Robosat: an Open Source and efficient Semantic Segmentation Toolbox for Aerial Imagery

@o_courtin

@PyParisFr 2018

RoboSat

Generic ecosystem for QoD and feature extraction from aerial and satellite imagery

https://github.com/mapbox/robosat

https://github.com/datapink/robosat

RoboSat

State of Art SemSeg

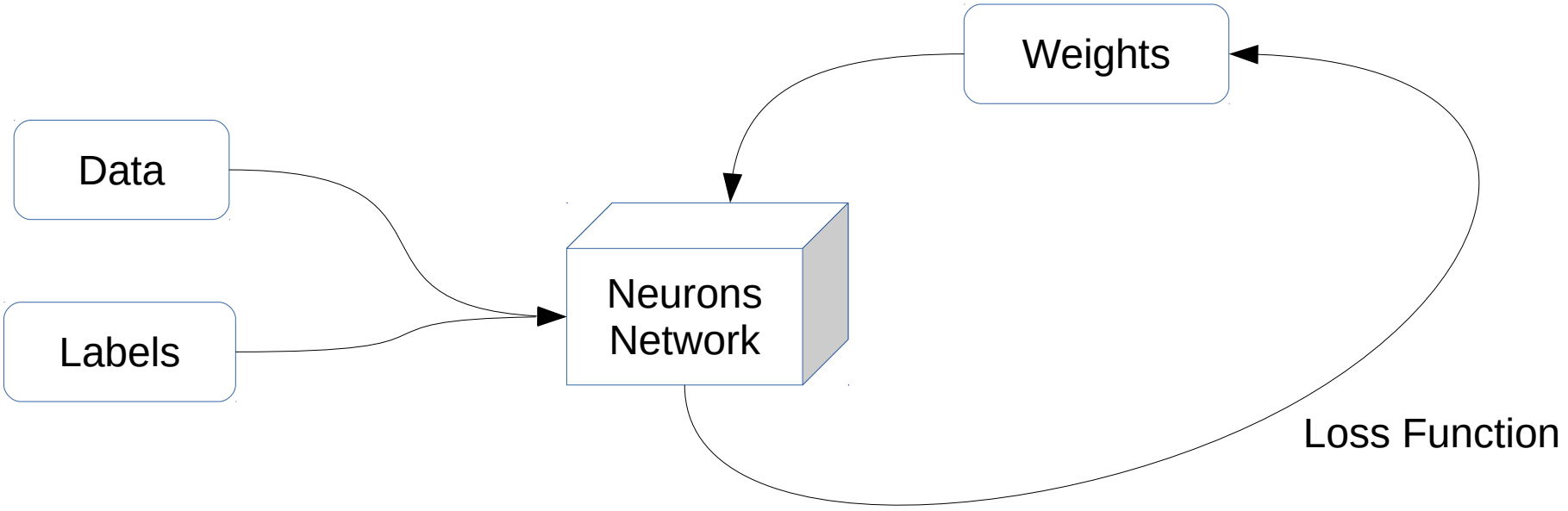
Industrial standards code design and written

Higly modular and quite extensible

OSM and MapBox ecosystem integration

PyTorch based

Licence MIT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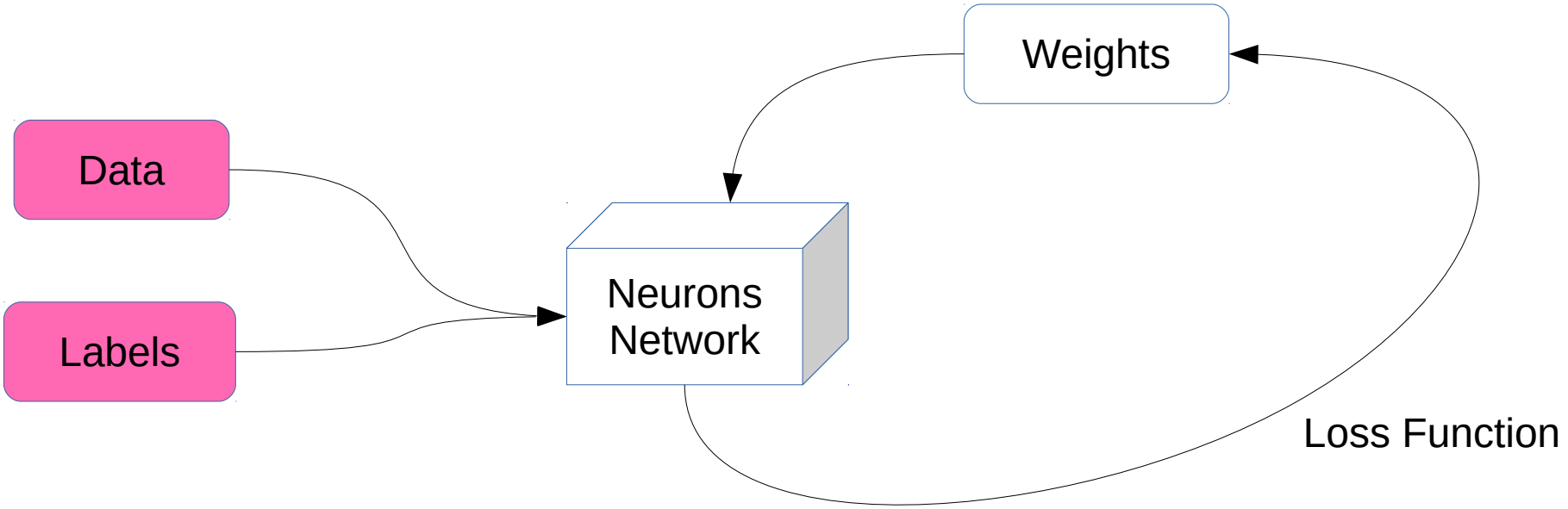
Loss Function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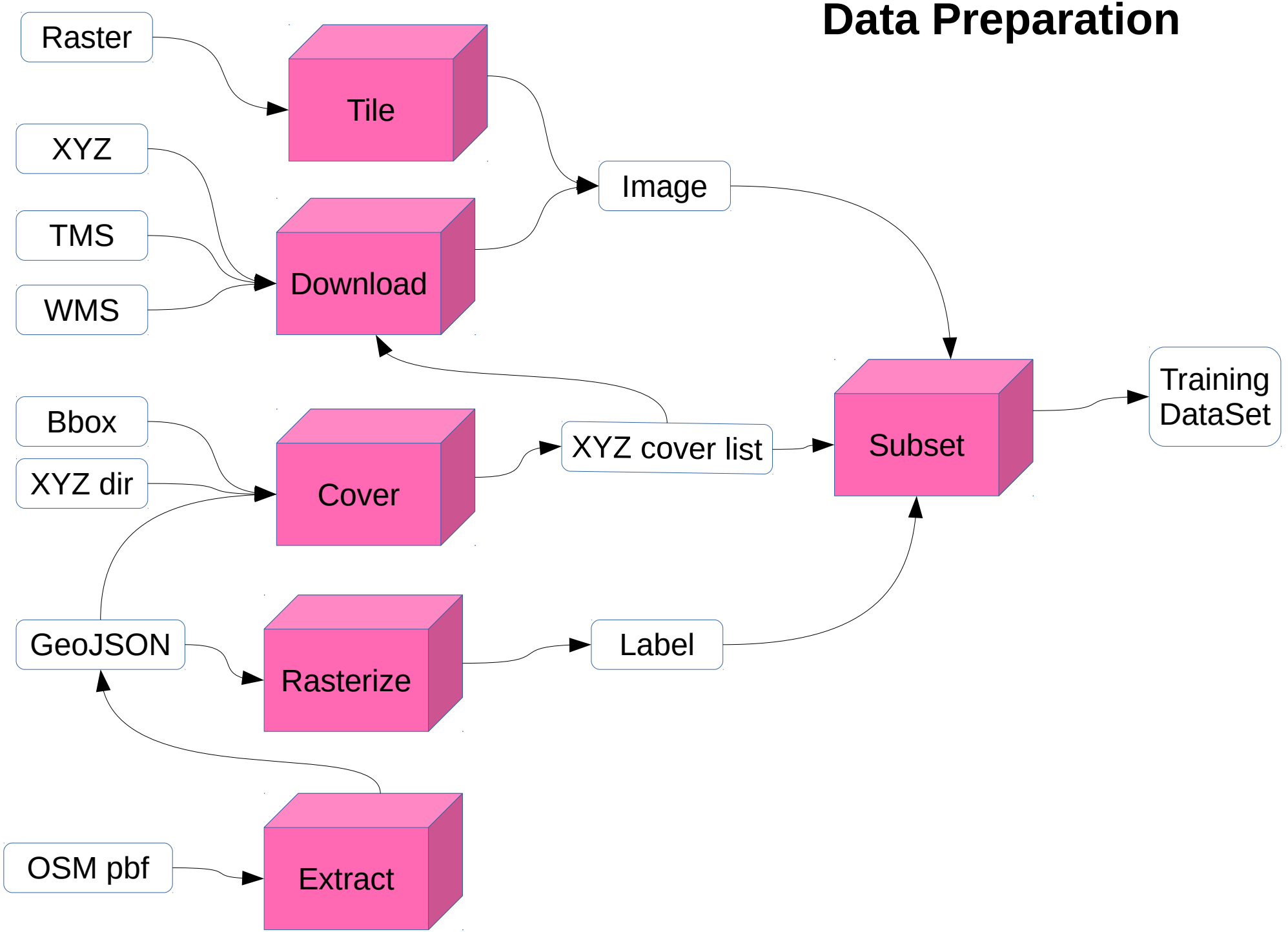
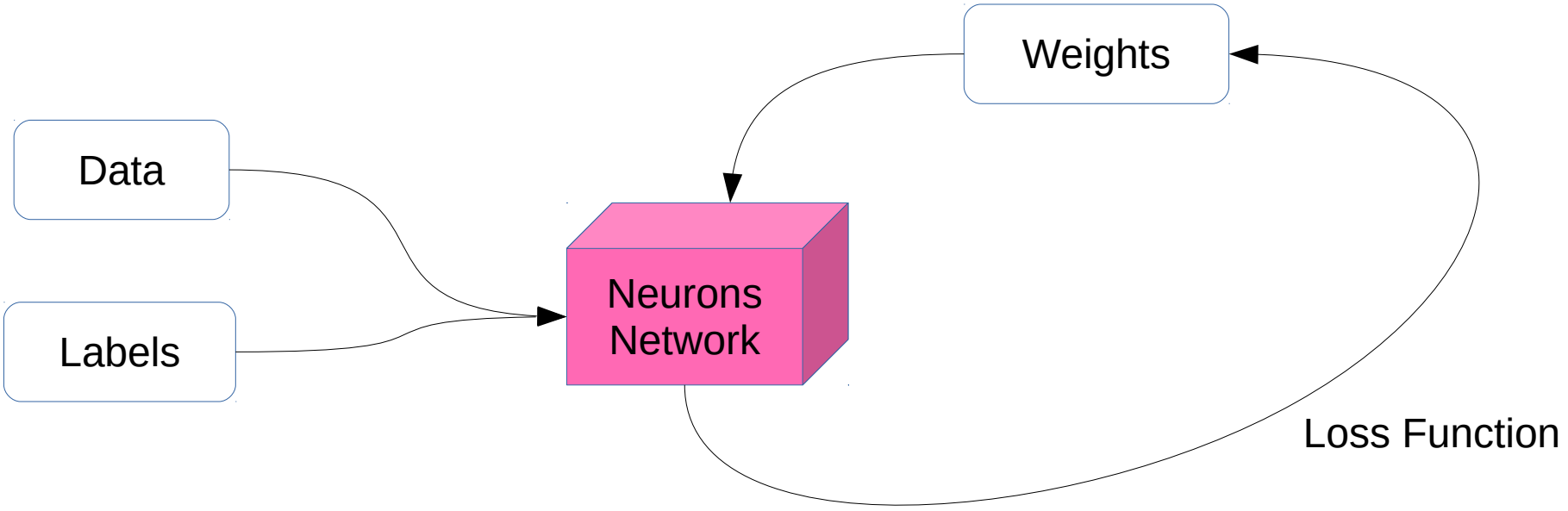
Data Preparation

