

**Thesis Project Portfolio**

**Machine Learning and Psychological Disorders: An Analysis of Research on Machine**

**Learning Diagnosis**

(Technical Report)

**Technology of the Generations and its Effects on Mental Health**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2021

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## **Sociotechnical Synthesis**

Mental illness is a global issue that is increasing in numbers, yet diagnostic tools have not evolved to be as effective as possible. Statistics in 2019 found that mental illness affects nearly one in five American adults, with 50 percent of Americans being diagnosed with a mental illness or disorder in their lifetime. In 2020, 40 percent of U.S. adults had mental health concerns, highlighting the substantial effects of a global pandemic. While this jump is not the norm, there has been a general upward trend in psychological distress, especially for individuals aged 12 through 29. It would make sense to claim 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. With these increasing trends, it is crucial to determine the cause and improve the diagnosis and treatment options for mental illness.

The STS research paper explores how different social groups have adopted internet-capable handheld devices and the respective effects on their mental health. Over the past few decades, technology has advanced at a rapid rate. However, different social groups did not adopt these technologies the same way due to the ages of each group upon release, which caused both distinct societal effects as well as different physical differences on the brain. The different social groups, namely Generation Z and millennials, are analyzed on both their utilization of internet-capable handheld devices as well as the respective effects on the structure of their brains. In turn, the changing brain structures are analyzed for similarities to structures of brains with mental illnesses. Conclusions are drawn on the potential effects of these technologies on mental

health issues due to the changes in the brain. This research is crucial in determining if there is a link between technology use on developing and or developed brains and an increased risk of developing a mental illness. If there is probable cause, increased awareness of the issue should be spread by health officials, as well as possible changes to the technology.

The capstone project is an analysis on machine learning for psychiatric diagnosis of mental illness. The current method for diagnosis 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. Previous 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. This project analyzes three different studies of machine learning and mental illness diagnosis. The first analysis is of a study conducted to determine the importance of symptoms, cognition, and other multilevel variables for psychiatric disease classifications by machine learning. The second analysis is of new research by the University of Tokyo, which used machine learning to train six different algorithms to differentiate between MRI scans of patients who were either neurotypical, schizophrenic, or had autism spectrum disorder. Lastly, a study on symptom differences of Major Depressive Disorder in psychiatric and general hospitals in China is analyzed. With each study, analysis will identify questions, discuss limitations, and propose further research. The analysis also discusses 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 subsequently progress treatment options. Early and accurate detection of these illnesses could drastically improve or save lives.

In both topics of mental health, further research is needed to draw firm conclusions and develop more effective industry standards. Mental illness is not an issue that will disappear on its own, especially if it is progressively worsening among individuals. Finding additional causations of mental illness, like increased technology use, is important in preventing worsening mental health in future generations. Improving diagnostic standards is also crucial in improving quality of life for individuals facing mental health issues. In short, mental health is a significant aspect of our lives, and research should continue to progress preventative measures, diagnosis, and treatments.