

# Processing Information *via* Cognitive System: Regressive Approach in the Consciousness- Reality System; Machine Learning and Artificial Intelligence Model Proposal

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**Abstract:** Reality is not what we see, feel or hear, but rather, how we interact with it. Consciousness is the summary of experiences, which were gained from natural and higher mental functions. Every day, the human mind processes so many variations of reality, that counting an exact number would not be reliable. Information goes in and out through mental functions and personality, enriching knowledge and widening the mind. Perhaps, it is possible to explain and trace each step that the human mind does in order to make a decision on how to react and respond.

**Keywords:** Personality traits, higher mental functions, conscious, consciousness, emotions

## Introduction

Mind, mentality, and consciousness are what we use when talking to each other. Psychology is a relatively young science, the concepts of which are often argued. Humankind is attempting to understand the ambient space along with our inner space. However, we still do not see the boundaries and, hence, continue using abstraction as one of the leading higher mental functions to give our mind the starting point.

This article provides a tool for building hypotheses about the cognition process. The combination of different approaches is discussed in order to demonstrate the multilevel information processing.

C. Jung in his report, presented at the Psychoanalytic Congress in Munich (September 7–8, 1913) [1], emphasized the conscious qualities, such as extraversion *vs.* introversion, meaning that duality of human nature is stochastic. In other words, humans balance between two extreme variants, depending on the situation caused by the necessity to keep mental health and stability. Human personality *sensu* Jung possess other qualities as well: intuition *vs.* sensation, thinking *vs.* feeling, and judging *vs.* perceiving.

In the twenty-first century, data presents the major concern of many institutions. In many cases, data quality is a crucial factor for empirical learning of the objective reality. Moreover, the data amount, which

doubles every six months, diminishes the data quality in the following ways:

- The data becomes outdated very fast;
- The variety of options is confusing;
- The data source is often undefined.

In the course of the research process, the hypothesis should be proved in several repetitions of the experiment: the more the better. Moreover, to be validated, the hypothesis needs to be tested by a group of the research participants.

The next step is implementation of the verified methodology. Repetitions yielding similar results, along with an accurate forecast, constitute a high-quality practice.

In machine learning (ML) or artificial intelligence (AI), the researcher has to pay attention to collected data. The data range is the most important issue in data science. Returning to psychological projects and human behavior analysis, it is important to point out the need in accurately collected data, which should both support the hypothesis and be sufficient (but not excessive) for ML. In other words, collecting all data about an individual is not the best way to build a prediction model for his or her behavior.

All in all, there are certain limitations that have to be formulated for further consideration:

- The dataset is true for the time it is collected. In other words, when the data are collected from an individual, for example, *via* some test, then these data become outdated shortly. This means that the human nature (psychological, behavioral, emotional) is constantly changing over time. Thus, collecting social data is closely connected to the time. Every piece of data, every parameter has its own lifetime value, hence this must be taken into account;
- There are many approaches to analyzing the personality, or to behavioral research from the modern standpoint. One of the issues is connected with the validity of individual observation and research. Psychologists are spread in time and space. Every scientist works in certain conditions and has access to a limited sample. Hence, this provides us with the

second problematic issue of sample representativeness and significance, which was noted by multiple investigators;

- Cognitive distortion is the third limitation, which should be taken into consideration. The data quality also depends on the participants. Ideally, all tested respondents should be in identical conditions and with the same set of cognitive distortions. The latter are habitual ways of thinking that are often inaccurate and negatively biased. Cognitive distortions usually develop over time in response to adverse events. It should be mentioned that everyone has some cognitive distortion(s). Indeed, for the need of current study, four cognitive distortions are clarified: overabundance of information, insufficient information, information noise, and deliberate distortion of data;

- There is also an interesting issue called the *observer problem*, which comes from quantum mechanics. It means that the result of observation highly depends on the condition of the observer. In psychological analysis, the observer exists and can be put on a list of limitations for current discussion;

- The final limitation is related to the fact that majority of people cannot be 100 % confident about their own selves. When the researcher asks the participant about the decision, the participant is likely to feel doubtful. Each of us cannot 100 % guarantee our own choice of a certain decision for doing or not doing something, because the context is very important. The straightforward example is: going out on Friday or staying at home. This is a normal question for the introvert vs. extrovert orientation, but it highly depends on the certain day routine of the certain person: extraverts may be deadly tired at the moment we ask for their decision, while introverts may feel like socializing today. This is a crucial issue to keep in mind while going into the further discussion.

