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Deep Residual Downscaling of Remote Sensing Imagery for Flood Hazard Assessment

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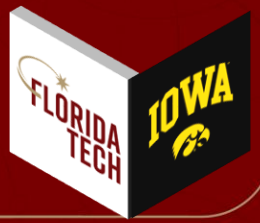
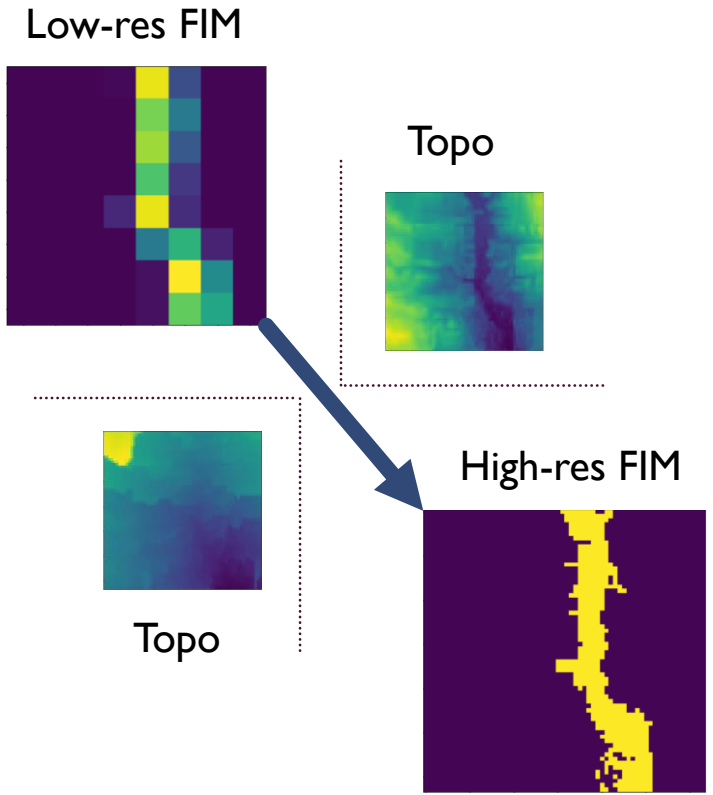
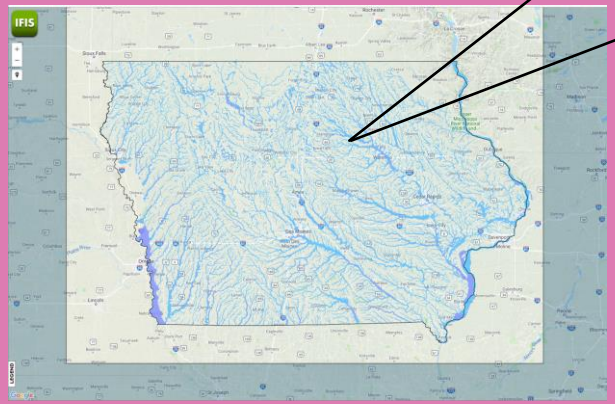


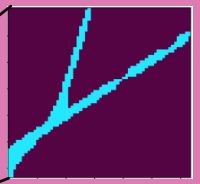
High quality **Flood Inundation Maps** (FIMs) help improve understanding of flood hazards over long term temporal scales

- We investigate deep learning architectures to downscale (by **10x**) low-resolution FIMs (at **300m**) to high-resolution FIMs (at **30m**).
- We evaluate the use of out-of-the-box super-resolution methods for this purpose.
- We investigate the viability of **topographic** information in enhancing downscaling fidelity.

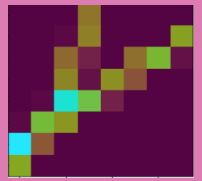


- Simulated 46K FIMs provided by the Iowa Flood Center via hydraulic simulations for the entire state of Iowa.



