

DigiTwin Waterkering en Ondergrond

WP3: Developers meeting Data Fusion framework

Bruno Zuada Coelho

Eleni Smyrniou

28-01-2022

Introduction

- Objectives for today
 - Intro round
 - Recap the DigiTwin project (data fusion)
 - Present the current development framework
 - Prepare/discuss the scrum:
 - What will we do in the scrum
 - How can everyone contribute

Introduction

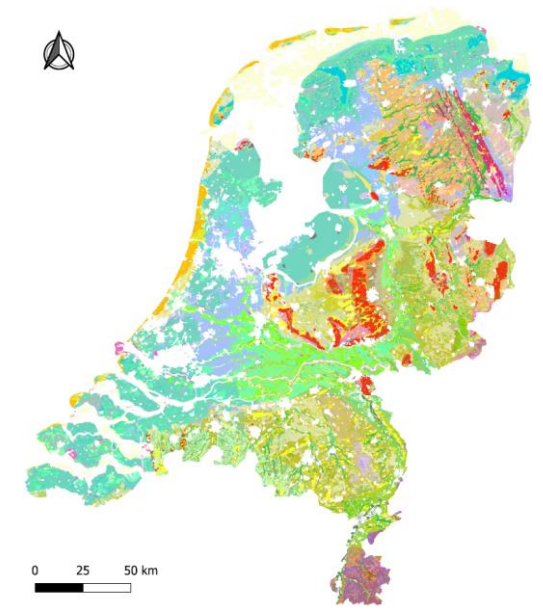
Recap

Availability of data and models is increasing

- Large datasets
 - Country wide
 - Local data
- Regional & local models



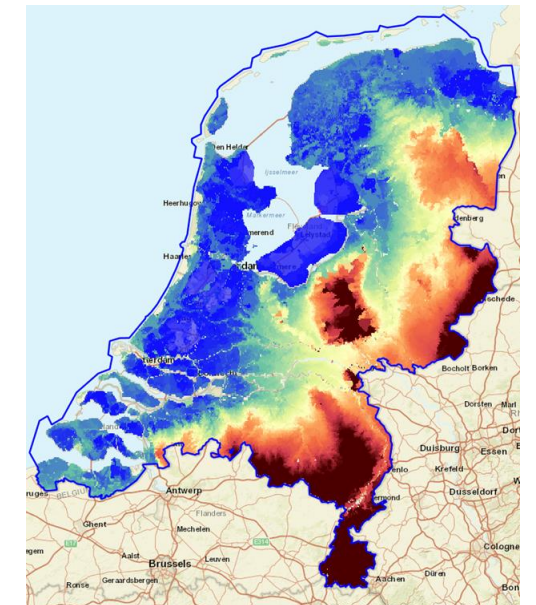
CPT



Geomorphological map



AHN (lidar)



