PYR2: AN OPEN-SOURCE STANDALONE GRAPHICAL USER INTERFACE FOR INVERSION OF ELECTRICAL RESISTIVITY AND INDUCED POLARIZATION MEASUREMENTS

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Abstract

Analysis and inversion of electrical resistivity tomography (ERT) and/or induced polarization (IP) data can be challenging. Among numerous codes that are developed for the purpose of ERT/IP data processing, very few non-commercial codes offer a graphical user interface (GUI) and many embedded their powerful cores in a command line interface. This will not only increase the data processing time (due to need for producing complex commands and input files) but also making the learning curve of such codes really steep and difficult. In pyR2, the goal is to do the data analysis and inversion as fast and efficient as possible while keeping the end user completely in control over the processing steps; by providing a powerful GUI package, that users do not need a complex knowledge of command line scripts. pyR2 is an open-source python wrapper around mature inversion codes (R2, R3, cR2 and cR3) which is capable of advanced data processing (e.g. filtering, error analysis and inversion tweaks) in both 2D and 3D space. Furthermore, having an open-source code that can be developed by an international community is a real advantage compared to a commercial interface.

pyR2 is composed of a python application programming interface (API) which contains all the processing routines within a GUI written with PyQt5. pyR2’s API is separated from the main GUI script; hence, it can be used in typical python integrated development environments (IDE), such as jupyter notebooks or to create more automated inversion scripts. Although pyR2’s source code (which needs python to run) is available to public, a single stand-alone executable file is provided that can be run on any computer which needs minimal to no external packages to be installed initially (depending on the operating system – e.g. windows users need no external packages). Additionally, pyR2 is intended to be multiplatform, so can be run on Windows, macOS and Linux.

This effort is the first stage of a bigger plan to create a collection of geophysical inversion codes in the open-source domain. We believe such a collection will provide the scientists and the industry to process geoelectrical data more efficiently and a greater collaboration opportunity that is not controlled by a few commercial developers.