## Literature Review

Psychologists have been attempting to comprehend the human nature and the nature of consciousness for over hundred years. However, many hypotheses were not validated but were approbated for novel analytical methods. To begin with, it is important to clarify several ideas. People communicate. They send messages and talk to each other every day, at any time, and with any purpose. People

share information. The term *information* has different meanings in different contexts. In this paper, we used C.E. Shannon's definition of information. The term has the same meaning and qualities as stated in his work, "A Mathematical Theory of Communication" (1948), but to some extent the communication channel is replaced, and the encrypting of the information is taken from another source: Richard Dawkins who used the term *meme* as a piece of cultural information in his book "The Selfish Gene". In this manuscript, the combination of Shannon's and Dawkins' ideas helped developing a communication theory over time. In Shannon's theory, the information is written in bits (the smallest measurement of information piece in information theory), while in Dawkins' theory, the culture is written in memes (the smallest metric for the culture piece in cultural evolution theory).

Following the method of discovering new parts of indivisible pieces, the meme *sensu* Dawkins is represented by the image and emotion in this study.

*Image* is a snapshot of the objective reality existing with the *emotion*, or separately in the consciousness of an individual, or else recorded by any tool in a graphic manner, text, sound or any other way in the objective reality.

*Emotion* is a clear and powerful feeling existing with the *image*, or separately in the consciousness of an individual, or else recorded by any tool in a graphic manner, text, sound or any other way in the objective reality.

The above definitions appear quite similar; however, the nature of an image is completely different from the nature of an emotion. Image has always a material form, which can be detected by five senses. On the other hand, emotion usually comes from feelings.

G. Kelly (1955) developed the repertory grid approach for building personal constructs. In short, Kelly formed a theory explaining the behavior of individuals by analyzing how a person perceives the world. This theory declares that human beings create constructs from birth: in other words, socialization process is followed up by construct making. From Kelly's perspective, everyone has a scientist in mind, who conducts research, formulates hypotheses, and tests them. When the acceptable result of

the test is achieved, then the personal construct is built. It is fair to say that actual objective world affects the personality. Although, in order to survive, individuals at any age have to be adaptive, flexible, thoughtful and careful, in the modern world, it is more about reducing suffering. However, the contemporary world is very complex, and it remains weak and rough without cultural education and the personality. Emotions and images are the key for saving and transferring the culture, as well as a great source for personality development.

M. Whittow defined the culture of recording as a source of knowledge and development of humanity. The significant role of capturing images and emotions, storing information in books and pictures is undoubtedly crucial in his discussion of Medieval Europe.

There are two great minds standing out from the crowd. They are C. Jung and L. Vygotsky. Jung conducted research on personality traits and their role in consciousness. The logic and description are clear and understandable in his publications. Basically, Jung said that, at all times, society affects the personality. Moreover, the community is a source for values determining the behavior. The typology is sometimes criticized for classifying individuals, but it can be the answer to the ML problem in the twenty-first century, as it helps transforming qualitative data into quantitative without losing connection to the research subject. Vygotsky undoubtedly widened the behavioral phenomena and created a simple classification of higher mental functions, which are easily implemented to new methods, as is shown in this article. Four core functions and four supporting functions represent the structure facilitating the implementation in the binary machine logic.

