



DESIGNSAFE-CI

A NATURAL HAZARDS
ENGINEERING COMMUNITY



Supporting Your Natural Hazards Research



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University of Texas at Austin



DESIGNSAFE-CI 
NHERI: NATURAL HAZARDS ENGINEERING RESEARCH INFRASTRUCTURE



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What is DesignSafe?

- A web-based research platform that enables transformative research to protect human life and reduce damage during natural hazard events

DesignSafe Vision

- A cyberinfrastructure (CI) that is an integral part of research discovery
 - Provide a platform for data sharing/publishing
 - Enable research workflows and access to high performance computing (HPC)
 - Deliver cloud-based tools that support the analysis, visualization, and integration of diverse data types
- Amplify and link the capabilities of natural hazards researchers in the US and abroad





Research Workbench ▾

Data Depot

Workspace

Recon Portal

SimCenter Research Tools

User Guides

Impact of Data Reuse

Learning Center ▾

NHERI Facilities ▾

NHERI Community ▾

About

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ased research
network that
al tools needed to
understand critical
data for natural hazards research.



Learn how to
Start Using DesignSafe



Browse the Data Depot's
Published Data Sets



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Learn more about
NHERI, the NCO & DesignSafe



**NHERI Five-Year
Science Plan
2nd Edition**



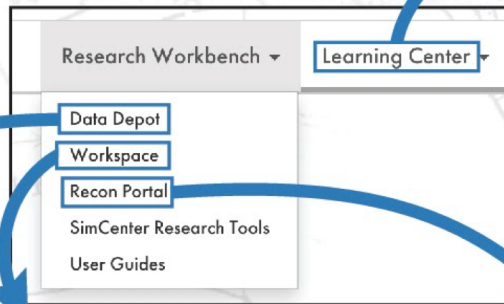
Visible GOES-16 satellite image of Hurricane Marco (left) and Tropical Storm Laura (right) at 12:50 p.m. EDT Sunday, August 23. (Image credit: NOAA/RAMMB, Yale Climate Connections.)

2020 Hurricane Season: NSF-Funded Natural Hazards Experts Available for Comment

For the 2020 hurricane season, experts from the NSF-supported Natural Hazards Engineering Research Infrastructure (NHERI) are available to discuss a variety of hurricane-related topics. NHERI researchers are authorities in infrastructure damage from wind and storm surge, damage mitigation efforts, societal impacts in hurricane-prone regions and post-event data collection.

[FIND MORE NEWS IN THE NEWSROOM](#)





DesignSafe Tutorials

NEW End to End Multi-Threat Fragility Modeling using DesignSafe
December 3, 2019
[Watch Tutorial](#)

Introduction to STKO
November 18, 2019
[Watch Tutorial](#)

Leveraging Python, Jupyter Notebooks, DesignSafe, and the SimCenter Educational Tools in the Classroom
October 29, 2019
[Watch Tutorial](#)

DATA DEPOT

Find in Published Projects

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Publication Type
☐ Experimental ☐ Simulation ☐ Hybrid Simulation

Project Title
Collaborative Research: Development, experimental validation and case studies for the next generation of landslide tsunami models for coastal hazard mitigation (Simulation)

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My Projects
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WORKSPACE

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Simulation [7]	Visualization [8]	Data Processing [2]	Partner Data Apps [5]
ADCIRC ADCIRC	clewpack C	Dakota D	LS-DYNA LS-DYNA

Recon Portal

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Show filter options

2019 Hurricane Dorian
First Landfall is at Cat 5: Elbow Cay, Abaco Islands of the Bahamas
2019-09-09 [View Data](#)

2019 Hurricane Barry
Louisiana Gulf Coast
2019-09-15 [View Data](#)

A map of the Gulf of Mexico and surrounding landmasses, with numerous blue location pins indicating data points.