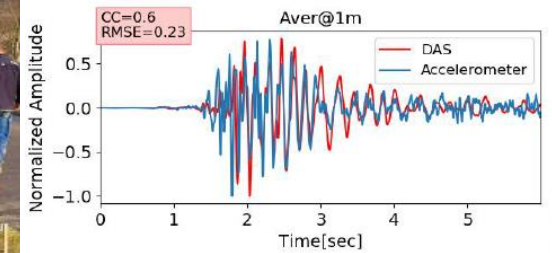
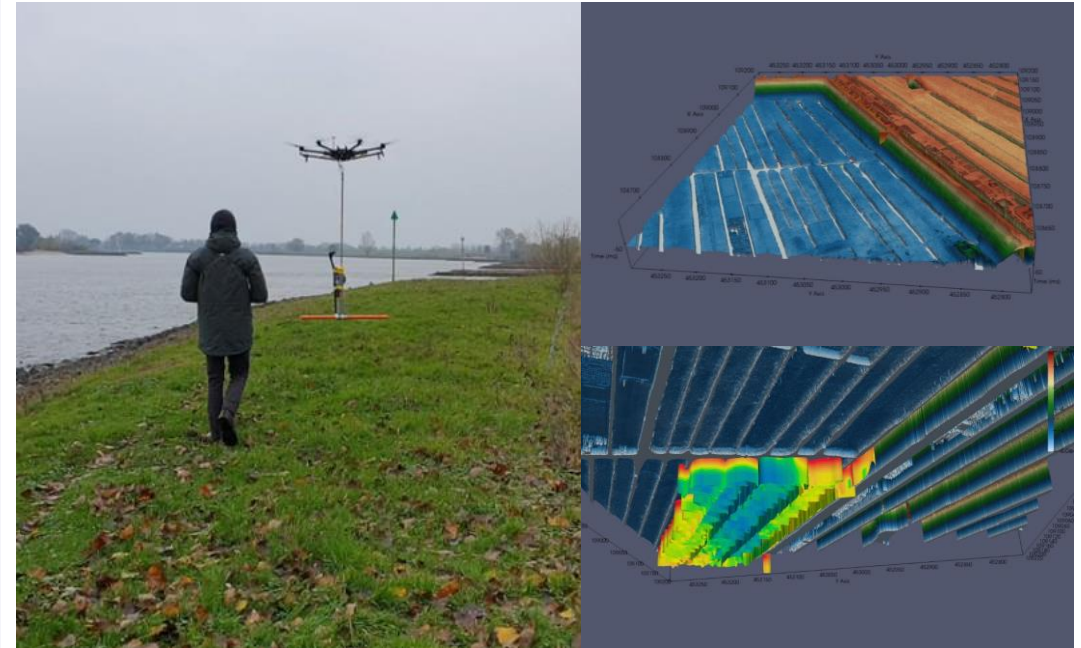
Ground water level

Introduction

Recap

Availability of data and models is increasing

- Large datasets
- Regional & local models



Introduction

Data Fusion methodology

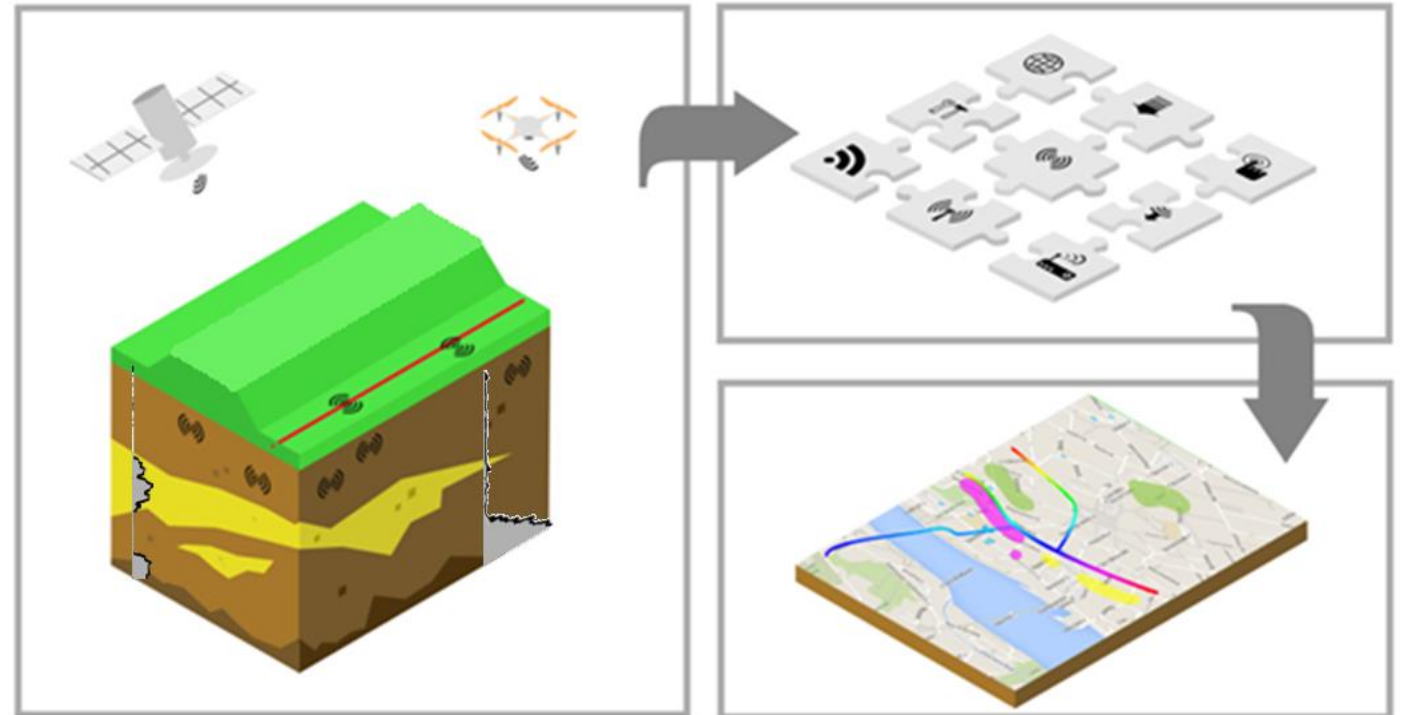
Data Fusion: the combination of results from multiple data sources, leads to more and better information, than using a single data source

