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USING MACHINE LEARNING ALGORITHMS AND 3D ANALYSIS FOR MONITORING AND MAPPING SPATIO-TEMPORAL CHANGES BASED ON ARCHIVAL REMOTE SENSING DATA

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The use of remote sensing data recognition and classification algorithms to analyze the dynamics of natural and man-made objects is the most promising area of big data processing. Computer vision methods and remote sensing data recognition and classification algorithms are actively used to analyze the dynamics of change and detect natural and man-made objects. These tools allow us to identify patterns, determine trends, and make informed forecasts using mathematical modeling and simulation methods. This study examines the application of land cover recognition and classification algorithms to multi-temporal remote sensing data. Particular attention is paid to three-dimensional analysis, which has significant advantages over two-dimensional analysis: it accounts for vertical changes and provides information on the extent of transformations. Three-dimensional data is critical for monitoring and assessing environmental evolution, as it reflects processes occurring in both the horizontal and vertical planes. Unlike 2D images, 3D models provide a more complete picture of changes. Two key sites in the Republic of Armenia were selected as study sites: the city of Yerevan to analyze urban development dynamics; and the Jraber and Gyumush mines to assess the scale of mineral extraction. The 3D approach offers several advantages, including obtaining clear quantitative data on the volume and area of changes, as well as a more complete picture of ongoing processes by taking into account the vertical component. The challenges of this approach primarily relate to the need for precise vertical and horizontal spatial referencing of the data and the increased requirements for the quality and preparation of the original data. The study results demonstrate that 3D terrain analysis provides unique data unavailable using a 2D approach.

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