

Automatic modeling of personality types: the 2-qubit model

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Abstract

The 2-qubit model is a model based on Jung's personality model and the general quantum theory. In this study, the model will be tested on the restrictions for quantum models and the goodness of the fit. Finally, there is an test to compare the different personality types. I found out that all the test subjects fit the restrictions and the quality of the fit was better than expected. When I compared the different personality types there was some problem with fitting them, because of many personality look a likes.

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1 Introduction

The search for personality types can be traced back at least as far as to the Greek physician Hippocrates. In the old age of the Greeks, Hippocrates was constructing a theory about personalities. In his theory there were four basic temperamental types: sanguine; choleric; melancholic and phlegmatic. This typology was very useful, for example for the philosopher Immanuel Kant [12]. He based much of his psychology on this theory of the four psychological types from Hippocrates. For many years the theory of Hippocrates was the basis for different personality analyses.

Carl Gustav Jung [10] was one of the modern developers of a personality theory. He constructed a theory in which individuals could be assigned to one of eight types of personality. He saw personality types as being dimensional instead of consisting of discrete categories. Later, the Myers-Briggs type indicator test (MBTI test) was developed with use of the model of Jung. Many modern theorists criticised the theory of Jung. Some of these criticsers created the "big five" personality theory [8] [9]. The "big five" use factor analyses to find someone's personality. At the moment the "big five" personality theory and the MBTI test are frequently used in personality type indication. In this thesis, these two theories will be further explained and compared with the theory of Jung.

In this thesis, I will look for a particular formulation of Jung's theory. It makes use of quantum probability instead of classical probability.

My thesis is organised in eight sections. Firstly, I will introduce the theory of Jung. Secondly, I will discuss the Myers Briggs type indicator. In the third section will be a short explanation about the "big five" theory. In the fourth section I will introduce the basics of the general quantum theory. I will explain the qubit and pauli spins matrices. In the fifth section I will give the results of a test with use of the new formulation of Jung's theory, which I executed. In the sixth section I will discuss a program which finds someone's counterpart. Jung explained in his theory that every personality has it shadow personality, because a well-known predicate is: "opposites attract".

A model which can calculate your personality could be useful for the gaming industry, especially the games that use avatars. Most people who play these kind of games want to have an avatar whose personality is the same as their own. In the current games the personalities have to be constructed by himself. This could be more accurate when it is created by some personality model.

2 Theory of Jung

In 1921 Carl Gustav Jung developed a theory about personalities. In his personality theory he defined two core mental activities. The first one was receiving, or taking in, information: which he termed perceiving. The second is about processing that information, which he termed judging.

Those two core mental activities were further defined in two alternative ways. He identified perceiving information in terms of sensing (S) and intuition (N). The alternative ways of judging information, he termed thinking (T) and feeling (F). Next, Jung needed to specify if someone is oriented to the outer world or more to his inner world. Those psychological attitudes Jung called extrovert (E) and introvert (I). The mental activities are related to the orientation. Considering the four psychological functions only, there are eight different personality types.

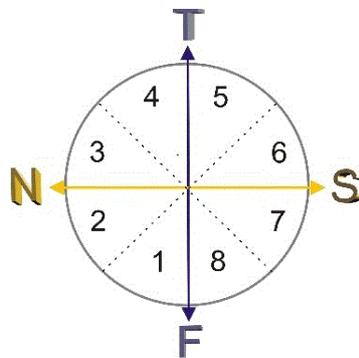


Figure 1: Compass view of Jung's psychological functions) [11]

People rarely develop both of the perceiving or the judging functions in their personalities. That's why Jung believed that thinking and feeling, and sensing and intuition should be the opposites of each other. Further the two dimensions judging and perceiving are orthogonal to each other as shown in figure 1. These compass with four functions shows that each person has a primary and a secondary function. These two functions have the same attitude and they are the most strong ones; i.e. we use these functions in a conscious way. The four possible psychological functions are used to express the state of a personality. The numbers in the compass indicate a classification of the different personalities. Example: if some personality is in section number 5, then his primary function is thinking and his secondary function is sensing. This is because his personality lies on the compass closer to the thinking function than the sensing function. The other two functions that each person has are called the tertiary and inferior functions and are used in an unconscious way.

Jung claimed that every person has a shadow personality. This is the side of the personality that is used in the unconscious way. The specification of this shadow is on the other side of the spectrum. So someone with personality number 5 has as unconscious function the personality functions feeling and intuition. Jung saw the model as a compass instead of a hard determination of personality. So someone's personality is in a certain direction.

Next, I will explain the different psychological functions and attitudes in some more detail.

