

Pronostico de Ventas con Redes Neuronales Multi Layer Perceptron

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Abstract—Este trabajo de investigación muestra técnicas de pronóstico de una Red Neuronal Artificial. Se usó como referencia un problema con datos de pronóstico de ventas. Para obtener un buen comportamiento de la Red Neuronal se aplican diferentes funcionalidades y diferentes criterios. Se presentan resultados que demuestran el potencial de estas redes neuronales.

Index Terms—redes neuronales, python, pronostico, mlp

I. INTRODUCCIÓN

La demanda actual, la variedad de productos y el constante cambio en los productos demandados, hace que los productores deban realizar una planificación más rigurosa para maximizar el uso de sus recursos, mano de obra, sus inversiones de manera que se cumplan con los precios que exige la actual competencia. Para hacer programas de producción es deseable un correcto funcionamiento de la información de las ventas con el fin de hacer pronósticos con un alto grado de confianza para el área que se necesite de la organización. Un pronóstico es una técnica que nos facilita hacer cálculos sobre las proyecciones de ventas, usando fuentes de datos anteriores de ventas realizadas. Permite también proyectar el futuro de las ventas. La economía peruana tiene la mayor parte de su producción basada en pequeñas y medianas empresas, según el ministerio de producción este segmento empresarial representa el 99,5%. En este trabajo se propone hacer un pronóstico de ventas usando redes neuronales, ya que esta tecnología nos permite predecir comportamientos de este tipo.

II. ANTECEDENTES

Según Eliana Toro en el trabajo PRONÓSTICO DE VENTAS USANDO REDES NEURONALES, nos menciona que la industria colombiana al igual que el Perú necesita mejores técnicas que ayuden a los empresarios, ellos diseñaron su red neuronal y fueron entrenadas con data de los últimos tres años.

En el primer caso fue entrenada con la totalidad del conjunto de entrenamiento y usando 50 neuronas en la capa oculta y usando función de transferencia sigmoideal. La tolerancia para el error por época para este caso fue 1×10^{-7} . Obteniendo un resultado en el cual no sigue el patrón de comportamiento según los años anteriores por lo tanto no generaliza.

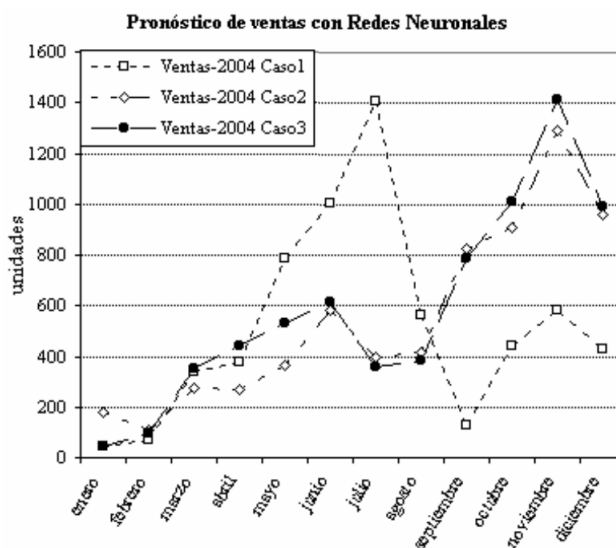


Fig. 1. Example of a figure caption.

En el segundo caso la red fue entrenada con el 90% del conjunto de entrenamiento y usando 25 neuronas en la capa oculta con función de transferencia sigmoideal. El 10% restante de los patrones no fue usado y se dejó como un conjunto de prueba para chequear la generalización de la red. Debido a los mejores resultados vistos en el segundo caso, una tercera red también fue entrenada con el 90% del conjunto de entrenamiento, usando 60 neuronas en la capa oculta, obteniendo un resultado más confiable.