We have to recognize the need of classification methods and their usefulness in the contemporary world, where the use of AI is booming. Conscious and Reality are philosophical paradigms. There are many discussions about them. Psychologists diagnose the human mind and record personality traits in a form of an essay, which is a grasp of thoughts, ideas and abstract discussions. Unfortunately, machines use pure logic. Therefore, a novel way of explaining (in the form of writing algorithms) has to be established and applied in order to stimulate the development of psychological AI, capable of understanding us.

## Social Code Consciousness-Reality Model

Historically, humans attempted to save the images from the real world by means of using art. The pieces of art are not just the way of storing data and the educational tools for the next generation, but they save emotions over time as well.

Pictures, books, films, etc. provide us with emotions and certain images, which accomplish the obtained experience. Socialization process is a long stage in human life, which, sometimes, continues until the end. Most of the personality is gained in the first 20 years of life. At the age of several months, the experience is genetic. After that and until the age of 5 years old, the imprinting process goes. Then, between the ages of 5 and 12, conditioning goes on. Finally, the educational stage starts at 13 years of age and continues for uncertain duration.

*Genetic* is what we inherited from our parents and ancestors.

*Imprinting* means copying parents' behavioral traits.

*Conditioning* signifies the compliance with regulations and limitations.

*Education* presumes learning new from questioning.

Each stage is rich in emotions and learning. Memory absorbs every piece of empirical experience and builds the image-emotion connections between our conscious and the brain. Moreover, five senses become stimulated during the learning of each image. Hence, this explains why we feel saliva when remembering the lemon juice. On the other hand, lemon juice provides emotions, which can be uncomfortable, reminding us of confusion. This consciousness-reality combination may be interpreted as sufficient evidence of the past gained experience.

Every stage of socialization has its own physical and psychological aspects. The decision-making core of personality, which is positive and naïve, has conscious and reality sides. It, so to speak, *floats* in the mental entity of the second socialization stage (imprinting), where the personality indicators, such as introversion, extraversion, sensation, intuition, feeling, thinking, judging and perceiving are in different proportions, depending on the personality type and current life stage. The third level consists of

higher mental functions: language, memory, intelligence, perception, attention, abstraction, art and math. And the last level is like a cloud comprising of emotions and images, since we are not able to predict the mere existence and exact timing of their occurrence; however, we can track them and search for correlation. The structure of the described paradigm is presented in Figure 1.

The presented scheme represents the personality construct. Emotions and images come emerge as a result of higher mental functions. At this stage, an individual can receive a certain amount of information, depending on how developed the latter are. Then information goes to the personality entity with personality indicators. At the level of indicators, the received and filtered information is perceived and accepted, or disregarded and declined. At higher mental functions' level, the information is absorbed, in accordance with capabilities; whereas at personality level, it filters through the personality qualities. The conscious/reality core split information in two groups depending on the nature of emotions or images. Some information coming from the ambience is a piece of objective reality, while some information comes from our conscious. Both types of information have the same impact on human ego (in the Freudian sense) and provide the same experience to the conscious, even though conscious is the source of information.

Four levels of human nature describe the structure of cognitive processing of information stimulus. They support the idea of predicting future behavior on the basis of the past experience (Kelly, 1955). Long data, recorded on the Internet, is a prodigious source of big data. It cannot be argued that the last decade is entirely recorded in some way in the global database. Every person is connected with email, phone number, ID, etc., to the chain of information transfer and processing. The problem of obtaining representative samples of people was solved by the Internet technologies and cloud-based testing systems. However, every tool is developed chaotically. There is no unified global system for recording qualitative personality data. The good move was to create a tool in the form of a situational test, which proved its usefulness over the past century. Undoubtedly, office routine is the same everywhere. Moreover, it is possible to use cameras, sensors, and other indicators to connect emotional reactions of consciousness with physical reality of behavior. Eye

