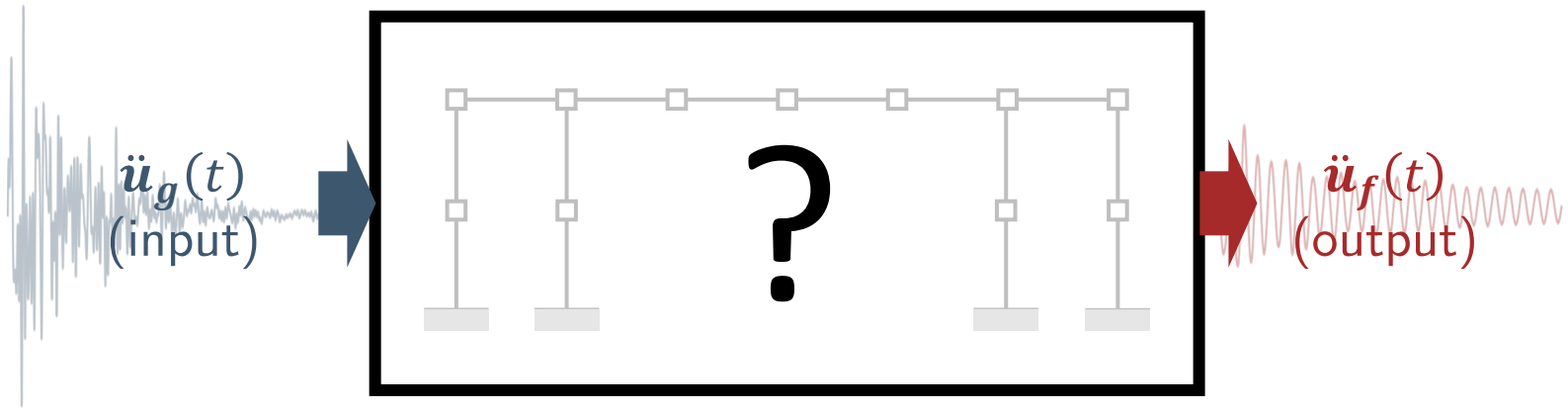
Station No.
CE58658

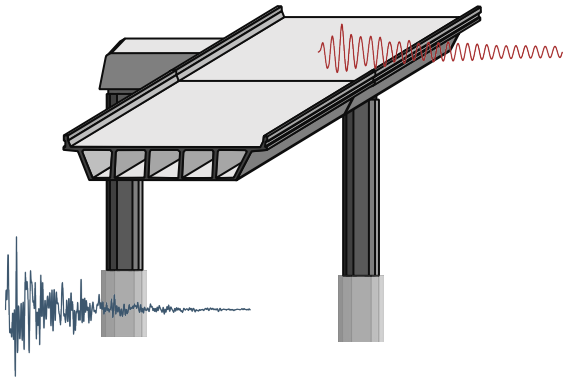
Chrystal Chern, PhD 2024
Supervisor: Prof. Mosalam
Topic: Vibration-based
Structural Health Monitoring

Vibration-based structural health monitoring

Inverse problem:

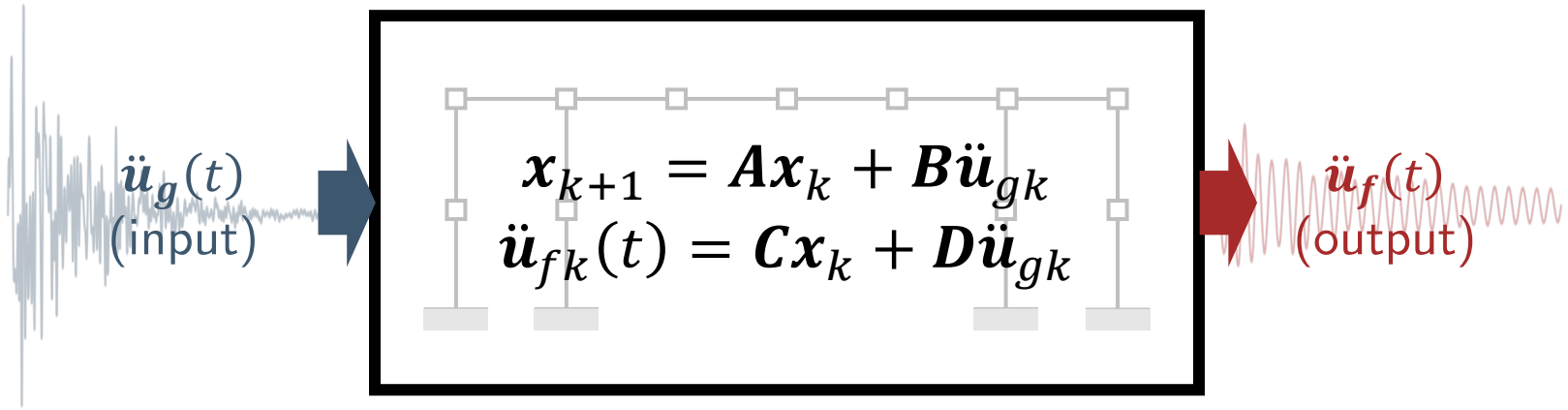
Given some directly observed data about a physical system for some scenario of interest, construct a causal relationship that would produce the same data as the physical system for all scenarios of interest.





