Smartphones and Twitter for Earthquakes

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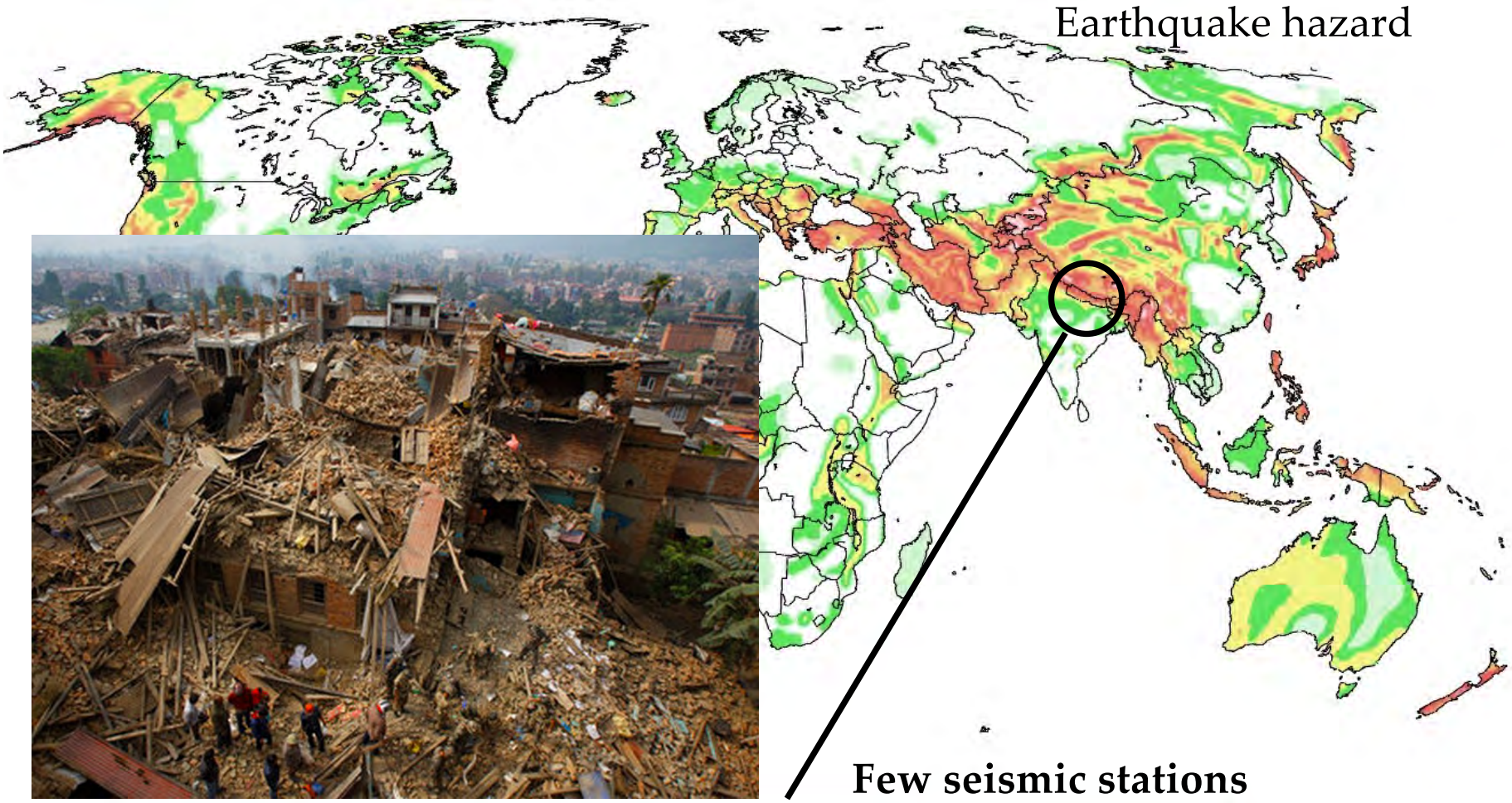
Prepared by LLNL under Contract DE-AC52-07NA27344.
This is document number LLNL-PRES-830566.

