

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IP)

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DEVELOPMENT AND PERFORMANCE ANALYSIS OF A MACHINE LEARNING BASED
COGNITIVE PERFORMANCE AND MENTAL FITNESS MONITORING SYSTEM FOR
ASTRONAUTS IN TRAINING

Abstract

The growing popularity and interest in extraterrestrial human exploration and colonization have resulted in the creation of additional chances for astronauts to prepare for and participate in these fascinating missions. In line with this, a number of universities across the globe are investigating the use of machine learning algorithms to forecast the cognitive performance of astronauts in an effort to provide a one-stop solution to all the prerequisites. It is essential to keep an eye on astronauts' psychological health and neurobehavioral performance due to the difficulties of long-term confinement in space, alongside isolation with a small crew, exposure to a variety of stressors and ecological factors, and restricted access to familiar stimuli.

This study aims to assess the mental fitness of astronauts during training using statistical techniques and artificial intelligence, utilizing the Google Colab platform and Python programming language. Over 300,000 data sets are loaded into the model as it is trained using a collection of labelled examples of human facial expressions, voice, and body posture. It is anticipated that using methods like convolutional neural networks and recurrent neural networks would increase the model's accuracy to over 80 percent. As physical and mental health statistics complement one another, the proposed model is also intended to take into account physical vitals like blood pressure, heart rate, blood sugars, etc. for accurate mental health prediction. When the astronaut's performance deviates from the intended range, the model will regularly monitor the parameters to issue an alert.

In conclusion, the use of machine learning algorithms to monitor astronaut training variables, such as body posture, speech recognition, and facial expressions, has the potential to give crucial details about areas where an astronaut may require additional guidance or assistance. The proposed study intends to shed light on the ways in which the built AI model may be utilized to assess and comprehend an astronaut's mental health backed by statistical data generated from the developed AI model and examine the possibilities for using natural language processing techniques, such as speech-to-text and sentiment analysis, and sensor data analysis further towards our knowledge of an astronaut's performance. Automating and improving the monitoring of astronaut training through the use of dynamic AI models like ChatGPT in combination with computer vision, sensor data analysis, and machine learning has the

prospects to yield insightful information and produce reliable statistical performance reports based on emotional state and communication skills.