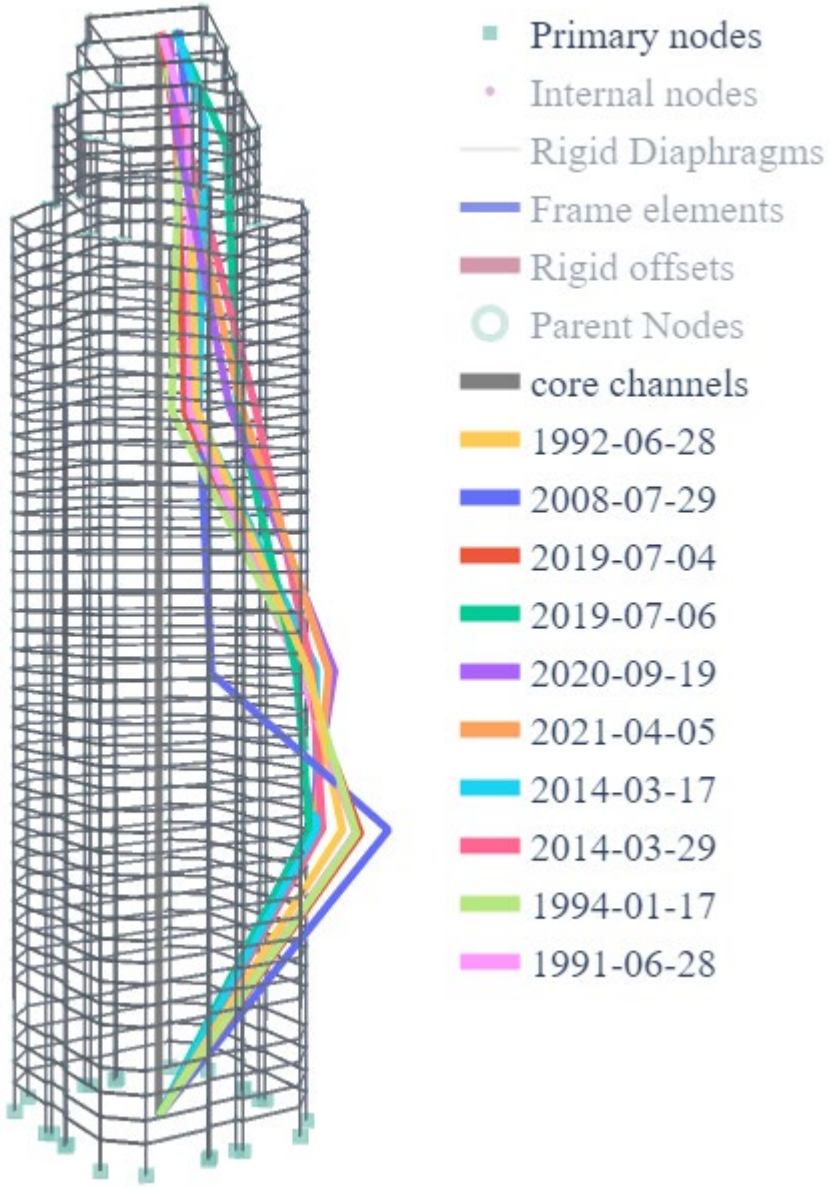
```
pip install mdof
```

System identification:
Pose the inverse problem in an algebraic structure.

