

# Chaos and the Psychology of Anonymity

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## Abstract:

**Motivated by the growing trend in anonymity, the present work studies and explores online anonymity and its effect on psychological aspects from both mathematical and experimental perspectives. Mathematically, using mappings, it is seen that anonymity corresponds to quantum entanglement like states, corresponding to an increase in chaotic nature. Experiments and subsequent analysis focusing on three psychological aspects, namely Structural Model of the Psyche, Maslow's Hierarchy of Needs and Affective Experience suggest that the barrier of identity protection offered by anonymity drives people to orient their psychological states towards id dominance, openness of negative emotions, and dominance of physical needs over higher level needs. From the results and discussions, one can easily observe and characterize the shift in behavioural trends of people during anonymity.**

## Introduction:

It is an undisputable fact that today internet is seen as one of the most basic resources, with some younger generations placing it as a survival need on par with food/nutrition. With respect to applications however, the internet has spawned a wide spectrum, from the most constructive uses, such as essential and emergency communications for rescue and resource management during periods of natural and man-made calamity, to destructive uses such as hacking and defacing government or private/corporate websites, and data and identity theft.

In this context, it is noteworthy that according to the annual report of Facebook, the social networking giant might have had as many as 140 million fake, duplicate or false accounts by early 2014, with the number being much higher today (<http://venturebeat.com/2014/02/03/facebook-has-no-idea-how-many-fake-accounts-it-has-but-it-could-nearly-140m/>). In spite of the phone and mail verifications imposed by Facebook during account creation, this staggering number of 'fake' accounts is a testimony for people's increasing preference for anonymity (completely obscuring their identities) and pseudonymity (operating under a different identity – a 'pen name' of sorts).

What do people gain out of being anonymous? Acts of charity have been performed anonymously, particularly in cases where benefactors do not wish to be acknowledged. A threatened person attempts to mitigate the threat through anonymity. A witness to a crime seeks anonymity to avoid retribution. Criminals use anonymously to conceal participation in a crime. In conversations, anonymity allows people to reveal personal history and feelings without fear of embarrassment. Examples of Web Services capitalizing, atleast partially on this aspect of anonymity are "random" chat services like Chatroulette and Omegle. Electronic conversational media provides physical isolation in addition to anonymity. Cleverbot, using artificial intelligence based "chat-terminal" takes this aspect of anonymity to a new level. Anonymous or semi-anonymous forums often provide 'soapboxes' for disruptive conversational behaviour, known as "trolls". Anonymity is also an important factor in crowd psychology, and behavior in situations such as riots and terrorist attacks.

In addition to anonymity and pseudonymity on the ‘surface web’ such as the examples mentioned above, there is an entire section of the internet, termed the ‘deep web’, making up to 96% of the world wide web content, and out of reach of conventional search engines such as Google, Yahoo and Bing (<http://www.news.com.au/technology/online/what-is-the-deep-web-and-anonymous-browser-tor/story-fnjwnfzw-1226844901718>). By using special anonymous browsers such as “Tor” (The Onion Router), it is possible to browse with complete anonymity. It is thus no surprise that Facebook recently announced Tor-based access (<http://www.makeuseof.com/tag/can-officially-browse-facebook-tor/>). This announcement follows events where nationwide revolutions and movements such as the Arab Spring and pro-democracy protests in Hong Kong were hosted using Facebook, and nationwide bans of Facebook were/are imposed in countries such as Iran and China. Additionally, an increase in the awareness of the NSA surveillance spying on people has motivated a surge in the use of the deep web (<https://blog.torproject.org/blog/being-targeted-nsa>). The deep web is also the host and haven for a plethora of disturbing crimes such as drug trade and trafficking, illegal pornography and hit men.

