A critical review of artificial intelligence in mineral concentration

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Abstract

Although various articles have reviewed the application of artificial intelligence (AI) in froth flotation (sum-marized in this article), other unit operations for mineral concentration in mineral processing have not been reviewed. Thus, this article reviews AI application in various unit operations for mineral concentration. Because unit operations for mineral concentration deal with yields not necessarily linearly correlated with input vari-ables, subsequent yield prediction using AI can add value to their control. The current applications of AI have neglected fundamental variables (e.g., particle agglomeration, particle magnetic susceptibility, particle wetta-bility, particle surface charge, and particle Hamaker constant) as inputs for prediction. Instrumentation and industrial simplicity have hindered the consideration of those variables because validation is required. There are kind learning (repeated patterns and high accuracy measurements) and wicked learning (continuously novel patterns and noise in measurements) environments, which are suitable and challenging for machine learning, respectively. Kind learning environments were largely used for the applications of AI. Furthermore, flow can be captured by AI (e.g., neural networks) to attempt to control drag and mixing using synthetic jet type actuators in equipment (shaking tables, fluidized beds, or vessels). Thus, future applications of AI should consider these points.

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