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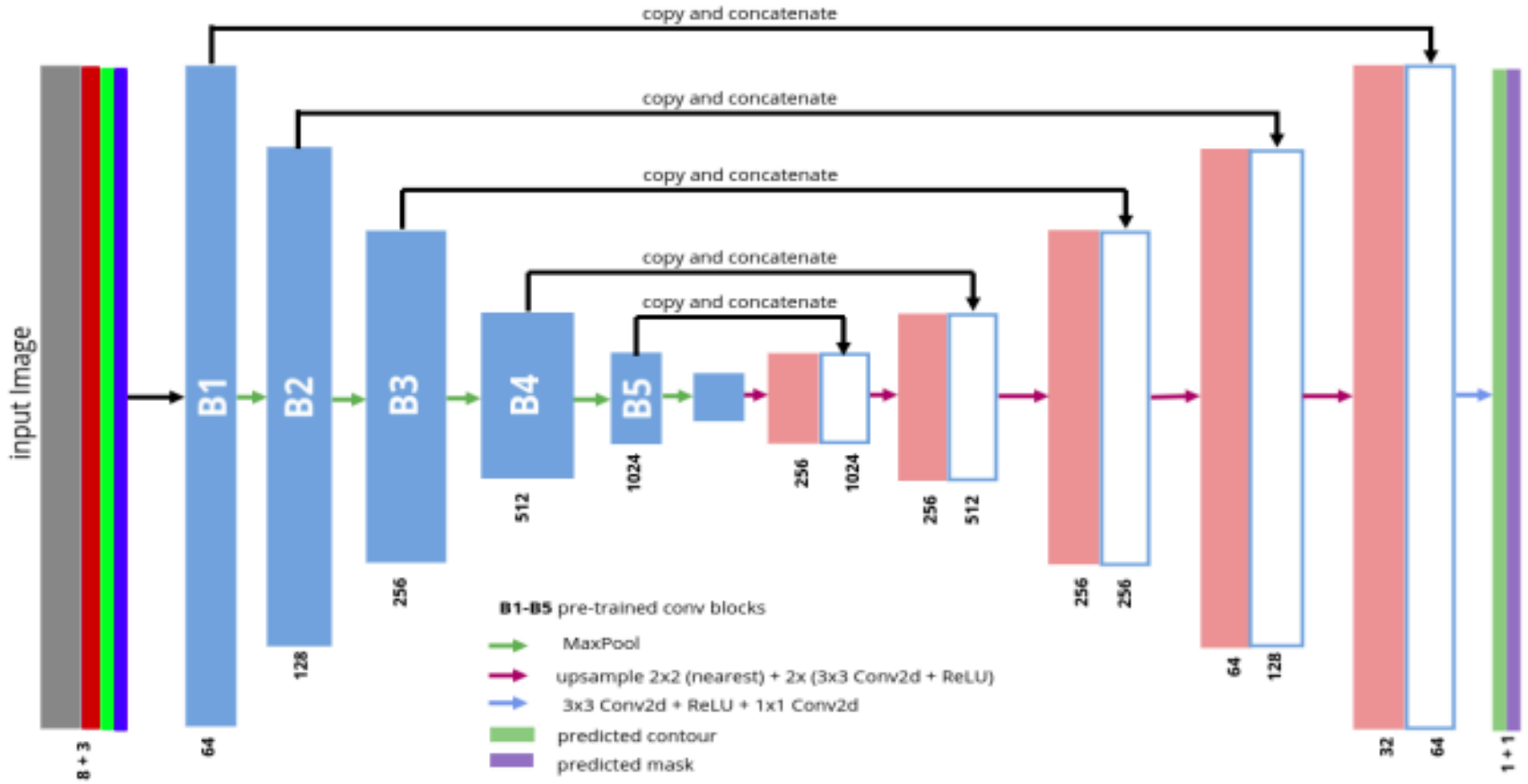
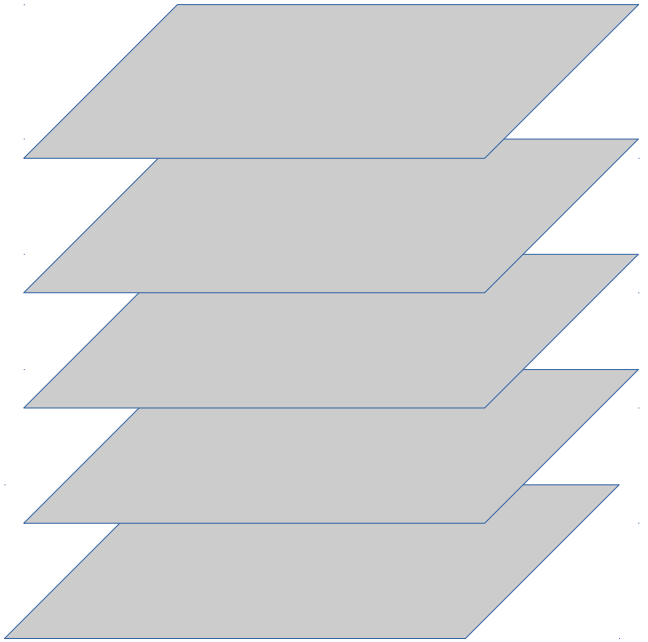