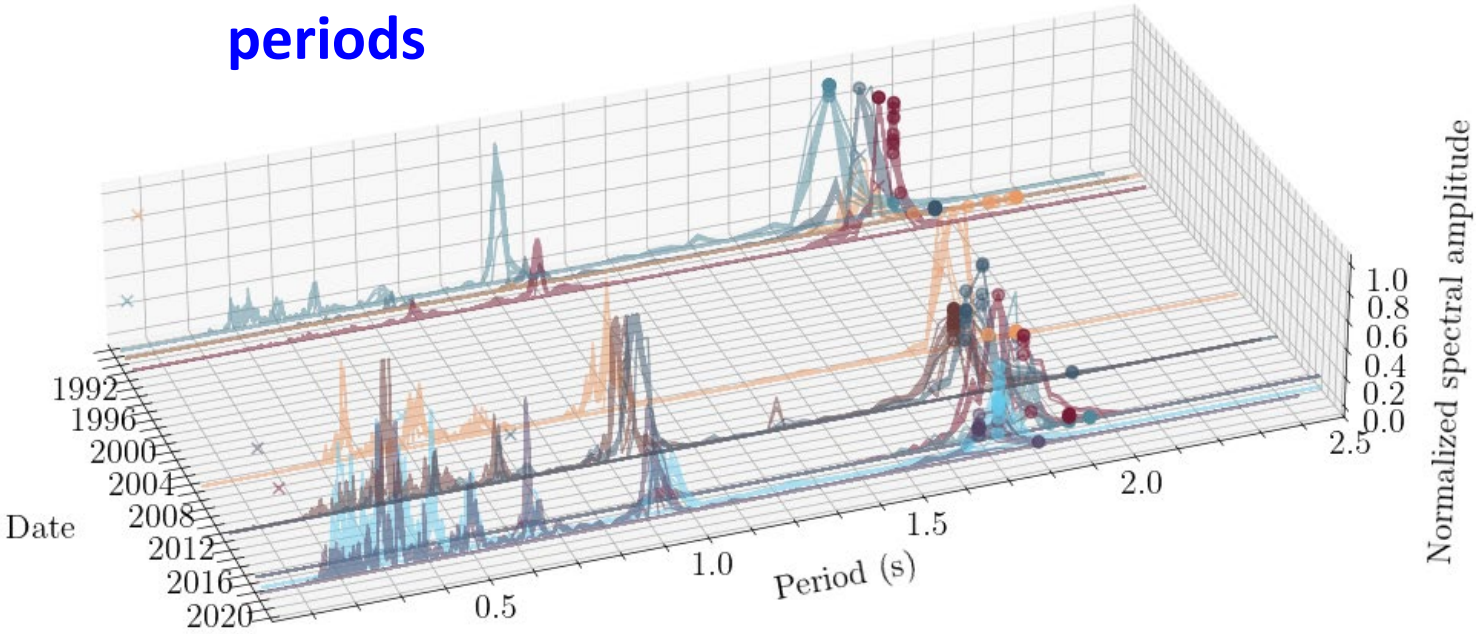


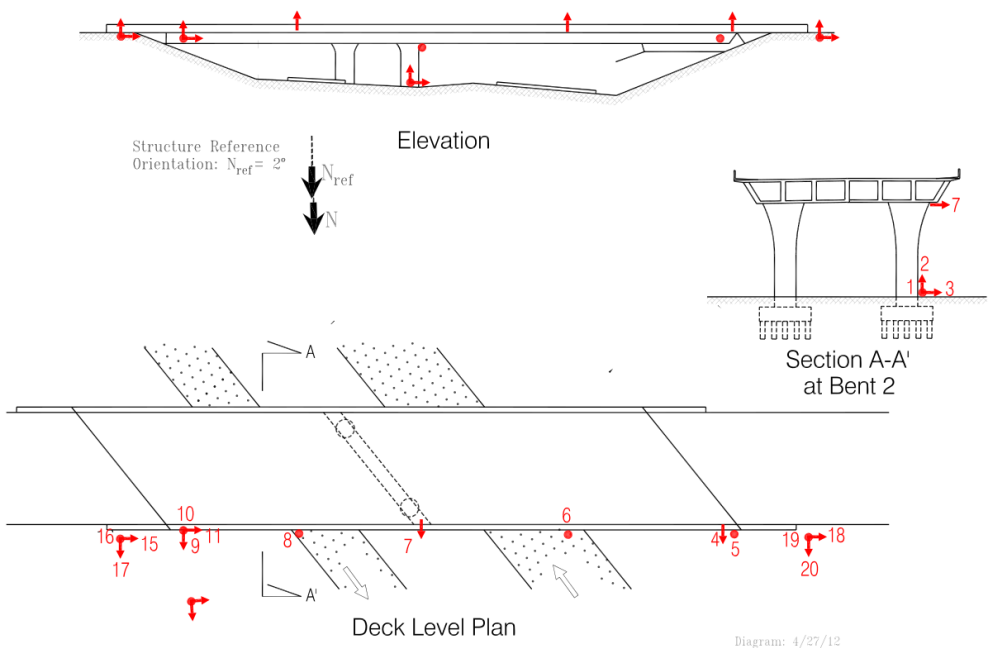
https://chrystalchern.github.io/mdof/

shapes

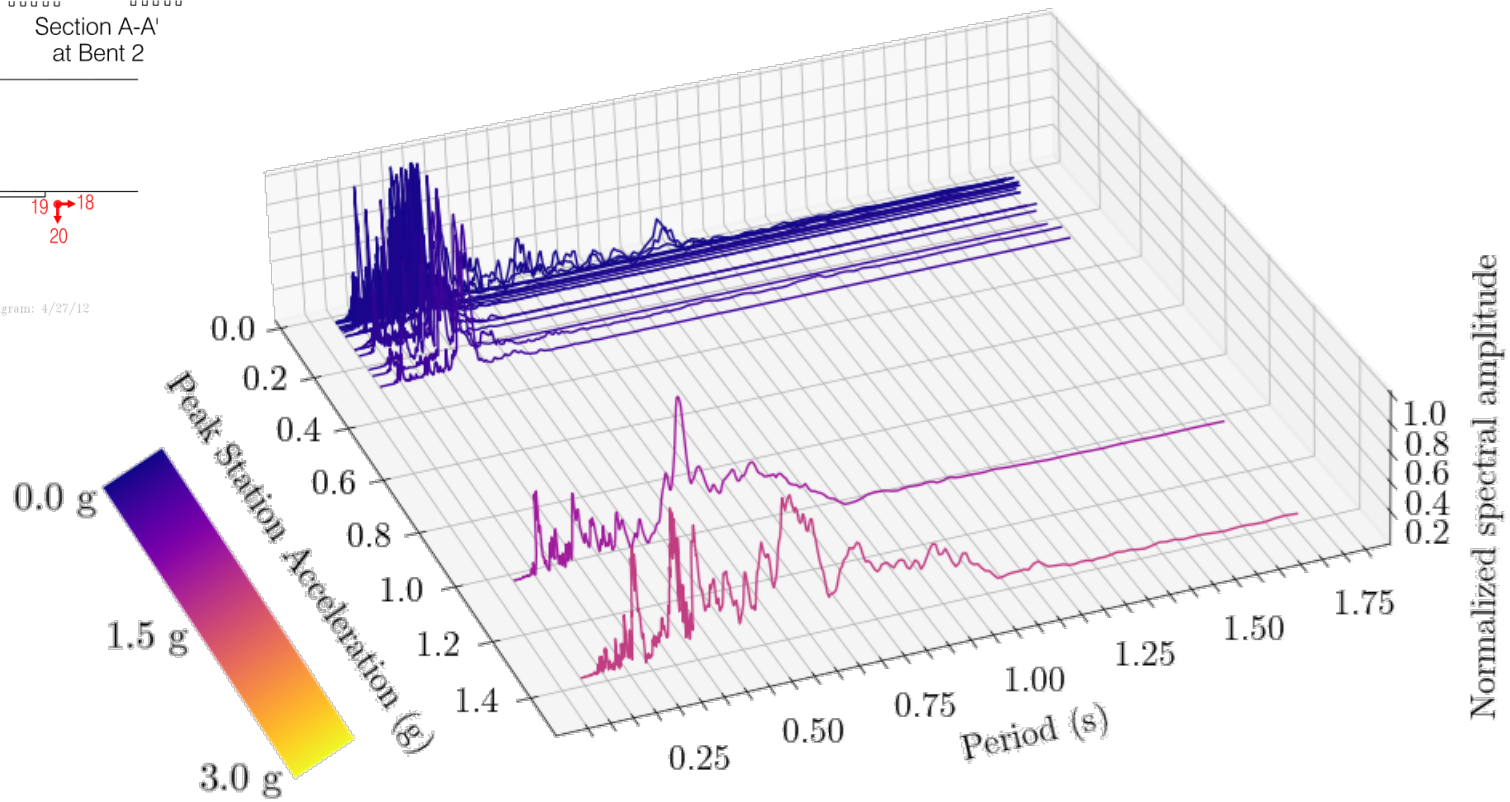


