## Directing. The company

DIRECTING INTELLIGENCE was founded in 2000 by a team of scientists aiming at introducing Artificial Intelligence in business processes, by creating open architecture platforms based on machine learning methodology and algorithms (neural networks, fuzzy systems, genetic algorithms, natural language processing, etc…).

Our solutions are always state of the science as they are continuously supported by our R&D Dept. They can be adapted in any requirement conceptual or/and technical and can operate in cloud environment and/or in memory database.

Our major clients : CITIBANK, ATTICA BANK, SOCIETE GENERALE, CYPRUS BANK, VODAFONE, TOYOTA, AUDI, MINISTRY OF AGRICULTURE, DELHAIZE, MARKET IN, LA VIE ASSURANCE, COLGATE PALMOLIVE, IATRIKO HOSPITAL, etc….

### DIRECTING. The innovation

In order to understand what is artificial intelligence (and DIRECTING's innovation) and its difference with machine learning and expert systems let's see definitions by an example.

### Classical Diagnosis

If a patient asks his doctor why and how he diagnosed his disease, the doctor based on examinations (eg magnetic resonance imaging) and his experience can substantiate his diagnosis. This method is the expert systems in decision making.

### Mechanical Learning

In machine learning, algorithms acquire knowledge through experience. Machine learning is based on large data sets in which it seeks to find common patterns. For example, if we have data from positive and negative cases of an exam-based disease

(magnetic resonance imaging), the algorithm looks at the images and identifies patterns that exist between these images that have similar conditions. Gray dots are input images and blue and green are images characterizing the progression of the disease.

When the algorithm receives a new image, it will compare the pattern in this image with the model learned from the analysis of all the previous images and then will predict disease evolution.

Based on this prediction, doctor will be able to adjust the treatment that he intended to administer using the classical method.
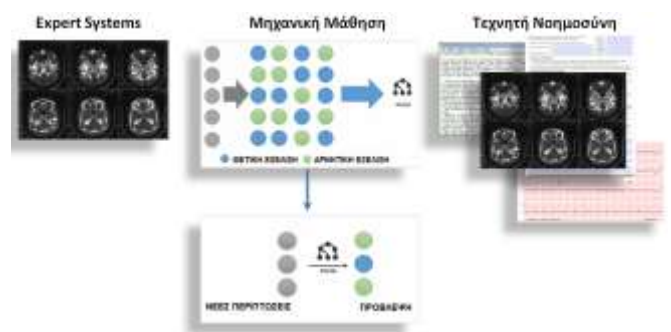


### Artificial Intelligence

An artificial intelligence model generates responses relative to the path it makes through the data it processes. Human provides the algorithm with data but no conceptual frame and the algorithm produce results based on a process that the scientist has yet to understand.

Thus the artificial intelligence model may have made a prediction based on some abnormalities in a patient's magnetic resonance imaging or in combination with some of historical data (hematological or other examinations, lifestyle, etc.) even from observations of the doctor(s) on both the patient himself and on similar cases.

There is no way for the doctor to understand how the artificial intelligence model came to be predicted. This is what we call the "black box" of artificial intelligence.

## Datactif. Artificial Intelligence Platform

Directing has created a methodology to succeed in training a neural network to learn how to explain itself. Basically we are talking about a Post model where everything is a neural network from data processing to reading results without any human intervention.

