High-resolution satellite imagery to train and validate deep learning models for mapping flood extent

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Satellite imaging reveals increased proportion of population exposed to floods (Tellman et al., 2021)

Satellite Imagery from Skysat showing scenes before and after flooding

Currently, we collect high resolution satellite images of our planet daily.

The vast amount of data has allowed the use of machine learning models for information extraction, such as flood extent.

However, we have not yet created a quality benchmark dataset through which we can train and validate deep learning models.

Research Goals

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1

Create a global, hand-labeled, flood dataset from high-quality commercial satellite imagery.

2

Add publicly available multi-sensor satellite data corresponding to each labeled data.

3

Evaluate the advantage of training deep learning models on commercial high-resolution satellite imagery from Planet (over imagery from publicly available sensors).

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How will we create this global flood dataset?

Organization	Name	Number of Flood Events	Spatial coverage	Sensors used for labeling	How will our dataset improve on this?
Cloud to Street *(Bonafilia et al. 2020)*	Sen1Floods11	11	120,406 km^2	Sentinel-2 and Sentinel-1	Our dataset will have a higher spatial resolution.
Maxar *(Gupta et al. 2019)*	xBD	4	~10,000 km^2	Maxar	Our dataset will have cover greater number of flood events.
NASA IMPACT	Deep learning flood data	5	36,625 km^2	Sentinel-1	Better spatial resolution.
This proposal	**FloodPlanet**	25	355,406 km^2	Hand labeled flooded images from **Planetscope** (commercial), **HLS** (publicly available)	