2.1 **Introversion and Extroversion**

As mentioned before, someone who is extroverted, is oriented to the external, outer world. And someone who is introverted, oriented towards the inner, subjective world. For example, an extroverted person prefers to talk with almost every person on a party, even if he does not know these people. For an introverted person, this is more complicated. They like to be on their own or be together with people they really trust.

The most important part of the Jungian model is the relation between the functions and the attitudes, because they are dependent of each other. Someone is never only a thinker or feeler, but an extroverted thinker or introverted feeler, for instance. As an example, an extroverted thinker is someone who not only thinks for himself, but also for other people. So he could organise and manage people but he could also help people to follow someone's theory or logic. So, people who are extroverted thinkers could be managers or teachers. Jung claimed that the different personality types could not be explained without the connection with introversion and extroversion. But to keep it short, I will try to explain the personality functions without using the attitudes introversion/extroversion.

Nobody is only introverted or only extroverted. It is always a combination of these two. But one of the two is better developed and consciously used and the other is more unconsciously used but also present. As mentioned before, this unconsciously used personality is the shadow of a person. The shadow is the counterbalance of the personality. Someone's personality is not only determined by their main personality but also by their shadow. It is important to understand your own shadow, claimed Jung (Stevens (1994)).

2.2 **Sensing and Intuition**

As shown before, sensing and intuition is a category of perceiving information. So, it is about how someone receives his information. It tells us what someone does with the information he gets from the world. Sensing is: *"any of the faculties by which the mind receives information about the external world or about the state of the body. In addition to the five traditional faculties of sight, hearing, touch, taste, and smell"* [6]. Thus sensing involves directly receiving information through the senses. People who prefer this form of perceiving tend to focus on the facts in a given situation, and on hard data.

On the other side is a person who is intuitive. Intuition means: *"knowledge or belief obtained neither by reason nor by perception"* [6]. People who are strongly intuitive discover possibilities which are not directly obvious from the sensory data. So they will look at the theoretical issues and hidden patterns. Of course, a sensing person could also see this, because none of the functions will bind exclusively to a person. But as shown before, this will happen unconsciously.

So, someone who uses consciously the sensing part to perceive information, will ask for the who, what, when, where. Because he wants to know the facts. On the other side is the intuitive person, who will ask for the why. Because he wants to see the patterns to reach his goal.

2.3 Thinking and Feeling

As mentioned before, the thinking and feeling functions are a form of judging information. So it is about how to organise and process the information someone gets. Thinking is "*the process of thought*" [6]. So this involves logical analysis of information. People who prefer this form of judging approach live in a rational, analytical way. They search for logical relationships between events and idea.

The opposite of thinking is feeling. Feeling is "*a physical or mental impression*" [6]. People who prefer this kind of judging are more concerned with what they feel about a person or event, how they evaluate it. They prefer feeling over what they can learn about it through logical, rational analysis.

Pretend that there are two kinds of judges, one is a thinker and the other is a feeler. They will decide the punishment for a certain suspect in a different way. The judge who is a thinker will look objectively to the case. He will think logically straight forward and look at the laws and rule. But the judge who is a feeler will look more subjectively. He will look at extenuating circumstances. He decides more with his feeling. Those differences could make the punishment longer or shorter.

3 The Myers-Briggs Type Indicator

Jung's model was the starting point for the MBTI model. It was developed by Isabel Briggs-Myers and her mother, Katherine Briggs. Their indicator is a rough simplification of Jung's model.

First Myers and Briggs extended the Jungian model with the extra functions judging and perceiving. In that way it is possible to easily find the dominant function. As an example, someone could be an INTP, where I stands for introvert, N for intuition, T for thinking and P for perceiving. Because the person has perceiving as the extra function, his dominant psychological function is intuition. This is because intuition is a form of perceiving information. I will further explain the MBTI pointing out the difference between the MBTI and the model of Jung.

The first difference between the Jungian model and the MBTI is the relation between the attitudes and the psychological functions. In the Jungian model it is important to remember that the functions are related to the attitudes. But in the MBTI they are independent of each other. So, the psychological function *intuition* in INTP is the same as in ENSP, while in the model of Jung the first person has an introvert intuition and the second person has an extrovert intuition.

The second difference between the two models is the shadow side. Jung's model has no pure personality types, only superpositions of dominant functions and their shadow sides. This was one of the other basics of the Jungian model. As mentioned before, this relates that every person has a shadow side which is unconsciously used. In the MBTI test, there is no shadow side.

In figure 2 all the 16 personality types are shown. After an MBTI test, someone could find his personality type in this picture. Below the types are the quote which fit with the personality type. In this scheme no direct shadow sides are shown.