DesignSafe Research Workbench

- Data Depot Data Repository
 - Private space (My Data)
 - Collaboration space (My Projects) for data sharing and ultimate publishing
 - Publicly accessible space (Published) for curated data from My Projects
 - Publicly accessible space (Community Data) for uncurated data
- Workspace
 - Apps/tools for computational simulation, data analysis, visualization, etc. with access to files in Data Depot
- Reconnaissance Portal: discover published field data associated with natural hazard events



My Projects: Data here can be eventually published

DATA DEPOT

+ Add

My Data

My Projects

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Box.com

Dropbox.com

Google Drive

Published

Published (NEES)

Community Data

Help ▾

Find in My Projects



Rename

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Project ID	Project Title	Project PI	Last Modified
PRJ-2752	CEC Project geohazards group	Paolo Zimmaro	9/15/20 2:31 AM
PRJ-2889	Earthquake Time Series from Events in Texas, Oklahoma, and Kansas	Ellen Rathje	9/11/20 2:02 PM
PRJ-2662	Displacement and subsurface characteristics of select lateral spread locations from the 2011 Christchurch, New Zealand earthquake	Ellen Rathje	9/1/20 9:52 AM
PRJ-1822	Hybrid Simulation Test Project	Keith Strmiska	8/24/20 5:01 PM
PRJ-2859	NEES, The George E. Brown, Jr. Network for Earthquake Engineering Simulation, 2004-2014 A DECADE OF EARTHQUAKE ENGINEERING RESEARCH	Julio Ramirez	8/14/20 12:13 PM
PRJ-2157	Simulations of Seismic Displacement of a Clay Slope using LS-Dyna	Ellen Rathje	8/11/20 2:24 PM
PRJ-2331	RAPID Data for DesignSafe Site Visit	Jeffrey Berman	8/3/20 3:54 PM
PRJ-1716	Bidirectional Testing of Drywall Partition Walls with Novel Details, Integrated into a Rocking Wall Subassembly	Keri Ryan	7/29/20 11:26 PM
PRJ-2824	Numerical modeling of lateral spread displacements at free-face sites using	Michael Little	7/13/20 4:48 PM



More detailed search....

DATA DEPOT

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Published

Published (NEES)

Community Data

Help ▾

Author	Title	Keyword	Description	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="checkbox"/> Experimental	<input type="checkbox"/> Simulation	<input type="checkbox"/> Field Research	<input type="checkbox"/> Other	<input type="checkbox"/> Hybrid Simulation
More Options ▾		Clear Filters	Search	

Project Title	Project PI	Project Description	Keywords	Date of Publication
GEER Reconnaissance of 2018 Palu-Dongala Earthquake and Flowslides (Field Research)  137  2.4K	Montgomery, Jack	View Description	Earthquake reconnaissance, Flowslide, landslide, liquefaction, ground failure, digital surface model, unmanned aerial vehicle (UAV), remote sensing, geotechnical earthquake engineering, Palu, Sulawesi, Indonesia	9/15/2020
StEER - Hurricane Laura (Field Research)	Kijewski-Correa, Tracy	View Description	StEER, reconnaissance, hurricane, Hurricane Laura, damage assessment, streetview, UAS	9/14/2020

**Coming soon:
Data Metrics**



DATA DEPOT

Find in Data Depot



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Google Drive

Published

Published (NEES)

Community Data

Help

PRJ-2363 | Soil-Foundation-Structure Interaction Effects on the Cyclic Failure Potential of Silts and Clays

PI **Brandenberg, Scott**

CoPIs **Stewart, Jonathan**

Project Type **Experimental**

DOI(s) in Dataset **10.17603/ds2-e7s5-b025**

10.17603/ds2-jpwh-nq72

Keywords **Cyclic Shearing, Fine-Grained Soil, Soil-Foundation-Structure Interaction**

Earthquake-induced ground failure has resulted in billions of dollars of damage during exhibiting either "sand-like" or "clay-like" behavior with respect to strength loss during soils, which are less well understood than "sand-like" soils. Cyclic failure of fine-grained and not in the free-field soils away from the structures, indicating that soil-foundation-centrifuge model testing to study cyclic failure of fine-grained soils beneath structures containing all of the experimental measurements and metadata required for users to

