

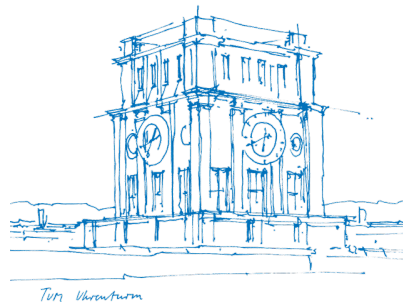
# Convolutional LSTMs for Cloud-Robust Segmentation of Remote Sensing Imagery

NeurIPS 2018 Spatiotemporal Workshop

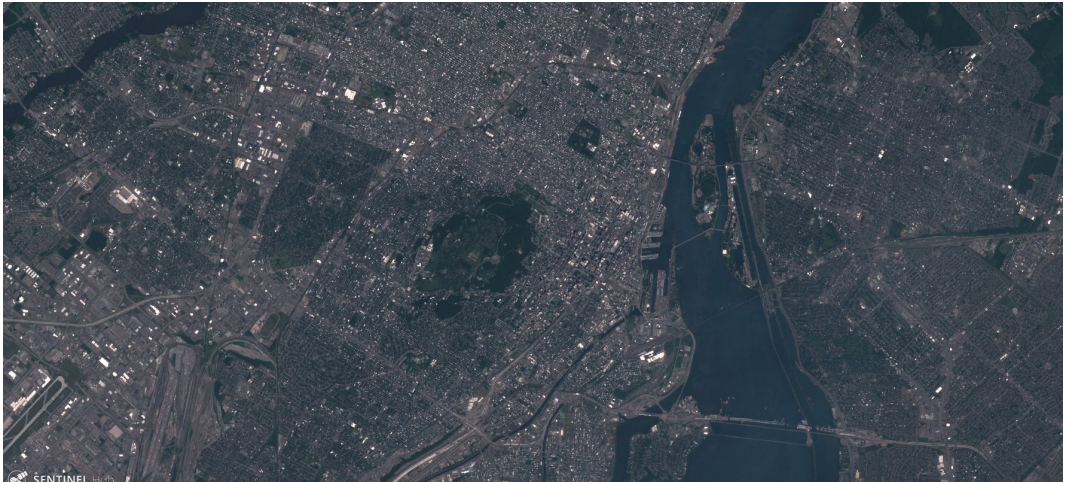
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[www.lmf.bgu.tum.de/vision](http://www.lmf.bgu.tum.de/vision)