The MBTI test is one of the most frequently used personality tests, at the

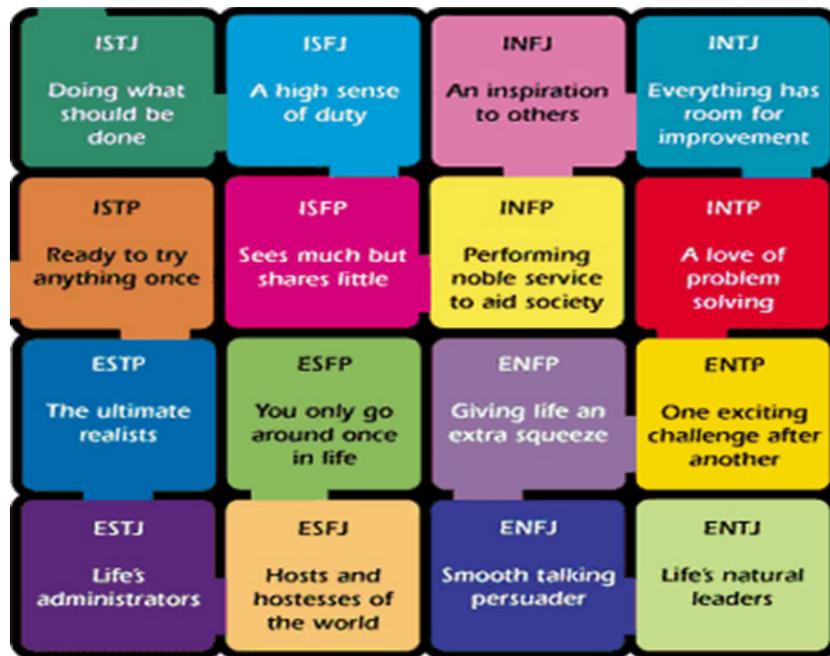


Figure 2: The 16 personality types and their quotes in the MBTI [2]

moment, especially in career and in sports. It is useful in career to find the perfect worker or the perfect job. For example, to be a judge someone should have an objective look at someone's case. So, to be a judge it could be useful to be a thinker. In sport it is useful to know how to coach someone or what kind of sport someone could do. As an example, Tiger Woods is an ISTP [3]. He is a golf player, that is a single-player sport so he could be introverted. *"This type is well-known for that they have been watching carefully and observing as the situation has unfolded. They know what is going on and they are ready to spring into action"* [3]

The MBTI test is a frequently used test. But as shown before, there are some shortcomings even it is a simplification of the Jungian theory. The functions are not related to the attitudes any-more. It is further simplified by the perceiving and judging function, because those functions shows which function is dominant. Lastly, the MBTI does not reflect the shadow or unconscious side.

4 The "Big five" model

There are many scientist who criticise the MBTI. Some of these scientists have created the "big five" personality model. The big five factors are: openness, conscientiousness, extraversion, agreeableness and neuroticism. Those five are broad domains or dimensions of personality which are used to describe human personality. In contrast with the theory of Jung, the five factor model is a purely descriptive model.

The "Big five" is based on a research on all words about personality. After outlining all the words to a view hundred core concepts, they created questions

of those concepts. As an example, how sloppy is that person usually? Next they gave those questions to a group of people. They had to answer those questions about someone they know well. They used factor analysis to look at the answers, if they could be compared in some sort of patterns or clusters. Eventually, they found five central personality dimensions, those are the "Big five". In later research they found almost the same five dimensions. In some languages, like Italian, there are different categories.

The big five factors can be summarized as follow:

- Openness - Appreciation for art, emotion, adventure, unusual ideas, curiosity, and variety of experience
- Conscientiousness - A tendency to show self-discipline, act dutifully, an aim for achievement; planned rather than spontaneous behaviour.
- Extraversion - Has energy, positive emotions, surgency, and the tendency to seek stimulation in companion of others.
- Agreeableness - A tendency to be compassionate and cooperative rather than suspicious and antagonistic to others.
- Neuroticism - A tendency to experience unpleasant emotions easily.

The creators of this model saw these five factors as independent random variables within a Boolean network. So someone could be 50% openness, 30% conscientiousness, 75% extraversion, 10% agreeableness, and 60% neuroticism. Unfortunately, it has been shown that the five factors of the model are not really independent of each other [14]. This increases the number of parameters needed to give a full statistical description.

"Much research has been conducted on the Big Five. This has resulted in not only support but also criticism for the model. Critics argue that there are limitations to the scope of Big Five as an explanatory or predictive theory. It is argued that the Big Five does not explain all of human personality. The methodology used to identify the dimensional structure of personality traits, factor analysis, is often challenged for not having a universally-recognized basis for choosing among solutions with different numbers of factors. Another frequent criticism is that the Big Five is not theory-driven. It is merely a data-driven investigation of certain descriptors that tend to cluster together under factor analysis" [1].

