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How the Artificial Intelligence Whit a Neural Networks and Rules based System are used to Find a Correlations, and therefore try to Maintain ED Improve the State of Health, in Patient Affect by Multiple Sclerosis at the Origin of the Food taken by the Patient

By Francesco Pia

Abstract- In this work we want to address an Artificial Intelligence problem related to human nutrition, in the case of MS, which can be myelinating or demyelinating according to inputs that are to be considered "pseudo-cybernetic" at a low level and of natural origin, i.e. foods that can be myelinating or demyelinating as already mentioned. Thanks to the use of NNs, it is possible to build a system that highlights the response of the human body to natural inputs; such foods are therefore easy to find, with low costs and without dynamometers for the measurement of the musculoskeletal response of the human body that can be self-assessed by the subject who is subjected to this diet.

The data search is conducted on the volatile web, not punctual, not necessarily found on specific sites but made to emerge from the browser in use in a summary form.

Keywords: food, myelinating, demyelinating.

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One of the aspects that must be considered is that this work does not intend to give a precise, exhaustive, untouchable indication of the eating habits of the people involved. For example, someone may really like a food that is given as demyelinating and would eliminate it from his diet, but it would be good for him in other ways. So everyone is free to interpret the indications that the intelligent system will give him at his convenience and pleasure and that's it because he could find some food, some myelinating foods that give him more strength than others, so if it doesn't cost him anything to replace it or integrate it, so much the better.

Keywords: food, myelinating, demyelinating.

I. Introduction

Thank you so much for your time. I have always studied, as a child, and with over a dozen works in which he is the sole author, [1]-[13], and is himself suffering from a secondary progressive *nrMSPS* form of MS that is blocking him as well as many patients and families around the world. He opened a fundraiser on "*www.gofundme.com*" with keyword "*Artificial Intelligence vs Multiple Sclerosis*" and in addition to thanking you, the author will make every effort to ensure that the funds raised are spent on the next steps which are certainly expensive.

- *Step 1:* Doing sports, fitness and any activity with your body
- *Step 2:* Stem cell implant, after medical opinion from different bell towers
- *Step 3*: Assumer TOLEMABRUTINIB® OF SANOFI®, hoping my neurologist agrees, I'm waiting anxiously.
- *Step 4:* Resorting to the intermittent diet.
- *Step 5:* Use, with the help of a nutritionist, mainly myelinizating foods.

In this work we want to address a problem with AI related to human nutrition that can be myelinating or demyelinating according to dietary inputs.

These inputs are to be considered "pseudo cybernetic" at a low "machine" level but of natural origin that can be for or against myelin. Thanks to the use of NNs, it would be possible to create a system that highlights the response of the human body to easily available natural inputs, without machinery and without weight gauges, only thanks to the musculoskeletal response felt by the human body that can be evaluated by the subject who is subjected to this diet.

The data search was performed on the "volatile" WEB, that is, the type of information that is not necessarily found in specific sites, so no one will be thanked except the various browsers that bring them to light and therefore there will be no bibliographic references or authors and their works.

One of the aspects to consider is that this work does not intend to give a precise, exhaustive or untouchable indication of people's eating habits. Why can a person really like a food that is given as a demyelinating agent, and would eliminate it for example, while instead it would be good for him in other ways. So everyone is free to interpret the indications that the intelligent system will give him at his convenience and pleasure and that's it; because he could instead find food with myelinating elements that give him more strength than others; therefore, if it doesn't cost him anything to replace them, or integrate them, so much the better. We repeat, therefore, that the data used in this work are those that are represented by browsers without entering into the specifics of particular bibliographic references: this type of data is called, in this work "volatile"; that is, high level information, not low level (which would mean that one would have the

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obligation to eat... as one could find in the bibliography that there is this particular food...), finding this data it will be the user's responsibility to put them into the system and process them at his convenience according to the nutritionist's instructions.

In essence, therefore, man is seen as a cybernetic system, natural, fed with input, at a low level and programmed because the diet is in any case a nutritional reprogramming of the human body whose results are deduced by the user himself who feels a possible benefit or not..

The foods considered are divided into two categories: remyelinating and demyelinating. Therefore, very few elements are considered as it is only a system that can receive modifications and expansions..

