

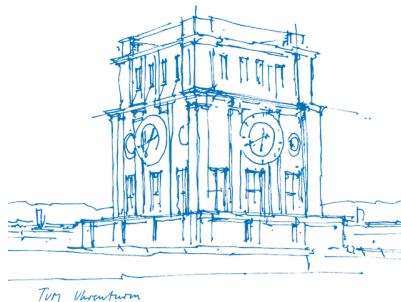
Convolutional LSTMs for Cloud-Robust Segmentation of Remote Sensing Imagery

NeurIPS 2018 Spatiotemporal Workshop

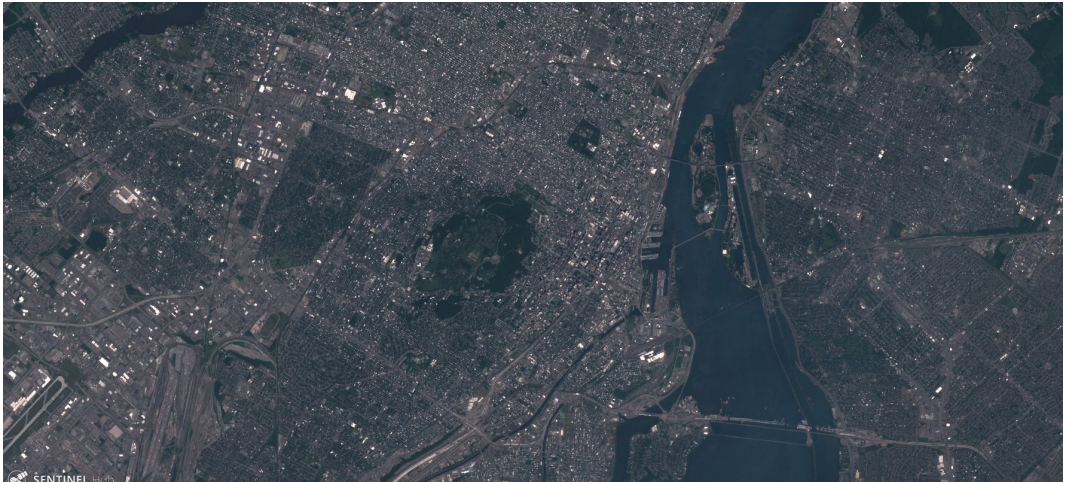
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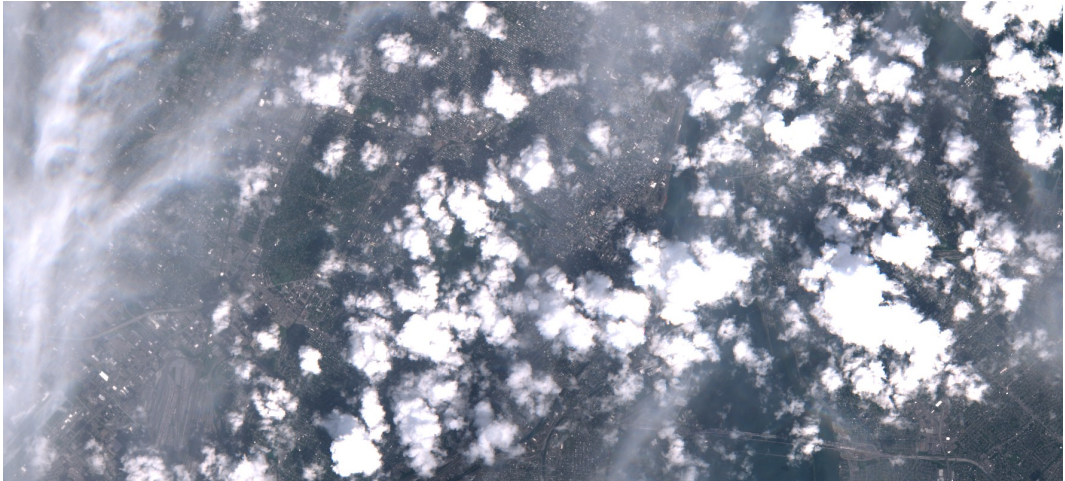
7th December 2018



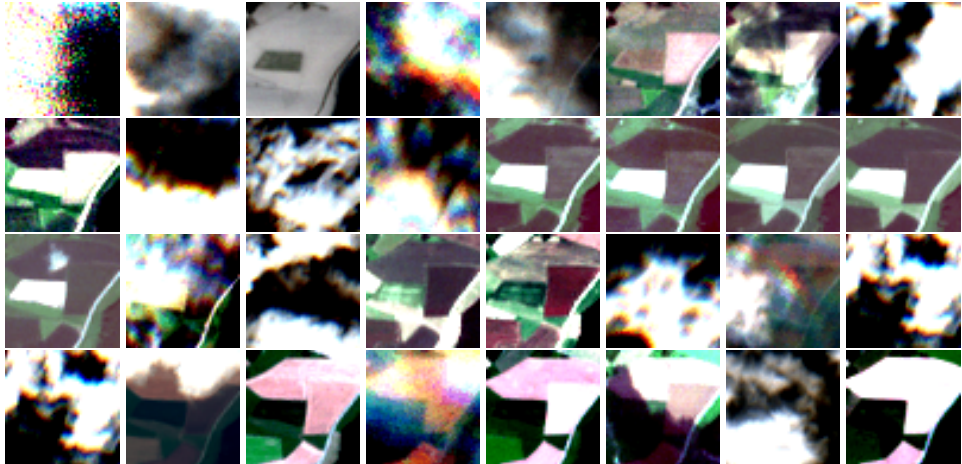
When we think of satellite images we picture this