5 2-qubit model for personalities

Another statistical way to analyse personalities is used in the recently introduced 2-qubit model for personalities [5]. This model makes use of Jung's methodology, formulas and ideas from quantum theory, like qubits. Qubits will be explained further in this section. Instead of classical probabilities we need to calculate quantum probabilities. Quantum probabilities are more general than classical probabilities and allow to express Jung's geometric intuitions (represented in figure 1) in a straightforward way. To keep it short and easy I will not give more arguments why we need quantum probability. The interested reader can found more arguments in the paper by Blutner and Hochnadel [5]. This model will be investigated and tested in this thesis.

Firstly, I introduce some formalism from quantum physics. This is necessary to understand the approach.

5.1 The qubit

A quantum bit or qubit is a unit of quantum information. It is similar to a computer bit, because both are fundamental units of information. The difference between them is that a computer bit could only have the values 1 or 0. A qubit could be in an arbitrary superposition of two orthonormal states.

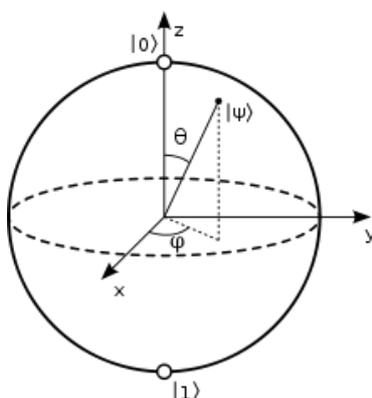


Figure 3: Bloch sphere [4]

In figure 3 it is shown that a qubit can be represented by a Bloch sphere. It is also shown that a qubit could be represented by the parameters φ and θ . θ is the superposition parameter and φ is the phase factor of the qubit.

In a qubit the two computational basis states could conventionally be written as $|0\rangle$ and $|1\rangle$. A pure qubit is a linear superposition of these states. A qubit could be represented as a linear combination of $|0\rangle$ and $|1\rangle$:

$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle \quad (1)$$

Where α and β are probability amplitudes.

When we measure a qubit in the standard basis, the probability of outcome $|0\rangle$ is $|\alpha|^2$ and the probability of outcome $|1\rangle$ is $|\beta|^2$. Because the absolute squares of the amplitudes equate to probabilities, it follows that α and β are constraint by the equation :

$$|\alpha|^2 + |\beta|^2 = 1 \quad (2)$$

because this ensures you must be in one state or the other. Since α and β are complex numbers we are concerned with three independent real numbers to express any state of a two dimensional Hilbert space, ignoring a general phase vector, we can parametrize this states by the two parameters φ and θ .

5.2 Pauli's spins matrices

Bloch spheres operate on the Hilbert space. We need a orthogonal basis for operators in the Hilbert space. This could be done by using Pauli's spin matrices.

These, in combination with the identity matrix I provide an orthogonal basis for operators in the Hilbert space. The spin matrices are defined as follows:

$$\sigma_x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad (3)$$

$$\sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} \quad (4)$$

$$\sigma_z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \quad (5)$$

We could directly ignore the σ_y , because we will not use it further. If we look to figure 4, we see that we need some sort of vector which uses the superposition value θ . As we know from geometry the *cosine* gives us our location on the z-axis and the *sin* gives us our relation on the x-axis. Both of them use the same variable. So, we could create a vector with use of θ . It gives us:

$$\psi = \begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix} \quad (6)$$

The standard formula for expected values in quantum physics is :

$$\overline{\sigma_z} = \psi^T \sigma_z \psi \quad (7)$$

By fulfilment of this formula we get:

$$\overline{\sigma_z} = \cos 2\theta \quad (8)$$

and

$$\overline{\sigma_x} = \sin 2\theta \quad (9)$$

These two are well-know formulas to find a point on the unit circle. This holds only if φ is zero.

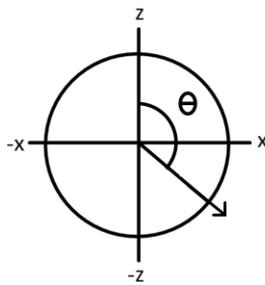


Figure 4: A Bloch "circle" representation with phase factor 0

6 Restrictions in Jungs theory

As the name 2-qubit model says we need two qubits to represent the Jungian model. The first Qubit represents the state on the introversion/extroversion attitudes. The other qubit represents the states with regard to the psychological functions thinking, feeling and sensing, intuition.

For introducing the connection between the qubit and the Jungian model, let's have a look at the Bloch "circle" when the phase factor is set to be zero, figure 4.

If we assume that the spin matrix σ_x represents the psychological function intuition/sensing and σ_z represents the psychological function thinking/feeling, then we can compare figure 4 with figure 1. Hence we assume $T = \sigma_z$ and $s = \sigma_x$. Because both are the compass view Jung assumed.