View Data Diagram

Experiment | **Centrifuge Test on Bentonite Clay - Test UCLA JZB01**

Experiment Type **Centrifuge**

Author(s) **Buenker, Jason; Brandenberg, Scott; Eslami, Mohammad; Stewart, Jonathan**

Experimental Facility **Center for Geotechnical Modeling, UC Davis**

Equipment Type **9m Radius Dynamic Geotechnical Centrifuge**

Date of Experiment **08-21-2017 — 02-08-2018**

Date of Publication **01-09-2020**

DOI **10.17603/ds2-e7s5-b025**

License(s) **Open Data Commons Attribution**

Download Dataset

**Also coming soon:
Version control for
revisions to datasets**

Report | **Data Processing**

Report | **Digital Data Report (JZB02)**

Model Configuration | **Centrifuge Model (JZB02)**

Sensor Information | **Centrifuge (JZB02)**

Event | **CPT (JZB02)**

Event | **Fast Data from Spin 2 (Dynamic Shaking Applied)**

Data collected at 5000 Hz during shaking

☐ 01162019@082639@110817@77.0rpm.bin

☐ 01162019@082639@112208@77.0rpm.bin

☐ 01162019@082639@113803@76.8rpm.bin

☐ 01162019@082639@115034@76.9rpm.bin

☐ 01162019@082639@122026@77.0rpm.bin

☐ 01162019@082639@125704@77.0rpm.bin



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



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DesignSafe Data Models



Structured, yet **flexible**, data models for different types of research

-  **Experimental Project**
For physical work, typically done at an experimental facility or in the field.
-  **Simulation Project**
For numerical and/or analytical work, done with software.
-  **Hybrid Simulation Project**
For work using both physical and numerical components.
-  **Field Research Project**
For work done by observation in areas affected by a natural hazard.
-  **Other Project**
For work other than the project types above.



Data Curation

- Curation and publication guidelines under User Guides
 - <https://www.designsafe-ci.org/rw/user-guides/data-curation-publication/>
- Data transfer methods
 - <https://www.designsafe-ci.org/rw/user-guides/data-transfer-guide/>
 - Web browser/Dropbox/etc (smaller uploads), Globus, Cyberduck
- Virtual Curation Office Hours
 - DesignSafe Data Curators: Maria Esteva and Mahyar Sharifi
 - Tuesday and Thursday at 1 pm Central (or by appt)
 - <https://www.designsafe-ci.org/learning-center/training/>



Make ****your**** data count!

Make your research re-producible and your data re-usable



- **Formally publish** data sets in stable data repositories
 - Include data processing scripts, visualizations, etc.
- Data needs a permanent, **digital location (DOI)** not just a URL
 - List curated data sets on your CV, just like papers
- Cite data publication **in your reference list** of your paper using DOI, citation language as indicated in DesignSafe

provided here. Additionally, the probabilistic approaches described in this paper are implemented as executable Jupyter notebooks (Saygili 2018a, b). These notebooks can be accessed in the Data

References

Saygili, G., Rathje, E., and Wang, Y. (2018a). "Probabilistic seismic hazard analysis for the sliding displacement of rigid sliding masses [Data set]." Designsafesafe-CI (<https://doi.org/10.17603/ds22d6k>)



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PRJ-2769 | **Food Access Impact Survey for Southeast and Harris County, Texas after Hurricane Harvey in 2017**

[Download Dataset](#)

PI **Rosenheim, Nathanael**
Project Type **Field Research**
Event **Hurricane Harvey | Southeast Texas | 08-25-2017 — 08-31-2017 | Lat 30.049840 Long -94.077210**
Event Type **Flood, Hurricane**
DOI(s) in Dataset **[10.17603/ds2-aq2k-dy92](https://doi.org/10.17603/ds2-aq2k-dy92)**
Related Work
Keywords **Field Research Planning, Food Access, Survey Instruments, Sample Frame**

[View Data Diagram](#)

Documents | **Food Retail Survey Instrument**

Author(s) **Rosenheim, Nathanael; Peacock, Walter; Perez, Maria; Lane, Gina**
Date of Publication **06-18-2020**
DOI **[10.17603/ds2-aq2k-dy92](https://doi.org/10.17603/ds2-aq2k-dy92)**
License(s) **Creative Commons Attribution Share Alike**

