that we have are loaded, then we have the process of creating the network, where the intelligent network to be used is created, the following process corresponds to training the network, this process takes the 200 data that correspond to 100 positive cases and 100 negative cases, with this data the network is trained and a response level of the network, in our case corresponds to 93% effectiveness, finally we find the prediction process, who takes the entered data, evaluates them with the trained network and presents us with a value between "0" and "1", which determines the possible success or failure of the new case.

The solution also features buttons to save the entered data, to perform a new evaluation and an exit button.

**Image 3. Computer application for the computational model**

### Conclusions

The conclusions reached at the end of the research are characterized by the use of one of the Artificial Intelligence techniques, which is the neural network, in the main process is to be able to predict possible positive or negative results of new cases. In relation to legal conflicts that correspond to workers with their employers, in most cases these labor relations are usually caused by arbitrary dismissals that originate from non-compliance with labor contracts, the solution presented is designed to be used from the worker's perspective, either personally or through a state attorney.

Depending on the circumstances of how the legal problem originated, documents are usually presented that justify certain responsibilities and show the employment relationship, in this sense, an analysis of the necessary documentation that is required was carried out, to be able to verify the employment relationship and with This built a vector of characteristics that are the inputs of the neural network, who makes the prediction in order to decide if the new case has a chance of winning or losing, when it is brought to litigation.

With an effectiveness level of 93%, the presented model has many possibilities of being used in a practical way, this level tends to improve if we increase the number of cases to be used in the training process, also with the increase of new characteristics that are able to discriminate between the success or defeat of a legal case of an employment nature.

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