The 2-qubit model is more restrictive than the big five, we can see this in the following way. First note that big five has five independent variables, and many more if we consider that those five variables are not independent. The 2-qubit model, in contrast, has two parameters for the identification of the states of the psychological functions, and one for the strengths of the superposition of the primary state of personality. Furthermore the 2-qubit model exhibits the following restriction, if we assume the phase vector to be zero [5].

$$\hat{E}(T)^2 + \hat{E}(S)^2 = 1 \quad (10)$$

If we assume an arbitrary phase factor we get inequality (11).

$$\hat{E}(T)^2 + \hat{E}(S)^2 \leq 1 \quad (11)$$

In this function \hat{E} represents mean value, T represents the thinking-feeling random variable (+1 for a clear thinking, -1 for a clear feeling), S represents the sensing-intuition random variable (+1 for clear intuition, -1 for clear sensing).

In order to test this equality/inequality I performed a simple experiment. 48 people had to answer questions of the MBTI test. This test can be found in appendix A. The test was online and could be made by everyone who know the internet address. The test was completely anonymous. The persons could make the test in English or in Dutch. It is important to know that most of the test subjects were from the faculty of informatics of the UvA. So the personalities could look like each other.

As a start our subjects got instructions. Here, it was told that they had to mark the answers they found most plausible. Next, it was told that they should give a number for how certain they took this answer. They could mark their answer with a number between 1 and 5. 1 was completely uncertain and 5 was absolutely certain. Next there was the example question so they could see how the test worked. The example was:

Common sense is:

- *usually reliable*
- *frequently questionable*

Next they got 24 questions, 6 for the type E/I, 6 for the type T/F, 6 for the type S/N and 6 for J/P. The latter were not used for this experiment. Those questions were asked randomly.

From these answers I only needed the answers about sensing/intuition and feeling/thinking. Later I will use all the data. For example consider question number three from the S/N group, to be repeated here:

Do you prefer to trust:

- *your experience*
- *your intuition*

The first answer indicates a preference for sensing, the second answer indicates a preference for intuition. For example, our subject chooses the first answer, *your experience*. And our subject is not totally certain so it gets the value 4. Hence I get $\hat{E}(S) = +0.8$. The final result for $\hat{E}(S)$ we get after averaging of the six relevant questions of the type S/N.

Collecting all the data in an appropriate way, I receive the resulting graphics of figure 5.

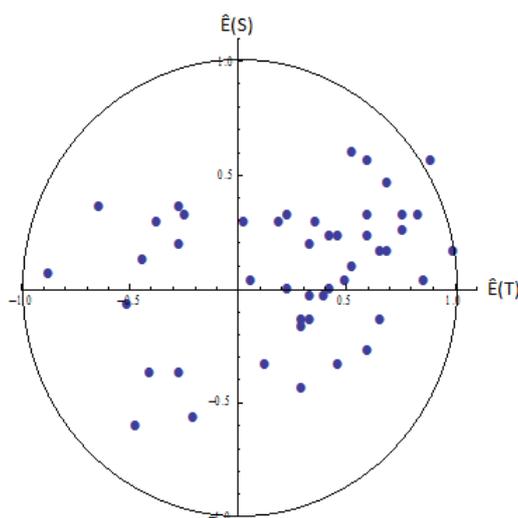


Figure 5: Checking equation (10). The graph shows that the results of 48 subjects are in agreement with this hypothesis. Only a few subjects are situated slightly outside the unit circle; however, the deviation from the unit circle is not significant in these few cases.

Prediction (11) holds in the most general case allowing even for non-zero phase shifts in the underlying wave functions. Logically, it is possible that the sum in (10) or (11) is greater than 1 (it could be 2.0 at the maximum). However, investigating 48 subjects, I never found a statistically significant violation of the inequality (11). For the single dot out of the circle I did a T-test. This test showed that this dot is not significantly out of the line, smaller than 10%. If we should put in the phase shift, we could get all the point on the circle and then the prediction holds completely.

7 Model fitting

The 2-qubit model has three input variables: α , θ and τ . The τ is about the knowledge of life of a person. This is not needed to explain the model fit, so I will not explain it further. The two other variables are α and θ . The α input variable will give the attitudes, so, extroverted and introverted. I will explain the way to find the value of this attitude with use of formula (8). So, if $\alpha = 0$ then $E = 1$, this means extrovert, and if $\alpha = \frac{1}{2}\pi$ then $E = -1$, this means introvert. So with use of one variable we can give the attitude. Furthermore, we have the variable θ ; this variable gives the functions. To explain this, I use formulas (8) and (9). To find the personality function T , thinker/feeler, I need formula (8). This will give us if $\theta = 0$ then $T = 1$ and if $\theta = \frac{1}{2}\pi$ then $T = -1$. And for function S , sensor/intuition, I need formula (9). So if $\theta = \frac{1}{4}\pi$ then $S = 1$ and if $\theta = \frac{3}{4}\pi$ then $S = -1$. So, with one variable we can give the personality functions.