Datasets

- Different spatial resolution
- Different time resolution
- Different accuracy

Machine learning

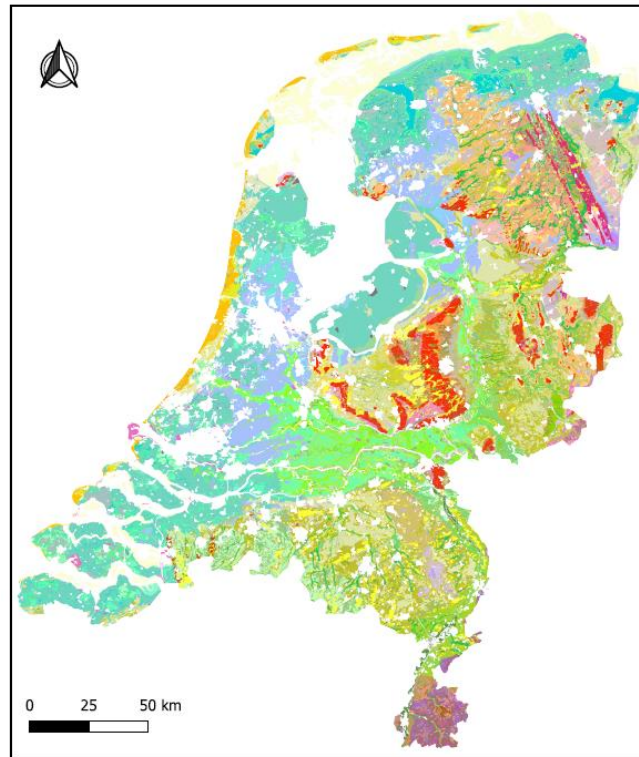
- Data is used to represent the behaviour
- Requires large amount of data
- Range of different techniques