MyShake and Android Earthquake Alerting System

Carrier
11:14 AM
JScript Landscape Test
Google
Is Portrait
Carrier
localhos
Is

A global test

for a global hazard



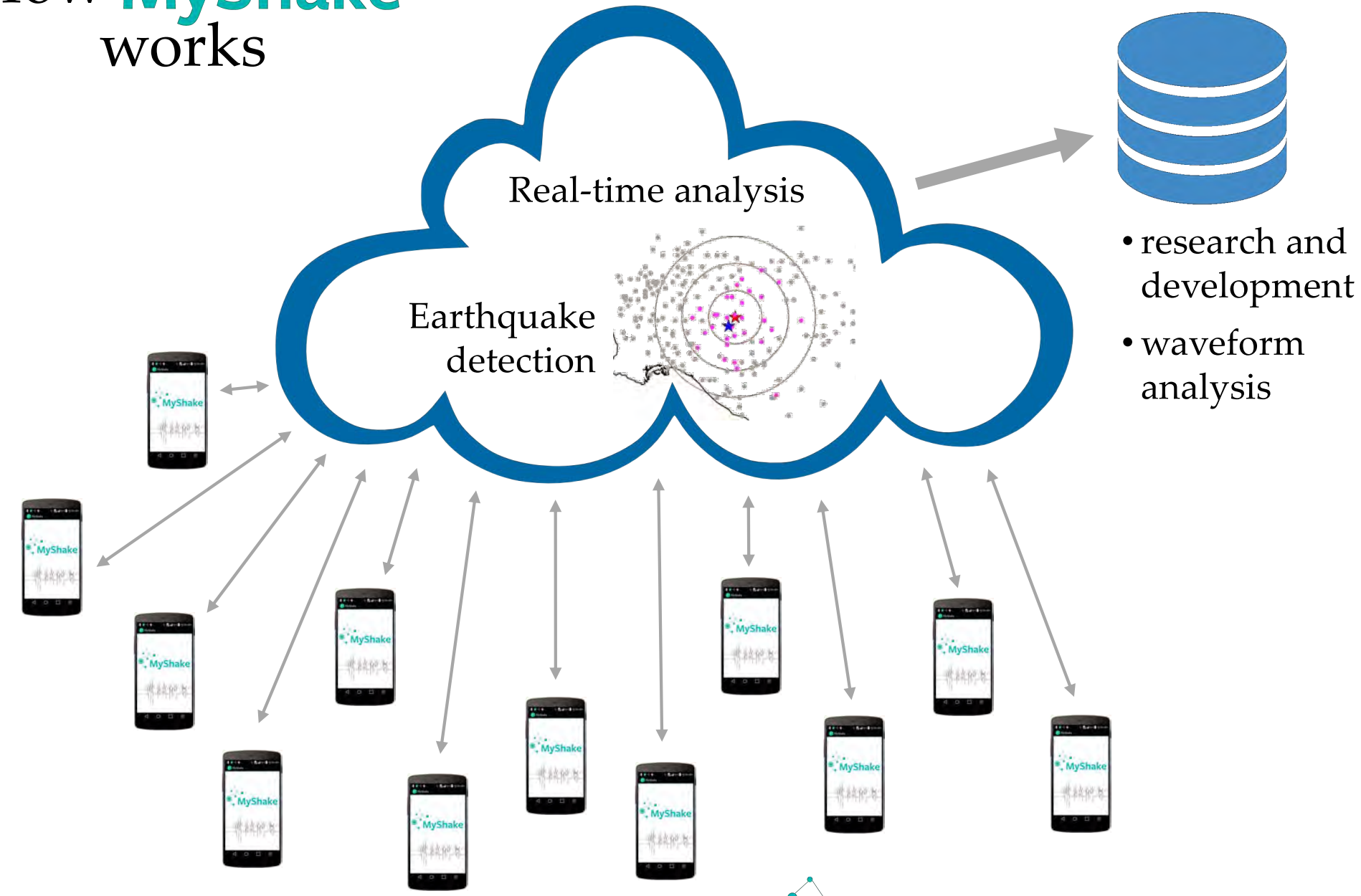
Few seismic stations

6 million smartphones

Katmandu, Nepal
April 2015, M7.9: 8000 fatalities

Early warning system

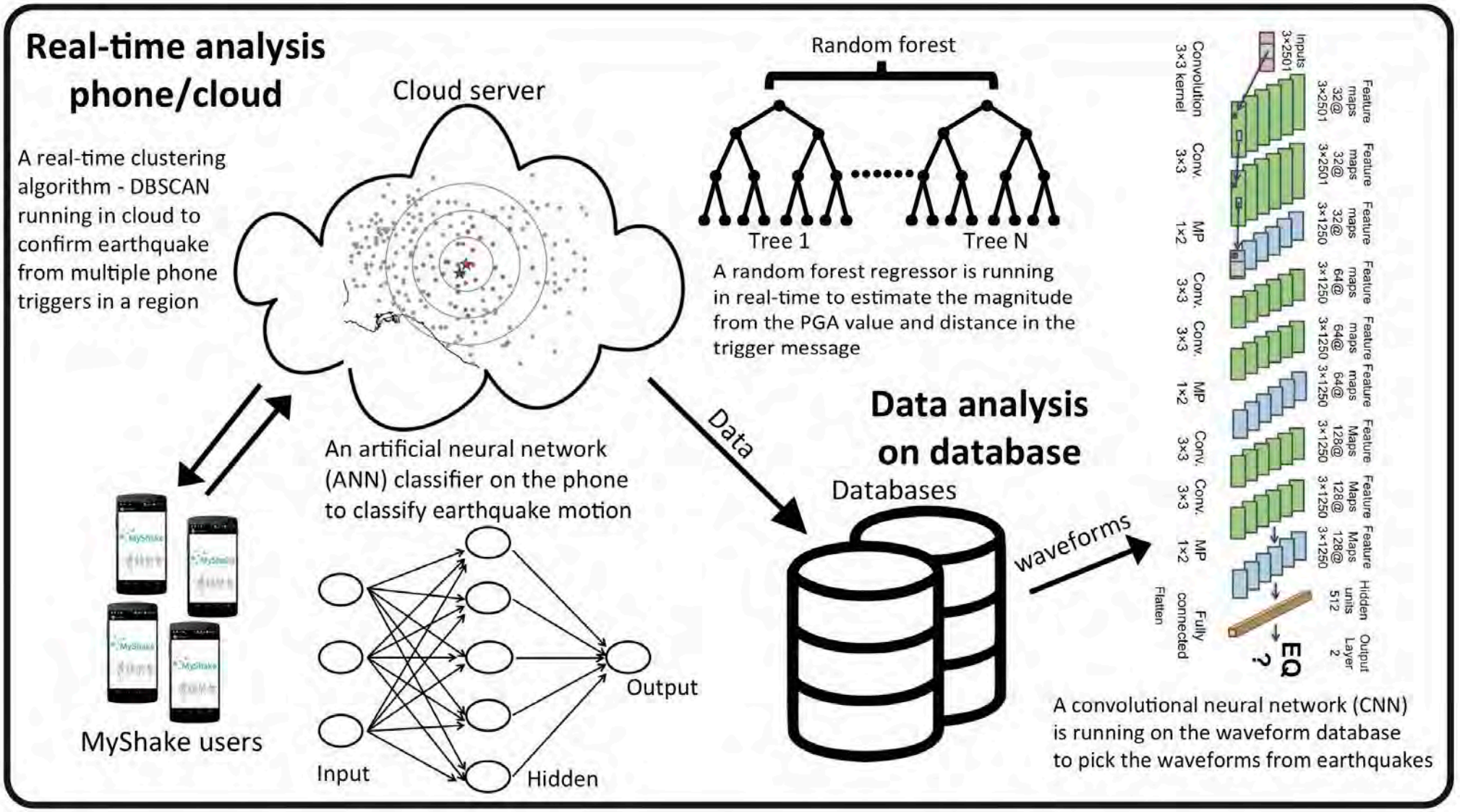
How MyShake works



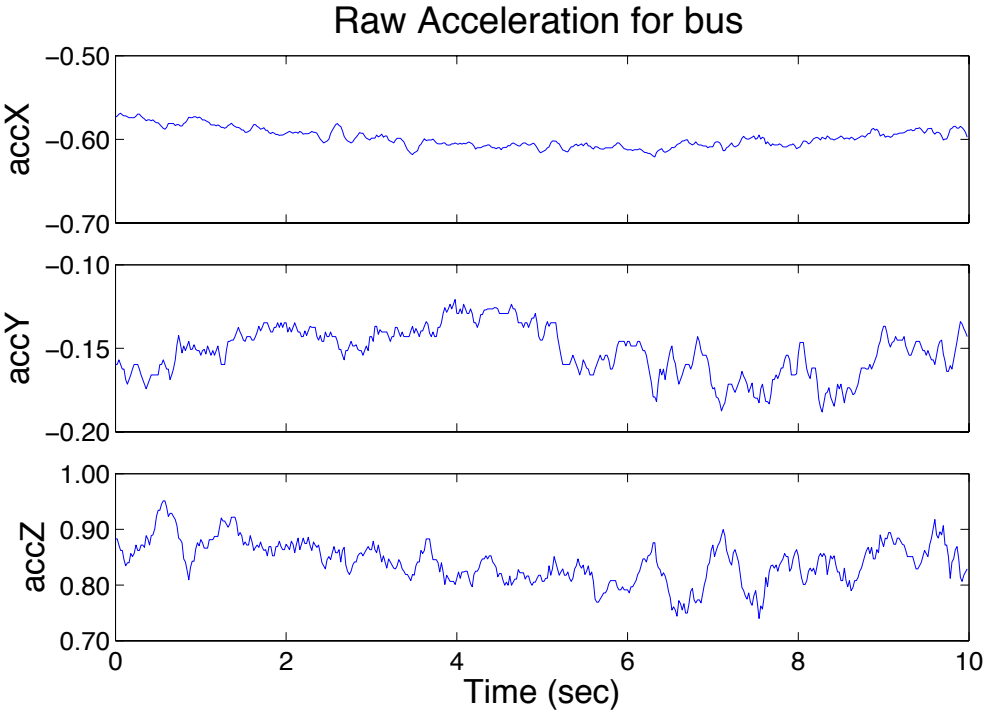
- research and development
- waveform analysis

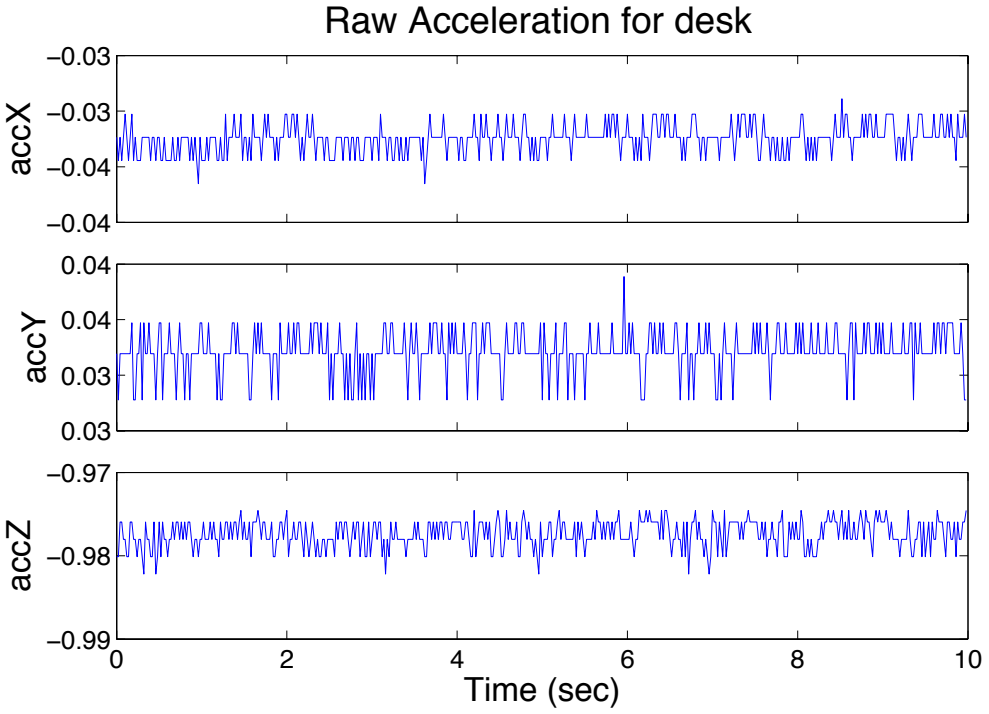
download the free app MyShake.berkeley.edu