To fit the 2-qubit model, I need a database of 48 people. For every subjects output of the MBTI test I searched for the closest α , θ and τ , where $0 \leq \alpha \leq \pi$ and $-\pi \leq \theta \leq \pi$. Next, I did the χ^2 -test to see how accurate the model really is. I did not expect a perfect fit because I did not use the phase factor. The χ^2 was used as follows

$$\chi^2 = \sum_i \frac{(f_i - \text{model}(\alpha_i, \theta_i, \tau_i))^2}{\text{model}(\alpha_i, \theta_i, \tau_i)} \quad (12)$$

where f_i is the mean value of the answers the test subjects gave during the MBTI test. The smaller the χ^2 the better, because the difference between the model and the result values should be as small as possible. The χ^2 should be at most 5, if it is bigger then it is significantly wrong.

After investigating 48 subjects I found 33 times a χ^2 smaller then 5 and 15 times bigger than 5. If we take a higher restriction with χ^2 smaller then 3, then 21 subjects are still correct. In this higher restriction, it is remarkable that 57 % is smaller than 1. So, an almost perfect fit.

So with a χ^2 of 5, there are 68.8 % in a good fit. With a higher restriction it has a fitting rate of 44.75 %. An almost perfect fit gave 25 % of the subjects. This is quite remarkable, because I did not use the phase shift.

There is also another problem with the 2-qubit model. Sometimes a value gives ambiguous results. A person could have a value that means that he is introverted and extroverted. The 2-qubit model returns only one of the functions, so this could also result in bad fit.

8 Shadow fitting

In 1997, Christopher Dryer and Leonard Horowitz researched when opposites attract. They looked at interpersonal complementarity and similarity by interacting. They had four groups with different dominance level. They let two persons solve a problem. First, the participants had to interact in pairs and their goals were the complement of each other. Next, they had to interact in pairs with someone who had the same goal. They discovered that the first interaction with the complement, was more satisfying than the second interaction with the same goal [7].

This is an example of the predicate “opposites attract”. As told in section 2, Jung thought that every person has a shadow side. Two people who are each other’s perfect opposite, shadow, are the complement of each other. As shown by Christopher Dryer and Leonard Horowitz [7], could have a better interaction with each other. To find this shadow, I can use the database with 48 subjects again. In the last section is shown that the model fitting is at the moment not perfect. But still, I will use the whole domain to find the opposite of each person in this domain.

Because it is a small domain it is almost impossible to find someone’s perfect shadow. That is why I use a one-nearest-neighbour function. This is a function which will search for a value which is closest to the original value.

The program works in the following way:

1. Give the mean values of the answers of the MBTI test
2. Model these mean values in the 2-qubit model
3. Get the value of the shadow for these values
4. Give the value of the nearest neighbour.

So someone with $E = 0.30$, $S = -0.45$ and $T = 0.89$ after modelling, has a shadow with $E = -0.30$, $S = 0.45$ and $T = -0.89$.

In the appendix, for every test person his shadow person is given. It is remarkable that 13 of the 48 test subjects are fit with the same person. In figure 6 are the 13 subjects shown with their shadow. In blue the subject, red is their shadow.

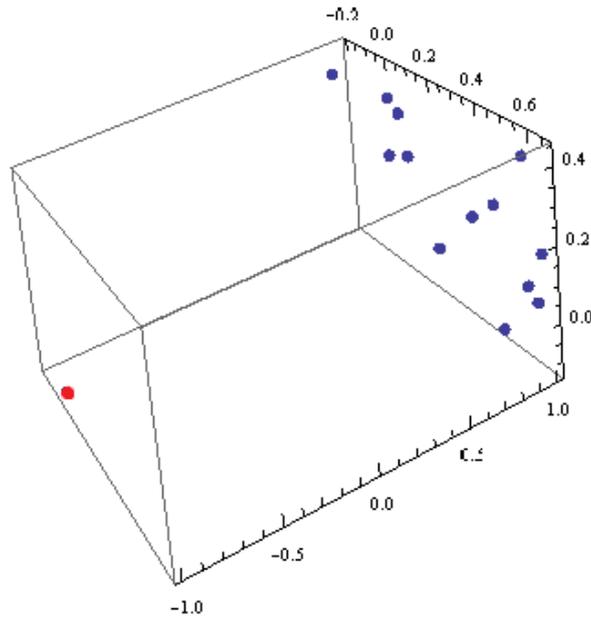


Figure 6: 13 subjects with their shadow

With regard to the figure it is understandable that those 13 subjects have the same shadow. All of them are thinkers with mean values close to 1, while

the shadow is a feeler with a value close to 1. In our data range is just 25 % feeler. This will give the reason why 13 subjects are coupled with one subject. There are 18 introvert subjects and 20 extrovert subjects. This is not a significant difference. With the psychological function sensing/intuition, is also not a significant difference.