Figure 2. TernausNetV2: encoder-decoder network with skipped connections that has ABN WideResnet-38 as the encoder. As an input, we have RGB + extra channels image. B1-B5 are the first five convolutional blocks of the base network that was pre-trained on the ImageNet. At every step of the decoder block, we perform upsampling, followed by the series of the convolution layers. Skip connections are added between convolution blocks in the encoder and the decoder of the corresponding size. In the end, 1x1 convolution is added to reduce the number of channels to the desired two, one for the binary mask and another one for touching instances.

https://arxiv.org/pdf/1806.00844.pdf

MultiBands and Fusion

Multi spectral imagery
or any (related) vector rasterization



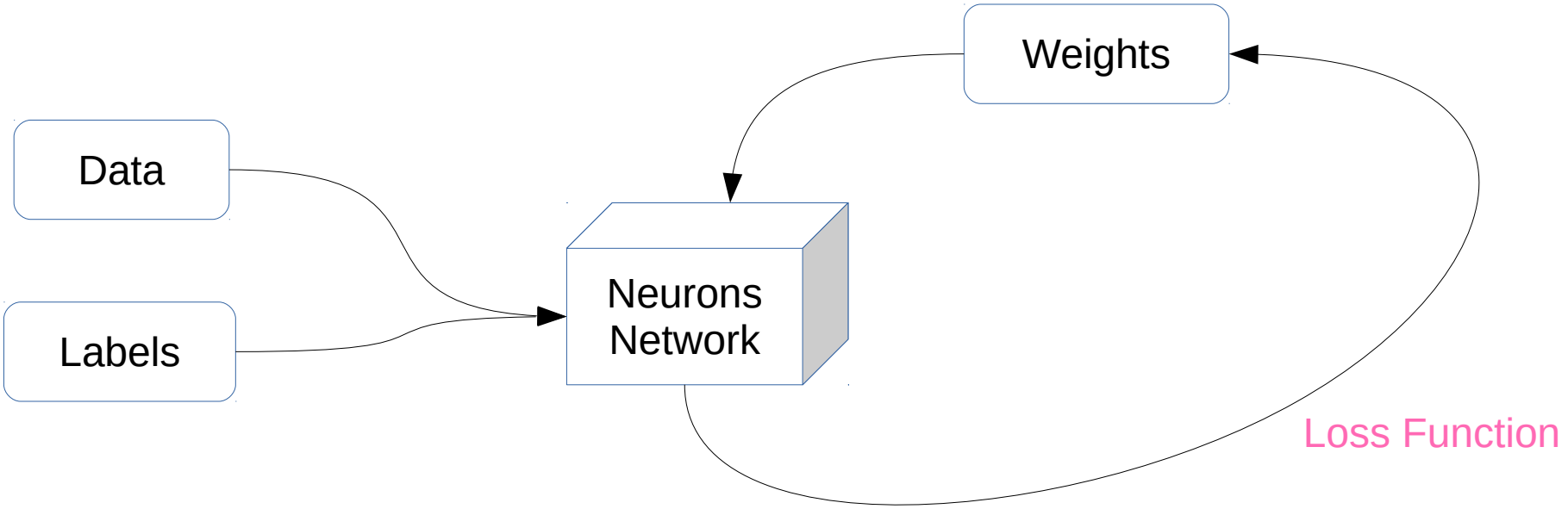

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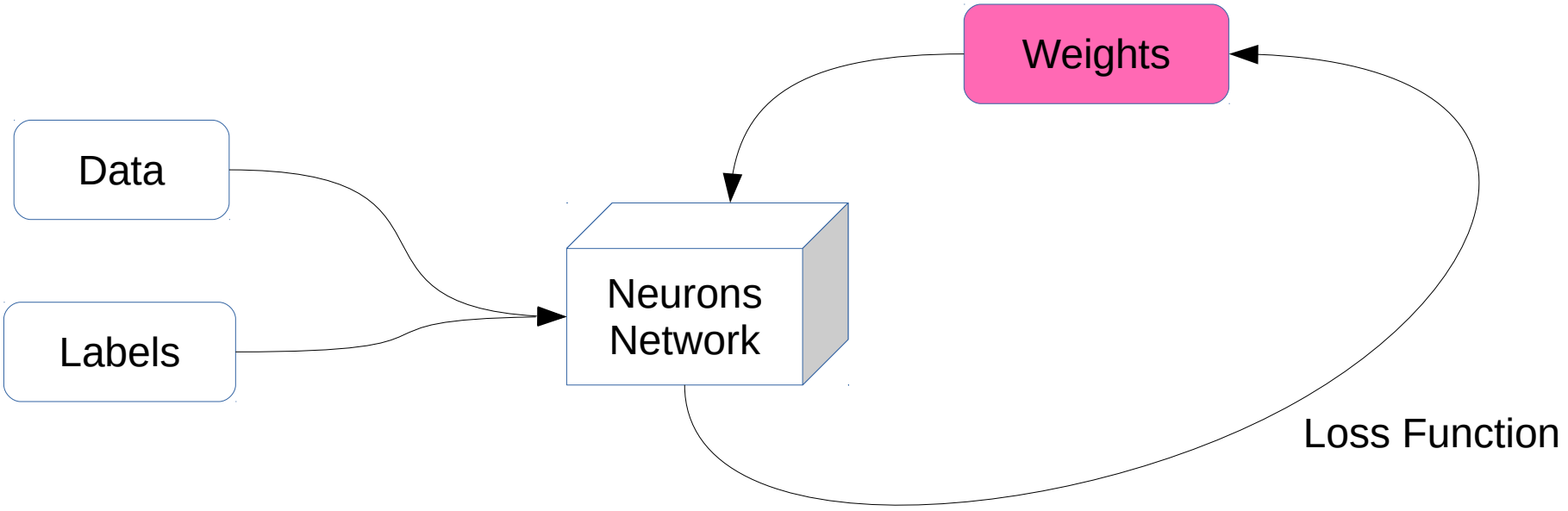
Image Label Cross Entropy mIoU Lovasz

http://www.cs.toronto.edu/~wenjie/papers/iccv17/mattyus_etal_iccv17.pdf
http://www.cs.umanitoba.ca/~ywang/papers/isvc16.pdf
https://arxiv.org/abs/1705.08790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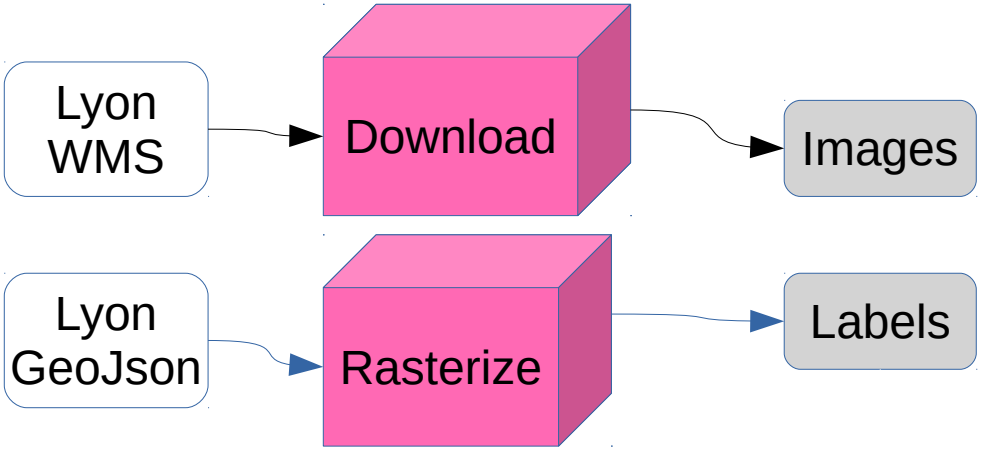
Weights

