

Multi-Scale and Multi-Temporal satellite data fusion for land cover mapping via Deep Learning

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Outline

Data Description

Deep Learning Architecture

Results and Findings

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Data Description

Reunion Island Study Site:

- Covered Area: 2512 Km²
- French Department located in Indian Ocean

Goal of the Land cover mapping task:

A 13 classes classification

We used two sources of the data:

- Time Series of Optical Satellite Images (Sentinel-2)
 - Acquired between April 2016 and May 2017
 - 34 images at 10m of resolution
- A Very High Spatial Resolution (VHSR) Image SPOT6/7
 - Acquired in April 2016
 - 1 image at 1.5m of resolution (resampled at 2m)

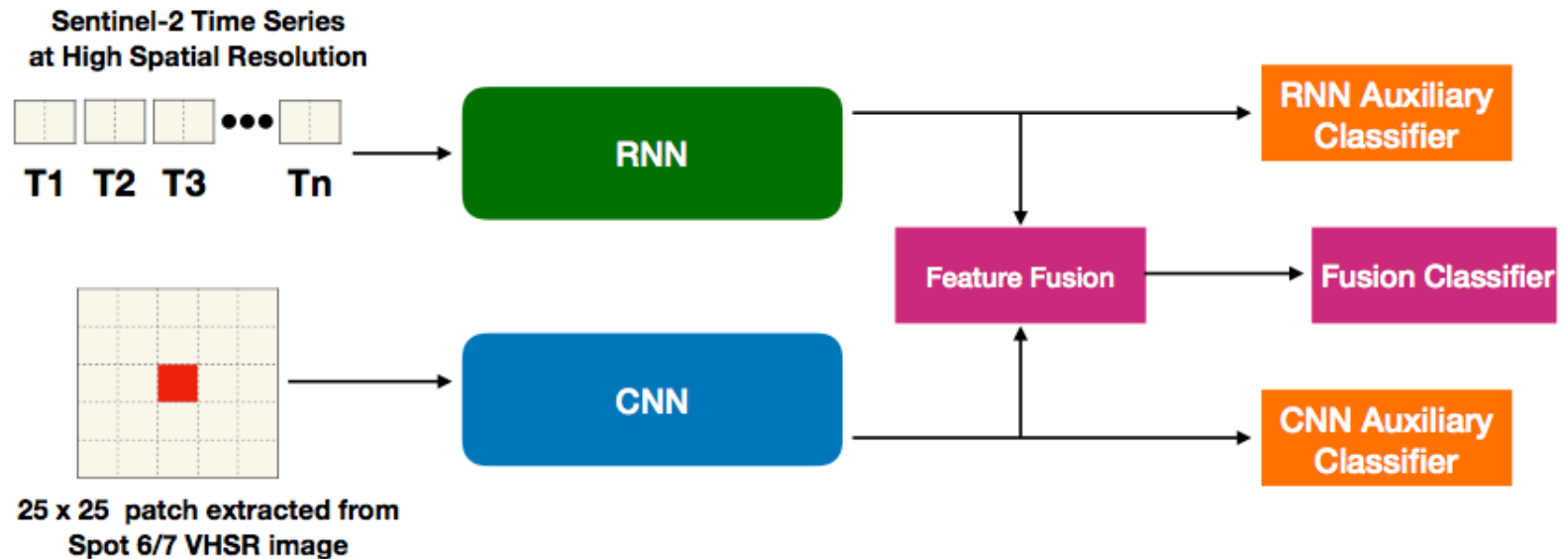
Reunion Dataset Characteristics

Class	Label	# Objects	# Pixels
1	<i>Crop Cultivations</i>	380	12090
2	<i>Sugar cane</i>	496	84136
3	<i>Orchards</i>	299	15477
4	<i>Forest plantations</i>	67	9783
5	<i>Meadow</i>	257	50596
6	<i>Forest</i>	292	55108
7	<i>Shrubby savannah</i>	371	20287
8	<i>Herbaceous savannah</i>	78	5978
9	<i>Bare rocks</i>	107	18659
10	<i>Urbanized areas</i>	125	36178
11	<i>Greenhouse crops</i>	50	1877
12	<i>Water Surfaces</i>	96	7349
13	<i>Shadows</i>	38	5230