It is thus undoubtedly true that anonymity and pseudonymity offer immense scope for positive and negative uses. With the recent and growing surge of users on the deep web, it becomes imperative to understand the implications of such a shift on the individual and societal levels. As a small step towards such an understanding, the present work explores the effect of anonymity and pseudonymity on three psychological aspects – namely the affective experience, the Structural Model of the Psyche and Maslow’s Hierarchy of Needs. As experimental exercise, chat sessions are conducted with around 500 people, in both anonymous and non-anonymous settings and in each case, the proportion of chatters in each level of each of the three psychological aspects is computed. As a prelude to the experiments, a general understanding of anonymity through set theory, functions and mappings is explored, where the presence of chaos and quantum entanglement-like effects are seen. From the results and discussions, one can easily observe and characterize the shift in behavioural trends of people during anonymity.

## Study of Anonymity through Mathematical Mapping:

We start with the fact that in a non-anonymous case, the identities used by people and the people themselves have a direct mapping. To represent this, we consider a community  $U$  to be the universal set, and denote the set of people in this community by the set  $P = \{a,b,c,d,e,\dots\}$ . We denote the identities through which people operate, by the set  $I = \{A,B,C,D,E,\dots\}$ . We finally denote the resources available in the community by the set  $R = \{a',b',c',d',e',\dots\}$ . Whether or not anonymous, each Identity in  $I$ , representing a person uses one or more resources from  $R$ , as per the needs.

In a non-anonymous setting, there are no hidden identities. Thus, the mapping between people  $P$  and identities  $I$  is direct, one-to-one and unique. Representing  $P$  and  $I$  as state vectors, we obtain utilization of  $R$  as  $|a\rangle R + |b\rangle R + |c\rangle R + \dots$ . Since  $P$ - $I$  relation is direct, the utilization can also be written as a scaled version of  $|A\rangle R + |B\rangle R + |C\rangle R + \dots$

However, in an anonymous setting, mapping between  $P$  and  $I$  is neither unique nor one-to-one, since for example, a single person may adopt multiple identities. We then have utilization of  $R$  given by a more complicated expression:  $|a\rangle(|A\rangle+|B\rangle+|C\rangle+\dots)R + |b\rangle(|A\rangle+|B\rangle+|C\rangle+\dots)R + \dots$ . Taking the inner products, we have  $(|aA\rangle+|aB\rangle+|aC\rangle+\dots+|bA\rangle+|bB\rangle+|bC\rangle+\dots)R$ . In any typical setting however, no person is likely to use all identities. Even assuming a person uses only one identity, which is maintained anonymous throughout the session, we have  $(|aA\rangle+|bB\rangle+|cC\rangle+\dots)R$ . The difference between this expression and the previous non-anonymous expression is that in the non-anonymous

case, it is possible to describe either of P or I and its interaction with R completely independent of the other. However, in the anonymous case, it is not possible to describe P or I completely independent of each other, since the expression involves the addition of their inner products.

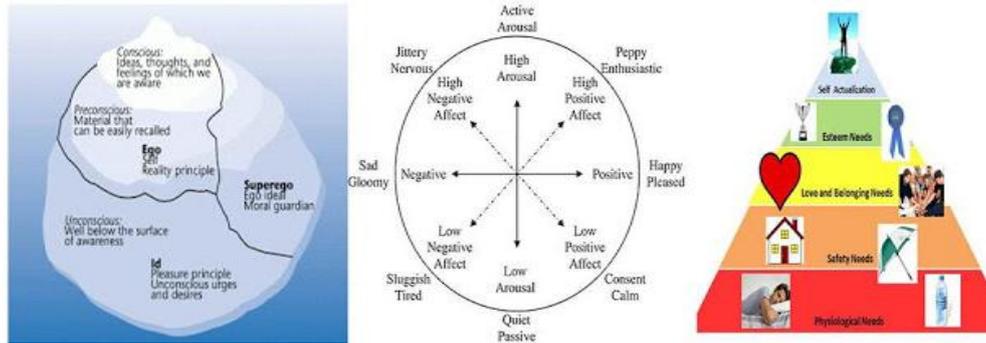
Thus, all measurements made on P will have to involve I “entangling” the two. This mathematical condition, corresponding to the anonymous setting, is precisely the same as the mysterious phenomenon of Quantum Entanglement [1]. In earlier sections, it is seen as to how quantum entanglement can be described as increase in chaotic nature and entropy of the system. Thus, it can be concluded that anonymity introduces a higher degree of chaos, which is characterized in nonlinear science as possessing determinism with an extremely sensitive dependence on initial conditions [2].

