Open Land Use Map improvement based on satellite imagery

Dmitrij Kožuch, Belaid Khemnou
In the light of increased availability of satellite data nowadays (for instance, data from Sentinel missions which is very easy accessible from Copernicus programme hub) it becomes an excellent data source for our Open Land Use Map, especially relevant for the regions where land surveys are rare or their data is not available.
• One such area were there are not so much data sources, from which land use can be derived is African continent

• Last year it was an attempt to create Open Land Use Map of Africa based on available data sources – Africover, Open Street Map, local data, but the major problem was that still big areas are not covered in this datasets and also not all the time it is possible to derive land use category from land cover category
Background

• Open Land Use Map of Africa visualization:
Background

• Open Land Use Map of Africa visualization:
• Problems also exist in Europe. For example, the land use attribute is in the Czech cadastral data. Each land parcel has this attribute. Nevertheless, often this attribute does not get updated although the land use of parcel changes. So there are many mistakes in this database.
Nowadays there is very big leap in development of technologies taking place. New fields of computer science such as machine learning emerging. They bring new tools and methods for image classification also, that could be very helpful for our purpose.
• The aim of this task then is to develop an algorithm for creating and regularly updating Open Land Use map based on satellite imagery.
• Satellite imagery (Sentinel 2)
• Global Urban footprint dataset, Africover for masking out non-urban areas
• Open Land Use map to select training/validation set
• TensorFlow machine learning framework
• Available as python/C++/Go library
• Select suitable training and validation dataset based on Sentinel 2 and Open Street Map datasets

• Run convolutional neural network deep learning to detect different land uses in Tensor Flow framework.
Samples
Convolutional Neural Network

Neural network with many convolutional layers
Convolution filter

Visualization of 5 x 5 filter convolving around an input volume and producing an activation map
Convolution filter

\[
\text{Multiplication and Summation} = (50 \times 30) + (50 \times 30) + (50 \times 30) + (20 \times 30) + (50 \times 30) = 6600 \text{ (A large number!)}
\]
Current goals

- Collect big amount samples of land use objects from Sentinel 2 images based on OSM
- Train and validate classification model
Thanks for your attention!