Univerza v Ljubljani
Fakulteta za računalništvo in informatiko

Kristijan Šuler

The role of uncertainty in labels for semantic segmentation

Mentor: doc. dr. Luka Čehovin Zajc
Co-mentor: mag. rač in inf. Matej Račič

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Project objectives

- Addressing the labelling uncertainty problem in the domain of semantic segmentation where labelling is difficult.

- To investigate how to exploit uncertainty in data to reduce labeling time, while improving learning robustness and performance.

- Understanding and developing or modifying existing methods on the topic of uncertainty in learning deep models for semantic segmentation.

Project objectives

- For the domain of semantic segmentation, we chose meadows and the actual use of agricultural areas on satellite images.

- For labels we used:
  - Manually checked labels of meadows in connection with the Faculty of Civil Engineering and Geodesy.
  - Freely accessible labels of GERK, agricultural land use [3].

- For acquiring of satellite images, we used sentinel hub [2].

Use of tools and data within cloud environments

- ESA NoR Sponsorship enabled us to use the sentinel hub services which facilitated the acquisition and processing of satellite images [1][2].

- For transmission, rasterization and processing of satellite images from sentinel hub we used their eo-learn library.

- We obtained satellite images in the area of Slovenia for the year 2019.

Use of tools and data within cloud environments

- Time series were constructed from the obtained data using linear interpolation and cloudy areas were filtered. We also calculated vegetative values NDVI, NDWI, NDBI.

- We integrated and rasterized the grassland labels and actual land use into the data, which we needed to train the deep neural networks

Highlights

- Implementation of basic models (Naïve Bayes, SVM, MLP and deep neural networks) that serve to compare the performance of our model.

- Overview of existing methods and algorithms for learning on noisy data.

- Implementation of a noisy learning method. We modified DivideMix algorithm, to work on satellite images [4]. Which produce improvement in accuracy when there is noise in the data.

Further work

- Work is still in progress. We need to further optimize our modified model.
- Present and discuss results in thesis.
- Publish model and code.

Literature

- [1] NoR Projects Sponsorship - eo science for society. https://eo4society.esa.int/network-of-resources/nor-sponsorship/, (Accessed on 10/20/2022).
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- [4] J. Li, R. Socher, S. C. H. Hoi, Dividemix: Learning with noisy labels as semi-supervised learning (2020). doi:10.48550/ARXIV.2002.07394.
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