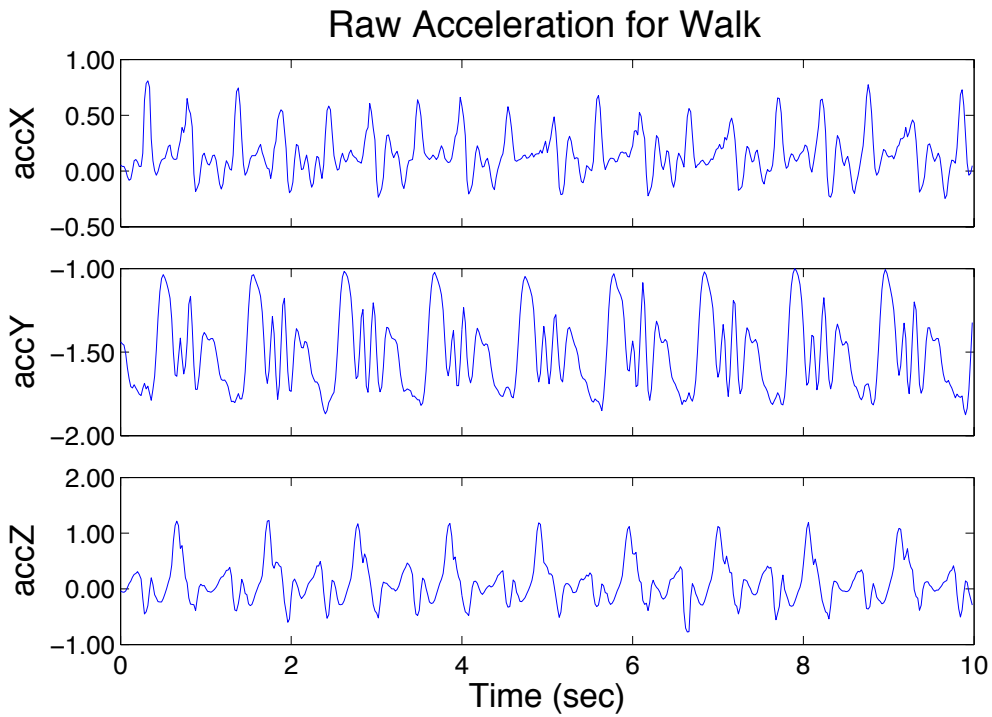
How MyShake works

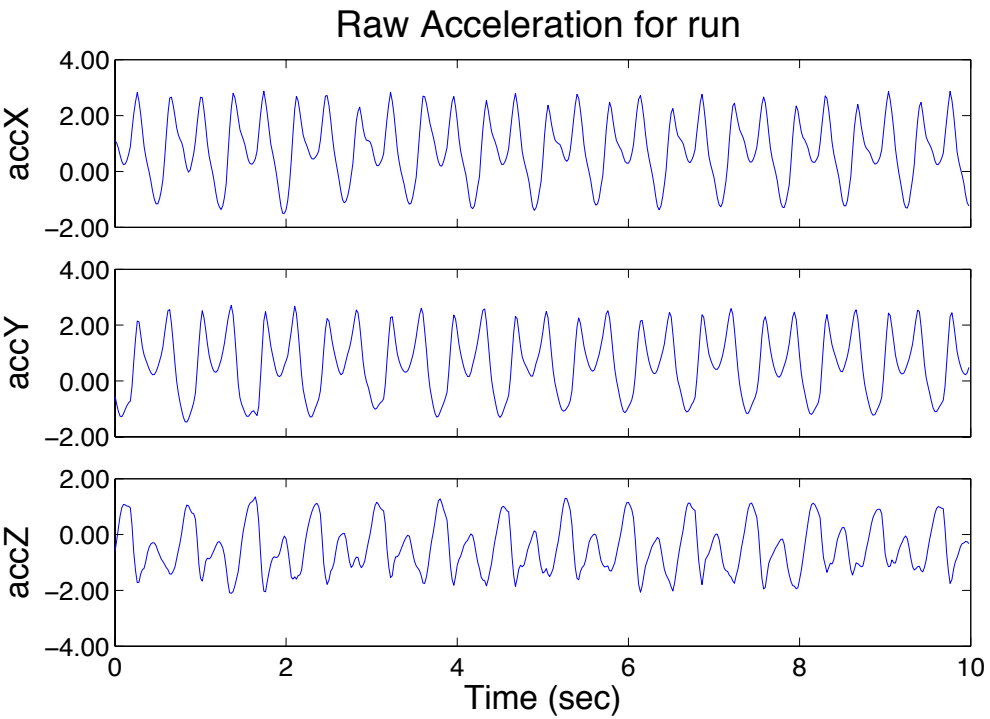


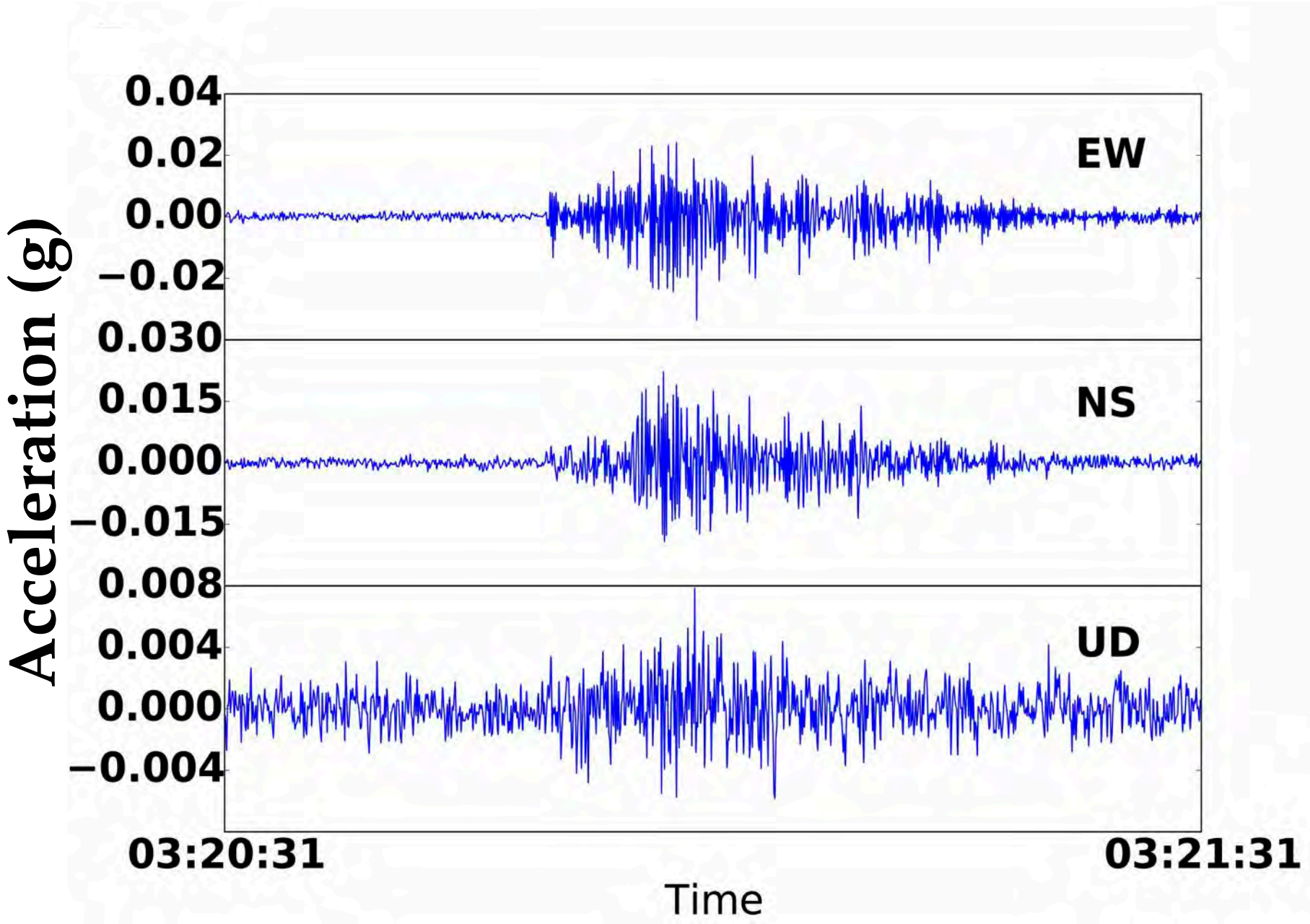
Is this an Earthquake?


Raw Acceleration for bus
accX
−0.50
−0.60
−0.70
accY
−0.10
−0.15
−0.20
accZ
1.00
0.90
0.80
0.70
0
2
4
6
8
10
Time (sec)

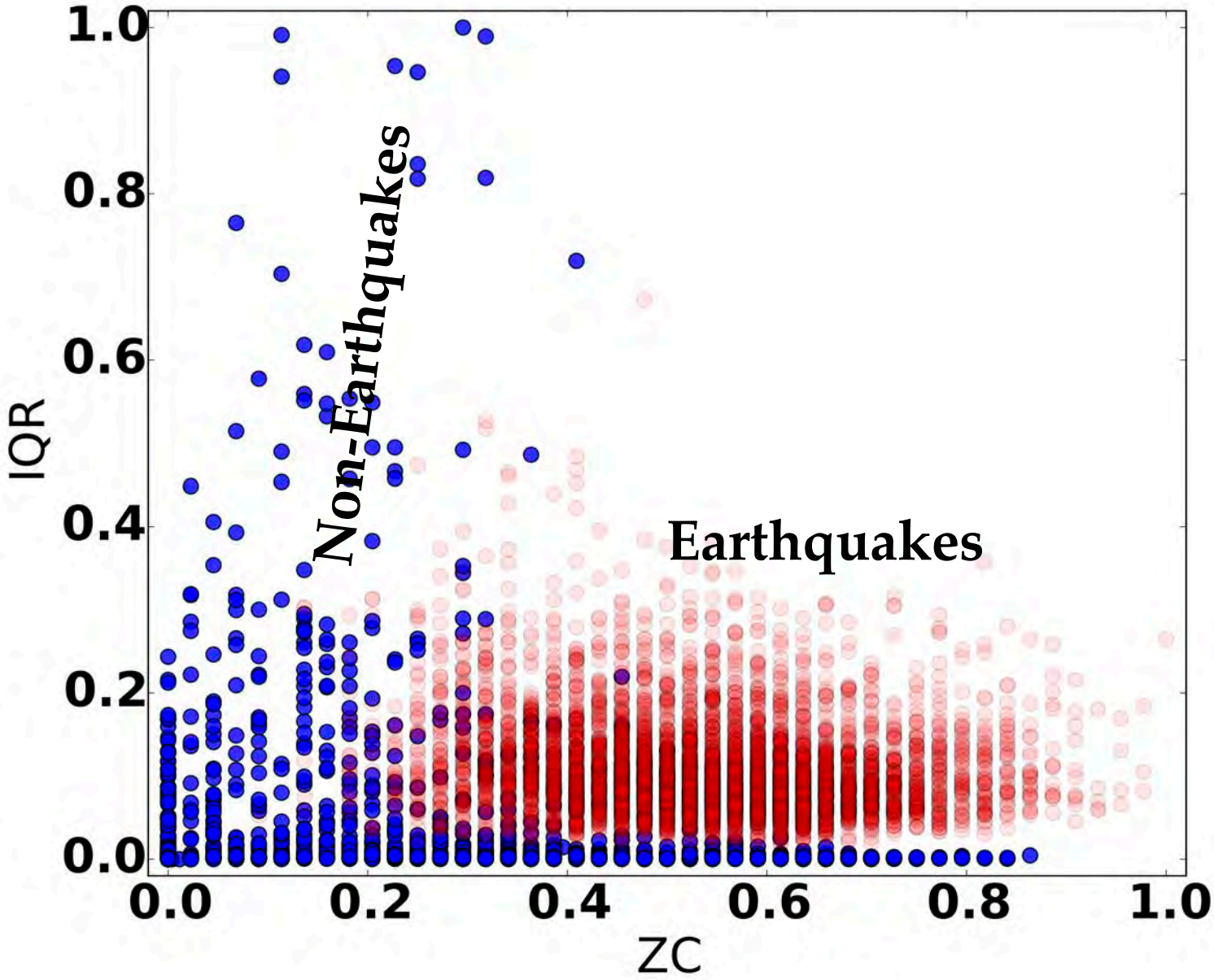

Raw Acceleration for desk
accX
−0.03
−0.03
−0.04
−0.04
accY
0.04
0.04
0.03
0.03
accZ
−0.97
−0.98
−0.99
0
2
4
6
8
10
Time (sec)


Raw Acceleration for Walk
accX
1.00
0.50
0.00
−0.50
accY
−1.00
−1.50
−2.00
accZ
2.00
1.00
0.00
−1.00
0
2
4
6
8
10
Time (sec)


Raw Acceleration for run
accX
4.00
2.00
0.00
−2.00
accY
4.00
2.00
0.00
−2.00
accZ
2.00
0.00
−2.00
−4.00
0
2
4
6
8
10
Time (sec)


Acceleration (g)
0.04
0.02
0.00
−0.02
0.030
0.015
0.000
−0.015
0.008
0.004
0.000
−0.004
EW
NS
UD
03:20:31
03:21:31
Time

