In the evaluation of magnetic field data, edge enhancement and detection techniques are important treatments for the interpretation of geological structures. In general geological sense, contiguity of deep and shallow magnetic sources leads to weak and intense anomalies that complicates the interpretation to disclose adjacent anomalous sources. Many of the existing filters for edge detection in magnetics mostly have the disadvantage that they require a reduction to pole transformation as the pre-process of the data or they cannot balance weak and intense anomalies and therefore fail in detecting edges of deep and shallow sources simultaneously. This study presents an improved edge detection filter LAS (logistic function of the analytical signal), based on the generalised logistic function configured by the ratio of derivatives of the analytical signal. This novel approach has the capability of reducing the dependence on the direction of the magnetization and also balancing anomalies of sources at different levels of depth. The feasibility of the method is examined on both theoretical and real data cases comparatively with some other methods that utilize the analytical signal in their basis. In comparison, the results demonstrate that the LAS method provides more accurate estimation of edge localization.