ImageNet pre-trained

Resume Training

Export ONNX

Grand Lyon OpenData use case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GeoJson
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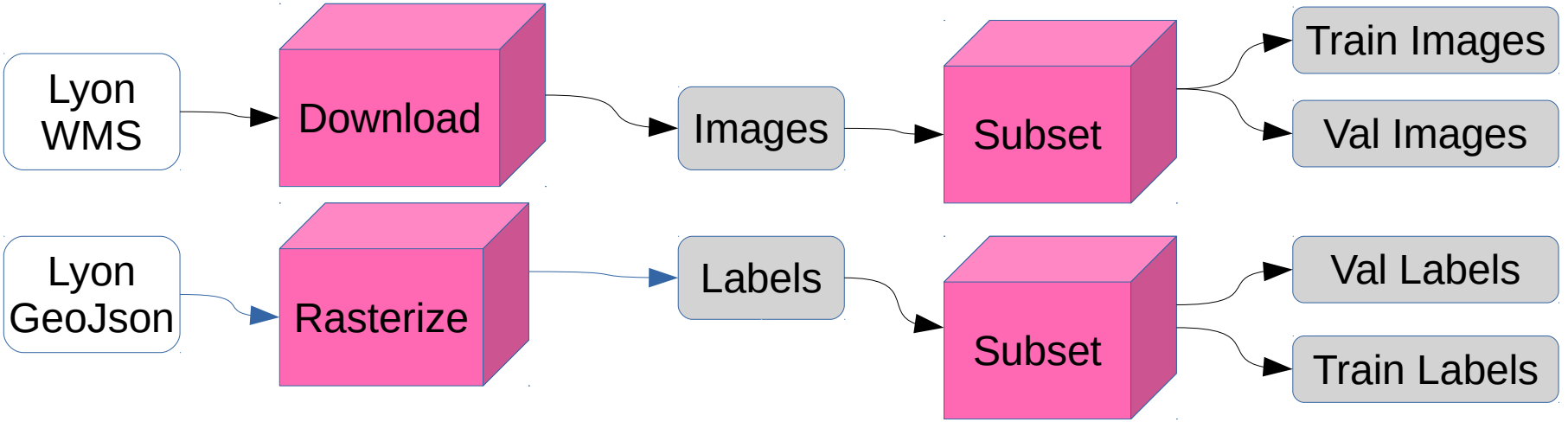
Labels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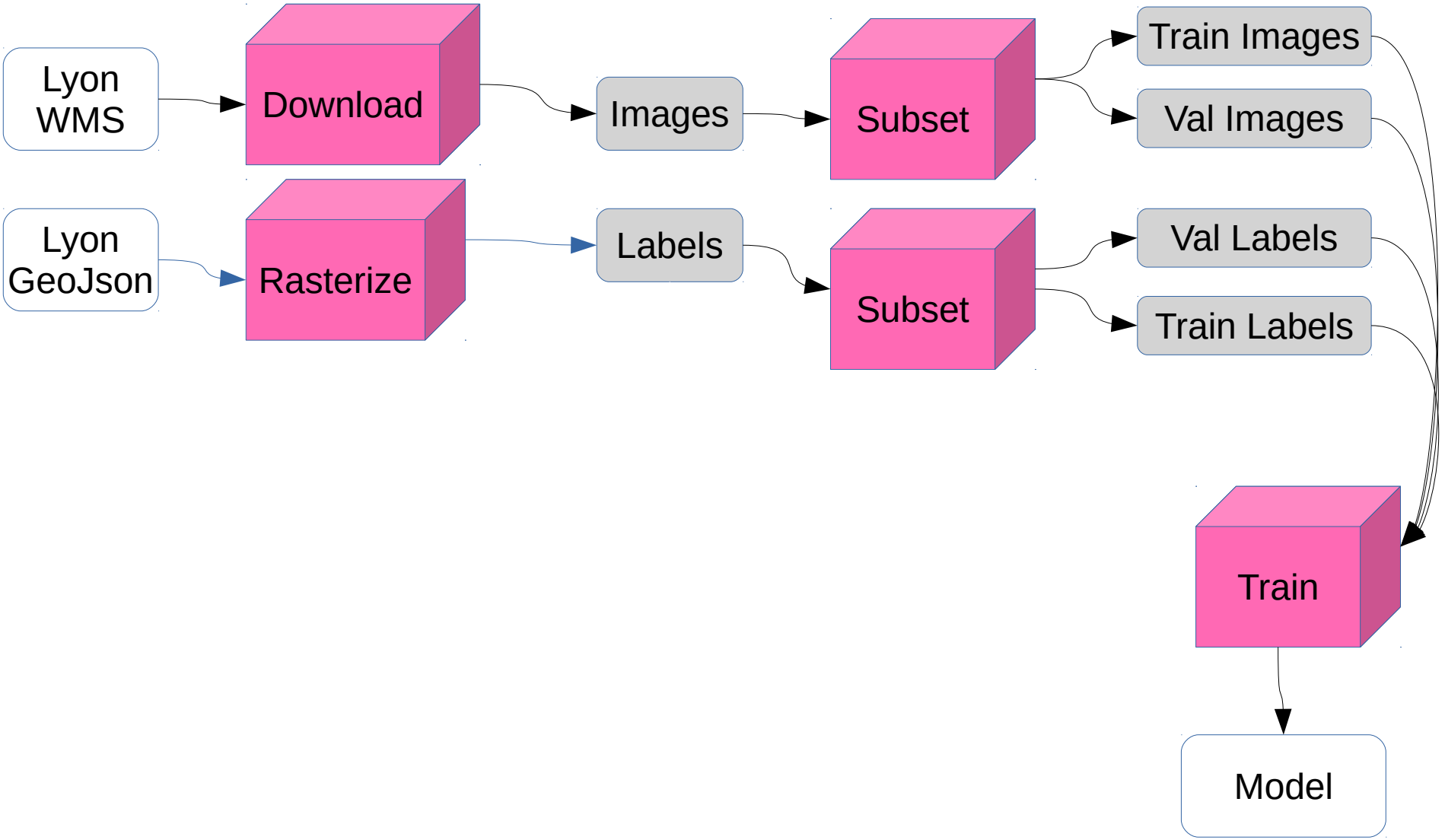