periods

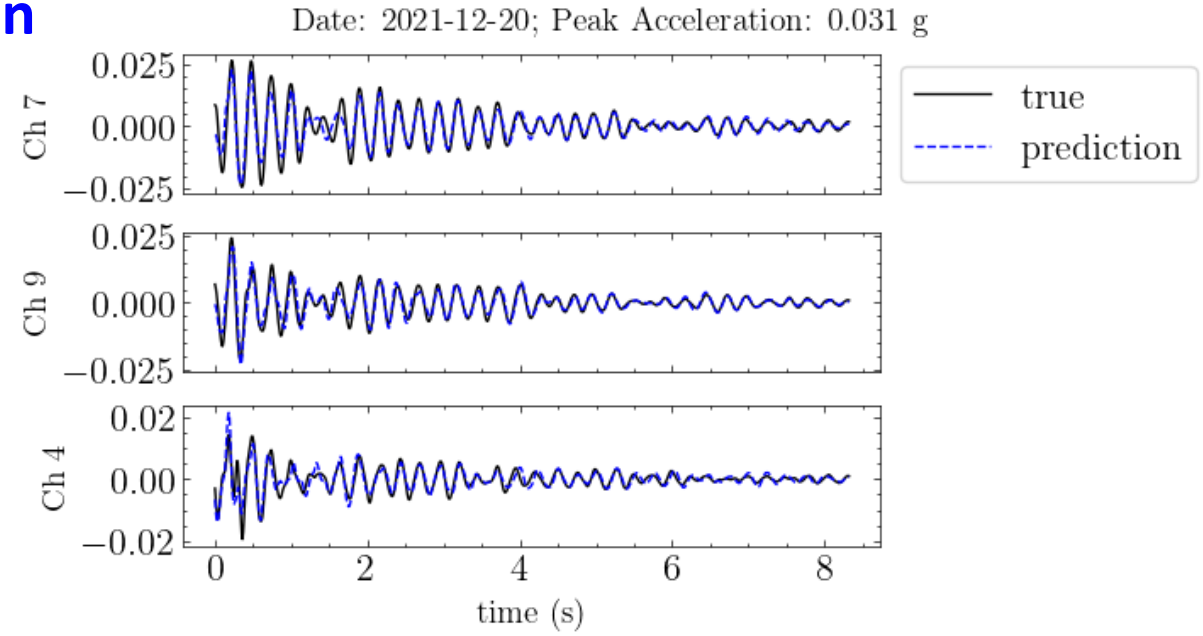


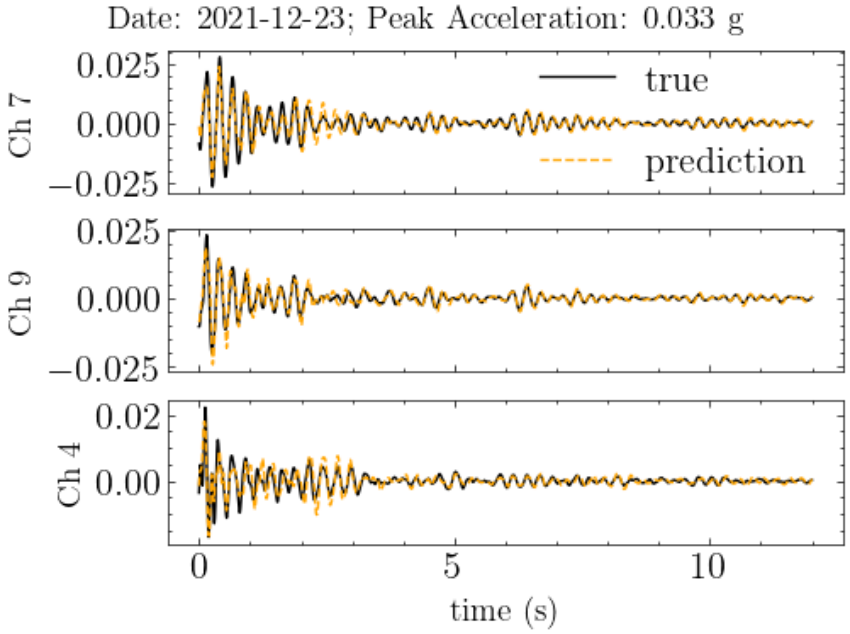


spectral shift

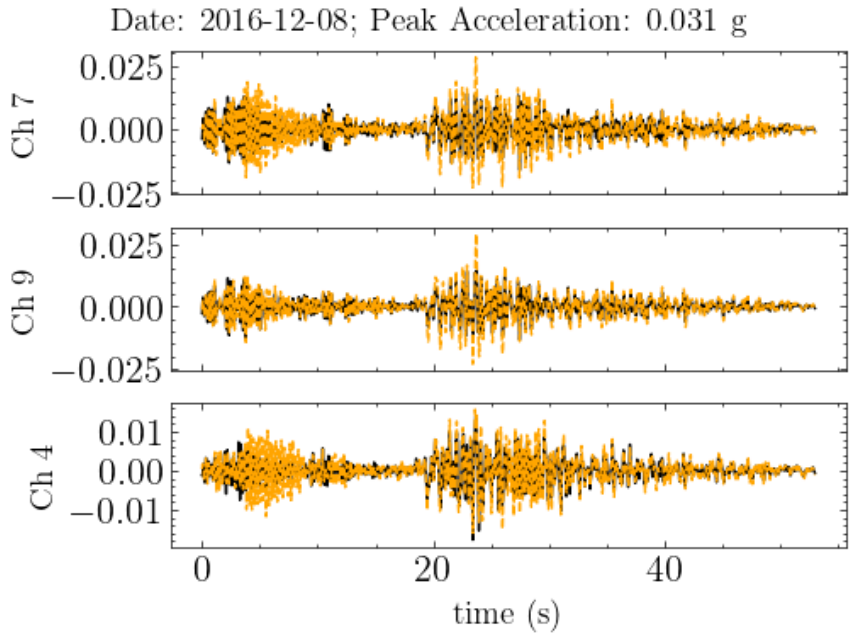