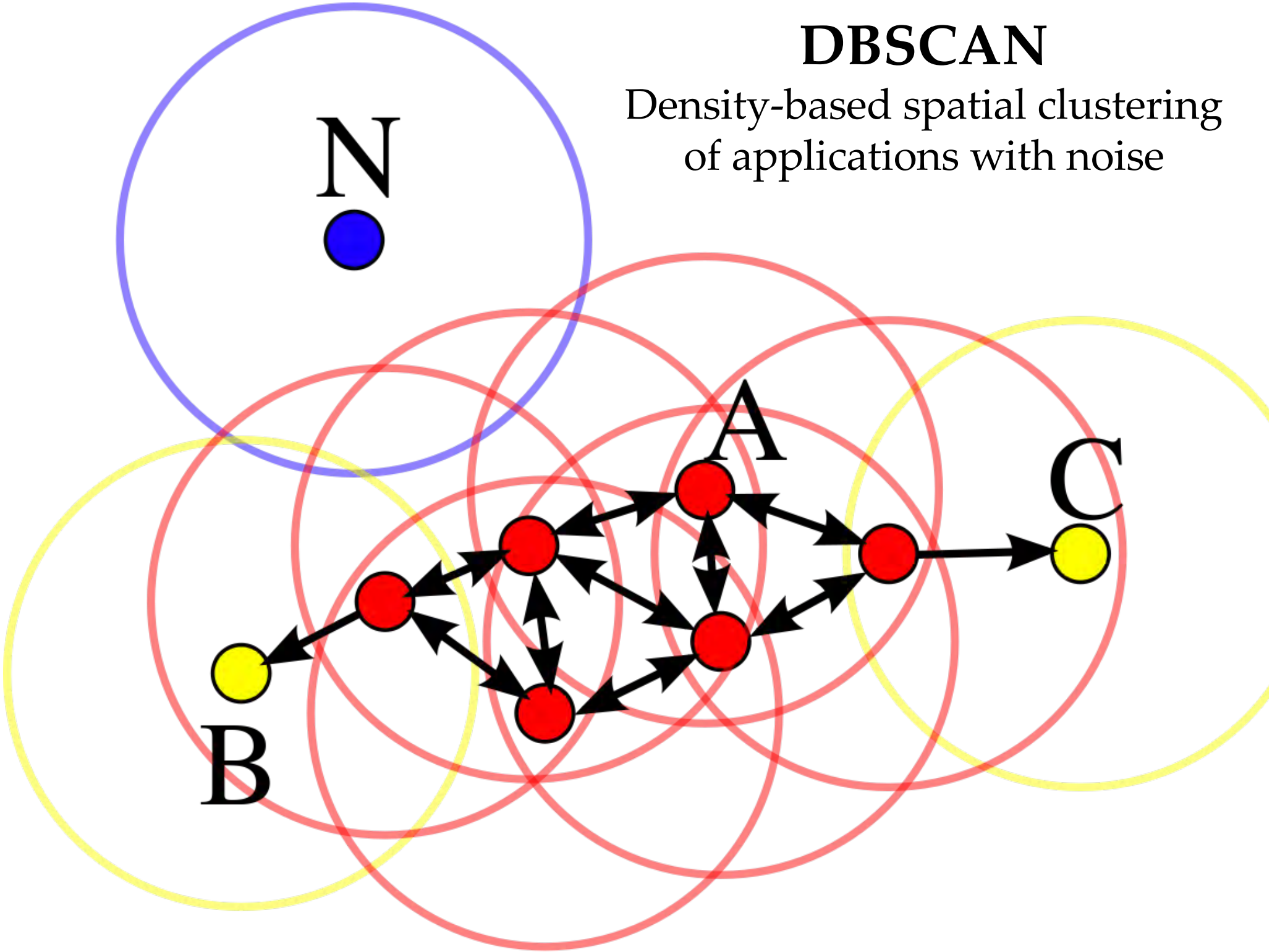
Classification



A network of MyShakers

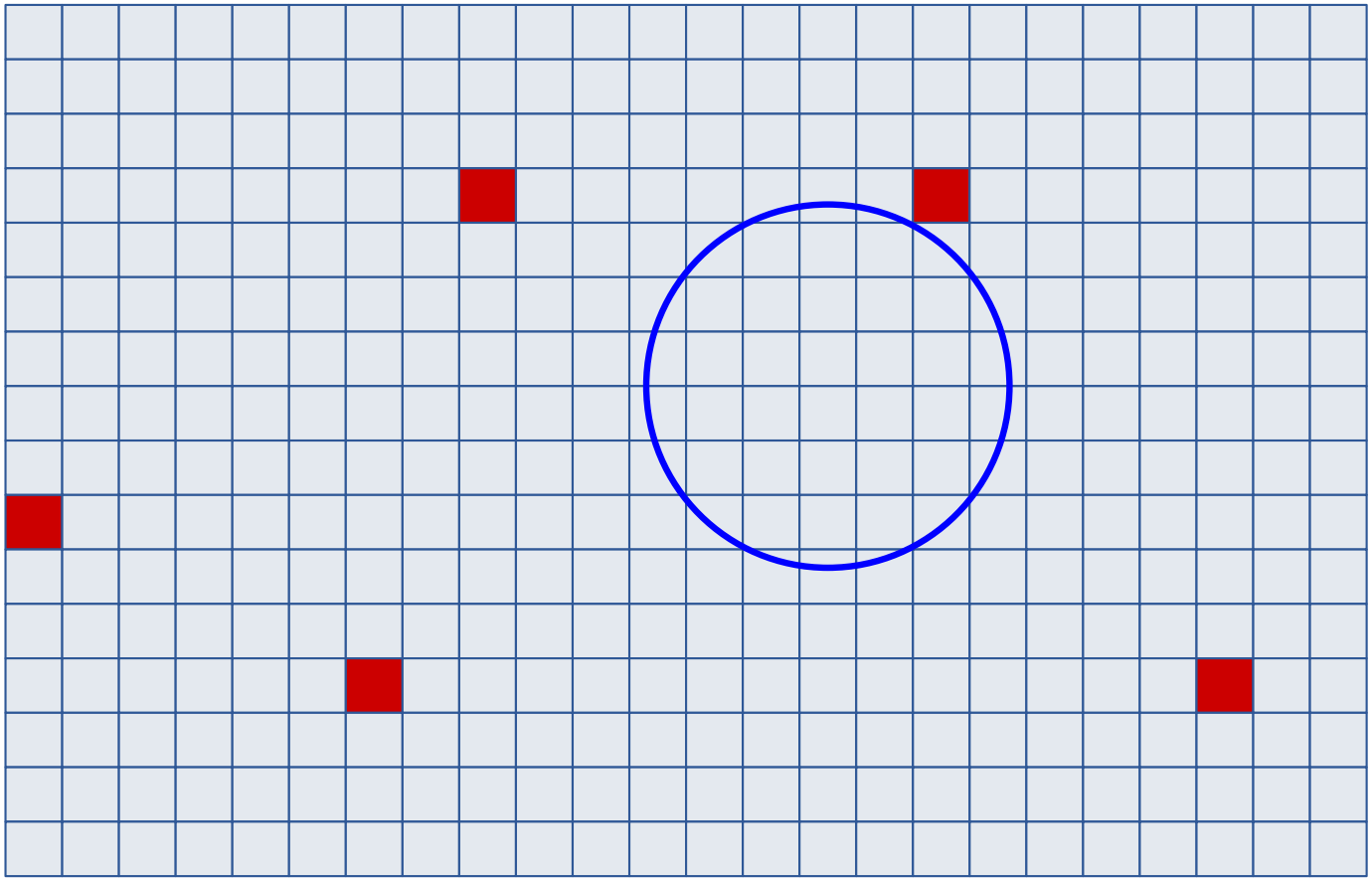
DBSCAN

Density-based spatial clustering of applications with noise



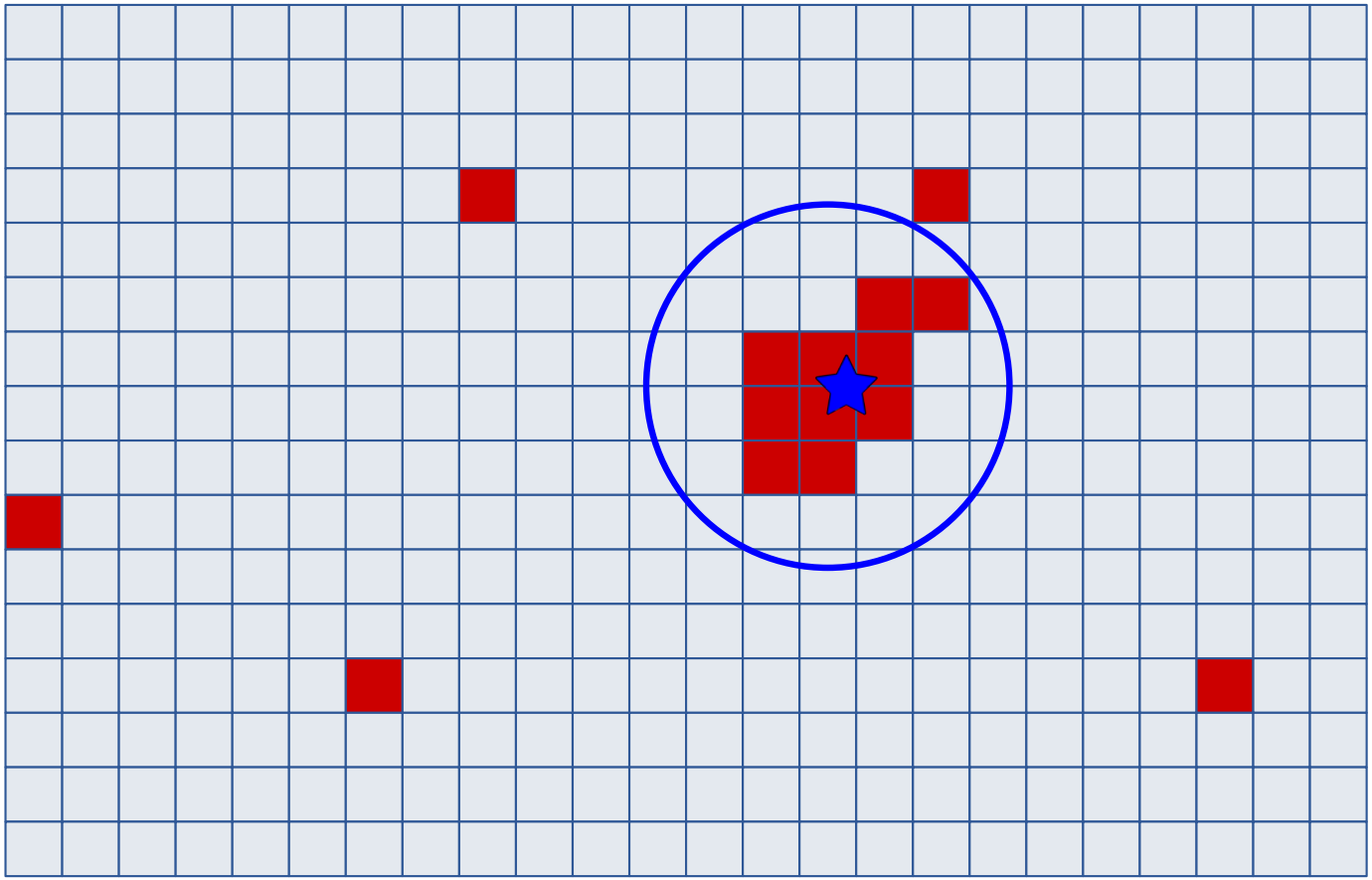
Using MGRS grid cells

Random



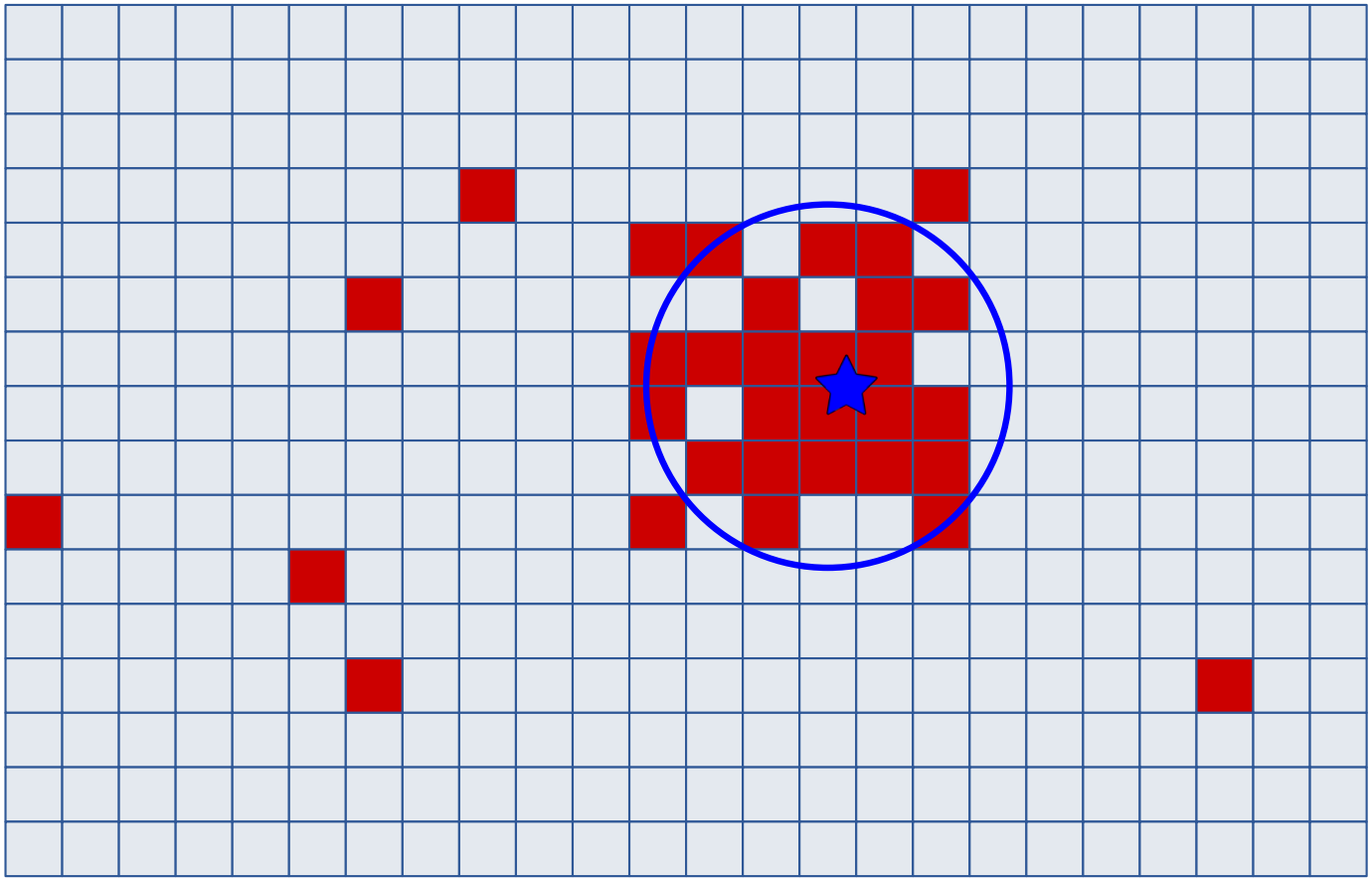
Using MGRS grid cells

Earthquake



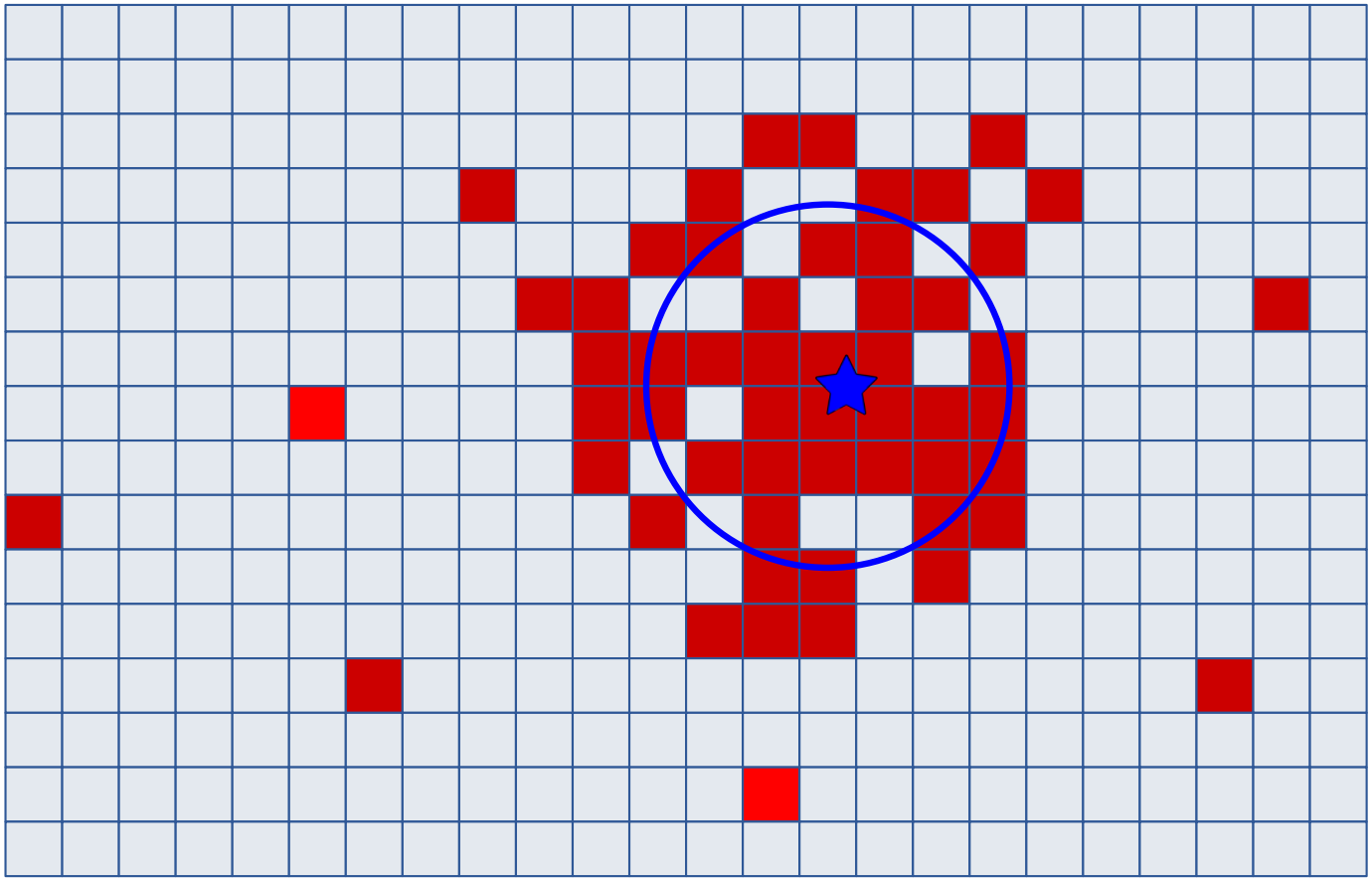
Using MGRS grid cells

Earthquake

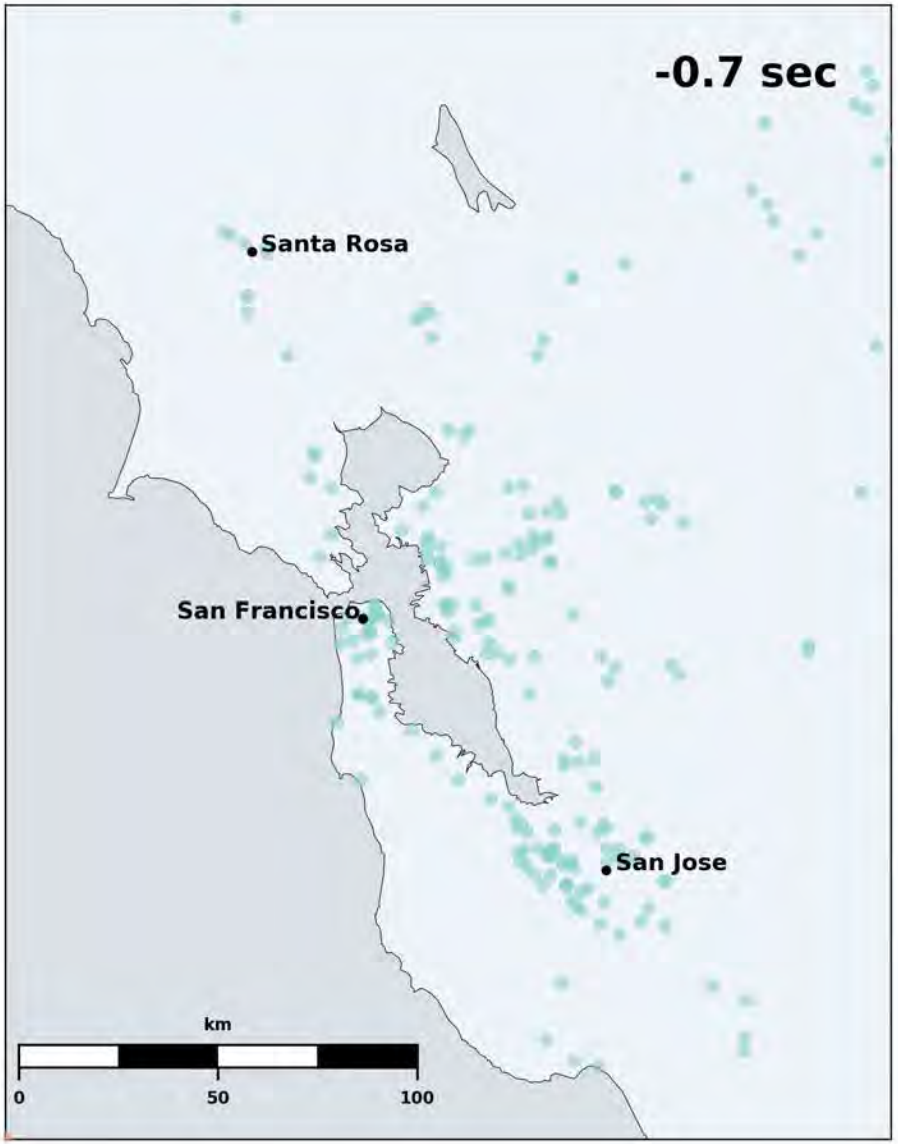


Using MGRS grid cells

Earthquake



Berkeley earthquake