The scheme used is the so-called "*seed of discernment [12]*"; that is, the use of two NNs, which interconnected, allow to give answers based on the nuanced representation of the inputs, where the answer is the advantage or otherwise that the user can report. This scheme is present in *[12]* where the same type of approach is used, however, with blood tests; in this work, no laboratory tests will be performed, but reference will be made to the state of well-being described by the user.

Among the rare substances, sulphuring, being myelinating, can produce actual myelin repair. The natural molecule, sulphuring, blocks the activity of an enzyme that is overactive in areas of myelin damage. This same enzyme also contributes to the growth and spread of tumour cells, meaning the discovery has implications beyond MS. Study co-author Angela Hoffman, a retired professor at the University of Portland who had examined the almost unobtainable plant-based hyaluronidase inhibitors, and Steve Bryson & colleagues at Oregon Health & Science University say it is very likely that the plant-based molecule is able to promote the growth of myelin-producing cells *[14]*.

And to think that our human body contains about 21 mg of Potassium 40, which is β radioactive and emits neutrinos (objects known to be cosmic) we emit about 400 million neutrinos a day; there would be nothing strange that it repairs itself, that it implements remedies to certain problems with the right stimulations. In this work we take as stimuli the food that we divide into two groups: remyelinating and demyelinating, the first helps myelination or that not only does not help it but damages it. We would like to use Artificial Intelligence to verify if this reasoning is coherent. With this we do not want to question or highlight foods that are normally taken by those who are well; such as obviously cereals for many people, however the foods that the network indicates as such and do not help this remyelinating are considered myelinating, only this. Therefore the research, developed for the present work, is also slightly superfluous since for the simulation it would have been enough to insert foods, as they say, generic for example from the Mediterranean diet; however divided into categories: this is important because this system consisting of two Neural Networks create the so-called "Seed of Discernment" used in *[12]*: the first work where MS is studied thanks to AI.

Considering the paradigm: move and you will move, stand still and you will stay still; we are, in a certain way, considering the metabolization of food, that is, burning the fuel that is given to it. So this paradigm can also be used as an input, in the sense that with any type of diet, drug etc. etc. if you don't exercise it all becomes useless; in the sense that if you take a "new drug" and do not follow up with adequate physiotherapy it becomes almost useless. Instead, if we consider physical activity as remyelinating and standing still as demyelinating, we can consider them as inputs, just like food, that is burned by movement. There would be nothing wrong, to imagine, that since a myelinating food is introduced and is not burned it does not go into circulation, it is digested as food and that's it; instead, if metabolized it is more likely to have an advantage.

II. A Little Corner of Matrix Algebra

From the following table tab.1 a square matrix can be extracted in order to obtain a function that highlights the trend of the new days, compared to the average of the days passed, of which the average will be calculated. The matrix can be constructed square by merging rows with low dietary impact (for example) and adding columns that take into account the response of the various parts of the patient's body subjected to the diet and others that are not linearly dependent on the previous ones, useful for describing the patient's health status.

Here's how you can proceed:

Given the original matrix $\left[Q \right]$, a random reallocation of its various cells is carried out, obtaining $\left[\overrightarrow{R} \right]$ of which we would calculate the average and normalization.

I then subtract that of the new day of the same patient $\left[\overline{G} \right]$:

$$\left[\overline{R} \right]^{1 \to j} - \left[\overline{G} \right]^{j+1 \to i}$$

$\left(j+1 \to i \right)$ *for any days more than one; from which we can calculate:*

$$(a) \quad \left[P \right] = \nabla \left(f\left(div \left[\overline{R} \right]^{1 \to j} - \left[\overline{G} \right]^{j+1 \to i} \right) \right) \begin{cases} > \\ = \quad 0 \\ < \end{cases} \quad {}^{*?1}$$

After proper reallocation to the original cells of patient:

$$(b) \quad \left[\overleftarrow{P} \right]$$

$$(c) \quad \begin{cases} > & 0 & \text{perhaps it has a negative impact} \\ = & 0 & \text{it's almost indifferen t} \\ < & 0 & \text{perhaps it has a positive influence} \end{cases}$$

From the examination of (c) we can use NNs to get more information, we call NNhope a neural network with multi-layer perceptron architecture with three layers and back-propagation learning algorithm with inputs and outputs equal to the number of cells of the matrices used so far and trained " *artfully* " to recognize what are the hypotheses, for better or for worse, examined so far on the myelinating diet or not with advantages, or less, on the various musculoskeletal districts examined for each patient subject to the diet.