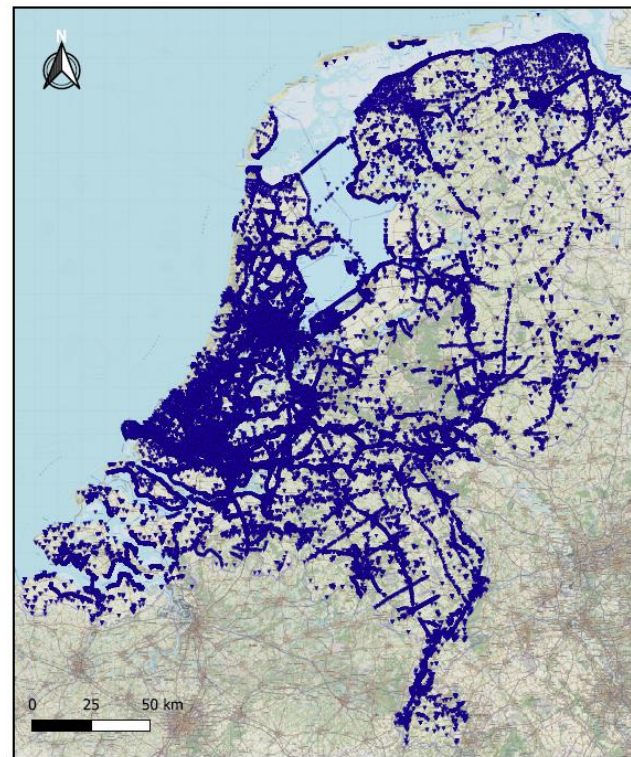
Data Fusion

Case study: Zeeland

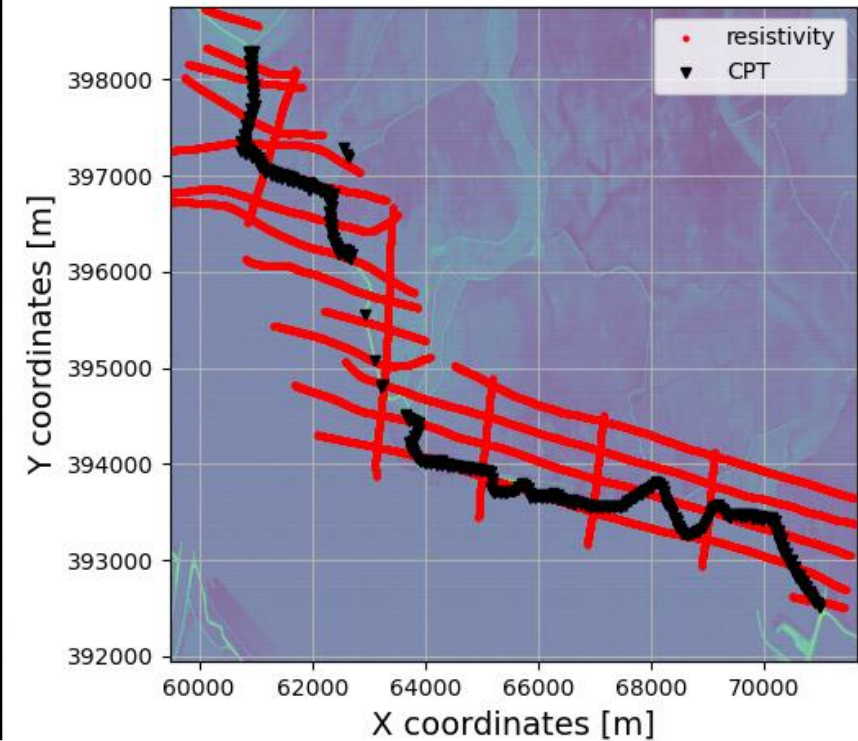
