

Leveraging machine learning for identify hydrological extreme events under global climate change



NeurIPS 2021: Tackling Climate Change with Machine Learning

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Introduction

Under future climate projection scenarios, the frequency of extreme hydrological events has been increased

The hydrological extreme events occurred in California during the past decades.

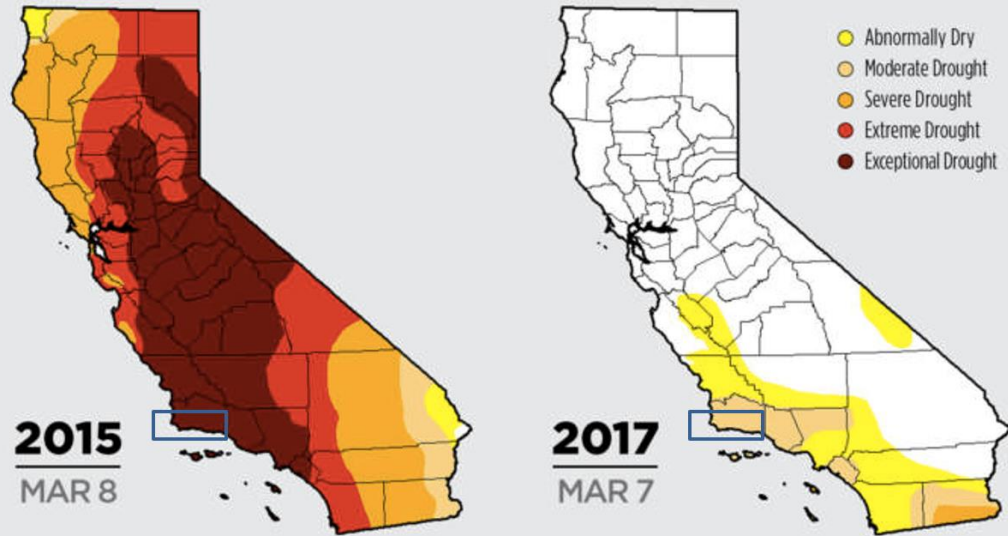
**Flood event in Jan. 2016
under atmospheric river
impact**