This collection archives instruments related to the food retail survey conducted by the Hazard Reduction Recovery Center, as part of a National Science Foundation-funded project. The instrument was designed to gather specific types of information on food retailers affected by Hurricane Harvey. The survey instrument was designed to collect information on: (1) Physical and infrastructure damage, (2) Accessibility problems, (3) Impact on employees and customers, (4) Business interruption, (5) Impact on fresh food availability, and (6) Business characteristics. The survey was designed to be answered by an employee with knowledge about store operations and food availability before and after Hurricane Harvey. The survey was designed to be conducted in-person. This archive documents two versions of the survey. The first version was for use in Jefferson and Orange County, Texas. The second version was for use in Harris County, Texas.

Citation

Rosenheim, N. Peacock, W. Perez, M. Lane, G. (2020) "Food Retail Survey Instrument", in *Food Access Impact Survey for Southeast and Harris County, Texas after Hurricane Harvey in 2017*. DesignSafe-CI. <https://doi.org/10.17603/ds2-aq2k-dy92>.

[Download Citation](#)



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PRJ-1811: NHERI UCSD Hybrid Simulation Commissioning

[Download Dataset](#)

PI	Mosqueda, Gilberto	View Team Members	DOI	doi:10.17603/DS25M42	Citation
Date of Publication	Dec/6/2018		Award	NSF 1520904	
Project Type	Hybrid_simulation		Keywords	hybrid simulation, shake table substructure, seismic isolation	

Description

The use of large shake tables can provide extended capabilities to conduct large- and full-scale tests examining the seismic behavior of structural systems that cannot be readily obtained from reduced scale testing, or under pseudo-dynamic conditions. When considering large or complex structural systems, however, additional challenges arise such as high costs of full scale specimens or capacity limitations of currently available shake table. Some of these limitations can be overcome by real-time hybrid shake-table substructure test method that requires only key parts to be evaluated experimentally on the shake table while the remainder of the structure is modeled numerically. As a demonstration of the applicability of this method using a large shake tables, a series of hybrid shake table tests were conducted on the UCSD Large High Performance Outdoor Shake Table (LHPOST) with capabilities to test full scale structural models. A physical specimen was built on the LHPOST, and coupled with a numerical model using hybrid simulation techniques. Comparison of different methods to interface the numerical model with the control systems were evaluated. The physical specimen consisted on a rigid mass resting on four triple friction pendulum bearings that represented the upper story of a shear building model having the effect of a tune mass damper. Numerical models of shear buildings with different periods and multiple degree of freedom were considered to evaluate the performance of the table and stability and accuracy of the simulation results. The test results demonstrate the effectiveness of tune mass dampers in reducing structural response and the benefit of using a hybrid shake table test method towards expanded system level dynamic testing. The performance of the shake table is evaluated and methods to compensate delay and other sources of error are discussed.

PRJ-1811

Hybrid Simulation Five story building with tuned mass damper ▼

Hybrid Simulation One story building with tuned mass damper - OpenSees ▼

Hybrid Simulation One story building with tuned mass damper - SimulinkRT ▲



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Five story building with tuned mass damper

Description

Shake table tests of 5DOF building model with experimental tuned mass damper using UC San Diego shake table (LHPOST). The 5-DOF model was ran using OpenSees/OpenFresco for the numerical substructure with Simulink for compensation.

Date of Publication:

DOI: doi:10.17603/DS2C687

Authors:

Vega, Manuel; Schellenberg, Andreas; Caudana, Humberto; Mosqueda, Gilberto;

Hybrid Simulation

Type: Earthquake

[Citation](#)

Global Model: Five Story Building

Five Story Building

OpenSees
Five Story
Building

Runn 43: LP
100% 5DOF
T=1s
Runn 44: LP
150% 5DOF
T=1s

Rigid Mass on
Seismic
Isolators

Runn 44: LP
150% 5DOF
T=1s
Run 43: LP
100% 5DOF
T=1s

<input checked="" type="checkbox"/> Name	Size	Last modified
<input type="checkbox"/> Hybrid_Commissioning_LHPOST_Overview.pdf	522.0 kB	--
<input type="checkbox"/> Worklog LHP.xlsx	20.1 kB	--
<input type="checkbox"/> pictures	--	--