Using the following scheme we will have to obtain more and more detailed information on how to adjust the diet to follow:

$$\left[\overleftarrow{P} \right] \Rightarrow \boxed{\begin{array}{c} \text{Neural Network} \\ \text{Back Progation} \\ \text{NNhope} \end{array}} \Rightarrow \left[hope \right] \qquad (c)$$

1 *? The use of certain mathematical operators, matrix ones, and not others, has as its objective the obtaining of a scalar; it would probably be sufficient to use only the calculation of the determinant of the matrix which is the argument of the operator.

From the examination of the matrix [hope] the salient data can be reported to the nutritionist and neurologist for the corrections of the case and the various conclusions. The undersigned follows, not at 100%, the indications reported in table 1 and are not detecting worsening but very slight improvements that fall within the fluctuating clinical picture of multiple sclerosis, however the results are expected in the long term. It is believed that this approach will most likely give positive and more visible results in mild forms and in newly diagnosed than in those who have been affected \ for years by the nrSPMS form like the undersigned who after the end of this work in addition to continuing the diet will dedicate himself more to rehabilitative physiotherapy and physical exercise

III. Methods and Tools

This paragraph will describe the main scheme of the setup that will be used, also in the next works and the present one which mainly describes the idea, and the second one which involves the use of neural networks and the drafting of an algorithm especially by virtue of the fact that the patients will be virtually encapsulated while the third will be much more challenging because the use of "*real*" patients; at this point in the exposition it is not easy to use real patients.

In the following figures everything is particularly "simplified" because only the preliminary project that will be described is represented, represented in the figures fig. 1, 2. All this is obviously simple compared to the scale of the overall project. As said in the introduction, it is not very useful to describe in depth these blocks that are part of the drawings represented in fig. 1 and 2 because the difficulties that will be encountered will not be few and above all the methods used to describe and realize the various components will not be simple, and the type of representation and its representation is unpredictable.

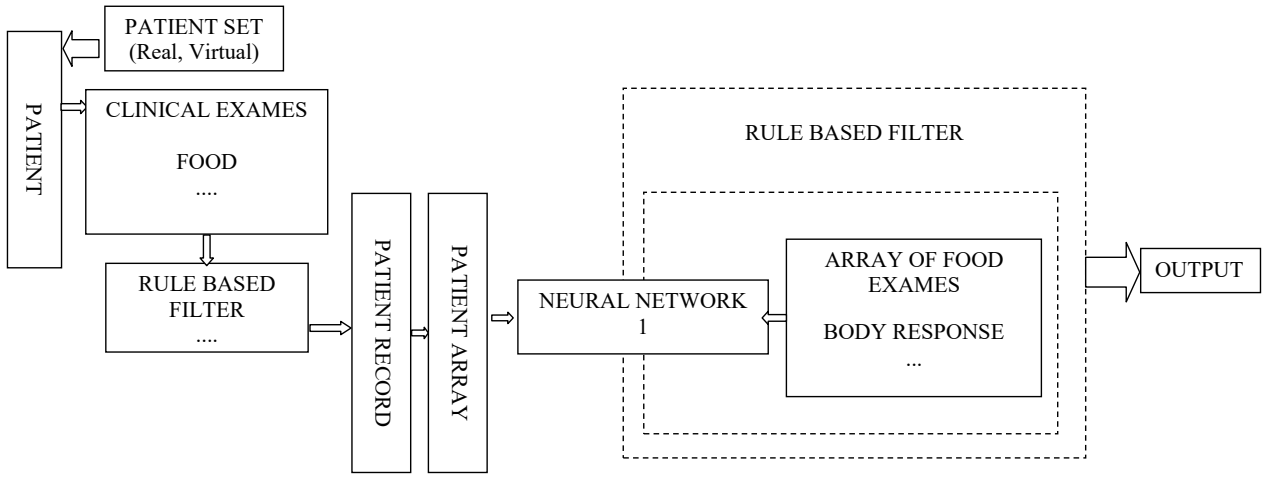

Fig. 1: This Figure Represents the Original Idea to Train a Neural Network to Distinguish an MS Patient from a Healthy One, as well as "Memorizing" the Cases Seen in Training