The reason for the significant difference between the psychological function thinking and feeling can be found in in the test subjects. Most of the subjects who did the the test were from the faculty of computer science at the university. A university and especially computer science is a place with many thinkers. If the test was done also with students of other faculties the shadow fit could be more secure.

9 Conclusion and further research

In this thesis the restrictions of the 2-qubit model are shown and tested. It is shown that the answers of our 48 subjects fit these restrictions. In section 7 the fitting rate of the 2-qubit model is shown. It is slightly better than expected but not perfect. This is because I have made the phase factor zero, else the fitting rate should be better. In the last section was a shadow fit of all the sections. It is clear that students of computer science are thinkers. This was the reason why 13 subjects were fit to one subject.

In further research the phase vector should be used. This is the only way to test if the 2-qubit model gives a good fit. If we want a better shadow fit, there should be a broader test domain with more subjects and more different people, not only students of computer science.

In the thesis I gave a short explanation of the ambiguity problem. This means that a value gives ambiguous results and the 2-qubit model returns only one of the personality functions. This is a big problem for the present calculations. Because of this ambiguity it is difficult to conclude anything concrete when you know that the fitted personalities could have another solution.

This thesis shows that one can characterize important aspects of a personality with only a few variables. Further it has been shown that people with complementary goals can interact better. So, this model could also be useful for human-computer interaction.

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A Appendix: Small MBTI test

Adapted from MBTI, see also Bachelor thesis of Douwe Oosterhout [13]

Instruction

Mark the answers which you think most valid. Next, indicate for how certain you take this answer:

1. completely uncertain
2. uncertain but with a weak preference for the given answer
3. moderately uncertain with a clear preference for the given answer
4. moderately certain
5. absolutely certain

Instructies

Geef het antwoord dat het meest bij jou past. Geef vervolgens aan hoe zeker je bent van je antwoord:

1. volledig onzeker
2. onzeker, maar je hebt een zwakke voorkeur voor het gegeven antwoord
3. gematigd onzeker, maar wel met een duidelijke voorkeur voor het gegeven antwoord
4. gematigd zeker
5. absoluut zeker

EXAMPLE

Common sense is

- usually reliable
- frequently questionable

VOORBEELD

Gezond verstand is

- over het algemeen betrouwbaar
- regelmatig twijfelachtig

Questions

E/I

At a party,

- do you take the first step in order to start a conversation
- do you wait until somebody else starts talking to you

Op een feestje,

- o neem jij de eerst stap om een gesprek te beginnen
- o wacht je af totdat iemand met jou gaat praten

When the phone rings, do you:

- o hurry to get to it ?rst
- o hope someone else will answer it

Als de telefoon gaat

- o neem je hem meteen als eerste op
- o hoop je dat iemand anders opneemt

Do you prefer to have

- o many friends with short-living contacts
- o only a few friends with long-standing contact

Heb je liever

- o veel vrienden waar je kortdurend contact mee hebt
- o alleen een paar vrienden waar je langdurig contact mee hebt

Is it the case that

- o it is simple for you to speak with people you dont know
- o you have less to say to people you dont know

In het geval dat je een onbekende tegen komt

- o praat je er toch makkelijk mee
- o heb je eigenlijk niets te zeggen

At a party do you

- o interact with many people, even strangers
- o interact with a few friends

Op een feestje

- o ga je om met veel mensen, ook onbekenden
- o ga je alleen om met een paar vrienden

Do you consider yourself

- o rather talkative
- o somewhat reserved

Zie jij jezelf als

- o praatgraag
- o ietwat teruggetrokken

T/F

Are you more comfortable in making your judgements based on

- o Norms
- o Feelings

Waar baseer je liever je oordelen op?

- o Normen
- o Gevoelens

Are you more comfortable in making

- o Judgements on a logical basis
- o Value judgements

Maak je liever

- o Oordelen op een logische basis
- o Waarde oordelen

Which is more of a compliment

- o Theres a logical person
- o Theres a sentimental person

Wat krijg je liever als compliment?