Master Simulation Coordinator OpenSees Five Story Building

<input checked="" type="checkbox"/> Name	Size	Last modified
<input type="checkbox"/> Hybrid_Commissioning_LHPOST_Overview.pdf	522.0 kB	--
<input type="checkbox"/> Worklog LHP.xlsx	20.1 kB	--
<input type="checkbox"/> pictures	--	--

Coordinator Output Run 43: LP 100% 5DOF T=1s

<input checked="" type="checkbox"/> Name	Size	Last modified
<input type="checkbox"/> Run43 numerical OpenSees	--	--




Reconnaissance Portal

Identifying Archived Datasets from Recon Events

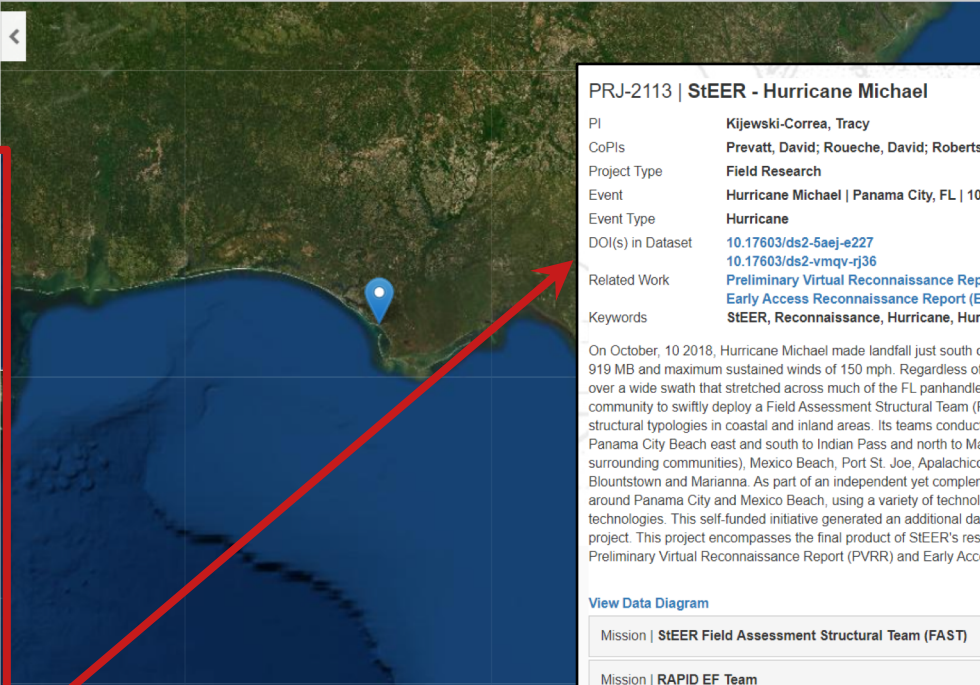


Recon Portal → Data Depot

**Recon Portal**
[Learn more about contributing.](#)

Available datasets:

- Hurricane Michael - StEER P-VAT Report
- Hurricane Michael Field Reconnaissance: Contrasting Performance of Structures at Design Wind Speeds
- ARA Windfield Data Day
- Hurricane Michael - StEER FAT Early Access Report
- NHERI REU: Assessing Structural Damage During Hurricane Michael of Low-Rise Large-Volume Steel Structure using Structure-from-Motion and LIDAR
- NHERI REU: Survey and Investigation of Residential Buildings Damaged by Hurricane Michael
- Assessing the Performance of Elevated Wood Buildings Including Manufactured Housing
- Finalized StEER FAST and RAPID EF teams reports



PRJ-2113 | StEER - Hurricane Michael
[Download Dataset](#)