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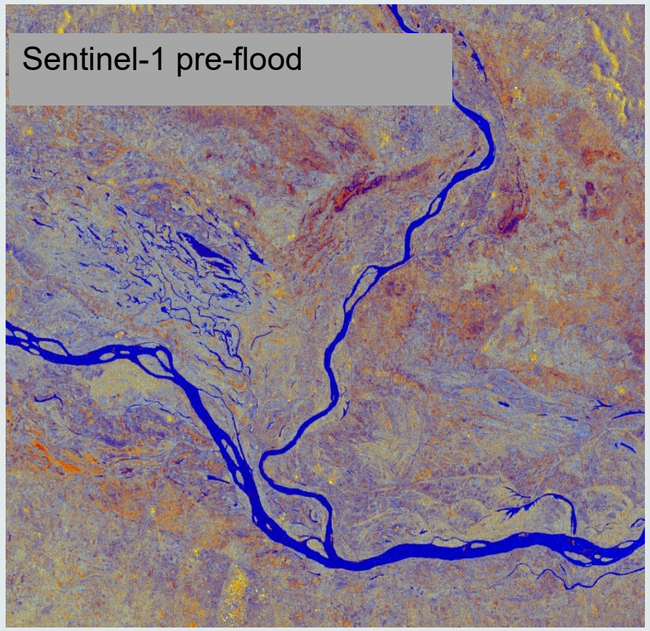
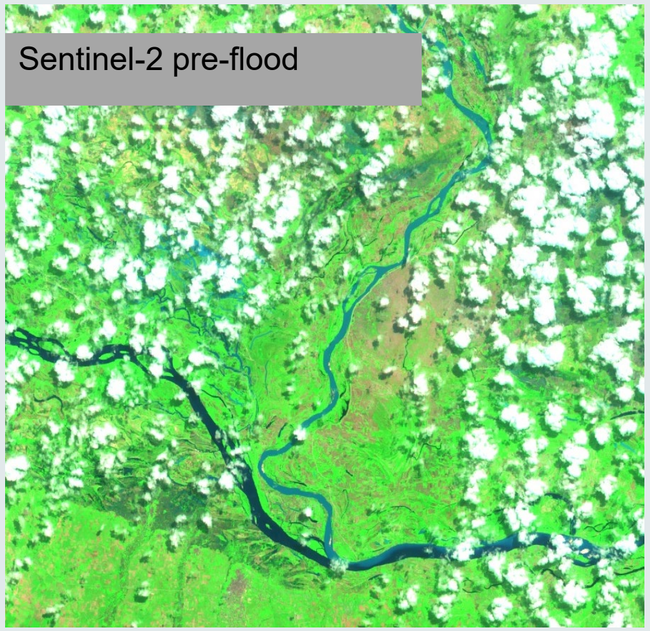
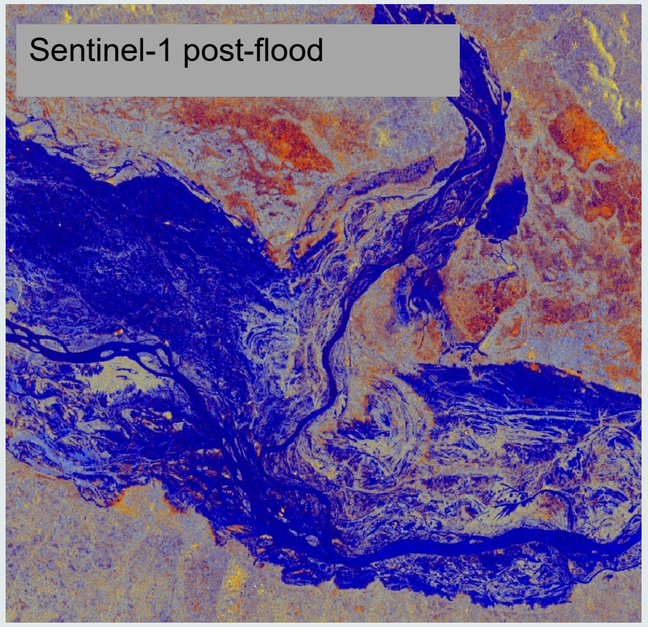
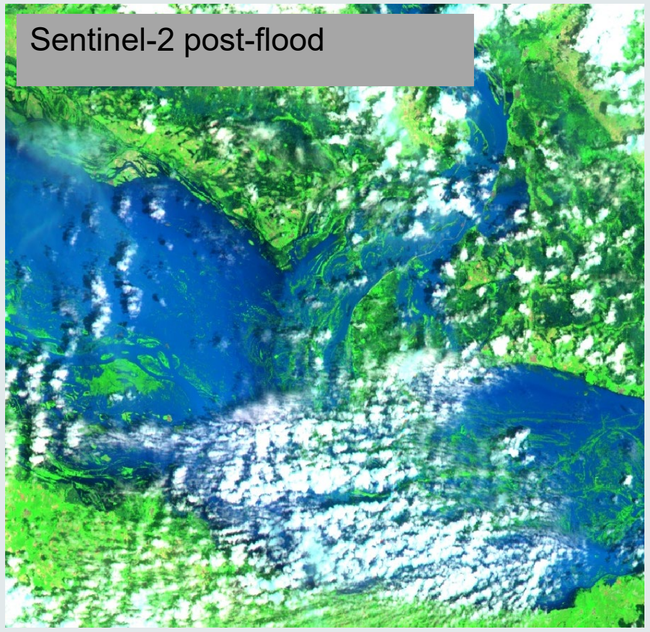


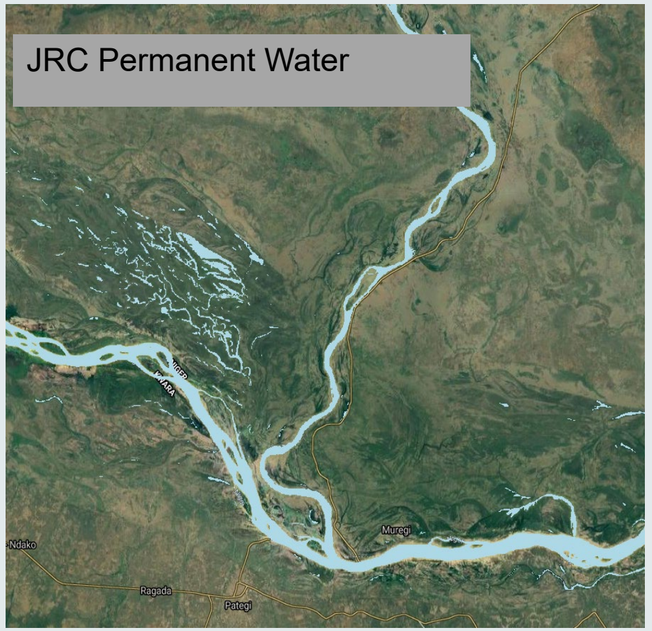


Sen1Floods11

Bonafilia et al. (2020)