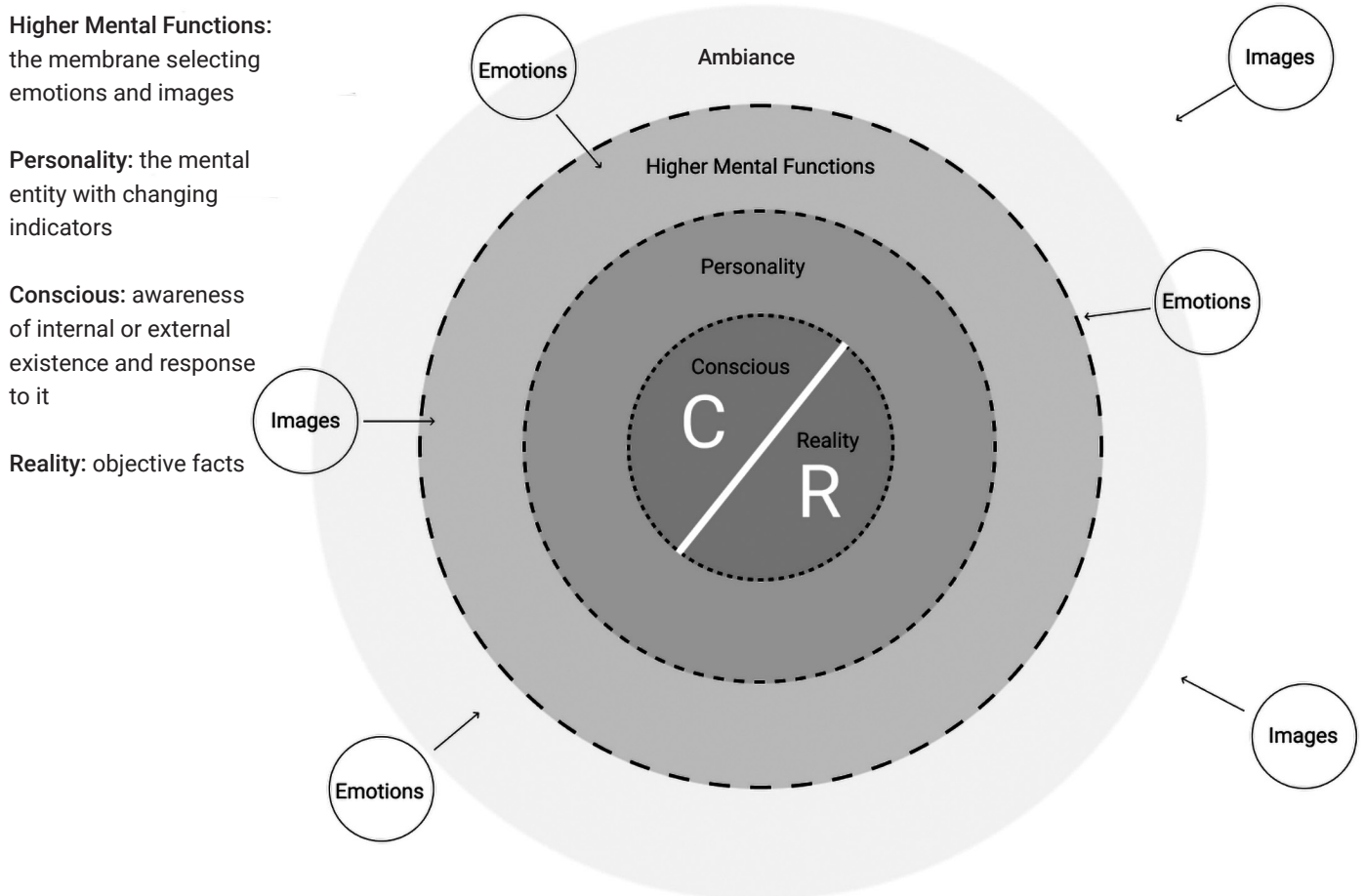


Figure 1. Social code: four levels of human nature

Tracktion software in combination with a heart beat, gestures and blood pressure is the next source of crucial data for machines aimed at a better understanding of the human behavior and feelings.