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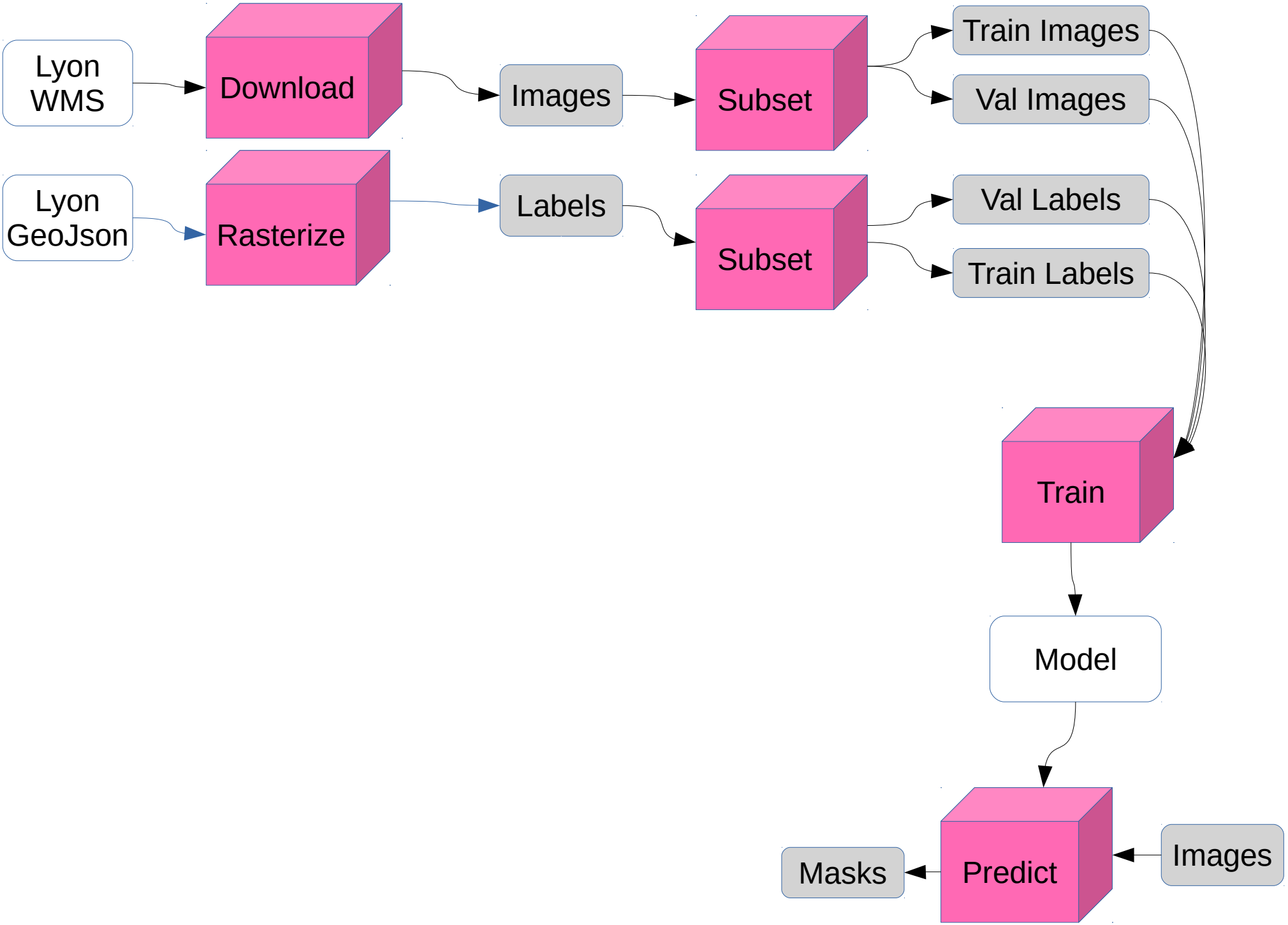
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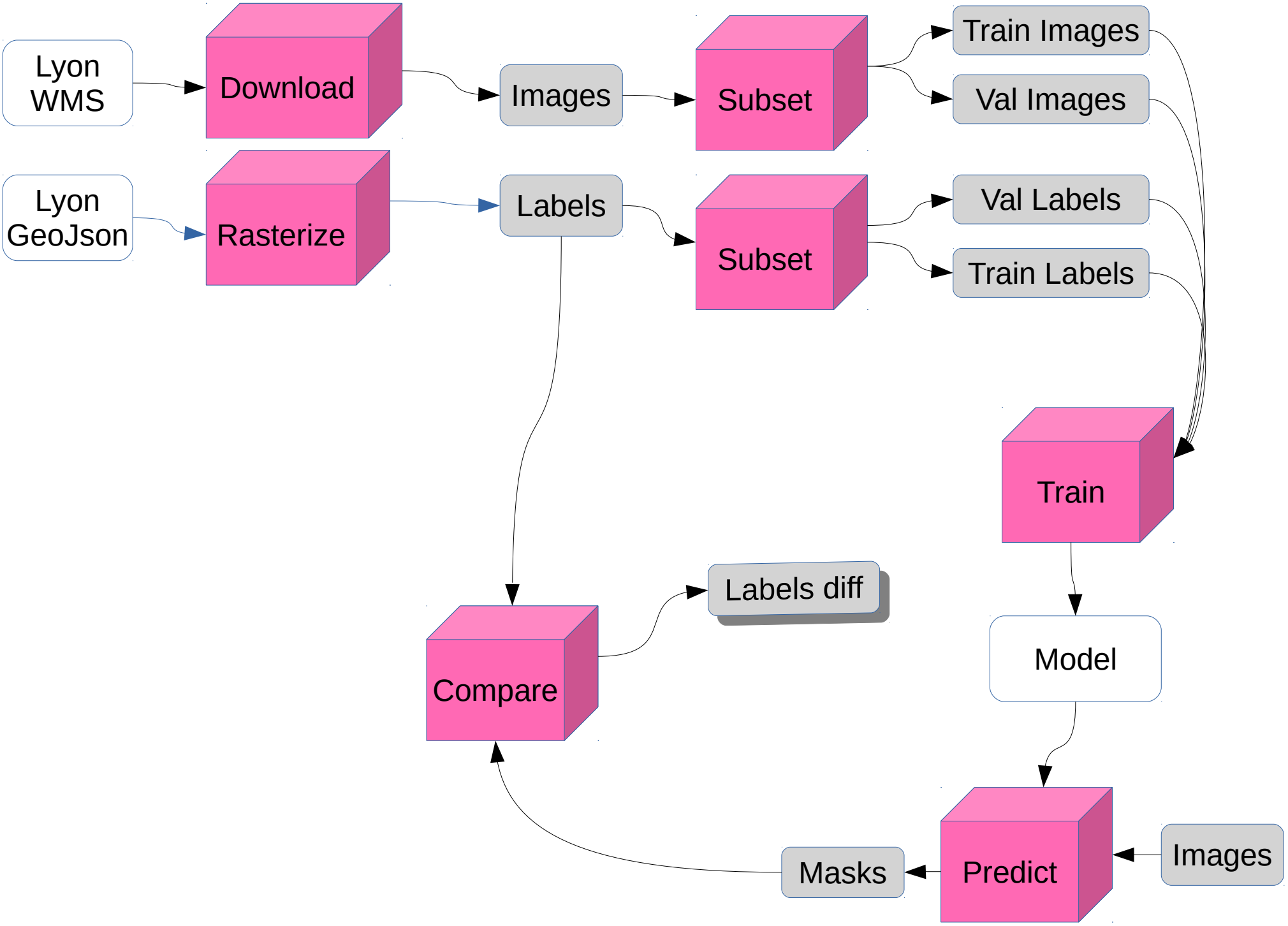
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Masks
Predict
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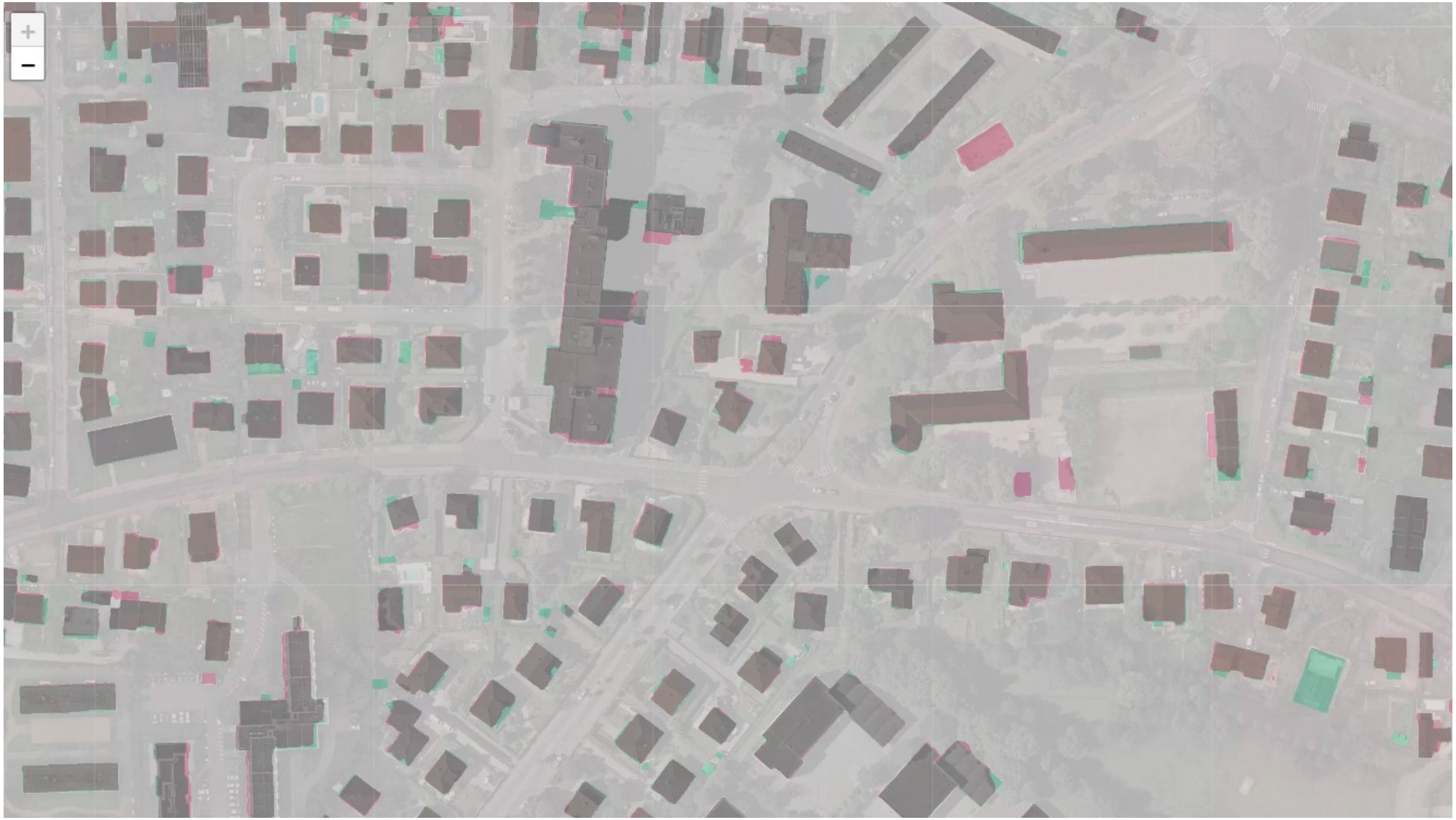