Datasets



Geomorphological map



CPTs

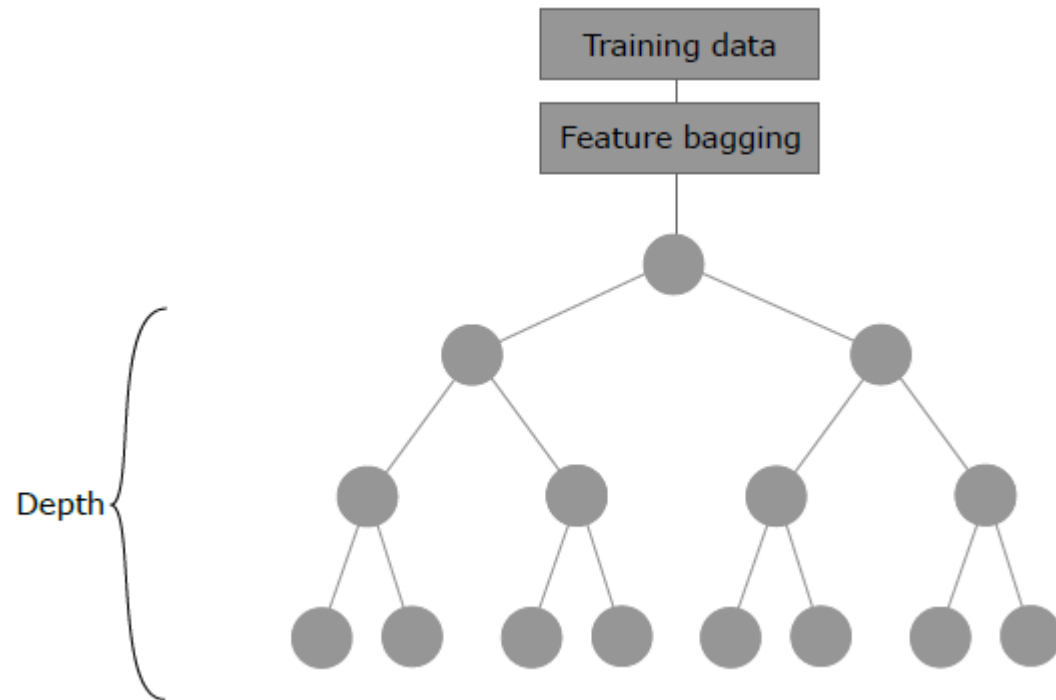
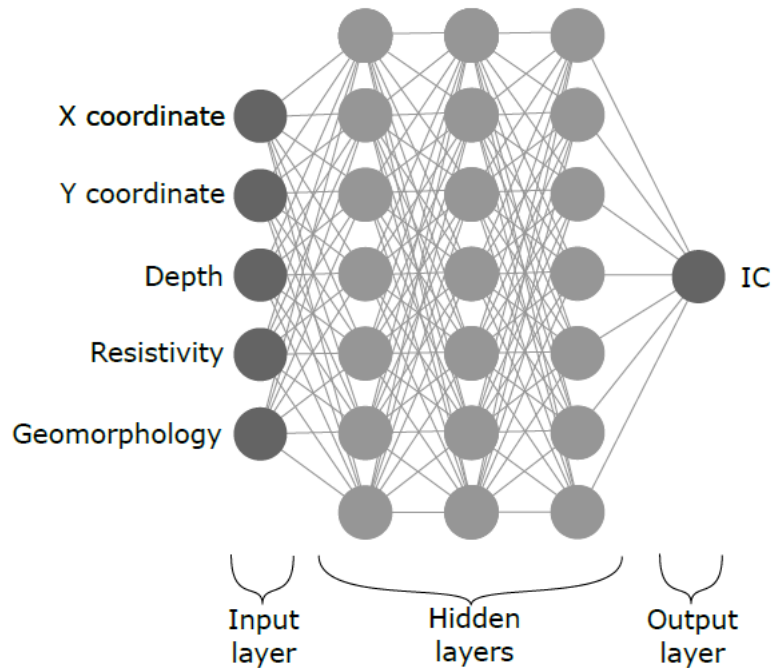


