

OPTISOIL

Artificial Intelligence applied to the process of excavation for buildings construction

Realization

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Keywords

- Machine learning
- Numerical simulation
- Civil engineering

Our skills

Machine learning applied to numerical simulations

Valorization

Highly speed up numerical simulations through machine learning

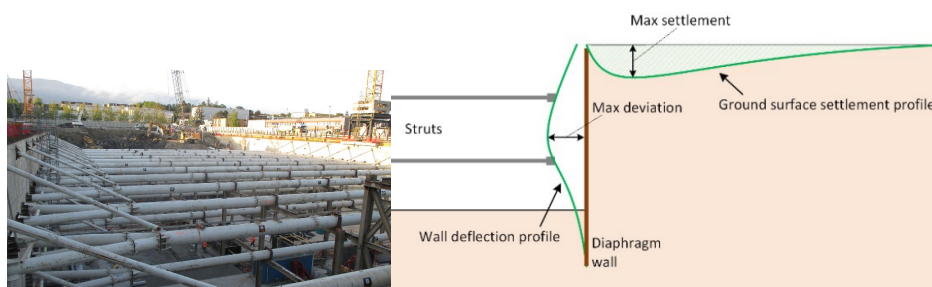
Partnership

- iCoSys
- iTec

Funding

HES-SO
Hasler Foundation

Schedule
2019



In several technical domains, such as mechanics or civil engineering, **numerical simulation** programs based on finite elements allows to simulate the behavior of the studied components. Very often, a full numerical simulation is necessary when, eventually, only a few values are beneficial to engineers. It is the case in the process of excavations for building construction. In this field, the ZSWalls simulation software is known to be able to predict some parameters such as internal forces in the support system (concrete or steel wall, anchors) and associated displacements accurately, given the geometry of the excavation, the stratigraphy, the water level, and the support system itself.

We propose here to take advantage of this software to build a synthetic database composed of thousands of excavations and then use **machine learning** to predict the useful parameters of a new case. The main advantage of this approach is that the trained model is **much faster to infer prediction** than running a complete numerical simulation.

Our main innovations are:

- **Reproduction of significant numerical simulation results** using deep learning and more precisely Convolutional Neural Network – CNN.
- **Data-sets generation through numerical simulation** – as opposed to the traditional method of data collection. Any field using a numerical simulation could actually benefit from this method.
- **Transformation of numerical data** describing an excavation to a CNN-compatible format (image-like data).

We aim at developing prototype web applications that allows civil engineers to automatically calculate the optimal way to approach a specific excavation, leading to significant time and cost savings.