This methodology is supported by Datactif, a neural network application that can process any kind of raw data (structured and unstructured, numerical, texts, speeches, cardiograms, measurements, test results, etc.) and data from others systems offering a holistic point of view in any kind of paradigm concerning multifarious sources of information
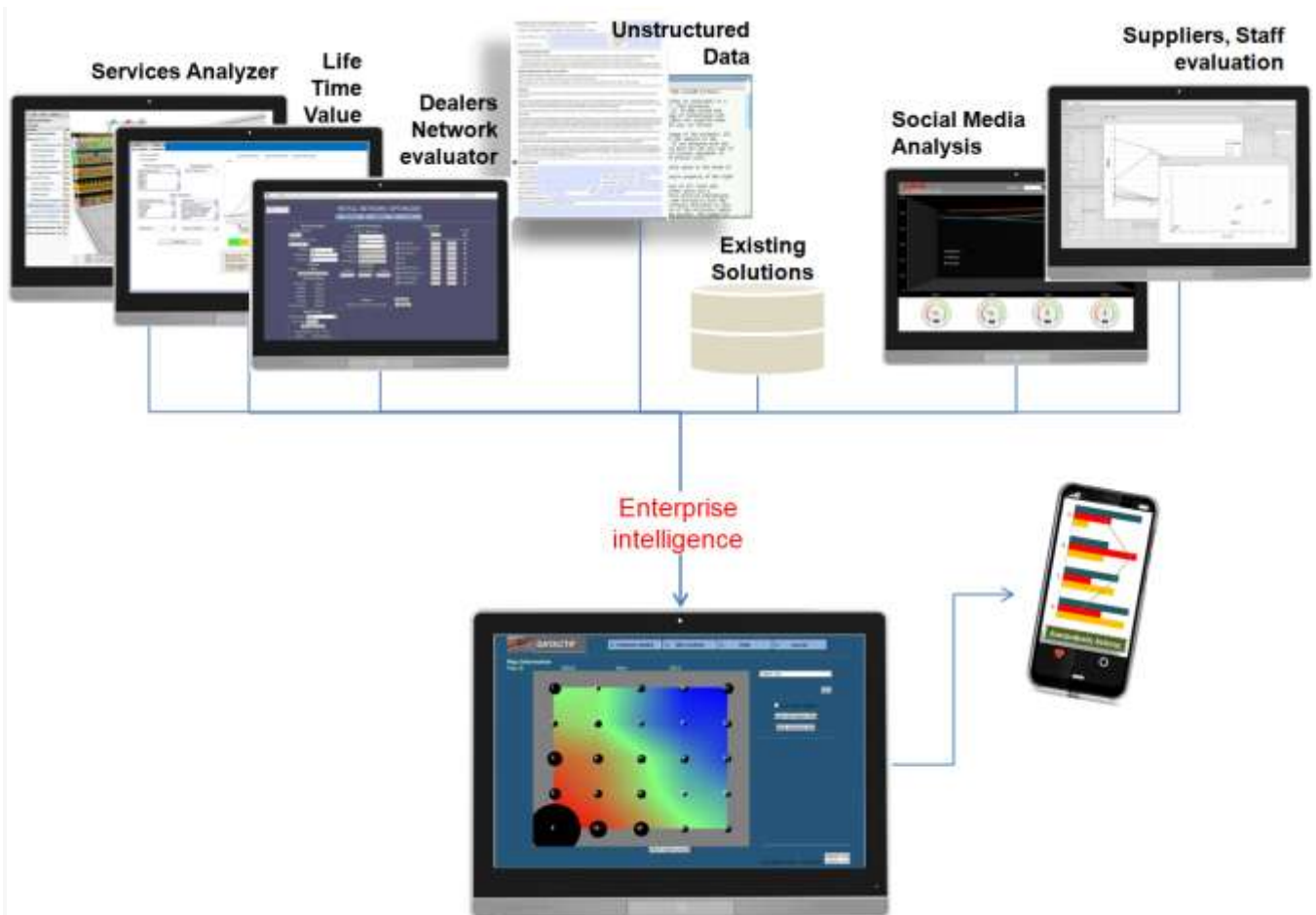


*On the above image we show Datactif Retail*
*and how it works for a supermarket chain*

## Datactif Pharmacis.
## Artificial Intelligence in Health

### Introduction

Since Covid19 nothing will be the same in population behavior concerning health as well as pharmaceutical companies, public health care, doctors, pharmacists, etc… The most important parameter is vulnerable population detection not just in terms of age and chronic diseases. And not just for Covid19. Vulnerable population detection can only be performed through historical data of drugs consumption (not only prescribed) and with the collaboration of pharmacists.

### The importance of pharmacists.

Pharmacists in Europe as well as US are undertaking that primary health (that means also early detection of symptoms for any kind of disease) and this is a fact. They have also the total view of patients. But they don't have the appropriate tools to performed their tasks and help in same time community.

### Our research

Last 3 years our company was focusing in research of artificial intelligence application in detection, analysis and understanding of patients with multiple chronic diseases, side effects of drugs (prescribed or not) as well as parapharmaceutical products, with objective the analysis of holistic health of each patient and evolution prediction in the frame of pharmacists-patient relation. We consider that our approach is the only reliable at today's specific epidemiological conditions but also for the future.
Our target groups was

1. Patients
2. Pharmacists
3. Public health care (states)
4. And in a second phase Medical community

We present examples concerning our approach. Our main objective will be achieved through 3 levels

1. Monitoring and predicting the progression of chronic and multiple chronic diseases
2. Monitoring and predicting the correct treatment application.
3. Due to the appearance of Covid19 we added a third level this of correlating the two above tasks with epidemics prevention.

