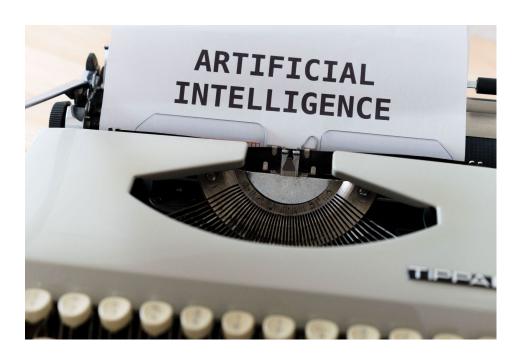**The word will tell you the truth - how artificial intelligence can help us foresee the effects of trauma.**

The power of science is not only the ability to describe reality but also to predict certain events based on observation of current phenomena. Psychology is a science in which human and their inner world is in the center, and language is one of the ways that man can express themselves.

What if, just by observing language, scientists were able to diagnose mental illness or predict its development in the future? Is this even possible?

I decided to verify if the way that trauma victims talk about their trauma can help predict whether a person will have PTSD.

This time my research assistant will not be a human, but a computer, or rather an artificial intelligence.

Trauma - our daily bread

In the course of everyone's life, negative events happen to people and turn upside down their previous way of functioning, as well as the way they look at their environment and themselves. Examples of such events can be divorce, sudden job loss, loss of a friend due to conflict, death of a loved one, or experiencing health problems.

Many people have a tendency to claim that they experienced trauma, while only a few of the above events meet the proper criteria for it, the rest are crisis events.

According to psychologists who specialize in crises and trauma, we can call a traumatic event a threat to one's own or a loved one's life or health. We can also be witness of that event.

Proper clarification of what is trauma is important to recognize one of the most serious consequences of a traumatic event - post-traumatic stress disorder, commonly known as PTSD.

Although in the public mind PTSD is a mental disorder associated with soldiers returning from the military, it can affect anyone who has experienced an extremely stressful event classified as traumatic.

PTSD or post-traumatic stress disorder

Imagine that a loved one has survived a very serious car accident. How do you know if that person might be suffering from post-traumatic stress disorder?

Kasia, a 25-year-old cashier working at a bank, was the victim of a workplace assault. She is a patient at the Trauma Therapy Center because of her diagnosis of PTSD.

"Every day I would dream about this man threatening me with a gun. I am waking up covered in sweat. Regular days don't bring me any rest from that event. Even a louder sound and I immediately recall the robbery. I had to quit my old job because just going near the bank would cause me to have panic attacks. Since that fateful day, nothing makes me happy anymore, I don't feel like hanging out with friends or pursuing my hobbies. I've become so explosive that even the smallest frustration can set off a whole storm of emotions. I can't go on like this". - Kasia said when she came to us. She described classic symptoms of PTSD, such as re-experiencing that event through intrusive thoughts or

dreaming about it. In addition, Kasia clearly avoids situations that remind her of the event, or she reacts emotionally when she accidentally encounters a stimulus that she associates with the attack. Another symptom of PTSD that Kasia presents is hyperactivity, which is associated with emotional disturbance. Recognizing PTSD is the first step to regaining normality and mental balance.

The next step is undertaking therapy in one of the recommended protocols: cognitive behavioral therapy (CBT) or eye movement desensitization and reprocessing therapy (EMDR).

Kasia could have been helped much earlier if she knew that she would suffer from PTSD.

How a computer analyzes your speech

A few years ago, the science world was talking about the scientific discoveries of James Pennebaker's research team, that people suffering from depression use more first-person pronouns: "I", "me", "my".

This would not have been possible without the computational capabilities of computers, which quickly count the statistics of words used in a particular text. Computers use the work of researchers who have grouped words used in specific situations, which may indicate the experience of certain emotions or the words that indicate certain psychological mechanisms.

Let's consider together what categories could be extracted from the sentence "I was very happy when I realized that my mother had recovered." An obvious one is to divide it into parts of speech or to assign the words "happy" to the "positive feelings" category. Less obvious is the "thinking" category, where the phrase "I realized" is a part of it, or the "family" (mom) or "health" (she recovered). Single words will not tell us much about a person's mental condition, but a summary and dependencies between those categories would tell us a bit more. Based on my analysis of stories about a traumatic event, I will predict the occurrence of PTSD.

The lower word level is... meaning!

In my study, I did not stop at words, but take a close look into their meanings. Each word has multiple meanings, such as "cancer," which can be an animal, a disease or a zodiac sign. Past analyses have used some simplification by assigning all word meanings to different categories.

Through the analysis of past research findings, I determined that the categories that predict PTSD are "insight" and "causation." In addition, I created several new categories, such as "acceptance" and "blame" to identify a certain mindset that promotes the development of PTSD.

For the study, I invited people who had experienced a traumatic event in the past 3 months and asked them to talk about that event again. I recorded the subjects' confessions (with their permission, of course), and the transcriptions of these stories helped me in the next part of the study, where my research assistant was a computer. In a very fast manner (just a few seconds!) it counted the words used by the respondents and assigned them to specific categories including the meaning of the words. In this way, a brief characterization was created containing statistics on the use of words meanings from each category for a particular story. I will need these numbers - in the second study.

Six months later... or can word meanings predict the future?

After six months, I met with the same people again to see if the subjects were suffering from PTSD, and then to verify if the word categories could predict the intensity of PTSD symptoms. It turned out that only the use of words in the insight category was correlated with reduced PTSD symptom intensity. This is probably related to the tendency to process and assimilate the event more deeply. Kasia while recounting the event will use the words "I think this event has completely changed me" and therefore confront it and give it meaning instead of pushing it into the unconscious which results in tension in the body.

A technological innovation, or perhaps the future of diagnosis?

What if Kasia, after bank robbery, was taken to an artificial intelligence center specializing in predicting mental illness, in which a few minutes of conversation recorded by a computer would be the basis for determining the likelihood of illness? It may be a song of the future, but research like mine could be the basis for helping people that anyone can access. Once Kasia is identified as being at risk, she would be taken to another room where artificial

intelligence would construct a therapy for her that she could participate in from her own home.

The low cost of diagnosis and participation in therapy, and its unlimited availability could be a step toward improving the mental quality of society. Speech analysis is non-invasive, simple to perform, and evolving technology that gives people more chances to improve their well-being.

The future will show if this vision from Lem's books is the next step in the development of science or just the wishful thinking of a scientist who dreams of improving the world.