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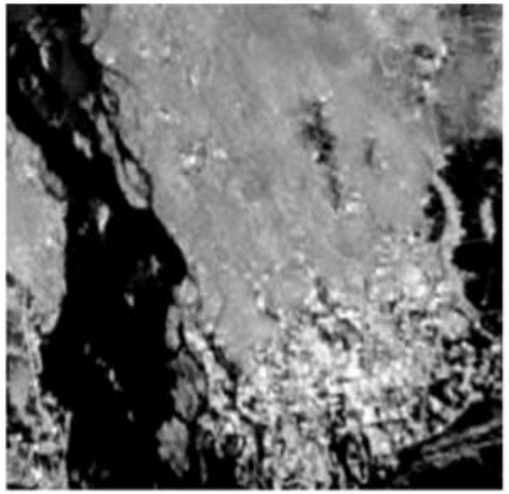			
(a) Sentinel-1 image (Grayscale: VV)	(b) Sentinel-1 image (Grayscale: VH)	(c) Reference flood data (Grayscale)	(d) Reference water body data (Grayscale)

NASA's IMPACT Sentinel-1 Flood Dataset

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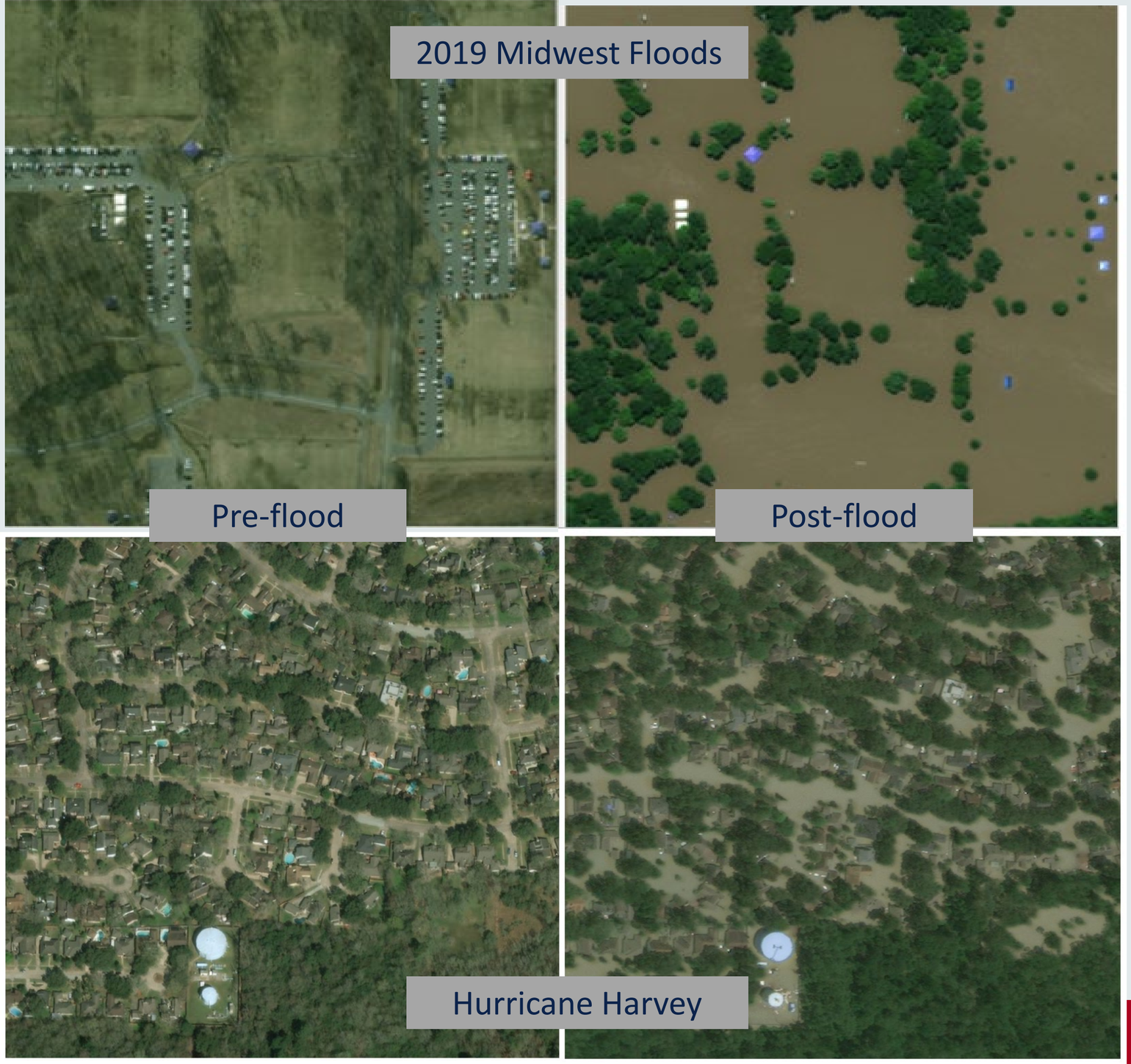