Time(UTC) 2018-01-04 10:39:37
Time(Local) 2018-01-04 02:39:37
Triggers 0

M4.4 Berkeley
Depth 12.3 km

- MyShake phone
- Triggered phone
- Used for location
- True earthquake location
- Estimated earthquake location
- P-wave front
- S-wave front
- Limit of shaking intensity 4

Before MyShake 2.0

Already a global seismic network

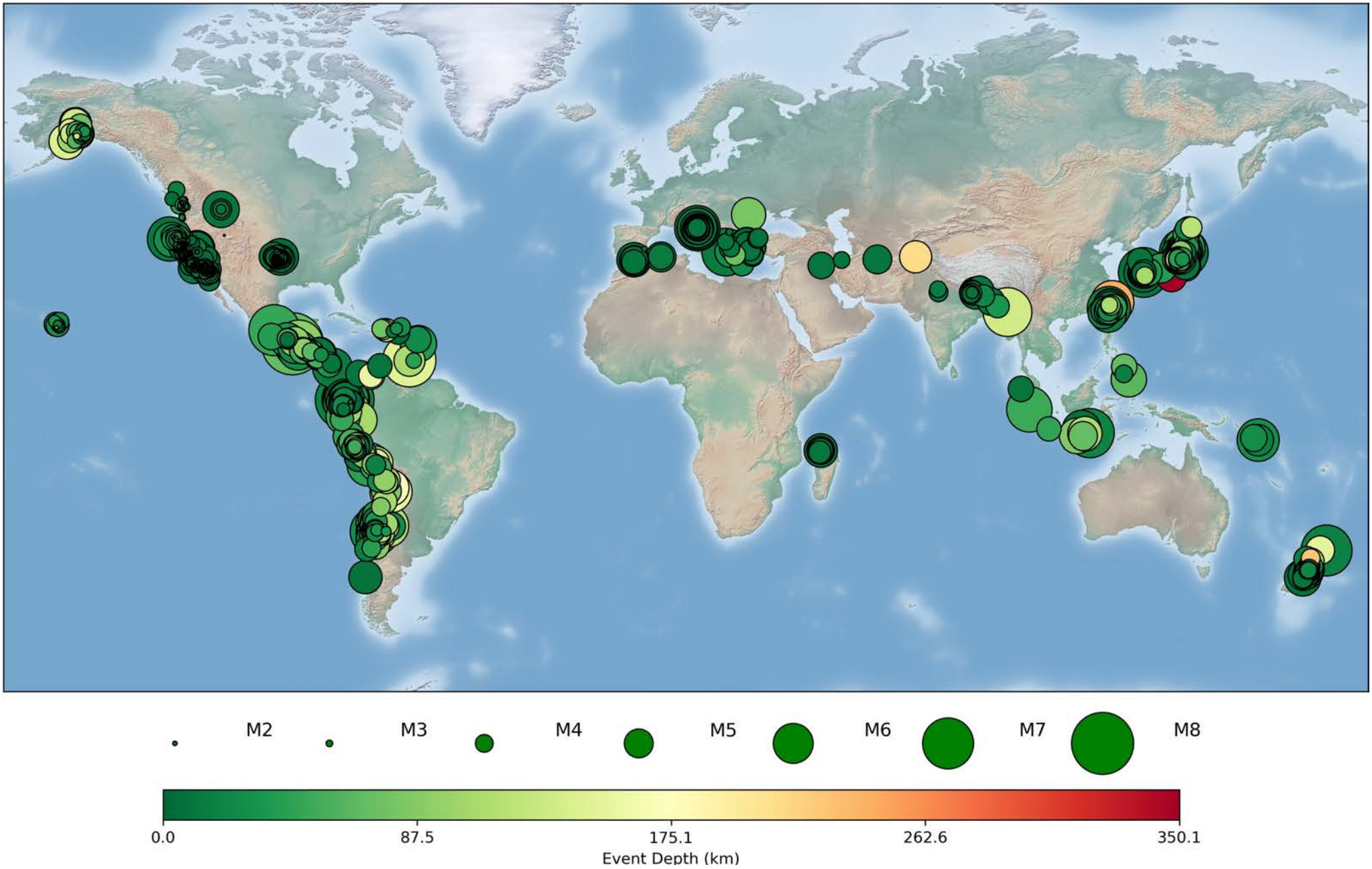
MyShake 1.0 downloads: 300,000

Earthquakes recorded: ***1000+*** to date

(usable seismic waveforms)

M1.7 to M7.8

Surface to 350 km depth



android