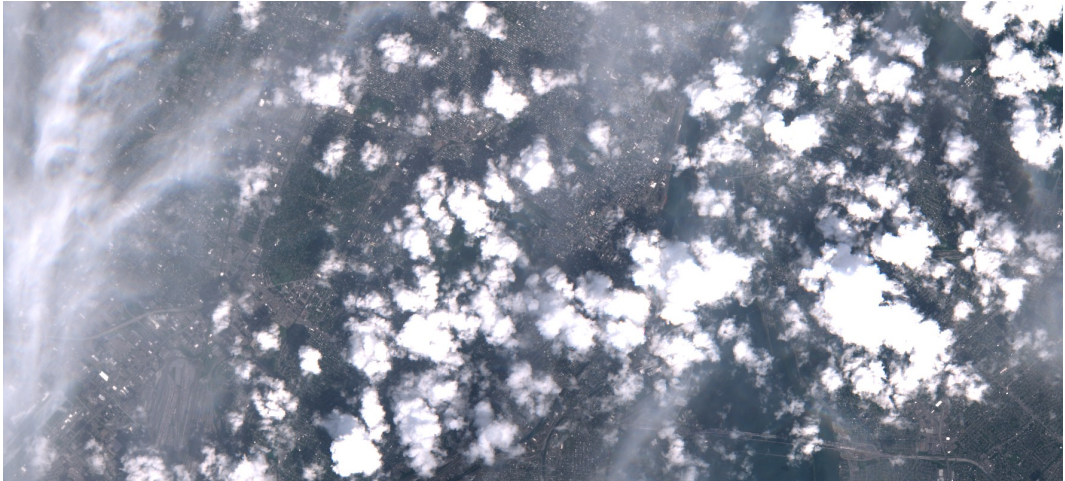
7th December 2018



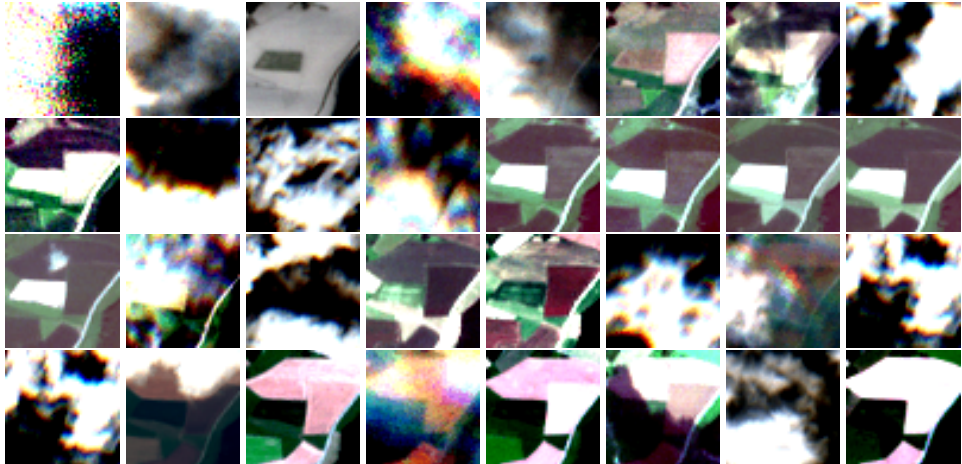
When we think of satellite images we picture this



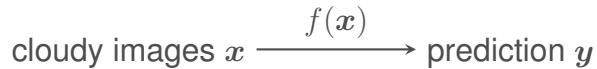
Cloud coverage is very common



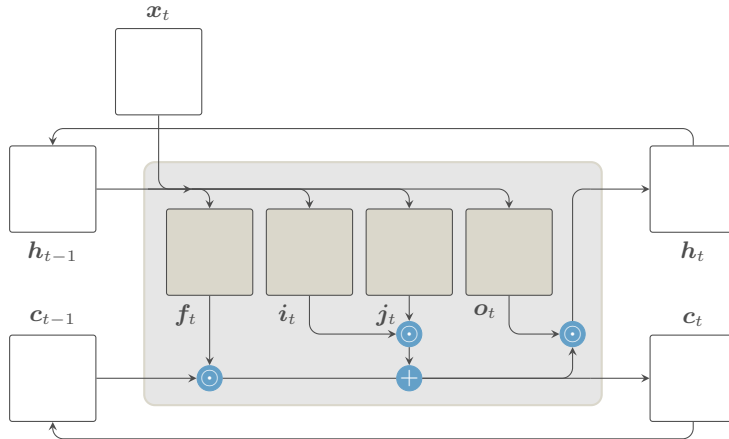
## Cloud coverage as spatiotemporal noise



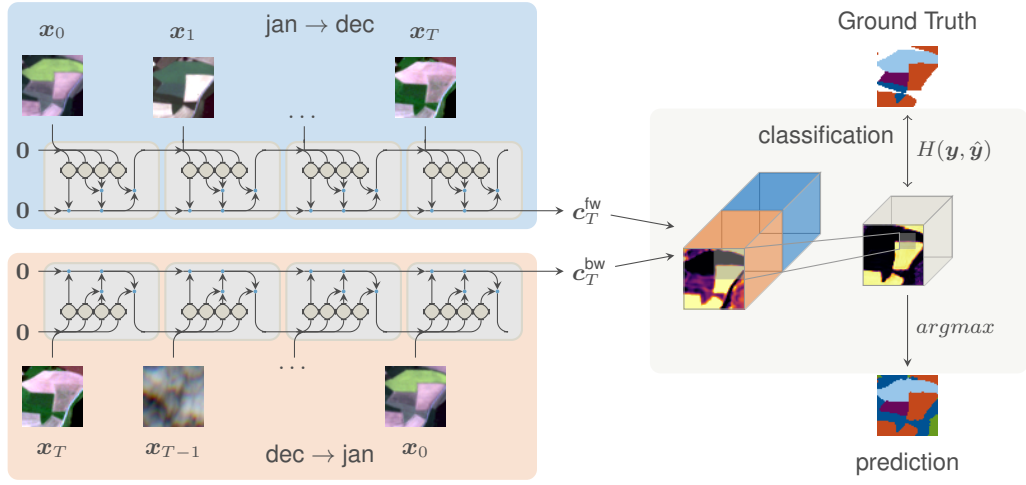
## End-to-end trainable model for robust classification



## Extracting features from noisy data with ConvRNNs



# Employ ConvRNNs for Vegetation Land Cover Classification directly



t

## It worked very well

Approach	Preprocessing	Accuracy	# Classes
<b>Rußwurm &amp; Körner (2018)</b>	<b>none</b>	<b>90</b>	17
Rußwurm & Körner (2017)	atmospheric correction	74	<b>18</b>
Siachalou et al. (2015)	geometric correction, image registration	<b>90</b>	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>.*