Calibration using AI

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*Abstract*—The work we had to do was to find the inverse function to calibrate sensors. To do so, we will train neural network, to find the best models, that can predict efficiently the true value using the sensors output as training set, and the true value of the environment as target, then when the models are precise enough we will have our calibration algorithm. All of the code is available on GitHub here: https://github.com/Justine-IA/Deep\_learning-/tree/main/Project

# Data Analysis

Firstly, the project will be a Deep Learning project that consist of finding an algorithm that predict true value in function of the value that a sensor finds, for that we will use a dataset that measure pollution in a city the dataset is available here: <https://archive.ics.uci.edu/dataset/360/air+quality>.

## Requirement

The requirement will be to find the inverse function to find the real value, through the value detected by the sensors, because sensor data (y) is a function of true measurement (x).

We have to find the inverse function, which is: *f^{-1}(y) = x.*

This is an important task because having the real measurement can be crucial to take actions later on.

## Data

The dataset is composed of time feature, value that the sensor finds, like hourly average sensor response of CO, and also the real value (Ground Truth) like of CO, not the one the sensor detected. There is no missing value according to the website but there is some not correct value like negative number of pollution or -200 for temperature so we removed it, the time and date will be used for a Recurrent Neural Network later on because the sensor is detecting pollution in a city so it will be useful to train a model with the times feature, because of cars or anything else that influence pollution. We also have humidity and temperature in addition to all the other feature of pollution and else.

## Visualisation

Here we have some visualization for the data such as:

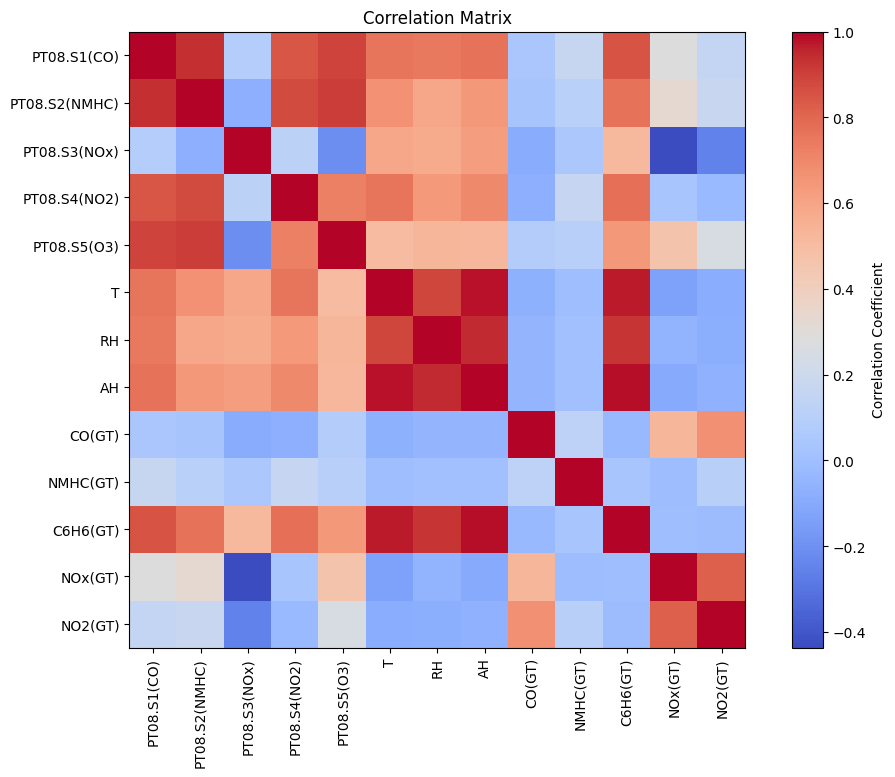


Fig. 1. Correlation Matrix

As shown in fig1, we can see the correlation between the polluting elements measured and its ground trurh are very related to each other. We can also see the C6H6, is related to most of the measurement, as well as CO GT and NMHC GT don’t have much links to others.

# Ease of Use

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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, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

## 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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* Do not mix complete spellings and abbreviations of units: “Wb/m2” or “webers per square meter”, not “webers/m2”. Spell out units when they appear in text: “. . . a few henries”, not “. . . a few H”.

Identify applicable funding agency here. If none, delete this text box.

* Use a zero before decimal points: “0.25”, not “.25”. Use “cm3”, not “cc”. (*bullet list*)

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Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tab stop. 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* 

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## Some Common Mistakes

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum **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).
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* Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
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* 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 [7].

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## Authors and Affiliations

**The template 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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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.

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1. Table Type Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
| copy | More table copya |  |  |

1. Sample of a Table footnote. (*Table footnote*)
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##### Acknowledgment *(Heading 5)*

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.

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