En el trabajo de investigación de Bellido B, Redes neuronales para predecir el comportamiento del conjunto de activos financieros más líquidos del mercado de valores peruano, desarrolla una herramienta de inteligencia artificial para predecir el comportamiento del conjunto de activos financieros del mercado peruano. Se usó la técnica de redes neuronales multicapa perceptrón, configurado con 3 capas, y con una tasa de aprendizaje de 0.01, con datos del mercado peruano en el periodo 2010 a 2016 a partir de datos de la Superintendencia del Mercado de Valores (SMV, 2017). Para el entrenamiento de la red neuronal artificial se utilizó un 80%. Llega a la conclusión

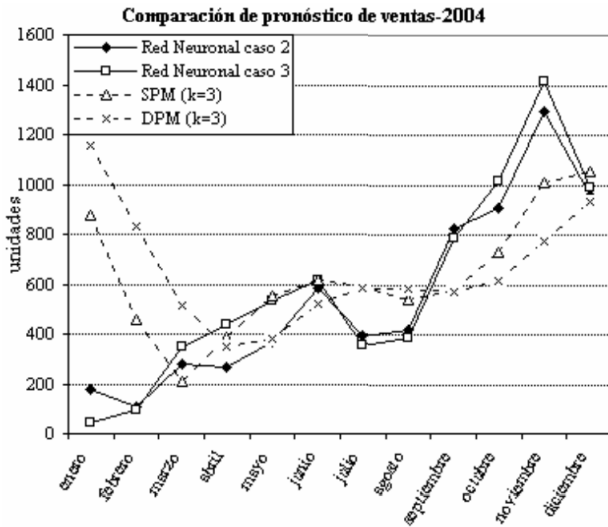


Fig. 2. Example of a figure caption.

que la capacidad de generación de la velocidad con la que rotan los activos, y la velocidad con la que se desembolsa el Capex constituye los principales factores que influyen en el rendimiento y riesgo de los activos financieros, independientemente del sector. Encontraron una red neuronal capaz de aproximar la predicción con un 76.93% de eficacia, mediante el reconocimiento de patrones diferenciados en aspectos financieros, de gobierno, comerciales y la capacidad gerencial.

III. PREPARE YOUR PAPER BEFORE STYLING

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections ??-?? below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not number text heads— \LaTeX will do that for you.

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
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Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \quad (1)$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(??)”, not “Eq. (??)” or “equation (??)”, except at the beginning of a sentence: “Equation (??) is . . .”

D. \LaTeX -Specific Advice

Please use “soft” (e.g., `\eqref{Eq}`) cross references instead of “hard” references (e.g., (1)). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don’t use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

Please note that the `{subequations}` environment in \LaTeX will increment the main equation counter even when there are no equation numbers displayed. If you forget that, you might write an article in which the equation numbers skip from (17) to (20), causing the copy editors to wonder if you’ve discovered a new method of counting.

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Do not use `\nonumber` inside the `{array}` environment. It will not stop equation numbers inside `{array}` (there won’t be any anyway) and it might stop a wanted equation number in the surrounding equation.

E. Some Common Mistakes

- The word “data” is plural, not singular.
- The subscript for the permeability of vacuum μ_0 , and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
- A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
- Do not use the word “essentially” to mean “approximately” or “effectively”.
- In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
- Do not confuse “imply” and “infer”.
- The prefix “non” is not a word; it should be joined to the word it modifies, usually without a hyphen.
- There is no period after the “et” in the Latin abbreviation “et al.”.
- The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [?].

F. Authors and Affiliations

The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

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Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you

to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced.

H. Figures and Tables

a) *Positioning Figures and Tables:* Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. ??”, even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
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^aSample of a Table footnote.

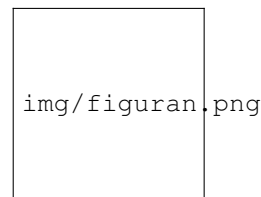


Fig. 3. Example of a figure caption.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

ACKNOWLEDGMENT

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

REFERENCES

Please number citations consecutively within brackets [?]. The sentence punctuation follows the bracket [?]. Refer simply to the reference number, as in [?],—do not use “Ref. [?]” or “reference [?]” except at the beginning of a sentence: “Reference [?] was the first . . .”

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

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