Resistivity

Case study: Zeeland

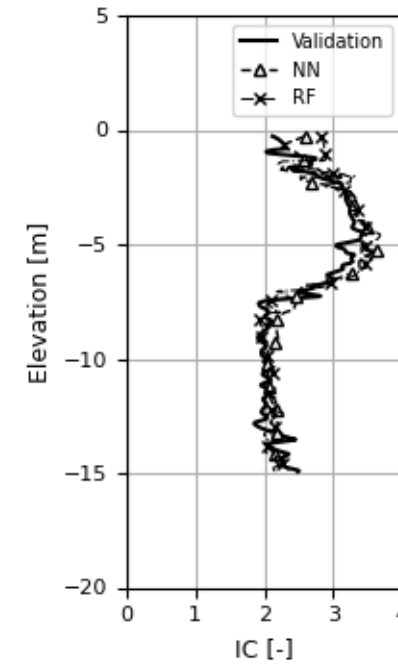
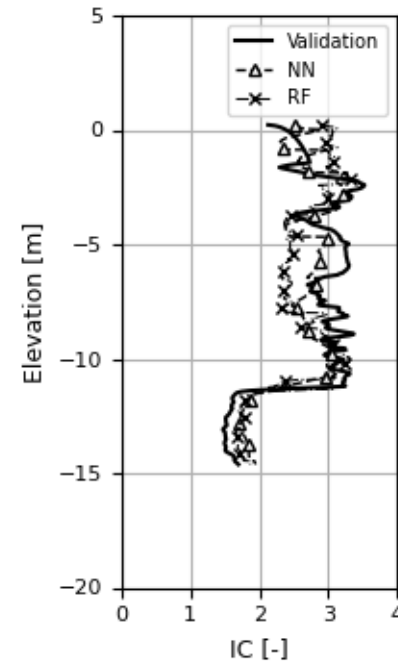
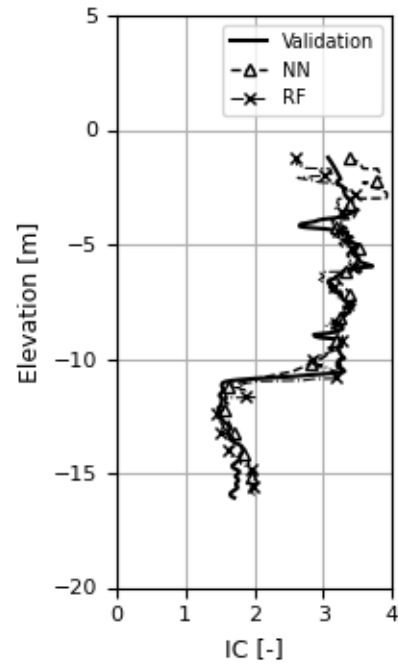
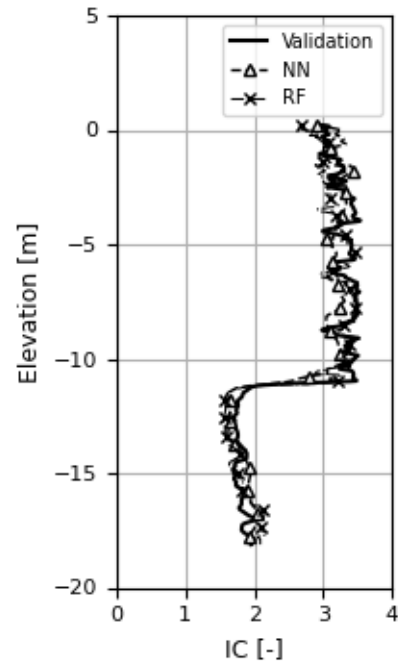
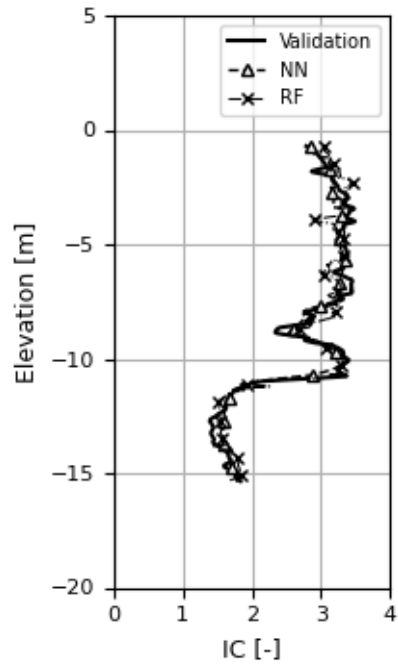
Methods