PI	Kijewski-Correa, Tracy
CoPIs	Prevatt, David; Roueche, David; Robertson, Ian; Berman, Jeffrey; Mosalam, Khalid; Grilliot, Michael
Project Type	Field Research
Event	Hurricane Michael Panama City, FL 10-10-2018 Lat 30.0800° N Long 85.6075° W
Event Type	Hurricane
DOL(s) in Dataset	10.17603/ds2-5aej-e227 10.17603/ds2-vmqv-rj36
Related Work	Preliminary Virtual Reconnaissance Report (PVRR) Early Access Reconnaissance Report (EARR)
Keywords	StEER, Reconnaissance, Hurricane, Hurricane Michael, Damage Assessment, UAS, Laser Scan, Streetview


On October, 10 2018, Hurricane Michael made landfall just south of Panama City, FL with the National Hurricane Center reporting a minimum pressure 919 MB and maximum sustained winds of 150 mph. Regardless of its place in history, Hurricane Michael caused catastrophic damage from high winds over a wide swath that stretched across much of the FL panhandle and inland into southeastern GA and beyond. natural hazards engineering community to swiftly deploy a Field Assessment Structural Team (FAST). This FAST broadly assessed the performance of a representative subset of structural typologies in coastal and inland areas. Its teams conducted assessments between October 13-15, 2018. FAST collected data in Florida from Panama City Beach east and south to Indian Pass and north to Marianna. The communities assessed included: Panama City Beach, Panama City (and surrounding communities), Mexico Beach, Port St. Joe, Apalachicola, a few routes out to barrier islands in the region, and the inland communities of Blountstown and Marianna. As part of an independent yet complementary effort, the RAPID EF continued data collection on November 7-8, 2018 in and around Panama City and Mexico Beach, using a variety of technologies including unmanned aerial vehicles, laser scanners and applied streetview technologies. This self-funded initiative generated an additional dataset that complements the data collected by StEER and is thus curated jointly in this project. This project encompasses the final product of StEER's response to this event: Curated Dataset, linking to previously published products: Preliminary Virtual Reconnaissance Report (PVRR) and Early Access Reconnaissance Report (EARR).


View Data Diagram


Mission StEER Field Assessment Structural Team (FAST)	<input checked="" type="checkbox"/>
Mission RAPID EF Team	<input checked="" type="checkbox"/>


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RESEARCH INFRASTRUCTURE

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Discovery Workspace

WORKSPACE

[Learn About the Workspace.](#)

Simulation [8]

Visualization [7]

Data Processing



MATLAB



Browsing:

erathje / Machine Learning

File name

Size

ipynb_checkpoints

4 kB

ML_DesignSafe_Tutorial.ipynb

62 kB

Select an application

The Workspace is a cloud-based tool using popular simulation tools like OpenFOAM, as well as Jupyter, MATLAB

Jupyter ML_DesignSafe_Tutorial Last Checkpoint: 20 hours ago (autosaved)

File Edit View Insert Cell Kernel Widgets Help

Run

(0) Importing Required Libraries

```
In [7]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import sys
sys.path.insert(0, '/home/jupyter/community/Machine_Learning_Bootcamp/')
```

(1) Importing Dataset

```
In [8]: #Import a pickle file using pandas library.
Harvey = pd.read_pickle('/home/jupyter/community/Machine_Learning_Bootcamp/Merged_Harvey_2G.pkl')
#Harvey = pd.read_pickle('/home/jupyter/community/Machine_Learning_Bootcamp/Merged_Harvey_3G.pkl')

#Display histograms of various variables.
Harvey["overall_building_condition"].value_counts()

#Display the entire dataframe.
Harvey.tail(15)
```

Out[8]:

	overall_building_condition	max_mph	age_yrs	number_of_stories	roof_shape	roof_cover	wall_cladding	structure
715	0	85	18.0	1.0	Gable	Asphalt shingles (3-tab)	Hardie Board Siding	
716	1	5	40.0	1.0	Flat	Metal shingle	Sheet metal	
718	0	110	5.0	2.0	Hip	Asphalt shingles (3-tab)	Stucco	
725	1	85	72.0	1.0	Gable	Continuous Surface	Wood Siding	
726	0	100	34.0	2.0	Hip	Asphalt shingles (3-tab)	Wood Siding	

cloud-based tools
HPC or VM
Batch
Interactive
Access to Data
Depot files



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Discovery Workspace - Simulation