Drought in 2012-2015

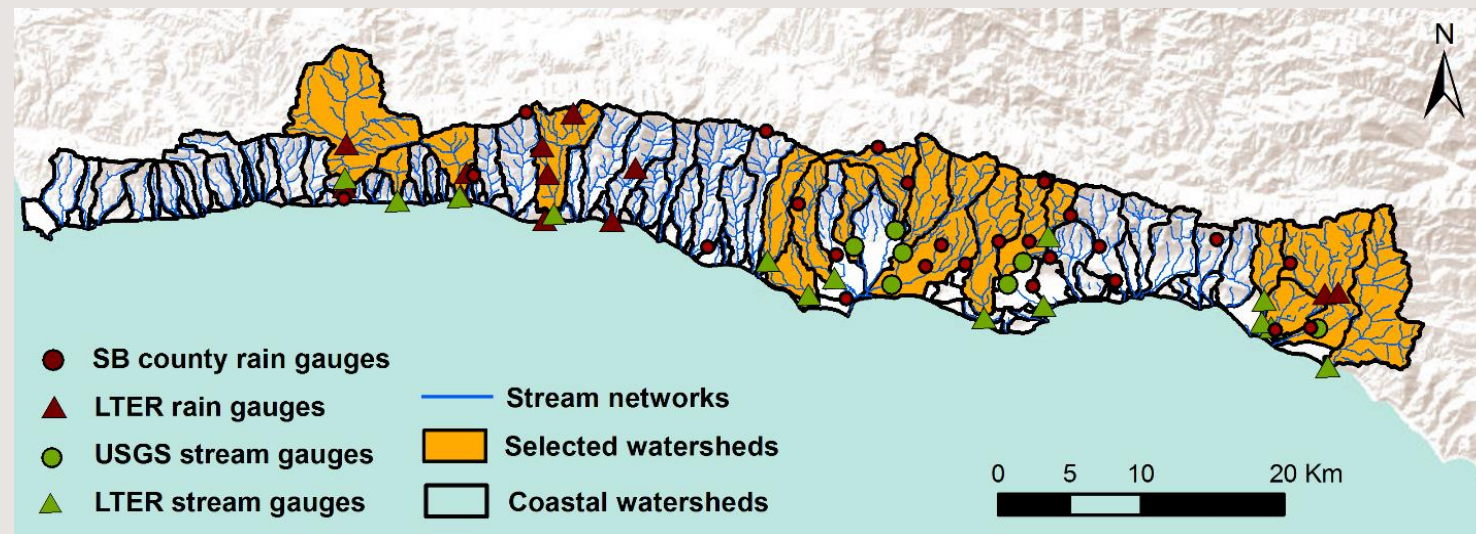


Case study region and Dataset



- **Coastal California watersheds**
- **Rainfall (42) and streamflow (12) gauge (1980-2015, daily)**

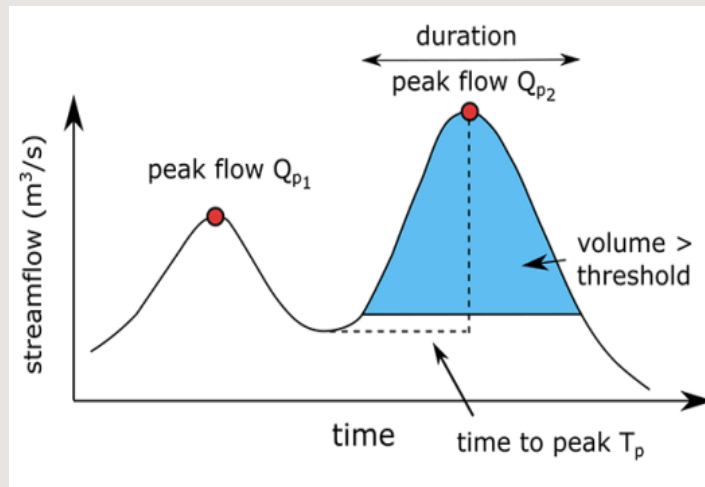
<https://ww2.kqed.org/science/2017/03/10/color-me-dry-drought-maps-blend-art-and-science-but-no-politics/>



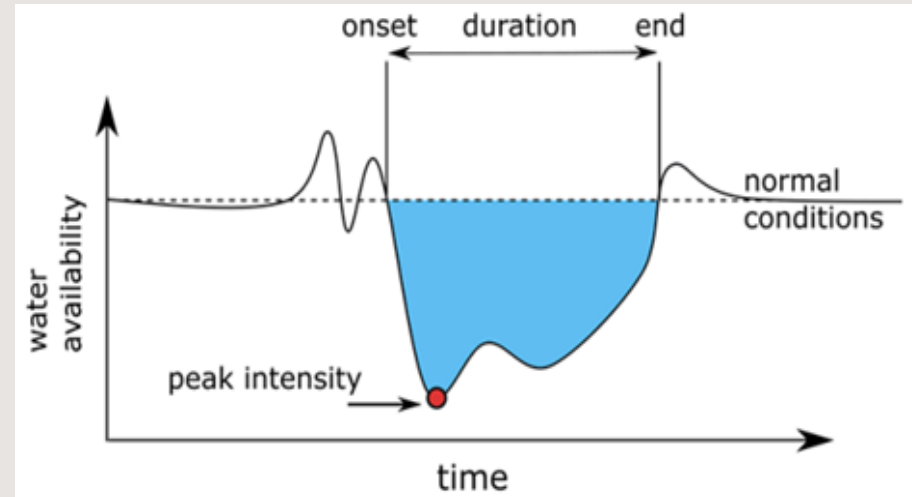
Methods

Extreme events threshold-based approaches:

Floods



Droughts

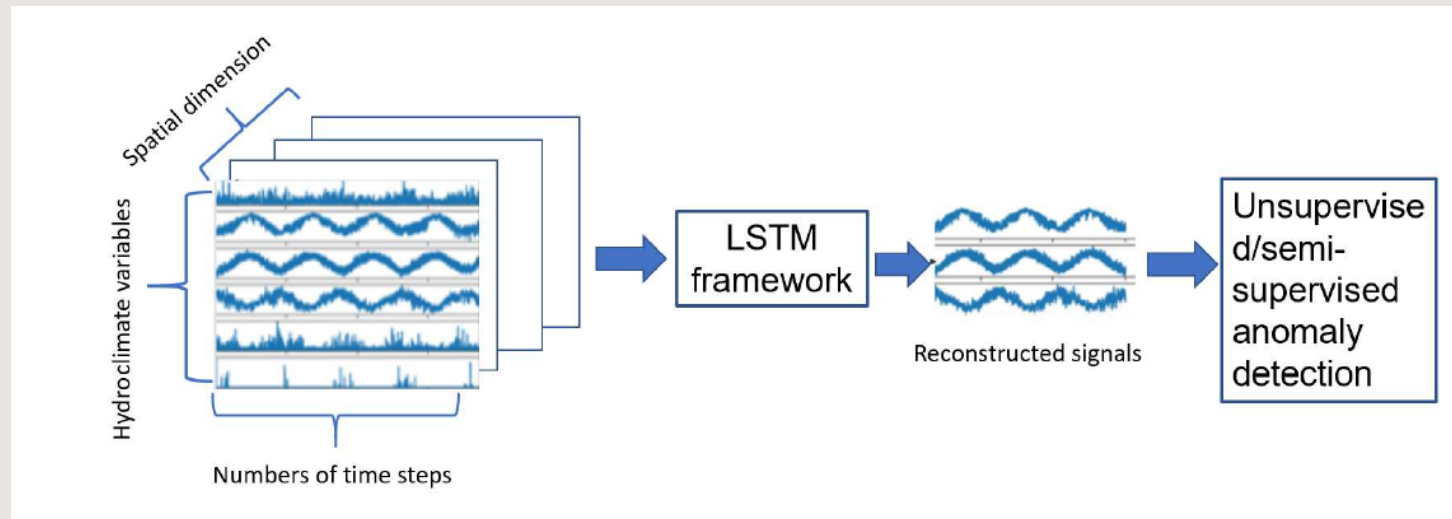


(Slater et al., 2021)

- **Peak over threshold (POT)**
- **Annual max/min daily hydrological information**

Methods

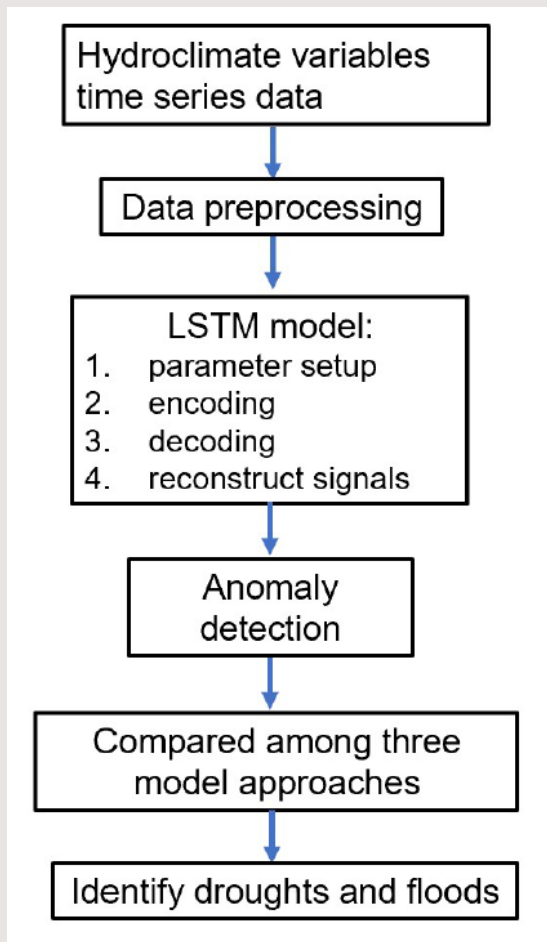
Machine Learning model approaches:



- **LSTM autoencoders (unsupervised anomaly detection)**
- **LSTM based semi-supervised anomaly detection**

Expected Deliverables

Flowchart



Deliverables

- Develop a ML-based anomaly detection model with semi-supervised approaches
- This model can easily apply to any other region and run with climate projection scenarios.
- This proposed modeling would serve as an early warning system for natural disaster response.





Thank you

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Related materials

https://github.com/hydrogeohc/NeurIPS_2021_CCAI