

# Python-based deep learning for detecting ditches from elevation data

The Estonian Topographic Database (ETAK) is a collection of geospatial vector data layers managed by the Estonian Land Board. In general, this data is generated by digitizing various man-made (e.g. buildings, roads) and natural (e.g. water bodies) geographic objects from satellite imagery. This process is currently largely manual and very time-consuming, which is why methods for automating at least some of the mapping process should be investigated. In recent years, deep learning (DL) models have been used successfully for detecting geographic features from remote sensing data.

This presentation gives an overview of our on-going project, which focuses on detecting drainage ditches in Estonia. We developed a DL model based on the U-Net architecture in PyTorch, which uses lidar-derived elevation data as input. We applied a transfer learning approach to overcome the lack of local training data by pretraining the model on labels originating from a previous Swedish study (Lidberg et al., 2023), after which we finetuned it on a small number of samples generated for Estonia. We also intend to extend the current DL workflow with geospatial packages like Xarray and TorchGeo, so that the resulting model is more convenient to apply at national scale.

## References

Lidberg, W., Paul, S.S., Westphal, F., Richter, K.F., Lavesson, N., Melniks, R., Ivanovs, J., Ciesielski, M., Leinonen, A., Ågren, A.M., 2023. Mapping Drainage Ditches in Forested Landscapes Using Deep Learning and Aerial Laser Scanning. *J. Irrig. Drain. Eng.* 149, 04022051. <https://doi.org/10.1061/JIEDDH.IRENG-9796>

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