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ADCIRC ADCIRC	clawpack C	Dakota D	LS-DYNA LS-DYNA	OpenFOAM OpenFOAM	OpenSees OpenSees
rWHALE R	SWbatch S	ANSYS A			




- HPC-enabled simulation codes (Stampede2, Frontera)
- Available through portal or at the Command Line, easy access to HPC allocation (CPUs, GPUs) through DesignSafe



Discovery Workspace - Visualization

WORKSPACE

[Learn About the Workspace.](#)

Simulation [8]	Visualization [10]	Data Processing [2]	Partner Data Apps [6]	Utilities [2]	My Apps [8]
FigureGen F	GiD G	Hazmapper (2.0) 	Kalpana K	Paraview 	Potree Converter P
Potree Viewer P	QGIS Desktop 3.8.1 	STKO S	Visit visit		

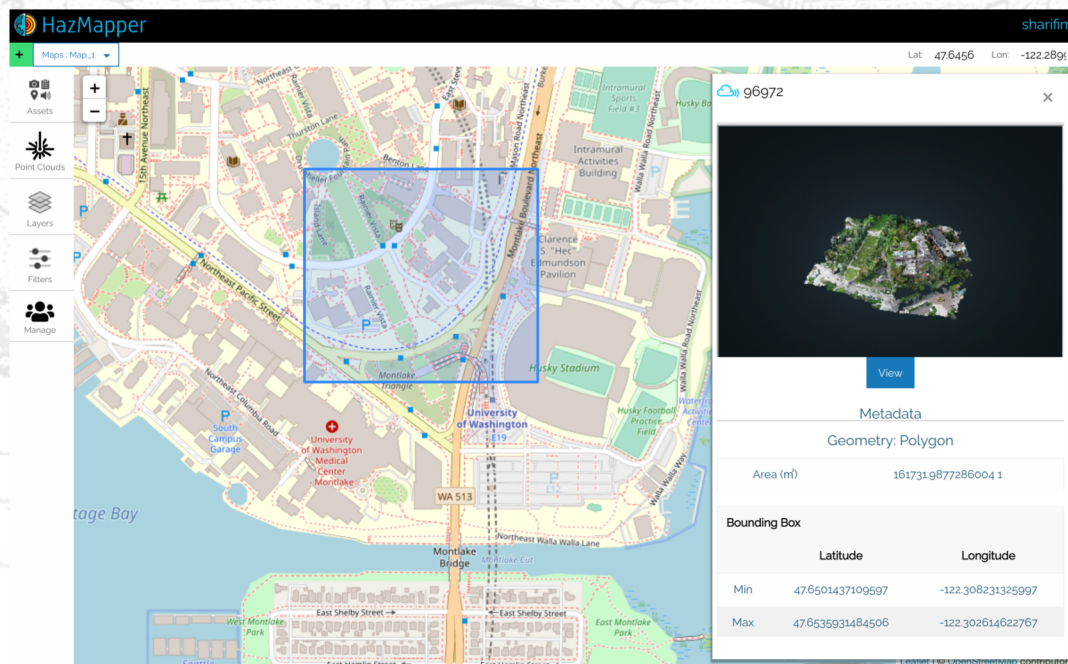
- STKO and GiD for pre/post processing of OpenSees simulations
- Enhancements to HazMapper, a web-app for geospatial data



Workspace –



- Interactive map viewer for geospatial data
 - Images
 - GPX tracks
 - Point clouds
 - Videos
 - GeoJSON
- April 2020 Webinar
- June 2020 updated documentation



DesignSafe: We are here for you!

Available to the Global Natural Hazards Research Community

- Interact with us and the community using the DesignSafe Slack team
- Cite data using DOIs in your reference list!
- Cite DesignSafe marker paper (Rathje et al. 2017, *Natural Hazards Review*) if you use DesignSafe in your research



Please share your feedback, ideas, experiences!

Ellen Rathje e.rathje@mail.utexas.edu

