Due to the simple construction and the fact that the current beam is not focused, resistivity values measured by normal and lateral logging tools are strongly affected by the borehole and shoulder beds. There is a great amount of data from boreholes drilled in thin-bedded formations (e.g. sandy–shaly Miocene formations of the Carpathian Foredeep) in which normal and lateral logs were measured. Data from these boreholes are a unique and very valuable resource, but the low vertical resolution of measured resistivity logs results in many problems. The availability of high-resolution information about resistivity of the rock formation will significantly increase the quality and value of data from these boreholes.

The purpose of the project is to develop an inversion workflow designed to increase the resolution of resistivity data from boreholes drilled in thin-bedded rock formations in which sets of the normal and lateral logging tools were used to determine formation resistivity. The research will focus on algoritmisation of the problem, developing a computer code which will perform an inversion of sets of resistivity logs and developing a methodology of incorporating results of inversion into the process of formation evaluation.

The following tasks of the project are planned:

1. Preparation of documentation for selected resistivity logging tools
2. Development of a finite-element modelling code for selected resistivity logging tools to solve the direct geophysical problem
3. Development of an iterative inversion code for sets of resistivity logs
4. Tests of results of modelling and inversion on synthetic and real data
5. Development of a methodology of incorporating obtained information into a process of formation evaluation
6. Evaluation of the impact of the data obtained as a result of the procedure on the quality of well log interpretation

The code will be written in Python programing language and will utilize FEniCS library which is an open-source (LGPLv3) computing platform for solving partial differential equations and a simulated annealing global optimization algorithm to find a formation model that best explains measured data.

The code will be tested on benchmark formation models prepared by the author and on real data from the borehole where normal and lateral logging tools were run in the same depth interval as more advanced resistivity logging tools and where some intervals were continuously cored. In addition, evaluation of the impact of the data obtained as a result of the inversion on the quality of well log interpretation will be made.