# Flood Vulnerability Mapping Using Sentinel-1 SAR and GIS

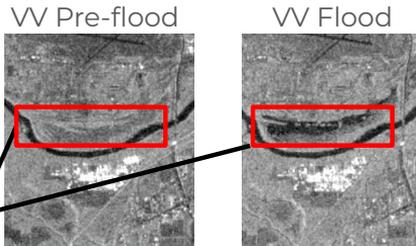By Melody Fei, West Lafayette Jr./Sr. High School, West Lafayette, Indiana

## PROBLEM

Floods are one of the most significant natural disasters, affecting communities, homes, and lives

- **Objective** - Identify flooded areas, exposed buildings, and populations to estimate flood risk
- **Research Question:**
  Can mapping radar signal changes effectively highlight flooded areas?

## RESULTS

- SAR and GIS mapping can provide accurate results to detect floods
- 8 bands: Detected flood broadly across scene
- 12 bands: Detection clustered heavily on top of the river

Population influenced by flood, estimate 1,242 people exposed to this flood event



<=20
<=50
<=100
<=180
<=280

## METHODOLOGY

- Used Sentinel-1 SAR radar images from before and during a flood event
- Machine learning (Random Forest) and GIS mapping
- Two trials:
  - 8 bands- Used only SAR features
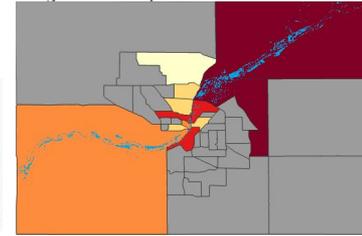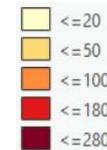  - 12 bands- SAR data with ancillary data

The dark area shows water flooding

VV Pre-flood    VV Flood



## CONCLUSION

- This method can map floods rapidly during emergencies
- Useful for risk assessment and urban planning

### FUTURE STEPS

Vulnerability Map

- Can be applied to other flood events and regions
- In the future, test more events and improve modeling



Vulnerability
0.0 - 0.04
0.04 - 0.10
0.10 - 0.18
0.18 - 0.35
0.35 - 0.57