In terms of identifying personality traits, it is very important to consider time and place of observing the object. Here, we refer to the physics, where the object changes in accordance with the observation process. In physics, the observer effect is the theory that the mere observation of a phenomenon inevitably changes that phenomenon. There are many examples of the observer effect in physics. When we conduct measurements of individual behavior, the object is always tested or measured in certain conditions. For example, a person comes to a recruiter to apply for any available vacancy. Consequently, the personality traits, which that individual would like to exhibit, would be chosen in accordance with the best fit to the positions in question. On the other hand, when the same person comes to apply for

a position at the bank, he or she would definitely change the strategy in order to get hired.

In the wild, such behavior would seem normal, since it would improve chances to survive. However, in society, we may call such people manipulative.

Returning to personality traits, such as introversion and extraversion, the nature of presenting one of these traits highly depends on the particular situation [1].

Extending this idea to the pairs of personality traits (introversion vs. extraversion, intuition vs. sensation, feeling vs. thinking, and judging vs. perceiving), it is possible to conclude that the probability of showing a trait from such pair depends on the ambiance: neighborhood, society, or a social group. Ability to adapt is one of the key instincts (skills) humans gained from their genes. This means that personality traits are not persistent, but rather changing

now and again depending on the stimulus received from outside or inside.

This is a good point because we use both sources of information in cognition: the real world and the abstractions. Broadly speaking, the source of the motives for determining our behavior can be either from reality, or from conscious, or both. Hence, following the logic of our discussion, the core of human behavior lies in the *image+emotion* of our mind, which is then sent to the personality trait level.

After choosing the best matching personality for the provided reality, an individual takes one or a group of higher mental functions. There are eight higher mental functions: language, memory, intelligence, perception, attention, abstraction, art and math [2]. Vygotsky stated that higher mental functions, largely based upon image and emotion transfer, constitute the crucial distinction of humans from the animals, and help people building their culture (civilization). Furthermore, mental functions participate in knowledge management. In other words, information processing would be impossible without them. In each action, a personality uses a different higher mental function, which is driven by the current personality. E.g., a person comes to a shopping center, where highly social conditions take place. There are many conditions that have to be taken into consideration. The reality is represented by a customer's bank account of 100 monetary units. Conscious individuals would think about available credit in the amount of 1000 monetary units. The credit, however, represents an uncertainty. Depending on the current personality, an individual would use one of the higher mental functions. Would it be language or math, memory or thinking? Detecting the current personality is a key to manipulating higher mental functions. Specifically, it can be formulated as '*emotions can be a driving force of the behavior*'. However, there are not so many models that can describe the entire behavioral algorithm, and this publication tries to illustrate the scope of decision-making vs. the ambiance.

The provided scheme can be implemented in the ML process in order to increase the effectiveness of forecast in such spheres as marketing, human resources or education (Figure 2). Research has shown that, for small datasets, the hit rate was very low, hence it could be additionally enriched with the so-called *social code* – behavior aspects, personality traits and higher mental functions. Furthermore,

mining data online, especially in social networks, has disadvantages. Users regularly post in their online profiles the facts that are not real but rather came out from the conscious (actually, from the higher mental function of abstraction). Thus, the consciousness-reality approach for the data frame may save time and efforts in analysis, as well as add the predictiveness and quality of the forecast.

The presented scheme provides the structure of the cognitive system. In the center, we have the conscious-reality trigger responsible for providing information to the decision-making center. Whatsoever, we observe it either in a real world, or in abstraction. The next level is the C. Jung's model of personality traits combined in pairs. Here, we need to understand what individual is represented. The next level includes the higher mental functions.

Regression method here is what we observe as a subject, and the information comes to cognitive processing through one of the channels. Therefore, it is somewhat similar to what a switch or a commutator does. As soon as we obtain information via perception, then certain personality traits are activated. When information goes through the language function, other personality traits are used. After that, the processed information comes back the same way, through personality traits, all the way to higher mental functions.