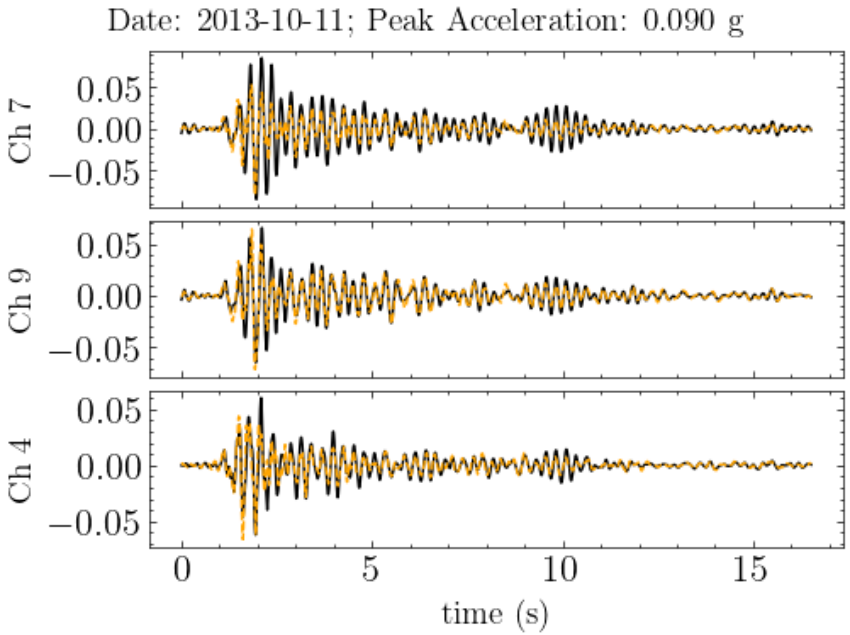
train

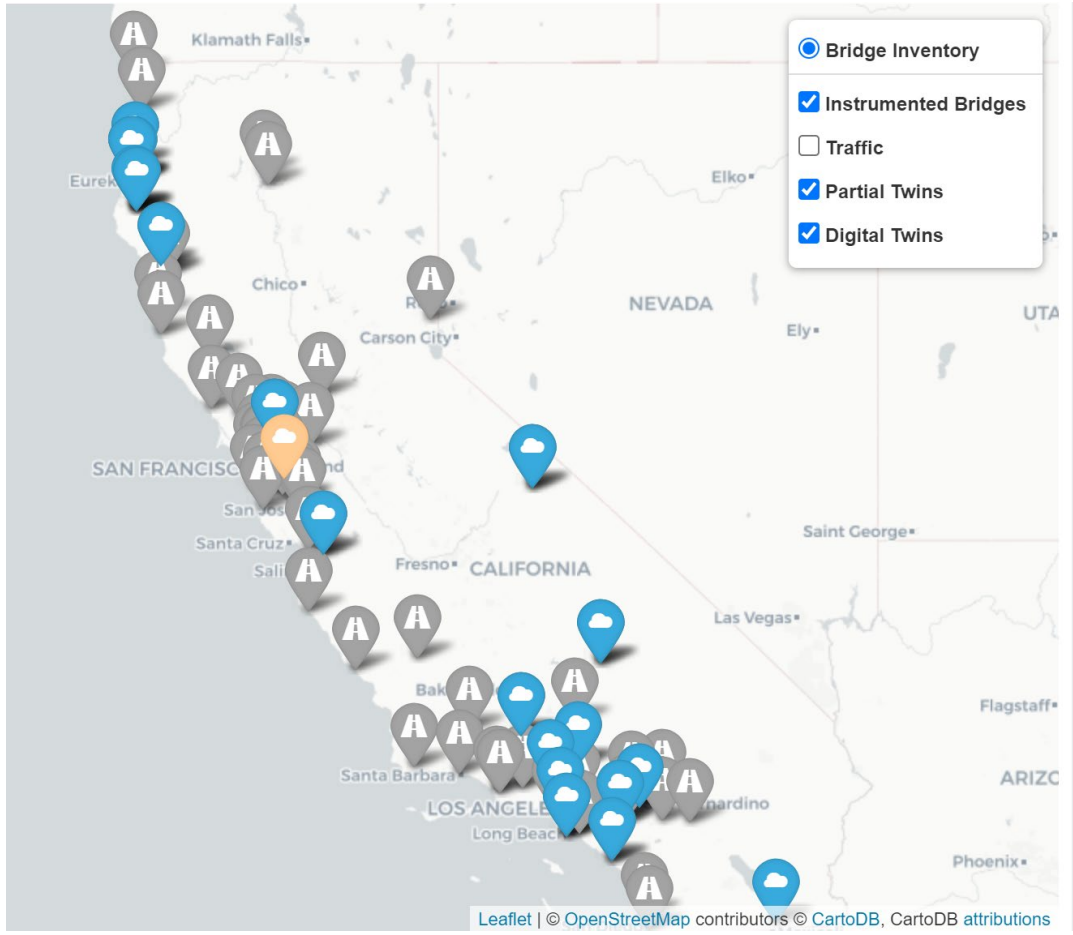

Date: 2021-12-20; Peak Acceleration: 0.031 g
Ch 7
Ch 9
Ch 4
true
prediction
time (s)


Date: 2021-12-23; Peak Acceleration: 0.033 g
Ch 7
Ch 9
Ch 4
true
prediction
time (s)

test


Date: 2016-12-08; Peak Acceleration: 0.031 g
Ch 7
Ch 9
Ch 4
time (s)


