

## Abstract

Radioactivity is spontaneous and thus not easy to predict when it will occur. The average number of decay events in a given interval can lead to accurate projection of the activity of a sample. The possibility of predicting the number of events that will occur in a given time using machine learning has been investigated. The prediction performance of the Extreme gradient boosted (XGB) regression algorithm was tested on gamma-ray counts for K-40, Pb-212 and Pb-214 photo peaks. The accuracy of the prediction over a six-minute duration was observed to improve at higher peak energies. The best performance was obtained at 1460keV photopeak energy of K-40 while the least is at 239keV peak energy of Pb-212. This could be attributed to higher number of data points at higher peak energies which are broad for NaITi detector hence the model had more features to learn from. High R-squared values in the order of 0.99 and 0.97 for K-40 and Pb-212 peaks respectively suggest model overfitting which is attributed to the small number of detector channels. Although radioactive events are spontaneous in nature and not easy to predict when they will occur, it has been established that the average number of counts during a given period of time can be modelled using the XGB algorithm. A similar study with a NaITi gamma detector of high channel numbers and modelling with other machine learning algorithms would be important to compare the findings of the current study.