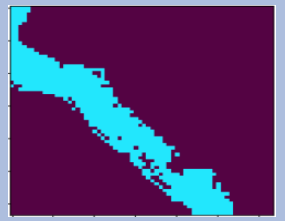


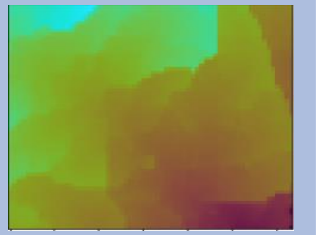
High resolution at 30x30 m^2 .



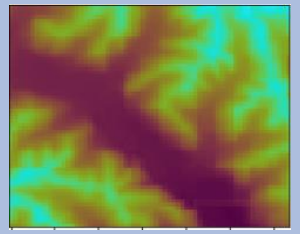
Coarse resolution at 300x300 m^2 .

- Topographic Features
  - HDND
  - VDND





The horizontal distance to the nearest drainage(HDND)



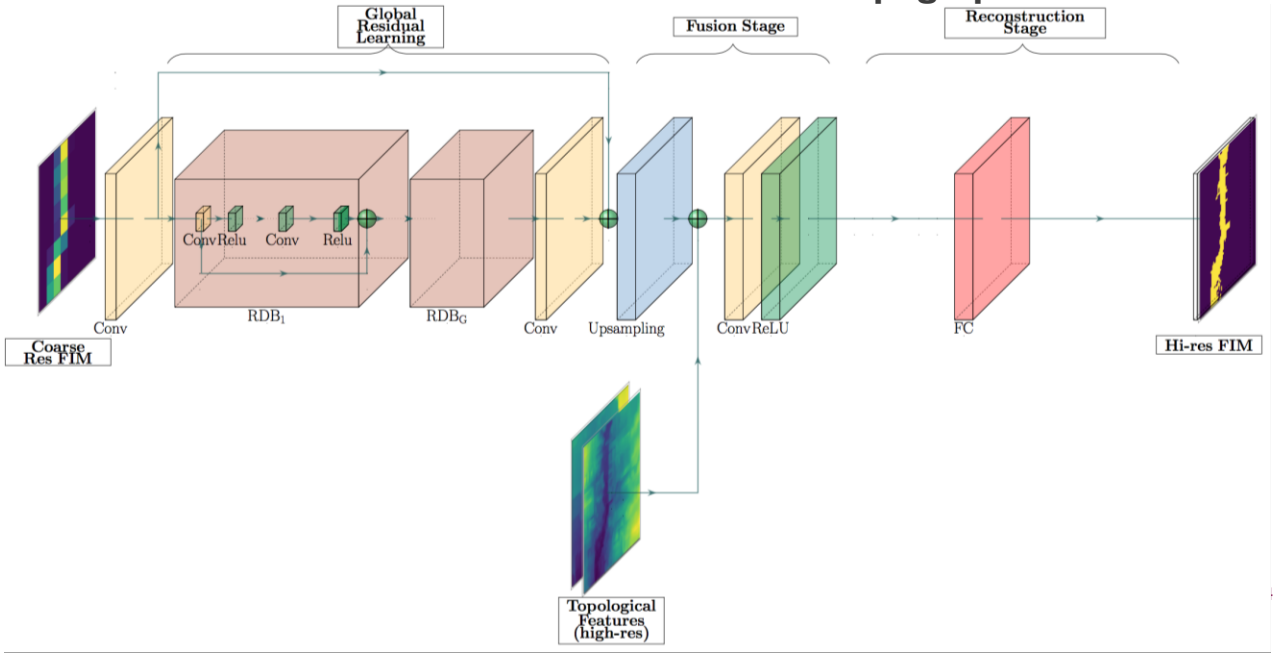
The vertical distance to the nearest drainage(VDND)

Model Selection:

- We chose to adopt a **Residual Dense Network** (Zhang et. al. 2018) based network for this task.
- State-of-the-art performance.
- We explore two different instances of these RDN-based models: with and without **topographic features**.

Learning to Downscale

Loss function: Average Cross-Entropy (**for binary classification**)



Coarse Res	High-res GT	LapSRN	Bicubic	Lanczos	RDN
					
Classification metric : Mathew's Correlation Coefficient		0.6069	0.6336	0.6367	**0.74**

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