Tab. 1: This Table Represents the "I-Th" Patient

$Patient_i$		$Diet_i$	Response	Example of A Rule Indicated by the Nutritionist
$Food_i$	My/Demy	Rules/Grams	$Diet_i$	
Dried fruit	My	$rule_1$	R_i	...
animal proteins	My	$rule_2$		$0 \leq 20[g]$
Fruits and vegetables	My	$rule_3$		...
Sulphuretin	My	$rule_4$		...
Fish + Ω_3	My	$rule_5$		...
Ω_3	My	$rule_6$		...
Biotin	My	$rule_7$		$0 \leq 400[mg]$
Vitamins B1, B2, B3, B5, B6, B12, C, Niacin	My	$rule_8$		...
Legumes	My	$rule_9$		...
				$\sum_{i=1}^{20} KCal_i \leq 2100[KCal]$
Grape seeds	MY/DEMY	$rule_{10}$		...
Salt	DEMY	$rule_{11}$		0
Sugar	DEMY	$rule_{12}$		0
Butter	DEMY	$rule_{13}$		...
Oil	DEMY	$rule_{14}$		
Refined foods	DEMY	$rule_{15}$		...
Beer	DEMY	$rule_{16}$		0
Dairy products	DEMY	$rule_{17}$		...
pork sausages	DEMY	$rule_{18}$		...
Cereals	DEMY	$rule_{19}$		...
Carbohydrates	DEMY	$rule_{20}$		...
$1 \leq PATIENT_i \leq 30$	2100 KCal	$rule_i$ $0 \leq KCal_i \leq g_i$	Response $0 \leq R \leq 1$	

Many foods, such as legumes "*for example*", are very healthy if present in the diet but the effects on myelin are not known, this fact we here would call the "*bean problem*"

For The patients' response is certainly subjective, but the intelligent system will most likely be able to give useful indications for MD clinicians will be used, hoping to limit the number of inputs, and since they are numerous, it will be necessary to ensure that the NN *[6], [12]* has a variable and selectable range for the inputs.

At this point in the simulation, it is recommended to use 10 patients for the system training phase, 10 for validation and 10 for testing.

At this point the first neural network should be able to associate food with the response of the sick patient at the onset of multiple sclerosis, but this is not what we would like only. In fact, thanks to the second NN, the most myelinating foods and their quantity to be taken daily should be noted with the supervision of the nutritionist and the neurologist. The following figure further highlights the potential of diet-patient matching highlighted in Figure fig. 1. The male/female ratio is an important factor for patient selection and the impact of MS, which must be represented in the patient population and therefore will be implicit in the selected sample.

As for training, validation should be done on MS patients, while for the testing phase it would be interesting to insert some patients with variable expressed parameters in the simulations: *new*, *old* and *healthy*, to try to represent the whole population. Over-fitting should be avoided by shifting the just evoked parameters and their respective inputs and by a somewhat broader representation of the output and inputs.

The following figure fig. 2 shows the system just exposed; that is, a system able to indicate significant parameters to be provided to the clinician with the totality of patients and simulated data thanks to *Tab. 1*.