Earthquake Alerts

the earthquake team

Marc Stogaitis
Alexei Barski
Steve Malkos
Robert Bosch
Patrick Robertson
Tajinder Gadh
Youngmin Cho
Summer Jiang
Boone Spooner
Richard Allen
Qingkai Kong
Greg Wimpey
Yiwen Chen
Stark Zhu

Two elements announced:

1. **Alerts delivered to all Android phones across California**

   M4.5 beneath Los Angeles:
   alert delivered to
   2.2 million people

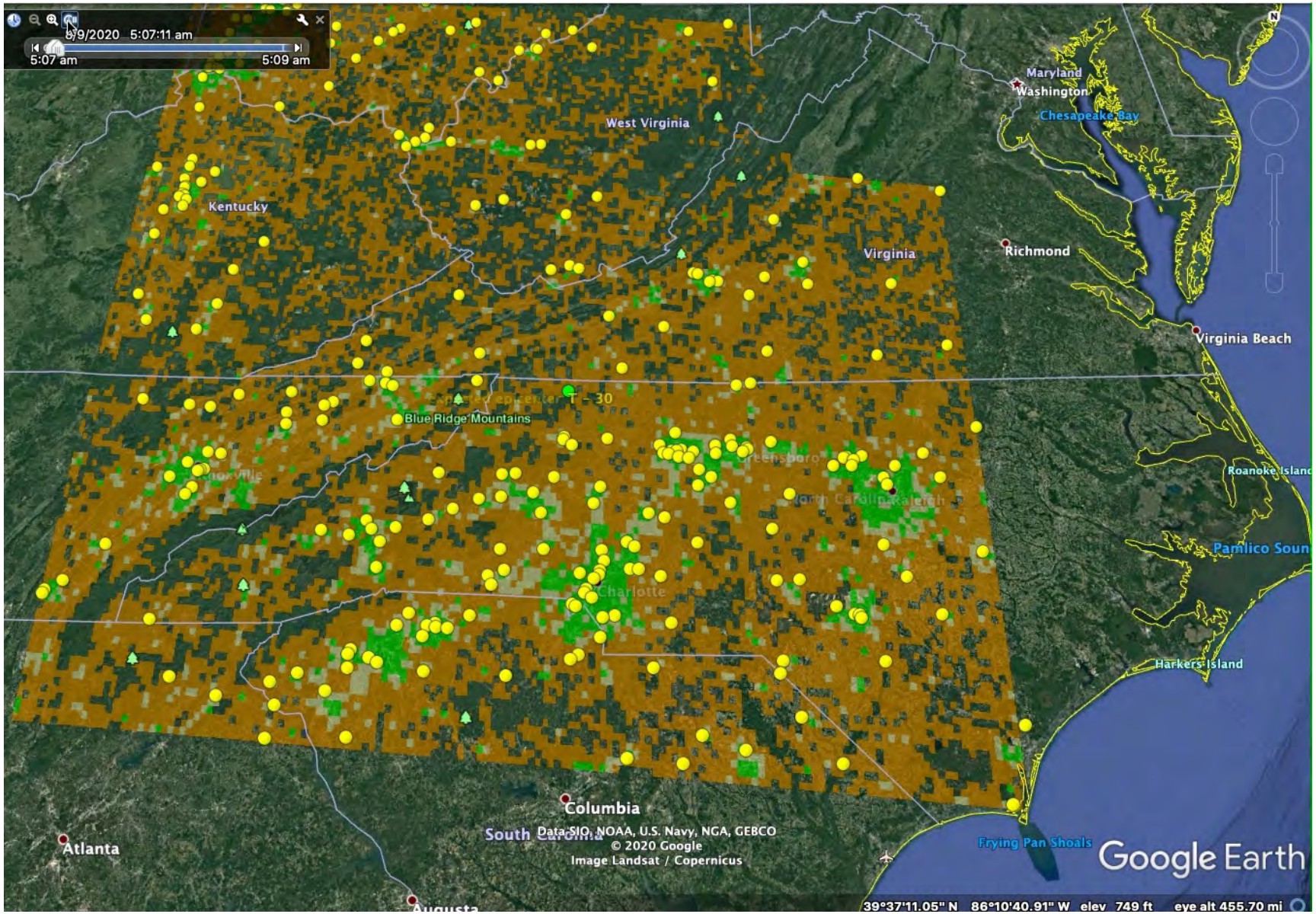
2. **Phones now being used to detect earthquakes globally**
   …with the goal to deliver alerts