Date: 2013-10-11; Peak Acceleration: 0.090 g
Ch 7
Ch 9
Ch 4
time (s)

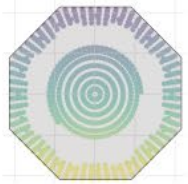


Sensor Data

Record ID: `58658-G0133-21275.03`

+ Acceleration

LOCATION	IDS	1	2	3
Abutment 1	1 2 3	-8.732	-12.072	15.011
Bent 3 South Column Grnd Level	6 7	11.807	-20.781	



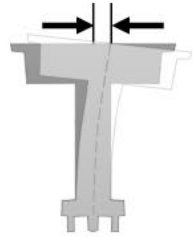
Component damage states

Max: DS0

timepoint: 0.0

At 28 of 28 evaluated columns

5 6 7



Peak displacement

0.300 in

timepoint: 385

Location: Bent 4 South

1 2 5 6 7

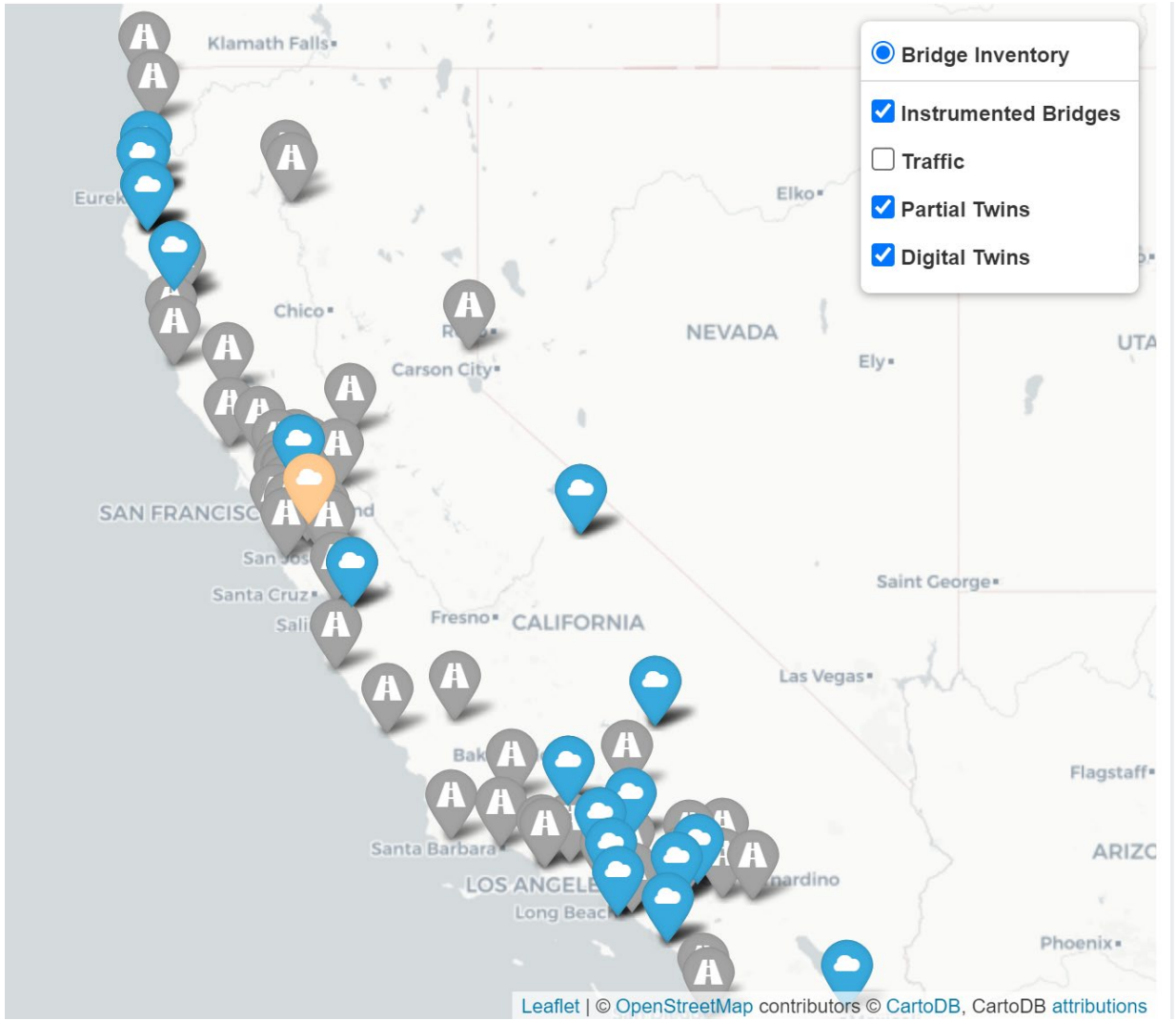
Peak acceleration

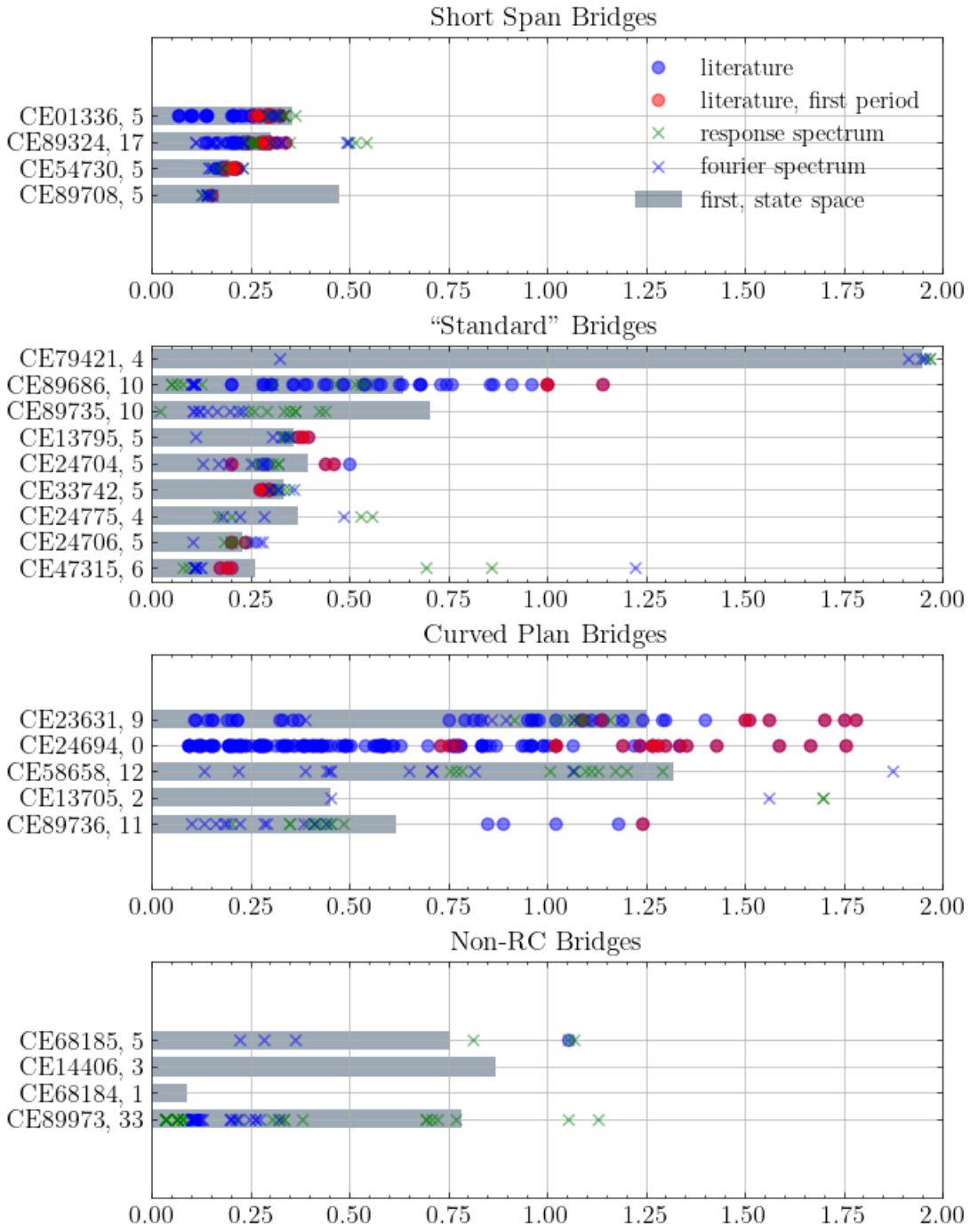
0.001 g

timepoint: 496

Location: Bent 9 South

1 2 5 6 7


Bridge Inventory
Instrumented Bridges
Traffic
Partial Twins
Digital Twins
Klamath Falls
Chico
Carson City
NEVADA
Elko
Ely
SAN FRANCISCO
Fresno
CALIFORNIA
Saint George
Las Vegas
Flagstaff
Santa Barbara
LOS ANGELES
Phoenix
Leaflet | © OpenStreetMap contributors © CartoDB, CartoDB attributions


Short Span Bridges
CE01336, 5
CE89324, 17
CE54730, 5
CE89708, 5
literature
literature, first period
response spectrum
fourier spectrum
first, state space
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00
"Standard" Bridges
CE79421, 4
CE89686, 10
CE89735, 10
CE13795, 5
CE24704, 5
CE33742, 5
CE24775, 4
CE24706, 5
CE47315, 6
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00
Curved Plan Bridges
CE23631, 9
CE24694, 0
CE58658, 12
CE13705, 2
CE89736, 11
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00
Non-RC Bridges
CE68185, 5
CE14406, 3
CE68184, 1
CE89973, 33
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00