

**AN AUTOMATED MACHINE LEARNING PIPELINE FOR MONITORING AND
FORECASTING MOBILE HEALTH DATA**

**PROTECTING PATIENT WELL-BEING IN THE ADOPTION OF ARTIFICIAL
INTELLIGENCE TO MENTAL HEALTH CARE**

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By

Anna Bonaquist

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SOCIOTECHNICAL SYNTHESIS

A growing gap exists between the amount of people requiring mental health care and the amount of available mental health practitioners. Fortunately, mental health treatments using the internet and artificial intelligence can help close this mental health care gap. The technical project seeks to demonstrate the feasibility of such technologies through creating and designing a mobile mental health app for monitoring and predicting depression in adolescents. While such treatments could benefit patients by making mental health care more accessible and affordable, they also have the potential to harm patients. The STS research considers the social and ethical effects of treating patients with artificial intelligence-based approaches using the Actor Network Theory Approach. The technical project designs and creates a technology for treating mental health patients, while the STS project examines how the technology will impact patients.

Widespread internet access provides an opportunity to use artificial intelligence for monitoring and diagnosing mental health problems. To use artificial intelligence as a treatment, a pipeline must be implemented to collect patient data from smartphones, process it, make predictions regarding patient mental health, and relay those predictions to the patient. The technical project designed and created a data pipeline to complete this process with a sample of adolescents facing depression as a use case. The team collected patient data using AWARE, a mobile framework for logging smartphone data, and relayed the data to a database. The data was cleaned using a Python script before machine learning, a branch of artificial intelligence, was applied to the data to predict depression levels of patients based on their mobile contexts. Finally, a dashboard showed patients their predicted depression levels along with a summary of their mobile data.

Through the technical research, the team noted that the machine learning methods which performed the best at predicting patient depression were those that employed ensemble learning. The team also examined several cross-validation techniques in predicting patient depression and found that the techniques which used only a patient's own data, as opposed to data from the entire sample, to create a machine learning model produced the most accurate depression predictions. The technical project demonstrated the feasibility of a data pipeline to connect a patient's smartphone data to the internet and artificial intelligence processes. Such data pipelines can be personalized for patients and expanded upon to track various mental health issues.

Mental health treatments using artificial intelligence are feasible, but how will such treatments effect mental health patients? The STS research concludes that artificial intelligence based mental health treatments violate patient privacy and wellbeing under current circumstances. Various scholarly journals point to the negative effects that inaccurate mental health predictions have on patients. Psychiatrists also reinforce the importance of the patient doctor relationship in mental health treatment, which artificial intelligence threatens. Additionally, articles from sources such as the New York Times document the threat that internet-based applications pose to patient privacy when patient data is not protected by the Health Insurance Portability and Accountability Act.

Artificial intelligence endangers the patient doctor relationship, putting patient wellbeing at risk. Furthermore, artificial intelligence may provide patients with black box results in contrast to doctors who can explain the reasoning behind their diagnoses. To protect patient safety, doctors must be involved in mental health treatments using artificial intelligence at present. Additionally, patient privacy must be protected by including smartphone data collected for artificial intelligence under the Health Insurance Portability and Accountability Act. Regulations

to require doctor supervision of patient artificial intelligence use and to ensure the inclusion of patient smartphone data under the Health Insurance Portability and Accountability Act can allow these technologies to safely treat patients.

Mental health treatments using artificial intelligence can provide inexpensive resources to a wide variety of patients. However, these technologies currently pose a risk to patient wellbeing and privacy. To protect patients, regulations should ensure doctor involvement in artificial intelligence technologies and should include personal smartphone data collected for artificial intelligence treatment in the Health Insurance Portability and Accountability Act. With such regulations in place, this novel technology can be accepted into mental health care and can help close the mental health treatment gap.

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Technical advisor: Afsaneh Doryab, Department of Engineering Systems and Environment

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STS advisor: Catherine D. Baritaud, Department of Engineering and Society

PROSPECTUS

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