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## An integrated prediction and optimization model of biogas production system at a wastewater treatment facility

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### Abstract

This study proposes an integrated prediction and optimization model by using multi-layer perceptron neural network and particle swarm optimization techniques. Three different objective functions are formulated. The first one is the maximization of methane percentage with single output. The second one is the maximization of biogas production with single output. The last one is the maximization of biogas quality and biogas production with two outputs. Methane percentage, carbon dioxide percentage, and other contents` percentage are used as the biogas quality criteria. Based on the formulated models and data from a wastewater treatment facility, optimal values of input variables and their corresponding maximum output values are found out for each model. It is expected that the application of the integrated prediction and optimization models increases the biogas production and biogas quality, and contributes to the quantity of electricity production at the wastewater treatment facility.

### Keywords:

Biogas quality, Biogas production, Neural networks, Particle swarm optimization, Wastewater treatment facility

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