### Data

We used anonymous proof of purchases of 4 pharmacies for a 3 month period. We train an artificial intelligent system with paths such as disease-ingredient, ingredient-prescribed drugs, then all the above with not prescribed drugs as well as parapharmaceutical products. We used Datactif Enterprise Platform a neural network application

### 1. Monitoring and predicting the progression of chronic and multiple chronic diseases

We succeeded in :

a. Discovering chronic and Multiple Chronic Diseases and monitoring their evolution,
b. Associating diseases with prescription and non-prescription medications.
c. Discovering causes and conditions of prescription and/or preference for a drug.
d. Detecting appearance of epidemics and predicting their evolution, etc ...

#### *Example of Side effects*
So, for example, we have discovered patients developing Infections and consequently are prescribed Anti-inflammatory, which in some people raise the Pressure whenever they are given Antihypertensive, which in turn creates gastropathy consistently as they are administered and Losec, Nexium etc ...
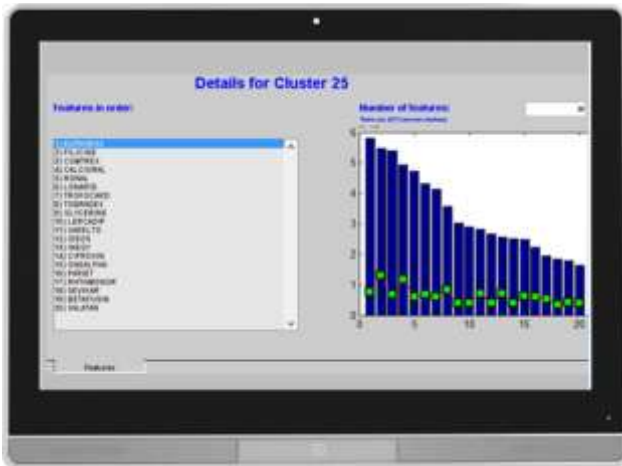
### *Example of Correlation of Thyroid with Infections*

Take another example of Thyroid Cluster 25 with Euthyrox designating this Cluster.

By examining its composition, we will observe the coexistence of the Thyroid with diseases such as urinary and respiratory tract infections.

Here, Artificial Intelligence has found that the coexistence of the Thyroid with various types of recurring infections is due to thyroid problems rather than individual diseases.

That is, the occurrence of infections is due to the decline of the immune system due to the thyroid.
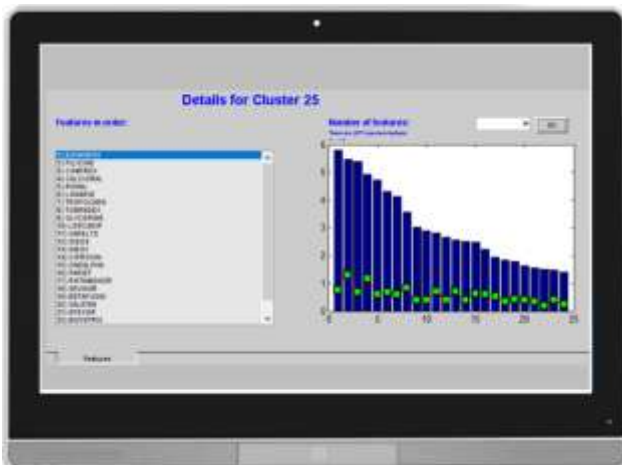


From the small sample we had to analyze, we saw variations in disease by region, variations not correlated at all with drugs sales or other statistic concerning diseases penetration.

## 2. Monitoring and predicting the correct treatment application.

Appropriate treatment for each condition is known (although in the case of multiple diseases where more doctors intervene, dysfunctions occur). But from prescription to correct treatment, there is a big difference for reasons such as financial, negligence, luck of information, etc…

We are designing an intelligent platform DATACTIF PHARMACIS for both pharmacists and patient that will indicate to each patient the actual treatment application status and alerts the pharmacist of any deviation.

The overall picture of each patient will be enriched with all findings of his historical analysis as well as with personalized additional information from the pharmacist himself.

DATACTIF PHARMACIS will offer personalized recommendations to help pharmacist to identify the best action for each client individually. Information such as:

1. Signs of allergies
2. Nutrition tips
3. Suggestions for a doctor visit
4. Comments and remarks

## DATACTIF smart phone

DATACTIF SMART is a smart phone application for every patient, which may include part of patient history reminders, information etc. ...
The patient will also be able to transfer personal measurements (Pressure, Oximetry, Cardiogram, etc.) through his / her own devices and applications to keep his or her history up to date



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## Epidemics

All the above data will produce knowledge and prediction concerning diseases of any kind as well as epidemics appearance and evolution. But also vulnerable population even these in the first time of appearance. Those findings can helps states and medical community to prevent, manage and finally offer best health condition using logistics, human and financial resources the most optimum way.