

Machine Learning and Psychological Disorders: An Analysis of Research on Machine Learning
Diagnosis
(Technical Topic)

Technology of the Generations and its Effects on Mental Health
(STS Topic)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Mental illness affects nearly one in five Americans, and suicide is the second leading cause of death for individuals between the ages 10 and 34. Unfortunately, mental health is still taboo in many countries and households. Trends are showing increases in psychological stress over the last decade, specifically for individuals age 12 through 29. While it could make sense to conclude that these individuals may experience more stress during these ages due to education, job markets, and other external economic factors of our time, it is important to note that there has been a general upward trend in psychological distress for individuals who were born starting around 1985 (Twenge et al., 2019). With these increasing trends, it is crucial to determine the cause and improve the diagnosis and treatment options for mental illness. For this reason, the technical project is analyzing research on the use of machine learning in accurately diagnosing psychiatric disorders, and the STS research aims to investigate how current technologies are impacting mental health.

Technical Topic

The current method for psychiatric diagnosis of mental illness is not as reliable as it should be. Instead of psychiatric evaluations by medical professionals, which can have many unreliable factors, machine learning could aid in diagnosing psychiatric disorders through neuro-imaging data and other evaluations. Currently, mental illness diagnosis is performed by a doctor or mental health professional. In a psychological evaluation, the doctor or psychologist talks to the patient about symptoms, thoughts, feelings, and behavior patterns. Although the current way to diagnose mental illness is the best available, it is not highly accurate. There are

several factors that influence the reliability of current diagnosis models, such as the patient's psychological state, clinician inconsistency, and inadequacies in defining different illnesses and recognizing different symptoms for the same illness (Yassin et al., 2020). A methodical, unbiased approach, like machine learning, for diagnosis would help reduce these inaccuracies. Machine learning creates algorithms that learn from data to improve their accuracy over time. These algorithms are trained with large amounts of data to find features and patterns so that they can make predictions on new data.

Previous machine learning research has been able to distinguish between patients with mental health conditions and patients without. However, until recently, research was not able to distinguish between different psychiatric disorders with similar symptoms. The technical project is an analysis of existing research on machine learning techniques and psychological disorders, and it will follow three central questions. These questions are: what factors are important for use in machine learning diagnosis, how can we utilize machine learning for diagnosis, and how can we improve diagnosis accuracy? The study of "Relative importance of symptoms, cognition, and other multilevel variables for psychiatric disease classifications by machine learning" will be analyzed to answer the first question. To answer the second question, the study "Machine-learning classification using neuroimaging data in schizophrenia, autism, ultra-high risk and first-episode psychosis" will be analyzed. Lastly, the third question will be analyzed with the study "Symptomatology differences of major depression in psychiatric versus general hospitals: A machine learning approach."

With each study, analysis will identify questions, the limitations, and propose further research. The analysis will also discuss the importance of a secure database to store research data. The use of machine learning in correctly diagnosing psychiatric disorders could change the

way we view mental disorders and illnesses and subsequently progress treatment research and treatment options. Early and accurate detection of these illnesses could drastically improve or save lives.

STS Topic

Introduction

Over the past few decades, technology has advanced at a rapid rate. The world wide web became public less than 30 years ago. In 1992, the first Smartphone was developed and put onto the market. The first iPhone released in 2007 began changing the way we spent our time and completed everyday tasks. However, different societal groups did not adopt these technologies the same way which caused distinct societal effects. The central question for exploration is how different societal groups have adopted current technology and the respective effects on their mental health. This will be analyzed through the Social Construction of technology (SCOT) framework. The societal groups will be grouped by age generations, namely millennials and Generation Z, and the technology in this analysis will be handheld devices with internet capabilities, such as smartphones and tablets. As mentioned earlier, mental health issues have become a growing concern, and potential implications of growing uses of technology should be analyzed so that solutions can be proposed and implemented.

STS framework

The Social Construction of technology argues that human actions shape technology and thus would propose that the development and advancements of internet-capable devices was caused by the public's perception of such technology. The key concepts of SCOT include

relevant social groups, interpretive flexibility, and stabilization. My thesis will explore the social groups previously stated, how these groups make meaning of the technology, and implications of the adoption of the technology by each social group.

Relevant Social Groups

In order to analyze the effects of internet-capable handheld devices on the mental health of different social groups, the groups must be defined. While there is no absolute date range for generations, millennials will be defined as being born between 1981 and 1996. In 2020, this would make millennials between the ages of 24 and 39. Generation Z will be defined as being born between 1997 and 2012, making them between the ages of 8 and 23.

Adoption by Different Social Groups

An important aspect in analyzing how the mental health of different social groups is affected by internet-capable handheld technology is to focus on how these groups make meaning of it. In SCOT, this is known as interpretive flexibility. This technology became relevant in society at different stages in people's lives and thus was adopted differently. Firstly, the meaning of this technology for millennials will be analyzed.