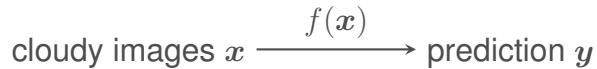
Cloud coverage is very common



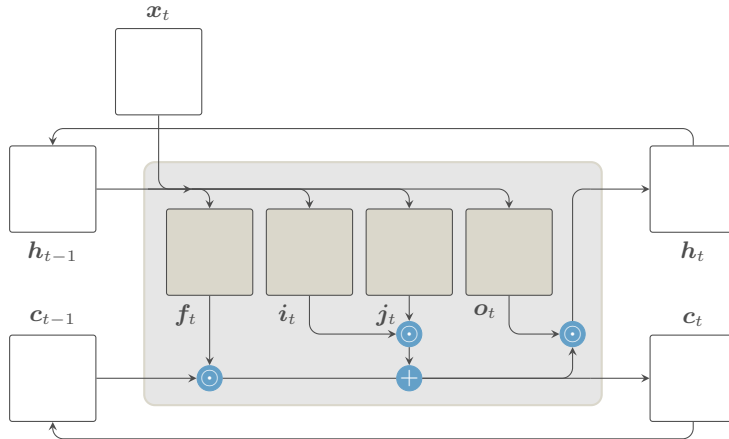
Cloud coverage as spatiotemporal noise



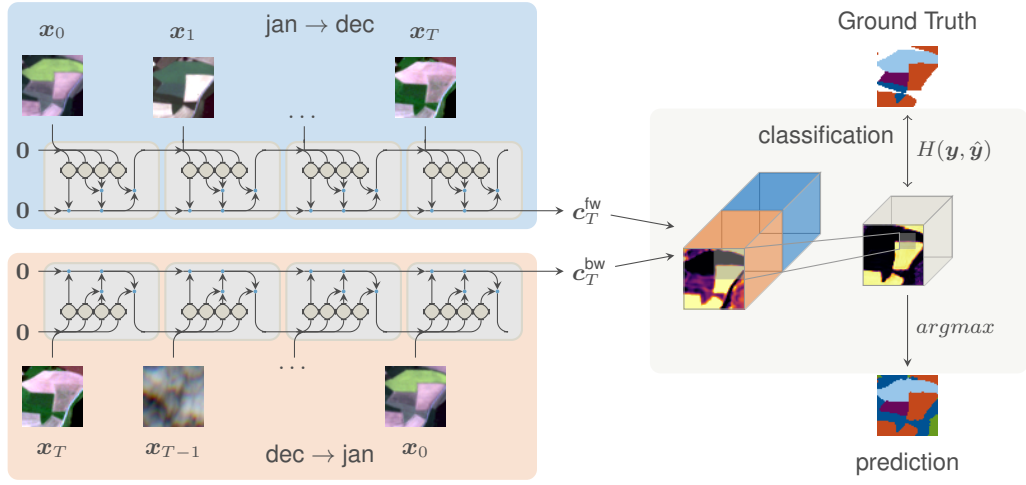
End-to-end trainable model for robust classification



Extracting features from noisy data with ConvRNNs



Employ ConvRNNs for Vegetation Land Cover Classification directly



t

It worked very well

Approach	Preprocessing	Accuracy	# Classes
Rußwurm & Körner (2018)	none	90	17
Rußwurm & Körner (2017)	atmospheric correction	74	18
Siachalou et al. (2015)	geometric correction, image registration	90	6
Hao et al. (2015)	image reprojection, atmospheric correction	89	6
Conrad et al. (2014)	segmentation, atmospheric correction	86	9
Förster et al. (2012)	phen. normalization, atmospheric correction	73	11
Barragan et al. (2011)	segmentation, atmospheric correction	79	13
Conrad et al. (2010)	segmentation, atmospheric correction	80	6

How did the ConvLSTM handle the clouds?

Experiments

1. Visualization of hidden states

we found specific states dedicated for cloud masking.

2. Ablation experiment on different cloud coverages

similar accuracies on different degrees of cloud coverage.

Takeaways & Poster

1. **ConvRNNs were very robust when considering noisy data**
2. **Would love to hear other's experiences on this**

Publications and Code

Github + DockerHub



<https://github.com/TUM-LMF/MTLCC>
<https://github.com/TUM-LMF/MTLCC-pytorch>

*Rußwurm M., Körner M. (2018). **Multi-Temporal Land Cover Classification with Sequential Recurrent Encoders**. ISPRS International Journal of Geo-Information. <https://arxiv.org/abs/1802.02080>.*