- o Jij een verstandig persoon
- o Jij bent een gevoelsmatig ingesteld persoon

Are you swayed (attracted) more by

- o convincing evidence
- o a touching appeal

Wordt je meer aangetrokken door

- o overtuigend bewijs
- o een emotioneel pleidooi

Are you more impressed by

- o principles
- o emotions

Wordt je meer overtuigd door

- o principles
- o emoties

What do you wish more for yourself

- o a pretty clear brain
- o strong sympathy

Wat heb je liever?

- o Gezond verstand
- o Veel symapahtie kunnen tonen

S/N

Do you like writers who

- o say what they mean
- o use metaphors and symbolism

Hou je meer van schrijvers die
o zeggen wat ze bedoelen
o metaforen en symbolismen gebruiken

Are you more often lead
o by facts
o by principles

Word je vaker geleid door
o feiten
o principes

Do you prefer to trust
o your experience
o your intuition

Vertrouw je liever op je
o Ervaringen
o Intutie

Do you prize in yourself
o a strong hold on reality
o a vivid imagination

Beschrijf jij jezelf meer als iemand met
o beide benen op de grond
o een levendige fantasie

In stories do you prefer
o action and adventure
o fantasy and heroism

Wat prefereer je in verhalen?
o actie en avontuur
o fantasie en heldhaftigheid

Are you inclined to take what is said
o more literally
o more figuratively

Neem je gesproken uitlatingen eerder
o ?guurlijk
o letterlijk

J/P

Do you tend to make your choices
o well thought out
o rather spontaneous

Maak je je keuzes

- goed doordacht
- nogal spontaan

What situation do you prefer

- structured and planned
- unstructured and unplanned

Welke situatie staat je meer aan:

- een geplande gestructureerde
- een ongeplande en ongestructureerde

Are you more attracted to

- reasonable people
- creative and unconventional people

Voel je je meer aangetrokken tot

- verstandige mensen
- creatieve en onconventionele mensen

Do you have a tendency

- to act planned rather than spontaneous
- to act spontaneous rather than planned

Heb je de neiging om

- gepland te handelen
- spontaan te handelen

Is it your way to

- make up your mind quickly
- pick and choose at some length

Neem je je beslissingen

- snel
- doordacht en langzaam

On the job, do you want your activities

- scheduled
- unscheduled

Wil je op je werk dat al je activiteiten

- gepland zijn
- ongepland zijn

B Appendix: Shadow results

	E	T	S	Shadow person
1	0.0333333	0.980581	0.196116	35
2	0.5	0.880471	0.4741	17
3	0.233333	1.	$-3.69859 * 10^{-9}$	35
4	0.466667	0.913812	-0.406138	42
5	-0.366667	-0.573462	0.819232	11
6	0.6	0.997785	0.066519	35
7	-0.5	0.573462	0.819232	48
8	0.933333	0.857493	0.514496	17
9	-0.00820002	-0.00820001	-0.999966	47
10	0.466667	0.727013	0.686624	43
11	0.433333	0.56921	-0.822192	5
12	-0.233333	0.874157	-0.485643	42
13	0.666667	0.894427	0.447214	35
14	0.4	0.986394	0.164399	35
15	$1.50603 * 10^{-11}$	0.773957	0.633238	17
16	0.5	0.970143	0.242536	35
17	-0.0082	-0.737155	-0.675724	15
18	-0.933333	0.5547	0.83205	48
19	0.0666667	0.664364	0.747409	48
20	0.466667	-0.773957	0.633238	21
21	-0.333333	0.813733	-0.581238	20
22	0.1	0.91707	0.398726	35
23	0.133333	0.932005	0.362446	35
24	-0.2	0.928477	0.371391	35
25	-0.466663	-0.0082	-0.999966	47
26	-0.9	0.928477	-0.371391	36
27	0.633333	0.999261	0.0384331	35
28	-0.00820002	-0.33282	-0.94299	19
29	0.133333	0.972806	0.231621	35
30	0.466667	0.83205	0.5547	17
31	-0.733333	0.944497	0.328521	34
32	-0.233333	1.	$5.82867 * 10^{-16}$	34
33	0.3	0.913812	-0.406138	42
34	0.1	-0.997054	0.0766965	39
35	-0.0666667	-0.991228	-0.132164	1
36	0.7	-0.865426	0.501036	26
37	-0.333333	0.996546	-0.0830455	34
38	-0.666667	0.110432	0.993884	9
39	-0.166667	0.980581	-0.196116	34
40	0.3	0.874157	0.485643	17
41	0.466667	0.846233	0.532813	17
42	0.0333333	-0.955779	0.294086	39
43	-0.0666667	-0.588172	-0.808736	19
44	0.666667	0.982872	0.184289	35
45	0.5	0.995037	-0.0995037	35
46	0.5	-0.8	0.6	21
47	0.0666667	-0.588172	0.808736	21
48	-0.00820056	-0.613883	-0.789397	19