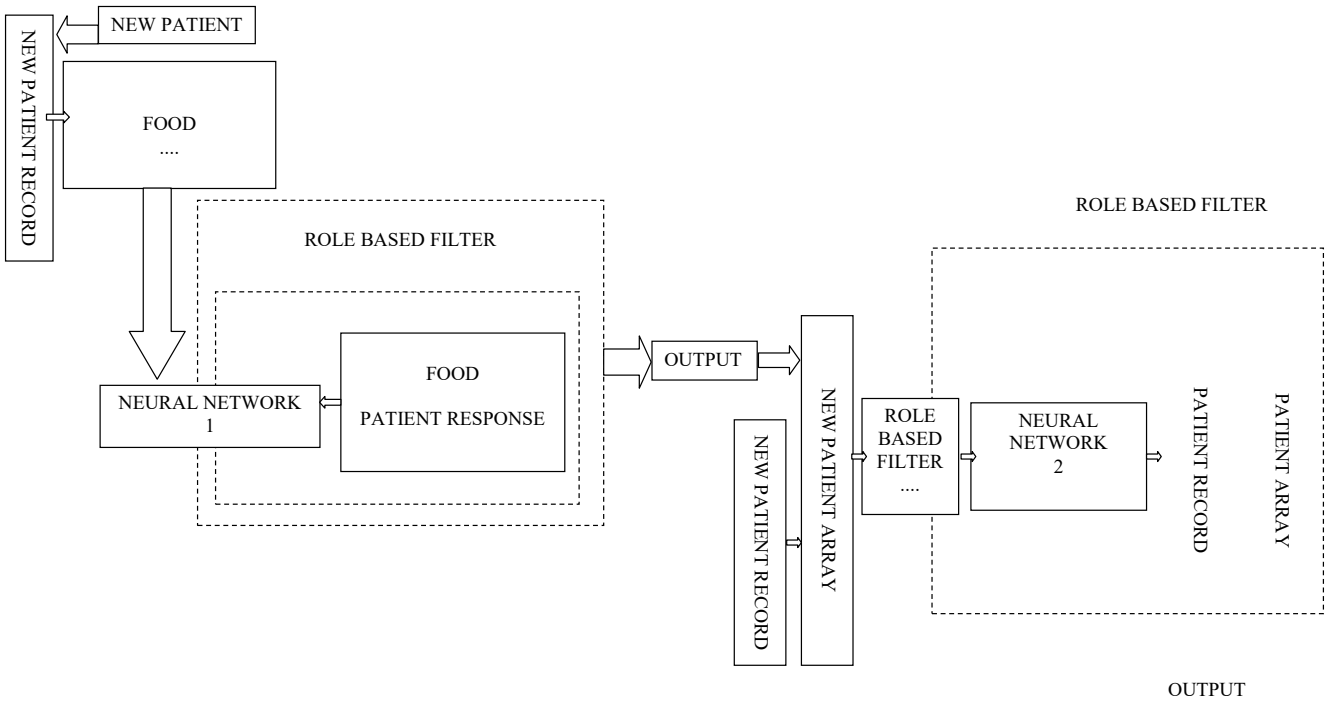

Fig. 2: This Figure Represents the Second Part of the System Which Could Give Important Indications to the DIET

To clarify, training can be done on "newly diagnosed" patients and validation on those "diagnosed not long ago" the Test is a somewhat nuanced middle ground, a bit of the first group and a bit of the second, assuming that the system in fig.1 is able to distinguish a healthy patient from a sick one by his diet, then we ask ourselves where the information resides?

The information and the result of the correct training of the NN n°1 of the successful learning of the diet-patient pairing; and up to this point after having carried out the training: then an average of the input vectors of the arrays of the patients and their diets is made and the significant food could be hidden, in truth the input of interest appears: then a new case is presented and at this point the network will say the most mylinizating diet and the difference is made between the representative vector of the new case minus the average of the patients, then we will see what are the variables in play that determine this difference between the representative vectors. The schemes proposed in fig. 1 and 2 should be considered a common place that can also be used for other pathologies, this aspect is very important to underline.

IV. Conclusion

Since we intend to proceed, at the end of this mainly descriptive work on the idea of using NNs, other steps are substantially planned that will concern the introduction of over-the-counter drugs into the entrances and then prescribed by the neurologist and with a lot of work to do. Once the correct functioning of the virtual encapsulator of the patient and the entire system has been verified, and the presence of sufficient funds has been verified, to then try to concretely implement the procedure that should answer, in part, the question of the title of this work, thus giving indications to clinical doctors who are experts in the sector covered in this article.

The undersigned, who has been following this diet for a month and more, has noticed great improvements, even if... due to autosuggestion. After all, due to waiting for drugs that never arrives: there's no harm in trying. Funds are needed for software simulations and the undersigned, in addition to making himself available, strongly recommends contacting competent doctors in the various fields of medicine. And like many things in the life of those affected by MS, even a diet must not deprive us of a few moments of happiness. For example, a pizza party with friends (pizza and beer): two non-myelinating foods and we do not participate, aware or not we are not happy but sad and depressed by the renunciation. Such suffering could make us lose the results obtained after months of myelinating diet: the diet should perhaps be faced with a serene, friendly spirit, like the life of a patient, and not only, of MS. We would say balance and serenity: therefore a yes with moderate behavior to pizza and beer with friends.

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