xBD: A Dataset for Assessing Building Damage from Satellite Imagery

Gupta et al. (2019)

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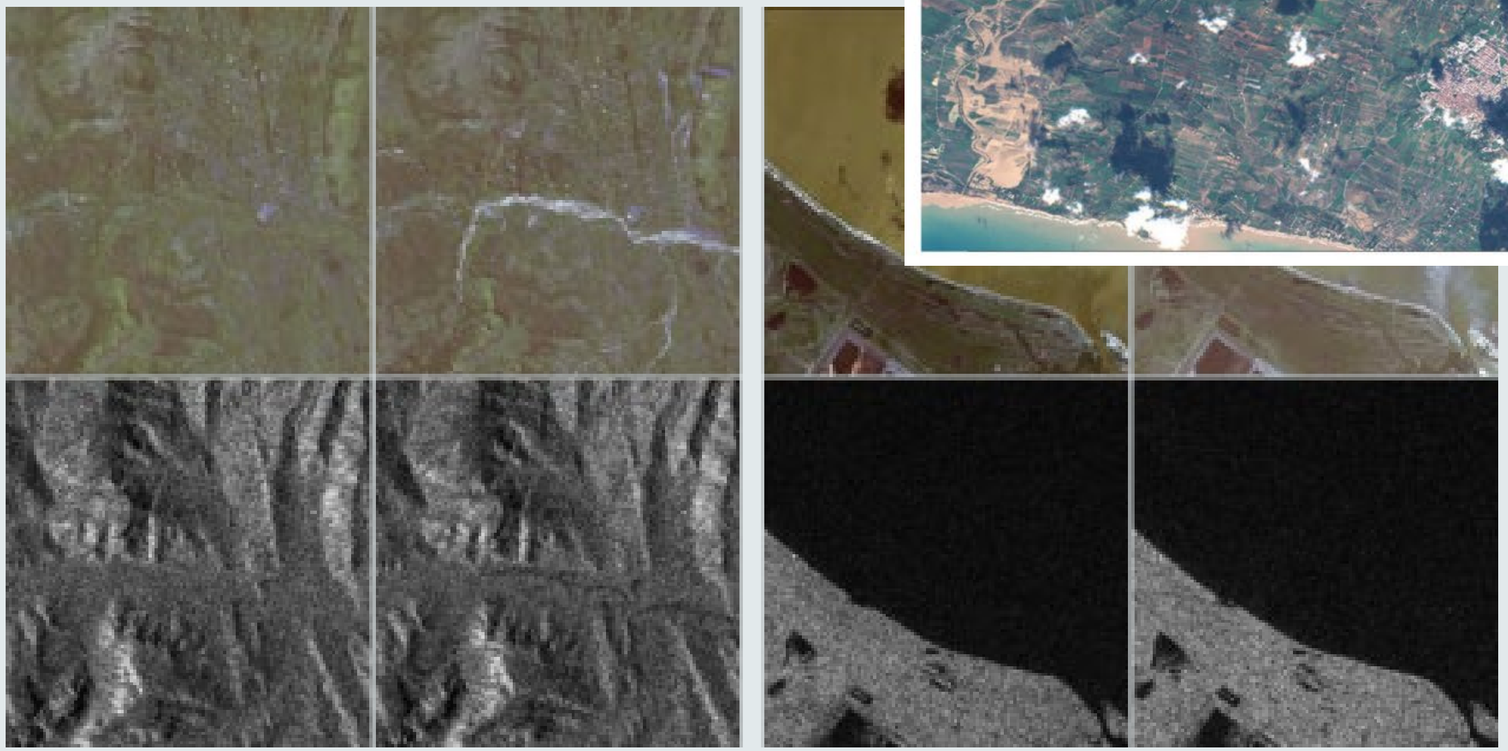
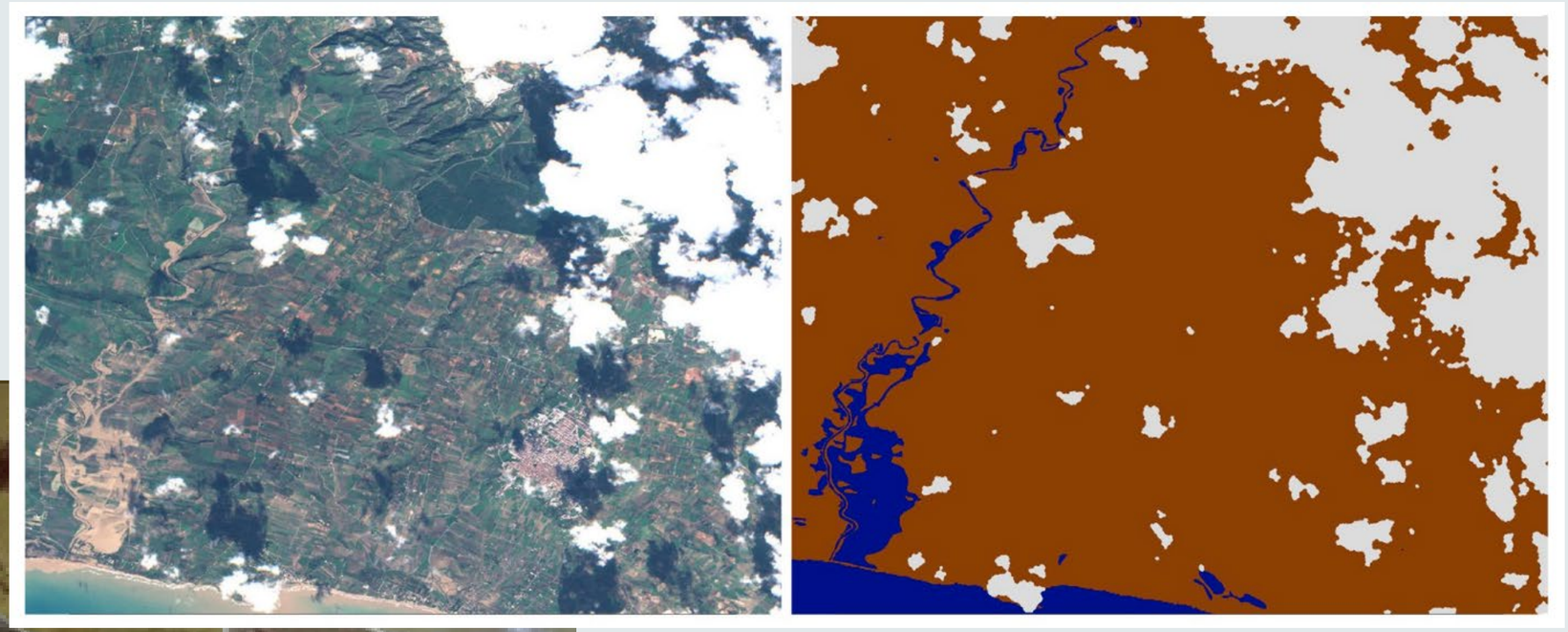
Additional Flood Datasets

SEN12-FLOOD : A SAR and Multispectral dataset for flood detection *(Rambour et al. 2020)*





WORLDFLOODS
(Mateo-Garcia et al., 2021)

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We expect our satellite image-based hand labeled flood dataset to help evaluate the generalizability of deep learning models for global flood detection.

Secondly, our high-quality dataset will be ideal for developing more accurate flood models based on deep learning.

Most importantly, we expect that the subsequent improvements in flood modelling will lead to more accurate flood extent predictions through satellite imagery.

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Thank you!

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