Google blog – August 11, 2020

Earthquake detection and early alerts, now on your Android phone

Phone detections

M5.1– North Carolina – Aug 9, 2020



An Analysis of Twitter Responses to the 2019 Ridgecrest Earthquake Sequence

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Ph.D student

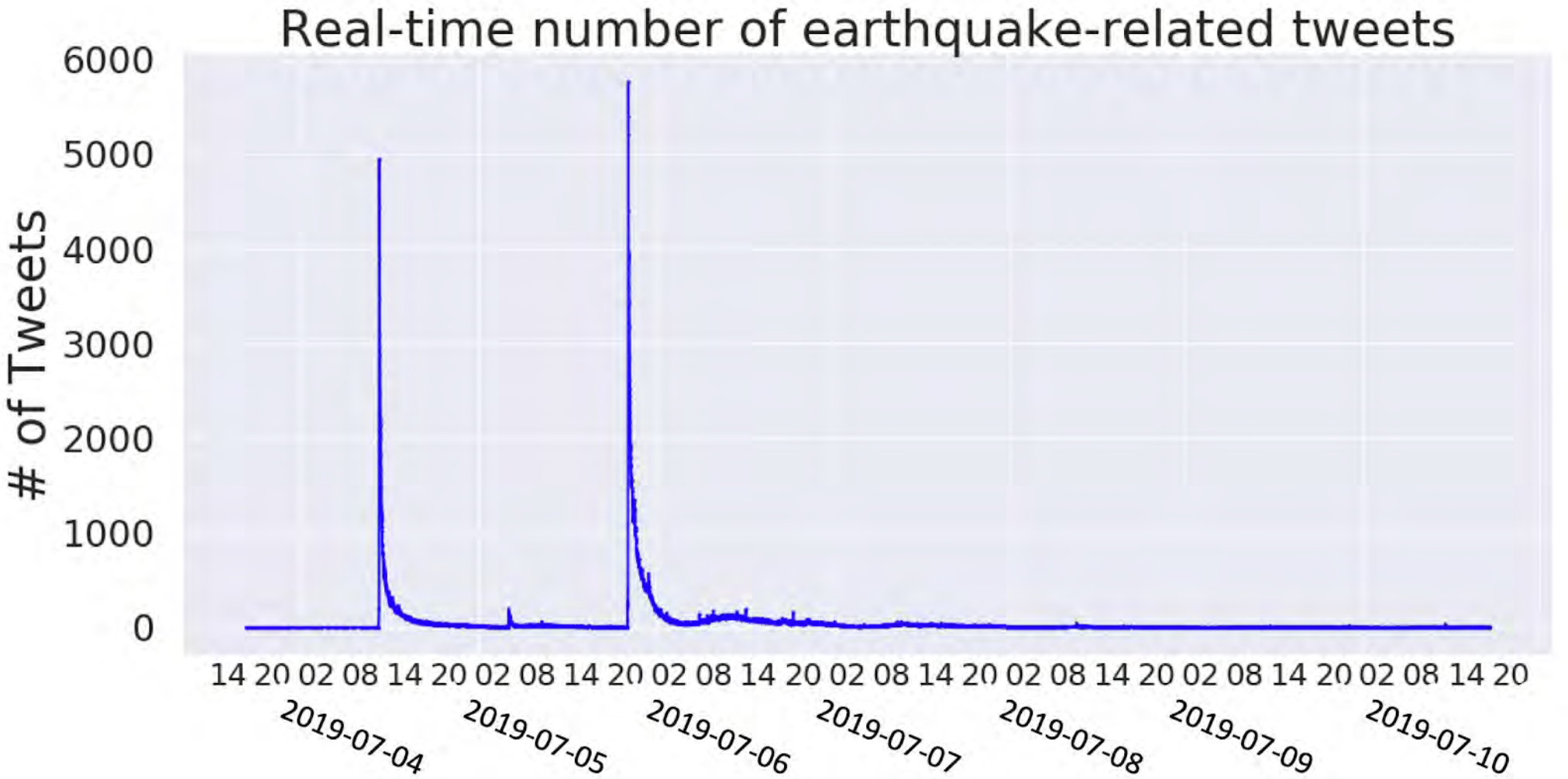
Yawen Zhang
Ph.D student

Sara Mcbride
USGS

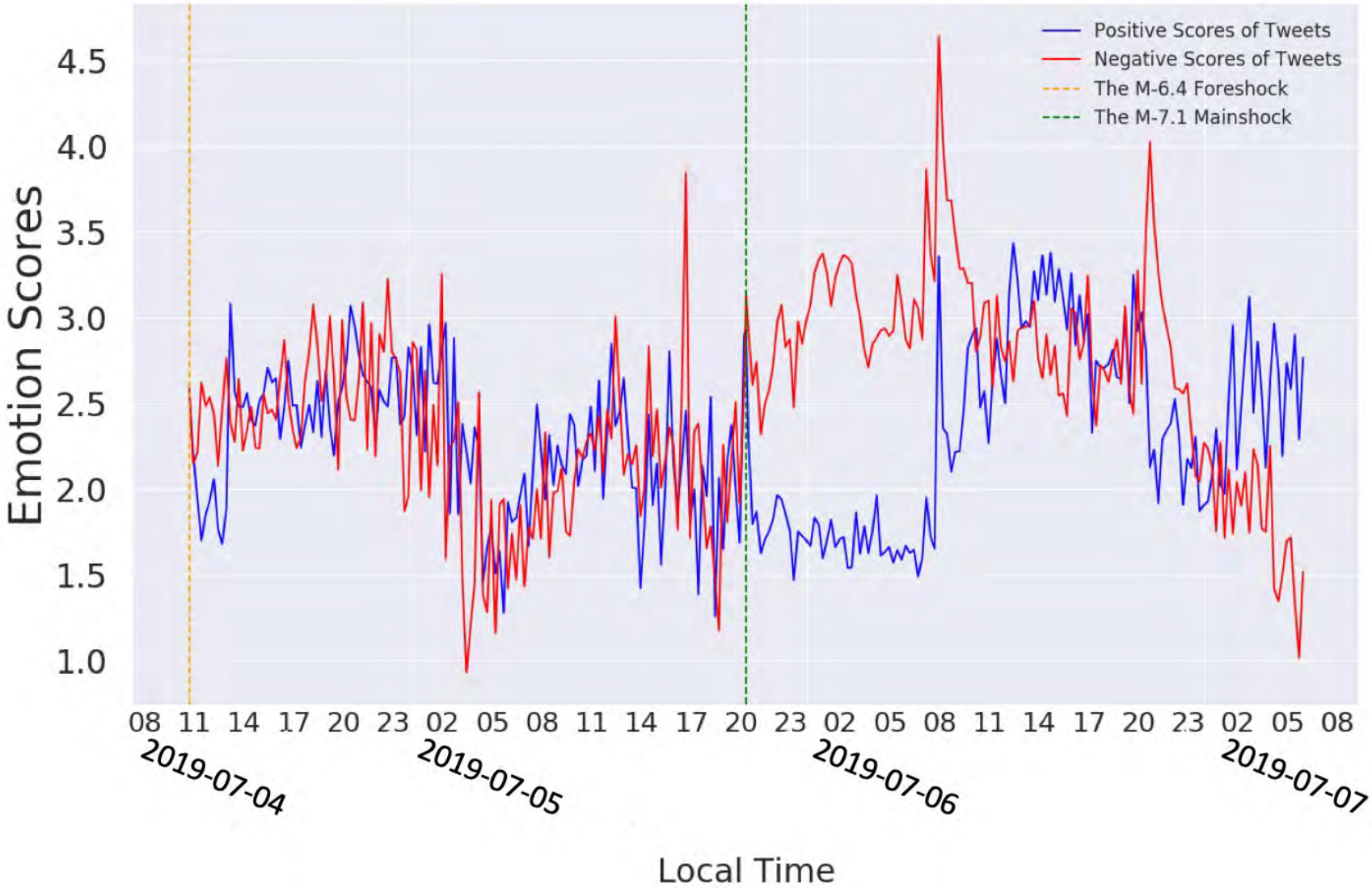
Christine Qin
Professor

