

The application of machine learning algorithms to implement the use of Child and Adolescent Needs and Strengths 0-5 (CANS) in a mental health service for children

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Introduction:

Psychopathological disorders in preschool age often present non-pathognomonic symptoms and can evolve in later stages following trajectories of development characterized by homotypic or heterotypic continuity. Therefore, the CHILD AND ADOLESCENT NEEDS AND STRENGTHS 0-5 (CANS) tool emerges as a valid alternative to address the issue of diagnostic approximation in preschool age. It is a tool based on Communimetrics principles that aims to integrate different information from specialists responsible for patient care, to achieve a shared vision among users, their families, and the Services system. This tool assesses, through 148 items on a 4 level, the needs and strengths of the user in various areas of daily life. The primary use of CANS is to guide the planning process of rehabilitative and habilitative interventions for individuals with atypical development. To enhance this process, it would be useful for clinical services to identify subgroups of patients with similar characteristics. In this perspective, machine learning could prove to be a suitable data analysis methodology in finding hidden clusters among patients.

Method:

The study was conducted at the FONDAZIONE IRCCS CA' GRANDA – OSPEDALE MAGGIORE POLICLINICO MILANO, specifically in the Daily Care for 0-5 years (Centro Diurno Piccoli). The center provides multiprofessional therapeutic and diagnostic interventions for children aged 2 to 6 with developmental disorders, language and communication disorders, motor activity disorders, regulation issues, emotional disorders, intellectual disabilities, and autism spectrum disorder. A total of 261 (F:20.6%; M:79.4%) subjects participated in the study. Principal Component

Analysis (PCA) was conducted, considering the scores of the total activation level (TAI) to identify potential associations in subcategories within the TAI. Additionally, unsupervised machine learning analysis, namely clustering, was performed to typify subjects falling within the identified principal components. Machine learning algorithms enable the analysis of hidden patterns within phenomena. These algorithms facilitate the prediction of phenomena and provide a new way of analyzing data. Specifically, the unsupervised machine learning used in the study is clustering. This specific algorithm is based on grouping objects with similar properties.

Results:

Results regarding the best models obtained will be presented.

Conclusion:

The identification of the principal components that characterize the CANS and the analysis of the diagnostic characteristics of subjects falling into each of them open up new scenarios in the field of clinical rehabilitation for patients with neurodevelopmental disorders and atypical development in the preschool age.

Research advancements:

The research in the field highlights the importance of choosing the intervention to be used for the successful outcome of a treatment. To increase the effectiveness of the treatment, it is necessary to enhance communication among professional figures. This is where the CANS is employed. To maximize the impact of the CANS, the decision was made to utilize PCA, a methodology that allows for a different analysis of the data.

Keywords:

CHILD AND ADOLESCENT NEEDS AND STRENGTHS 0-5 (CANS); Principal component analysis; Machine learning.

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