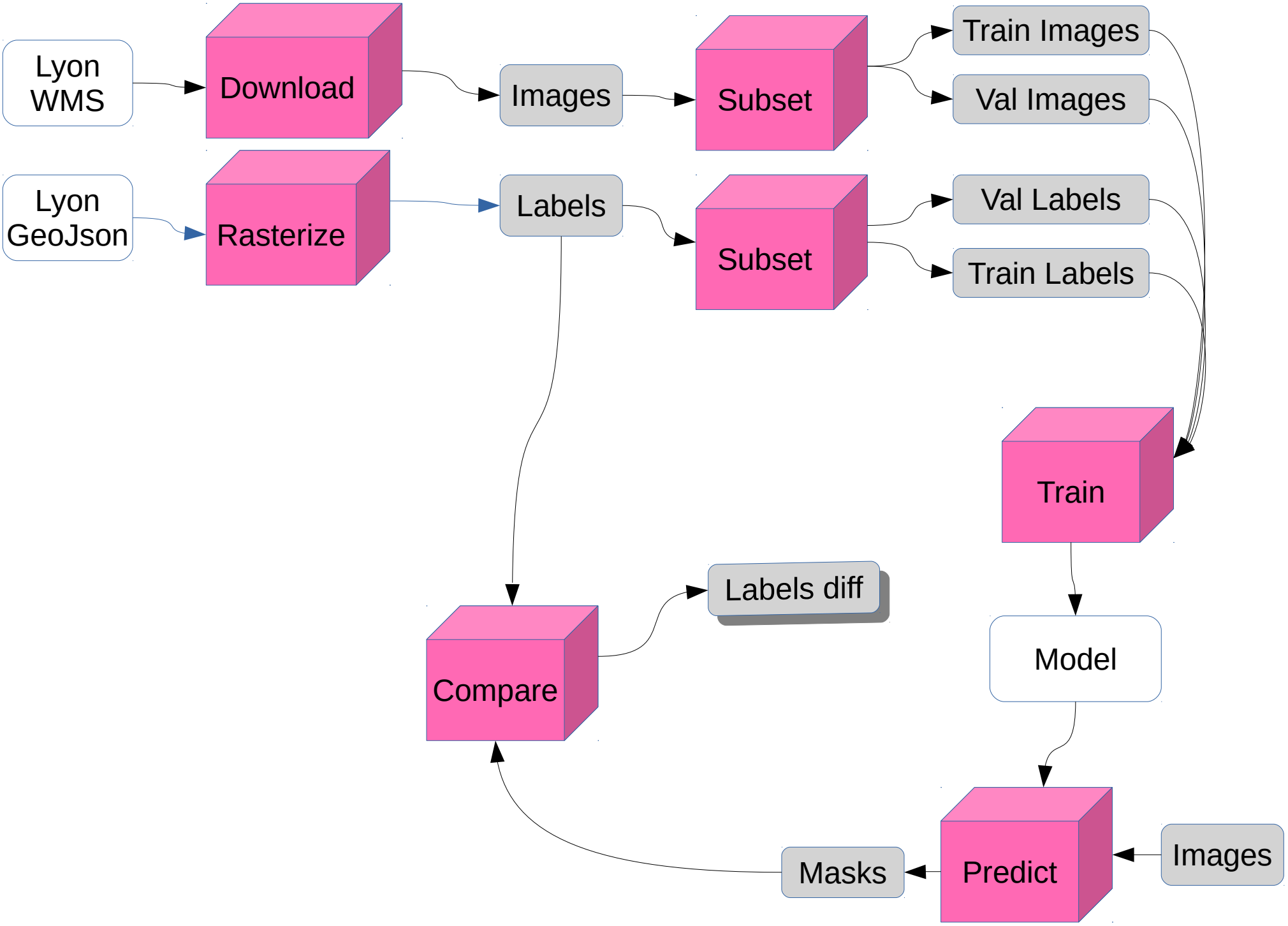
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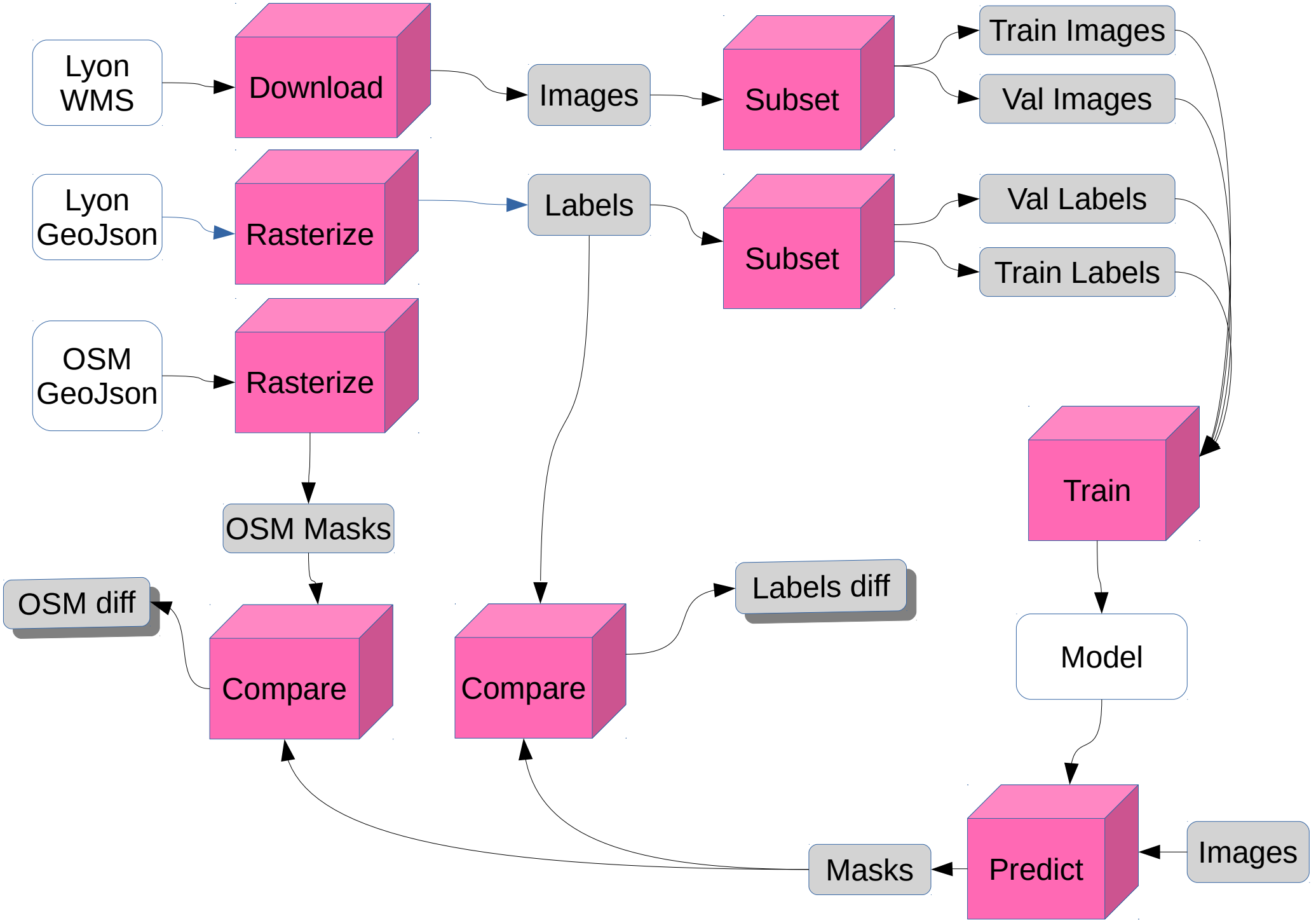