Information processing can use multiple cycles when information goes in and out of the conscious vs. reality sector. Using the above scheme, we could trace every information piece.

An example:

*A friend said, "Hello".*

The first trace would be:

**atESFPR** – attention | Extraversion | Sensation | Feeling | Perceiving | Reality

*We received the message from a friend, and, in order to reply, we say, "Hello".*

The second trace would be:

**RESFPla** – Reality | Extraversion | Sensation | Feeling | Perceiving | language

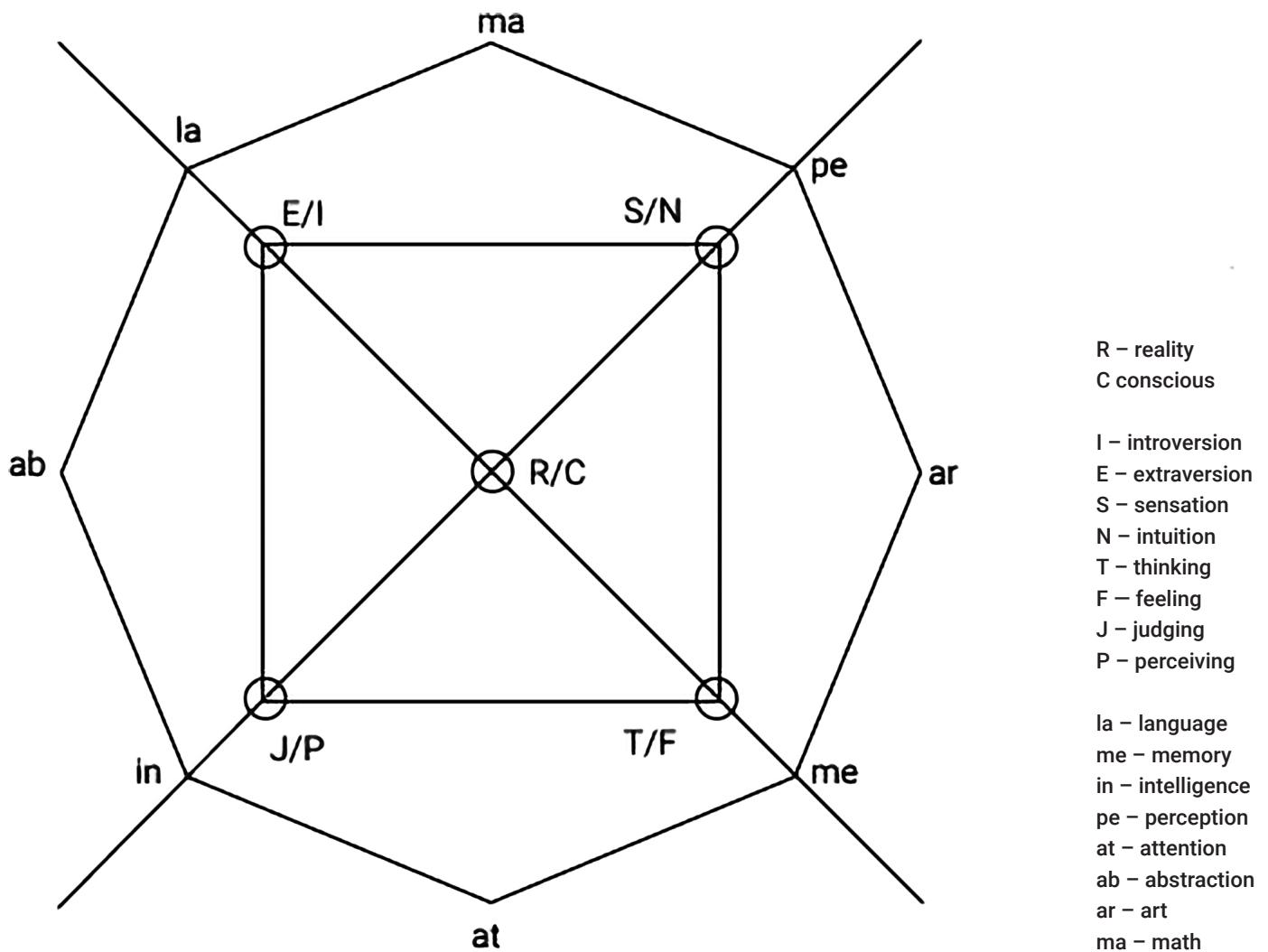


Figure 2. Illustration of the consciousness-reality approach

Meanwhile, in Conscious, we would have a various thought modeling situation, making abstract copies of us to formulate the correct answer and reaction.

In our mind, we have **Conscious** {ISTJla, ISTJar ... ENTPme}

It can be presented as the complex of all possibilities for 18 parameters (i.e., 256 unique combinations for each thought).

Provided information processing model extend to 16 existing personality types.

In total, we can record the meeting of two friends on the street as follows:

atESFPR

C(ISTJla, ISTJar ... ENTPme)  
RESFPla

### Field Experiment and Research

The discussed method is at the approbation stage. Currently, over 8400 participants connected their social profiles to the CV CODE system. Every user has registered on the cvcode.ru platform and completed several personality tests (BigFive, MBTI, IQ). Social network profile supply algorithms with the posts, likes, shares, and friends' data. Social code collects inventory for every detected personality change, and records the stimulus for personality transformation. Every time, when an algorithm receives the confirmation of changed behavior, it increases the weight of the stimulus. There are several hypotheses, which are tested. The groups of stimuli are as follows: semantic, personal data, and interface behavior.

Semantic inventory is taken from the posts and comments of participants.

The personal data is taken from the basic profile page, in the section *About*.

The interface behavior is recorded with Webvisor and Tracktion algorithms.

The social networks used in our study are Facebook, VK and LinkedIn. However, each network has an API usage limit – but our experiment is ongoing.

