DamageMap: A post-wildfire damaged buildings classifier

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Predictions for the Dixie Fire in Greenville, California. A blue outline indicates an "undamaged" prediction and a red outline indicates a "damaged" prediction.

Introduction

- Fires are increasing in both intensity and occurrence in the US and this trend is predicted to worsen
- In 2017 50,629 structures have been lost to wildfire in the US
- DamageMap was developed by an interdisciplinary team at Cal Poly, San Luis Obispo and Stanford using public Cal Fire damage assessments and other open data sources to help rapidly determine the extent of damage in the wake of a wildfire.

Objectives and Goals

- Validate DamageMap on more wildfire sites
- Test impact of spatial resolution on accuracy
- Fine-tune model to improve accuracy on new fire sites

FIRE NAME (CAUSE)	DATE	COUNTY	ACRES	STRUCTURES	DEATHS
CAMP (Powerlines)	November 2018	Butte	153,336	18,504	- 85
TUBBS (Electrical)	October 2017	Napa & Sonoma	36,807	5,636	22
TUNNEL - Oakland Hills (Rehindle)	October 1991	Alameda	1,600	2,900	25
CEDAR (Human Related)	October 2003	San Diego	273,246	2,820	15
NORTH COMPLEX (Lightning)	August, 2020	Butte, Plumas, & Yuba	318,935	2,352	15
VALLEY (Electrical)	September 2015	Lake, Napa & Sonoma	76,067	1,955	-4
WITCH (Powerlines)	October 2007	San Diego	197,990	1,650	2
WOOLSEY (Electrical)	November 2018	Ventura	96,949	1,643	3
CARR (Hussian Related)	July 2018	Shasta County, Trinity	229,651	1,614	8
GLASS (Undetermined)	September 2020	Napa & Sonoma	67,484	1,520	0
LNU LIGHTNING COMPLEX (Lightning/Arson)	August 2020	Napa, Solano, Sonoma, Yolo, Lake, & Colusa	363,220	1,491	- 6
2 CZU LIGHTNING COMPLEX (Lightning)	August 2020	Santa Cruz, San Mateo	86,509	1,490	1
9 NUNS (Powerline)	October 2017	Sonoma	54,382	1,355	3
DIXIE (Under Investigation)*	July 2021	Butte, Plumas, Lassen, & Tehama	963,309	1,329	1
* THOMAS (Powerline)	December 2017	Ventura & Santa Barbara	281,893	1,063	2
* CALDOR(Human Related)	September 2021	Alpine, Amador, & El Dorado	221,835	1,903	1
OLD (Human Related)	October 2003	San Bernardino	91,281	1,003	6
 JONES (Undetermined) 	October 1999	Shasta	26,200	954	1
* AUGUST COMPLEX (Lightning)	August 2020	Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake, & Colusa	1,032,648	935	1
BUTTE (Powerlines)	September 2015	Amador & Calaverna	70,868	921	2

This list does not include fire jurisdiction. These are the Top 20 regardless of whether they were state, federal, or local responsibility. Numbers not final

Cal Fire details the California's Top 20 Most Destructive Fires. Boxed in red are the fires that have been classified by either DamageMap or ESRI classifiers: Camp Fire (#1), Woolsey (#8), Carr (#9), and Dixie (#14).











Inference

Confusion Matrix for Dixie Fire (Greenville, CA)

		Ground Truth		
		Damaged	Undamaged	
ed	Damaged	410	9	
	Undamaged	10	119	

Dixie Fire Damage Inspection Specialist (DINS) points detailing damage severity ranging from No Damage to Inaccessible, and Minor - Destroyed assessment. Points are overlayed on impacted county boundaries: Tehama, Plumas, Lassen, and Butte. (CAL FIRE, 2021)

Confusion Matrix for Marshall Fire (Boulder County, Colorado)

		Ground Truth		
		Damaged	Undamaged	
ed	Damaged	898	4600	
	Undamaged	106	50654	



REFERENCES

Galanis, Marios, et al. "DamageMap: A post-wildfire damaged buildings classifier." International Journal of Disaster Risk Reduction 65 (2021): 102540. **2** Dixie DINS Points (2021)[Online]. Cal Fire, <u>https://www.fire.ca.gov/</u>. https://frap.fire.ca.gov/mapping/gis-data/. [April 2, 2022]. **3** Imagery data from Maxar and Planet



Predictions for the Marshall Fire in Colorado, December 2021-January 2022. This dataset was more challenging because of the snow on the ground, a phenomenon not often seen in our post-wildfire training data.