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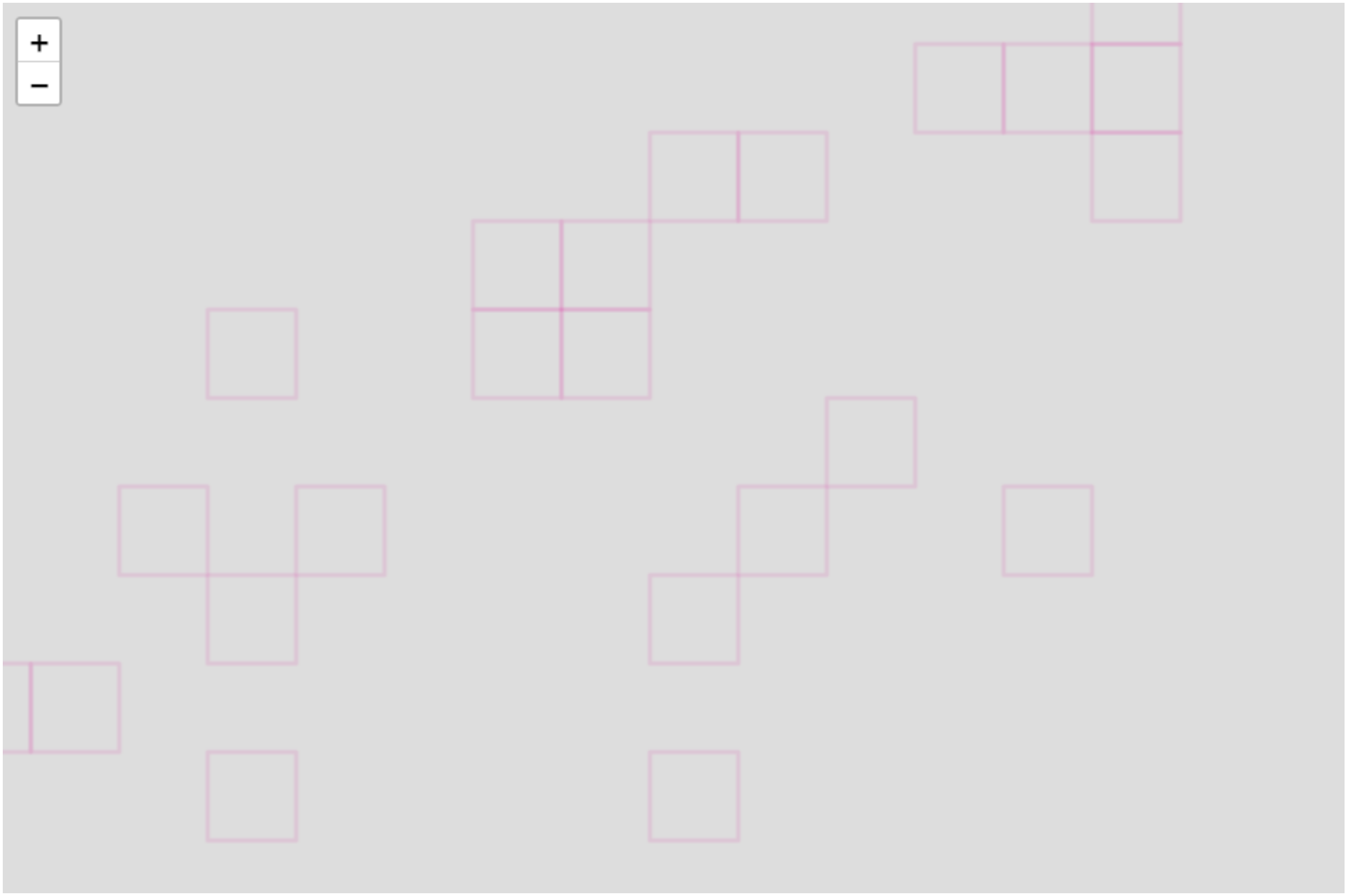
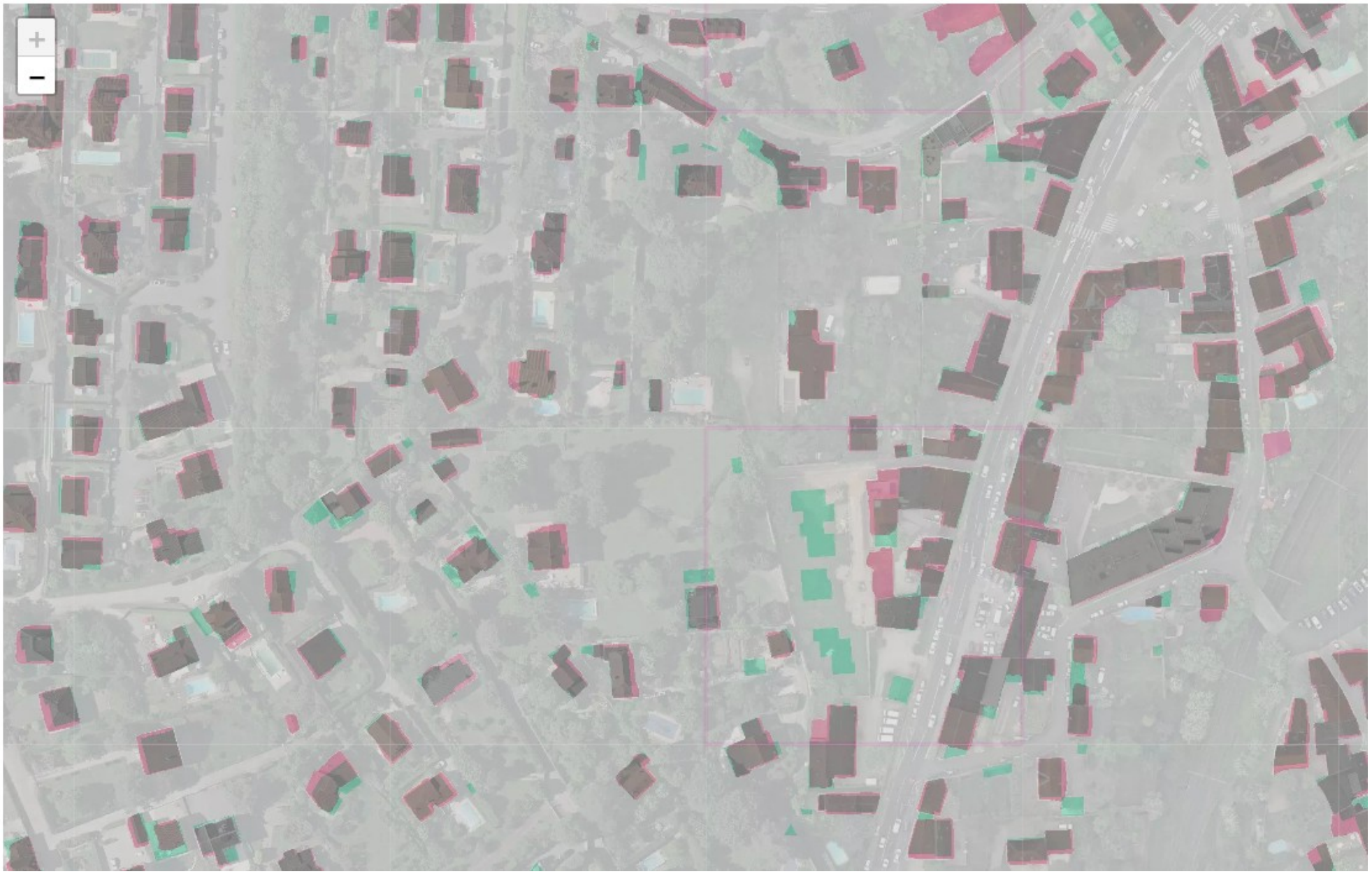
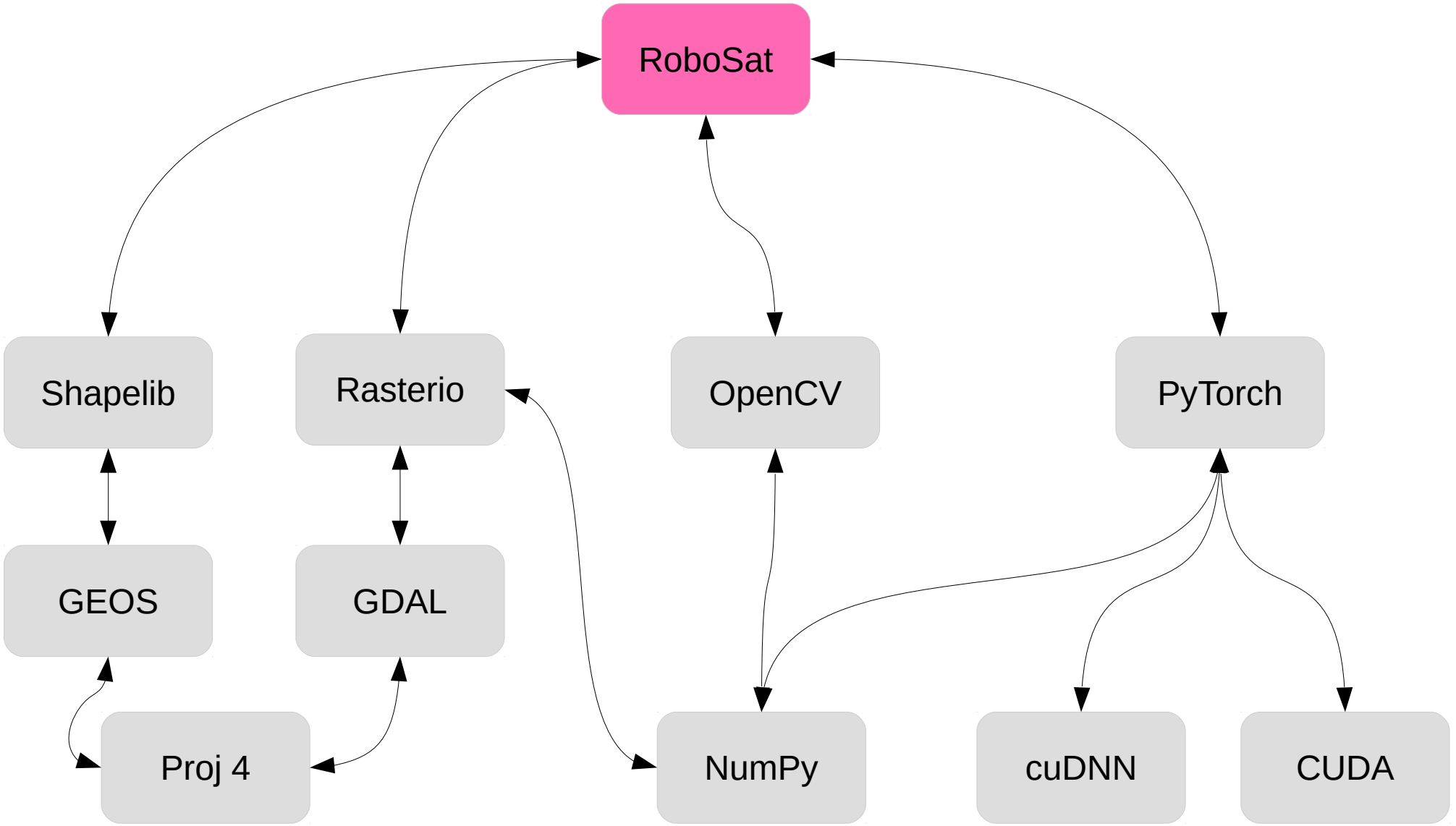