### **Psychological Effects of Online Anonymity:**

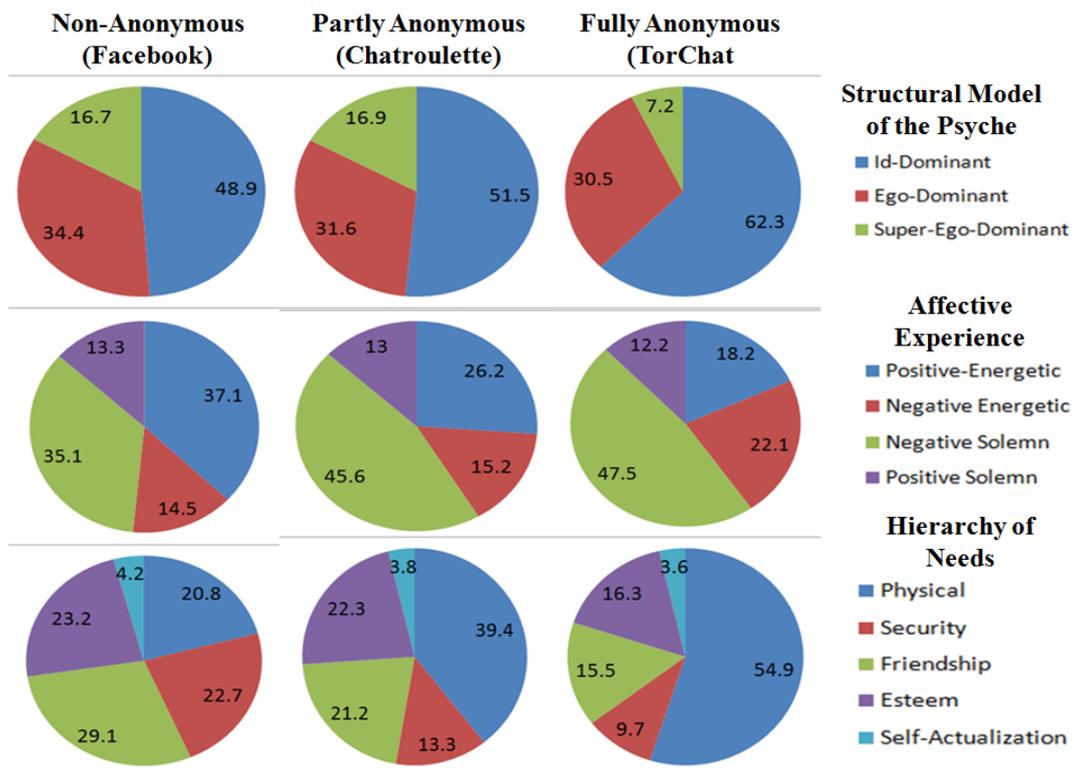
Having understood anonymity as an aspect of nonlinearity and chaos, the next goal is to study the effect of anonymity on psychology of users. For this purpose, the following three psychological aspects are considered:

1. **Structural Model of the Psyche:** This model, introduced by Sigmund Freud essentially outlines three theoretical constructs whose activity and interaction describes the mental aspect of the self [3]. According to this model, “id” is the set of uncoordinated instincts; the “super-ego” plays a critical and moralizing role; and the “ego” is the organized, realistic part mediating between the id and the super-ego. The super-ego thus stops one from doing certain things, sometimes immoral, that one's id may want to do. The id is unconscious, while the ego and the super-ego are partly conscious and partly unconscious. According to this model, Transference neuroses correspond to a conflict between the ego and the id; narcissistic neuroses, to a conflict between the ego and the superego; and psychoses, to ones between the ego and the external world.
2. **Affective Experience:** The circumplex model of emotions was developed by James Russell and suggests that emotions are distributed in a two-dimensional circular space, containing valence (“positiveness” of feeling) and arousal (“energy” of feeling) dimensions [4]. In this model, emotional states are represented by varying levels of valence and arousal. Circumplex models have been used most commonly to test stimuli of emotion words, emotional facial expressions, and affective states. The Circumplex model is best understood by considering four quadrants counter-clockwise from positive valence axis, corresponding to positive energetic, negative energetic, negative solemn and positive solemn emotions respectively.
3. **Maslow’s Hierarchy of Needs:** This model is portrayed in the shape of a pyramid with the largest, most fundamental levels of needs at the bottom and the need for self-actualization at the top [5]. The fundamental four layers of the pyramid contain "deficiency needs": esteem, friendship, security, and physical needs. If these "deficiency needs" are not met, the individual will feel anxious and tense. In essence, the most basic level of needs must be met before the individual focuses motivation upon higher level needs. Thus, at any given time, a certain need "dominates" the human organism.

These three aspects are schematically illustrated as follows:



To analyze the effects of anonymity on these psychological aspects, experiments carried out over 2 years, involving 500 chat sessions of at least 30 minutes each are conducted using each of the three web services – Facebook, corresponding to non-anonymous, Chatroulette, corresponding to partly anonymous (owing to camera and verification/IP-Tracing options) and TorChat (Completely anonymous in the deep web). Word based analysis is used to classify chats into various categories, such as Id/Ego/Superego by using words indicating urges/commands, Valence-Arousal Quadrants using words of positive/negative/energetic/calm classifications, and Maslow’s needs using appropriate words reflecting various levels. The proportion of the Chats in each category, computed as percentage is then recorded for the three anonymity cases, as follows:



From the table, the following can be inferred with regard to the three aspects of psychology:

1. A surge in the dominance of Id is seen in anonymous cases. With the ego dominance at more or less the same level, this surge in id is at the expense of a decline in the moralizing super-ego to less than half its value. This suggests that with anonymity providing a barrier against exposing of people’s identities and character, people are more open with the feelings and urges of the id, without the overarching control from super-ego. However, compared to face-to-face interactions, non-anonymous online chat and typing already provide a level of

openness for release of id based urges and feelings, though to a much lesser level than anonymous cases.

2. In non-anonymous cases, the affective experience centred on the first and third quadrant, representing people trying to impress, and “lazed out” people respectively. However, anonymity witnesses a decrease of first quadrant dominance, with people using the identity barrier to be more open about “socially taboo” negative feelings such as anger, fear, disgust, hatred and frustration. So too, with identities hidden, the need to impress falls greatly in anonymity.
3. In non-anonymous cases, among Maslow’s needs, friendship, security and esteem are seen almost in balance. However, this relationship is skewed for anonymous cases, with people exhibiting more of lower level physical than any other need.

## **Conclusion:**

Motivated by the growing trend in anonymity, the present work studies and explores online anonymity and its effect on psychological aspects from both mathematical and experimental perspectives. Mathematically, using mappings, it is seen that anonymity corresponds to quantum entanglement like states, corresponding to an increase in chaotic nature. Experiments and subsequent analysis focusing on three psychological aspects, namely Structural Model of the Psyche, Maslow’s Hierarchy of Needs and Affective Experience suggest that the barrier of identity protection offered by anonymity drives people to orient their psychological states towards id dominance, openness of negative emotions, and dominance of physical needs over higher level needs. From the results and discussions, one can easily observe and characterize the shift in behavioural trends of people during anonymity.

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