

This lecture will focus on gradient-based linearized inversions. It will cover the classic  $L_2$  least-squares approach, as well as iteratively-reweighted-least-squares method for applying any norm in the objective function. Furthermore, the Levenberg-Marquardt method will be discussed in detail, focusing on the importance of the damping parameters, also in multi-parameter inversions. Finally, the uncertainty on the inversion model, as well as the estimation of the depth of investigation, will be treated. Examples of geoelectrical and electromagnetic geophysical data will be used for demonstrating the approaches.