Stacks


RoboSat
Shapelib
Rasterio
OpenCV
PyTorch
GEOS
GDAL
Proj 4
NumPy
cuDNN
CUDA

RoboSat Timeline

August	v 1.0.0	Initial release	daniel-j-h	bkowshik
September	v 1.1.0	Increase Training perfs	Jesse-jApps	ocourtin
October	master	OSM Roads extraction	DragonEmperorG	
		mIoU and Lovasz losses	ocourtin	
November	PR 138	Multibands and tools stuff	ocourtin	

Code reviewer since ever : daniel-j-h :)

Next ?

#1 Predict performance improvment

#2 Lower resolution Imagery SemSeg: Sentinel-2 or PlanetLab

#3 Feature extraction

Next ?

#1 Predict performance improvment

- PyTorch 1.0 JIT
- CUDA 10 FP 16 models
- ONNX export to high performance env (Caffe2 / Microsoft ?)
- Lighter models

Next ?

#2 Lower resolution Imagery SemSeg: Sentinel-2 or PlanetLab

- Improve again Fusion and Topological Losses
- SuperPixel resolution

Next ?

#3 Feature extraction

- Generic feature post treatment. Explore GAN

Next ?

Predict performance improvment

Lower resolution Imagery SemSeg: Sentinel-2 or PlanetLab

Feature extraction

Take Away

Industrial state of art Aerial SemSeg available, and playful

Data are also available

Decent OpenDataSet is a bottle neck

Predict speed performances had to been improve to scale at large

@data_pink expertise, core dev and solutions :

Computer Vision

NLP

TimeSeries

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Computer Vision

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Coming conf, 05/12 @OSS_Paris : NLP State of Art

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