We conducted a field experiment after the first milestone of 1000 participants was surpassed. Social code algorithms were applied in the personality testing event. The group of 130 customer service professionals was interested in the qualities, which help faster career growth in customer service industry. The sample of 130 profiles is too small for ML. Hence, each profile was additionally filled with the social code data (recorded behavioral patterns). This procedure helped identifying that, in 97% of cases, the driving force for career growth was irrational way of thinking. This discovery is helpful for future research.

We had to admit that this illustration of the social code method with 130 profiles is just an example of its potential application. Further research and experimental work are needed to validate this method.

## General Discussion

The social code is the method of encoding the personality through its traits, psychological functions and consciousness. The presented model was chosen due to its binary logic and easy prototyping. Its

software and hardware implementation were simple due to straightforward algorithm and model simplicity. Tracking the information processing supports further research in the complexity science (also called complex systems science), which studies the society as a complex system.

Data mining process, especially in business fields, such as marketing or human resource management, requires a novel approach. Collecting digital traces could help predicting the consumer behavior. Recruiting, engaging and training need a personal approach, too. The provided model facilitates making offers and training the personnel.

Presented social code method needs some clarity. First of all, the higher mental functions are connected to each other in the provided illustration. These connections show that there are some roundabout ways for memes to pop from reality into the conscious. Higher mental functions may work in a group and support, or even replace, each other. The same is true for the personality traits *sensu Jung*. Personality traits are not separate categories. Introversion and extraversion always work together providing individuals with a social flexibility. Feeling and perceiving are in the irrational group, whereas thinking and sensation are in the rational category. The conscious and reality are always related to each other. Globally thinking, the reality exists in the conscious; however, the reality of other individual consciousness is not the same. Thus, it is reasonable to conclude that the reality in this model is the conscious of other participants of the communication process. Still, these ideas have to be accurately used and investigated in a separate study.

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