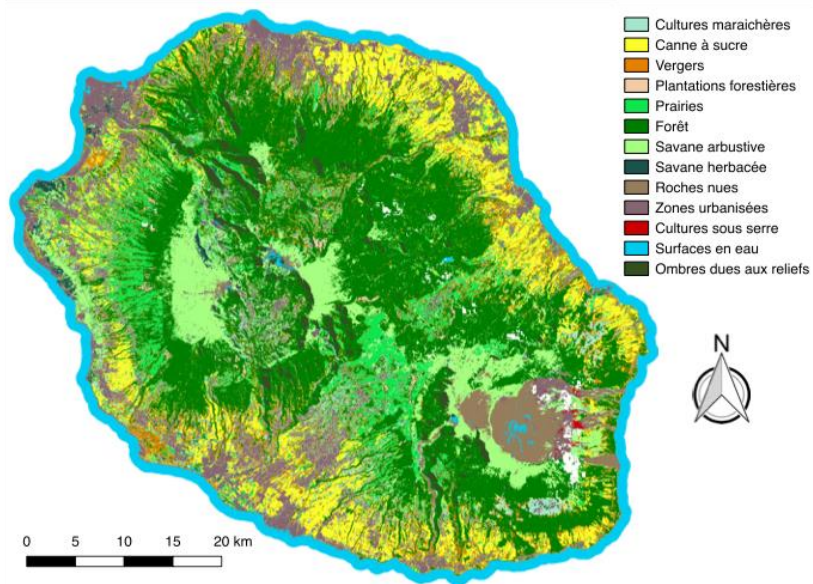
Total of 322 748 pixels (2656 objects)
over 13 classes

Method Description

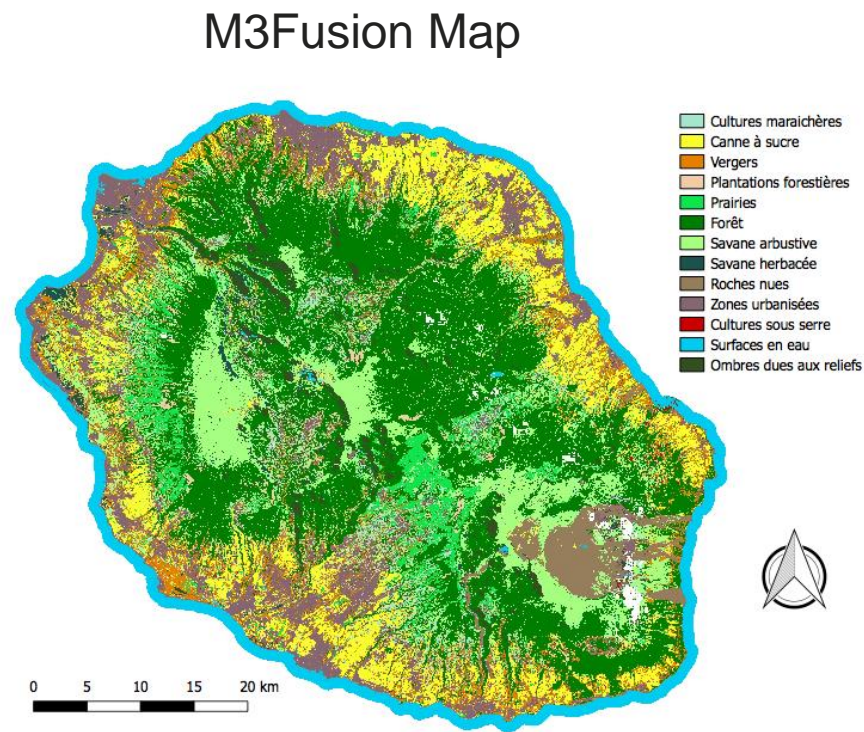
M3Fusion: Multi-{Scale/Modality/Temporal} data fusion architecture



Map Production



Random Forest Map



Conclusion and Future Works

Conclusion:

- A deep architecture to merge Multi-Scale and Multi-Temporal Data
- To our knowledge, this is the first DL method to make this kind of Data Fusion (S2-SPOT6/7)
- Performance results underline the quality of the proposed approach

Future Works:

- Perform the same kind of analysis in other study sites
- Study more in depth the fusion process performed by our Architecture