Millennials grew up alongside the internet. The oldest of this generation experienced the rise of the internet in their pre-teens, and many had access to computers in elementary school ("Benefits Strategies for Millennials in the Workplace", 2020). However, not many millennials had access to computers and the internet outside of school. In 1993, only 22.8 percent of U.S. households had a computer. By 2000, 51 percent of households had a computer and 41.5 percent had internet access (Newburger, 2001). The oldest of the millennials would have been 19 in 2000, meaning access to the internet through computers still was not widely available through

their teenage years and start of adulthood. The 2000 census even states that for children ages 3 to 17, which is around the extremes of the generation, the internet was being used mostly for emails and school-related projects (Newburger, 2001). Internet-capable technologies were not yet being used for more than improving the efficiency of everyday tasks; they had not yet offered sweeping social changes to the way people communicated or spent their time.

Unlike millennials, Gen Z was born into an age of technology. With the release of the first iPhone in 2007, the oldest of the generation was age 10, while the oldest of the millennials was age 26. By this time, around 69.7 percent of households had a computer and 61.7 percent had access to the internet ("U.S. Households with Computers and Internet Use, 1984–2014", n.d.). With the introduction of handheld internet-capable devices during the childhood of the oldest Gen Z, it is not a sweeping claim to say Generation Z has not known a life without internet-capable technology. To put this in perspective, a 2018 study found that 95 percent of Gen Z had a smartphone, and 25% had a smartphone before the age of 10 (Watson, n.d.). An important social group who allows the adoption of these technologies is the parents of Generation Z. Without the parents buying their children handheld devices like smartphones, the culture around them may not have developed as it did. In a survey of parents who were likely to buy their child a wireless device before age 13, 90% agree that a reason for doing so was to get hold of them easily ("Mobile Kids: The Parent, the Child and the Smartphone", 2017). Some of these parents may be part of the millennial generation, which may explain their willingness to interact with the technology they have seen evolve.

Differing use

Although millennials and Generation Z grew up with different technologies, analysis needs to be done on how each social group makes sense of the current technology. For

millennials, their earliest forms of social media, namely MySpace and Facebook, were forms of connecting with friends and sharing their life statuses. They did not have many internet platforms available for entertainment. Generation Z, however, primarily uses internet-connected devices as a form of entertainment and a time filler ("Social Media for Every Generation", n.d.). On a weekly basis, Gen Z's top internet platforms to visit are YouTube (89%), Instagram (74%), and Snapchat (68%). This follows with their main use of internet-connected devices being for media and entertainment. Millennials' top three platforms are Facebook (87%), YouTube (86%), and Instagram (71%). With millennials typically using technology to stay connected with friends and family, their use of Facebook, compared to Gen Z at 36%, also follows. Another differing use of this technology is that Gen Z typically spends more time on fewer platforms whereas millennials spend less time on more platforms (Cox, 2019). While this may not have an impact on how technology has been affecting the mental health of its users, it is an interesting note.

Mental Health of Millennials and Generation Z

To attempt to analyze the possible effects of technology on the mental health of millennials and Gen Z, we must first look at the trends in psychological distress and major depressive episodes. In a study of mood disorder indicators, psychological distress between 2008 and 2017 generally rose among most age groups, with the largest increase among 20 to 21 year olds. While this makes logical sense in average situational settings for 21 year olds, trends were found to be most dependent on cohort, rather than time period or age. Cohorts experiencing serious psychological distress were highest among Boomers and Gen Z. There is a consistent increase in distress from the millennial cohort onward, with those born in 1985 at the lowest since 1980 and those born in 1999 at the highest distress. According to the data, the 1999 cohort was 49% more likely than the 1985 cohort to report serious psychological distress with age and

time period controlled. The trends are almost identical for major depressive episodes (Twenge et al., 2019). If time and age are not a factor in psychological distress, it is reasonable to assume that the cause is from other social factors.

However, it is difficult to analyze the cause through the Stabilization concept of SCOT, which is the prevailing of one social group in the midst of competing groups. It has been shown that millennials and Generation Z use internet-connected handheld devices for relatively the same tasks, though the frequency of use and time spent on the different platforms available differ between the two social groups. However, this does not explain why younger generations are experiencing psychological distress at higher rates. The analysis will instead focus on how brain development is affected by technology use, and how this brain development may impact mental health. Although this topic hasn't been widely researched, it has been proposed by medical experts that brains are physically developing differently because of the constant interaction with technology (Zachos, 2015). With the almost constant use of technology by Gen Z during development, there is evidence that there are many negative side effects, such as poor social skills, anxiety, ADHD, and even depression (Scott et al., 2016).

Research Methods

The statistics on millennial and Gen Z use of internet-connected devices, as well as their respective trends in mental health are known, yet the effects of these devices on mental health is not quantitative. Further research will be conducted on how these devices may affect brain development, and how a possibly altered development may impact mental health. A conclusion on how the technology may directly impact mental health will be drawn from this effect. A possible source for research is the article titled "Children, Wired: For Better and for Worse", which touches on the effects of technology on childhood development.

Conclusion

While diagnosis is a significant step in treating psychiatric disorders and other mental health concerns, finding potential causes should not be overlooked. The effects of technology on brain development should be made aware by technology developers as well as its users, whether negative or not. If an impactful link is found, it could result in more extensive research and change how we create and use technologies. This could lead to steps in reducing the negative mental health effects and hopefully flatten the trend of worsening mental health among teens and young adults.

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