Data we worked on

Clearly see the response

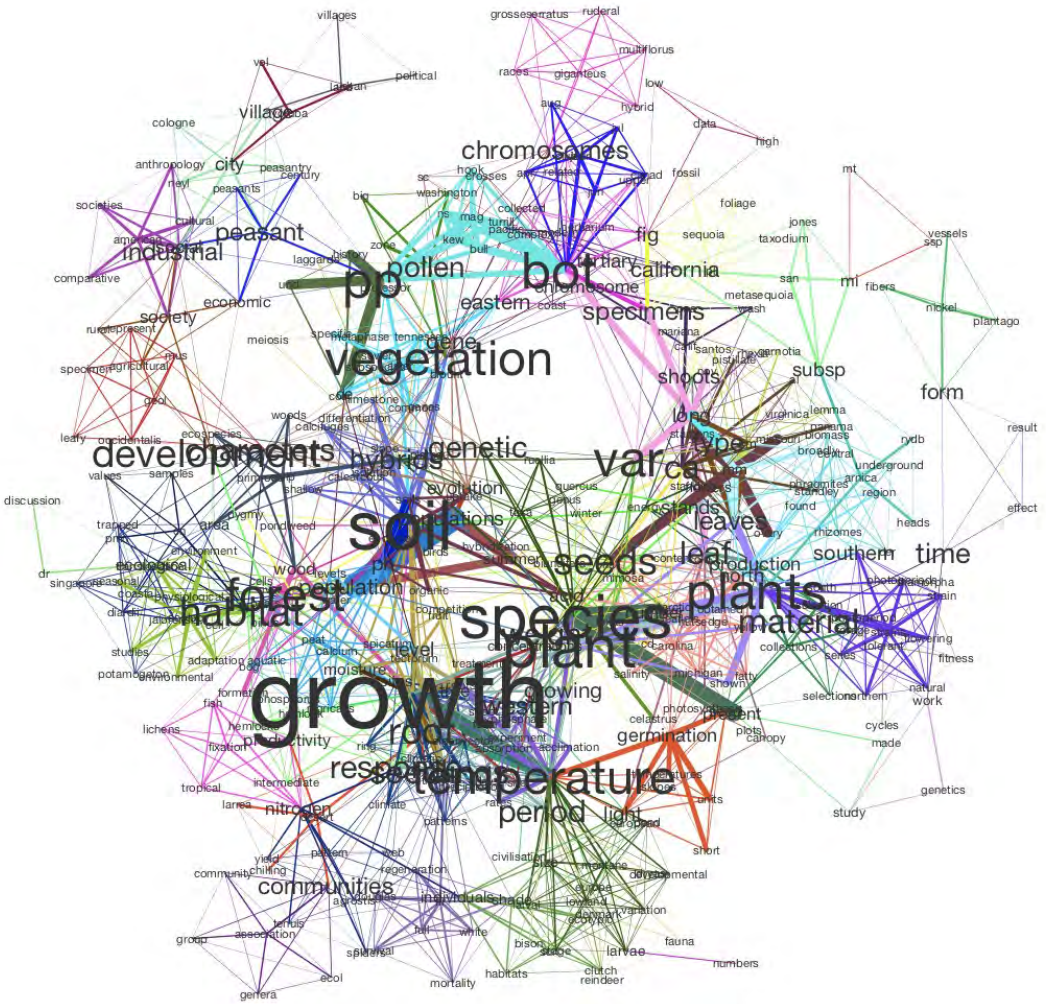


Emotion response



Topic modeling

- Word Network Topic Model (WNTM)

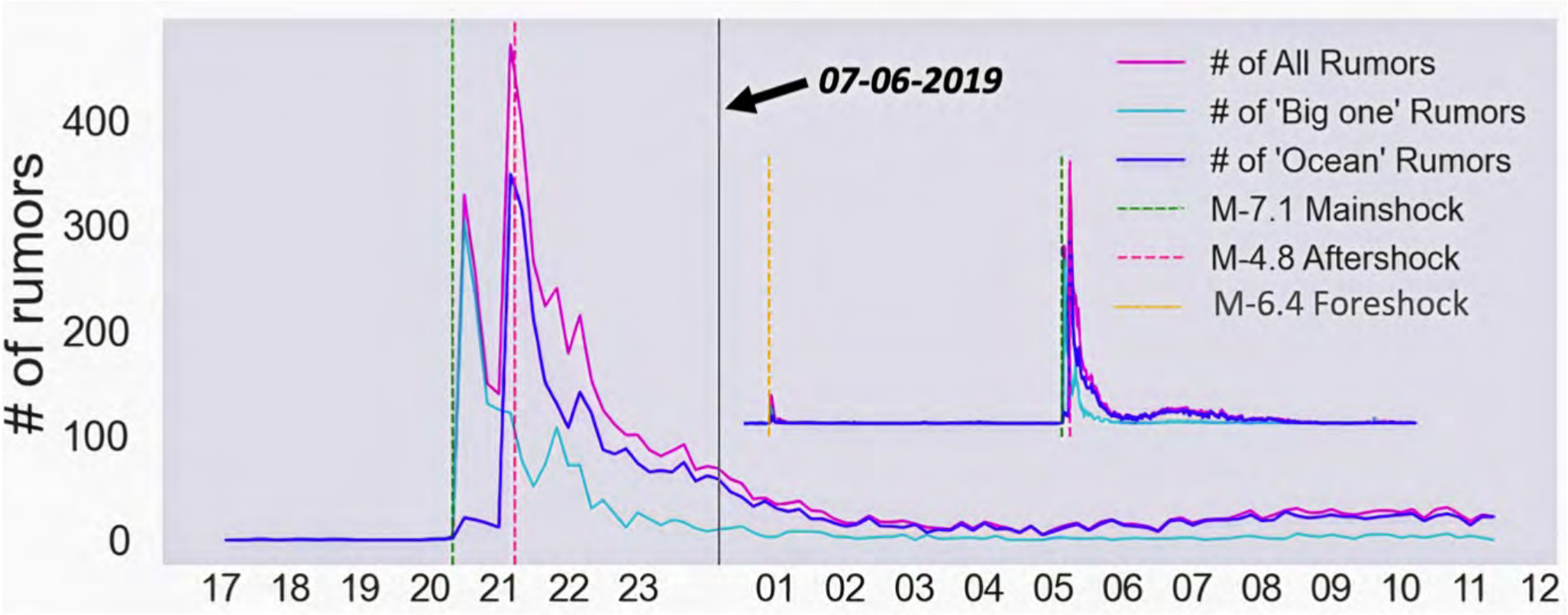


It is clustering of the words in each document into different topics

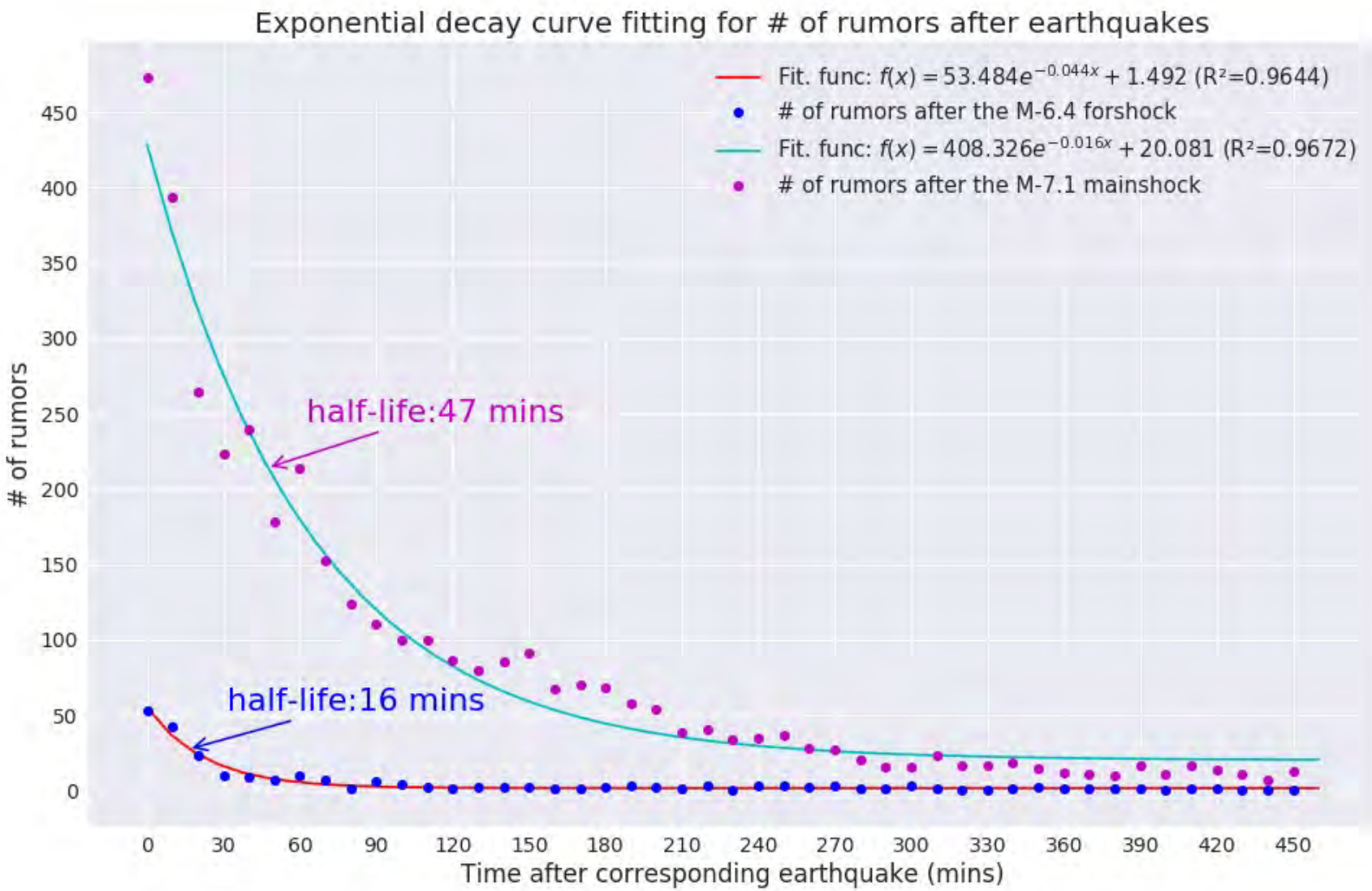
Assumption:

the semantics of two words will be similar if they tend to occur in similar contexts.

Rumor analysis



Rumor life span



Thank you!