Two methods: Neural Networks & Random Forest



Case study: Zeeland

Comparison methods



Case study: Zeeland

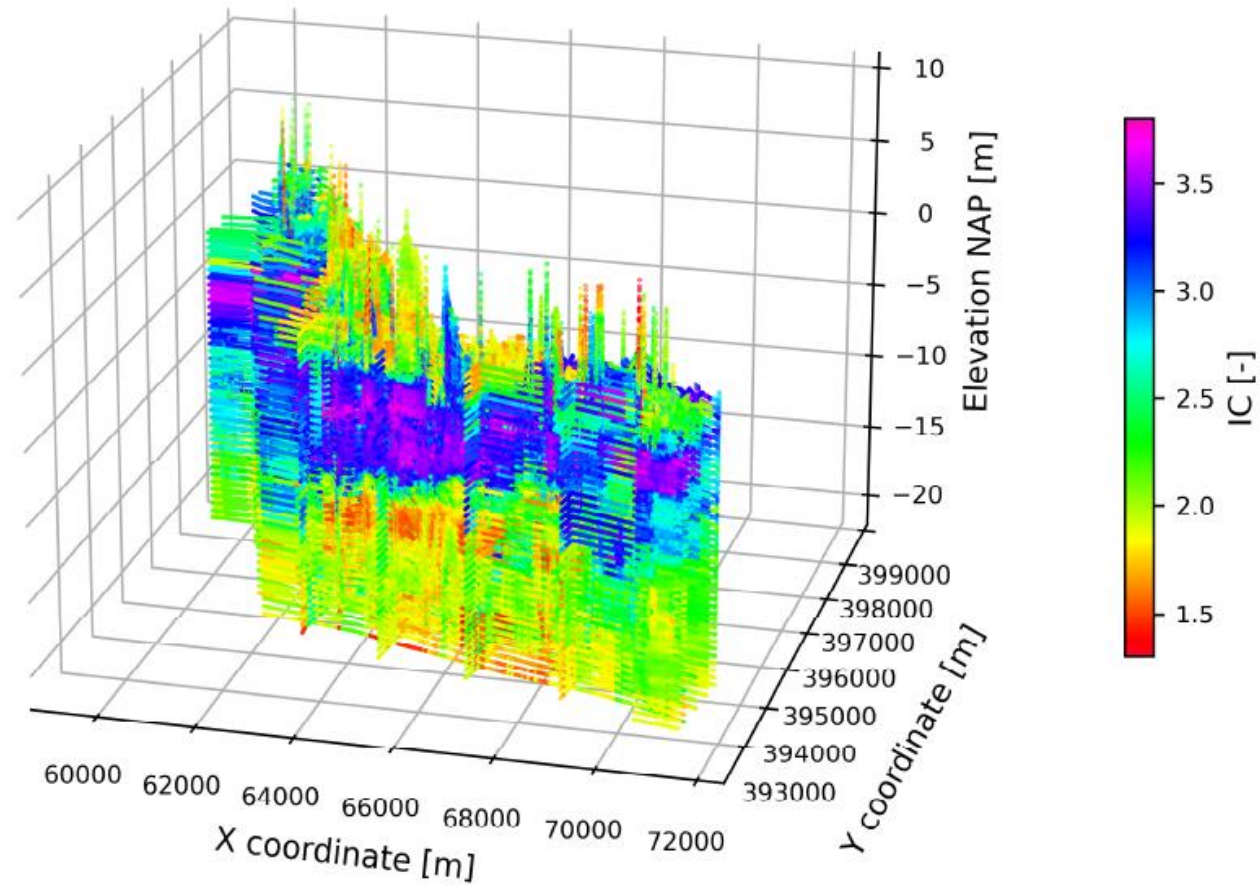
Three-dimensional schematisation

Random Forest method

80% CPTs training

20% CPTs validation

RSME training: ~ 0.02



WP3: Data Fusion

Activities

T1 Framework & data management

T1.1 Definition of the generic input format for the data

T1.2 Definition of the output format

T1.3 Definition of uncertainty and reliability of the data fusion approach

T1.4 Report describing the data fusion approach, tools and methods

T2 Data Fusion

T2.1 Create a general API for the data fusion procedure

T2.2 Extend the data fusion algorithms (currently supported: ANN and CNN). To extend with SVM, RF (maybe Bayesian), for both classification and regression

T3 Geo-interpolation

T3.1 Create API for the geo interpolation methods

T3.2 Extend the available geo interpolation methods (currently supported: Inverse Distance, Nearest Neighbour). To extend with Natural Neighbour, Multilinear interpolation, Kriging and Inpainting

T4 Model updating

T4.1 Create API for the model updating methods

T4.2 Implement model updating methods: Kalman filter (and its variations), Gauss–Newton formulation (and its variations), Genetic algorithm (Particle Swarm method)

Relation between WP3 and the project

