**A COMPARATIVE ANALYSIS OF FOUR OPTIMIZATION ALGORITHMS FOR SELF-POTENTIAL INVERSION**

*Peter Adetokunbo, Oluseun Sanuade, Farag Mewafy, Ahmed Ismail*

*Oklahoma State University, Stillwater, OK, USA*

In this study, we evaluated and compared the performance of the Levenberg-Marquardt (LMA), genetic (GA), simulated annealing (SA), and modified symbiotic organism search (mSOS) algorithms for the automatic inversion of self-potential (SP) data. Using a synthetic SP data set, we evaluated the algorithms in terms of their accuracy in modeling SP parameters (depth, polarization angle, electric dipole moment and location of the center of anomaly) and their computational efficiency. To account for the effects of measurement errors and uncertainties present in real-world data, we added an additive noise level of 10% to the synthetic data and we resampled the noisy data at discrete points. The results showed that the mSOS algorithm performed the best in terms of modeling accuracy. The LMA algorithm had the shortest completion time and the lowest root mean square error, while the GA and SA algorithms exhibited intermediate performance in both accuracy and efficiency. However, the SA algorithm seemed to overestimate certain model parameters, such as the depth to the self-potential anomaly, and required more iterations to reach convergence. Despite these differences, all the algorithms demonstrated high capability and acceptable level of performance for self-potential inversion to estimate the depth and size of the source of the SP anomalies.