Variations in earthquake frequency and seismicity

CASE STUDIES IN STATISTICAL THINKING

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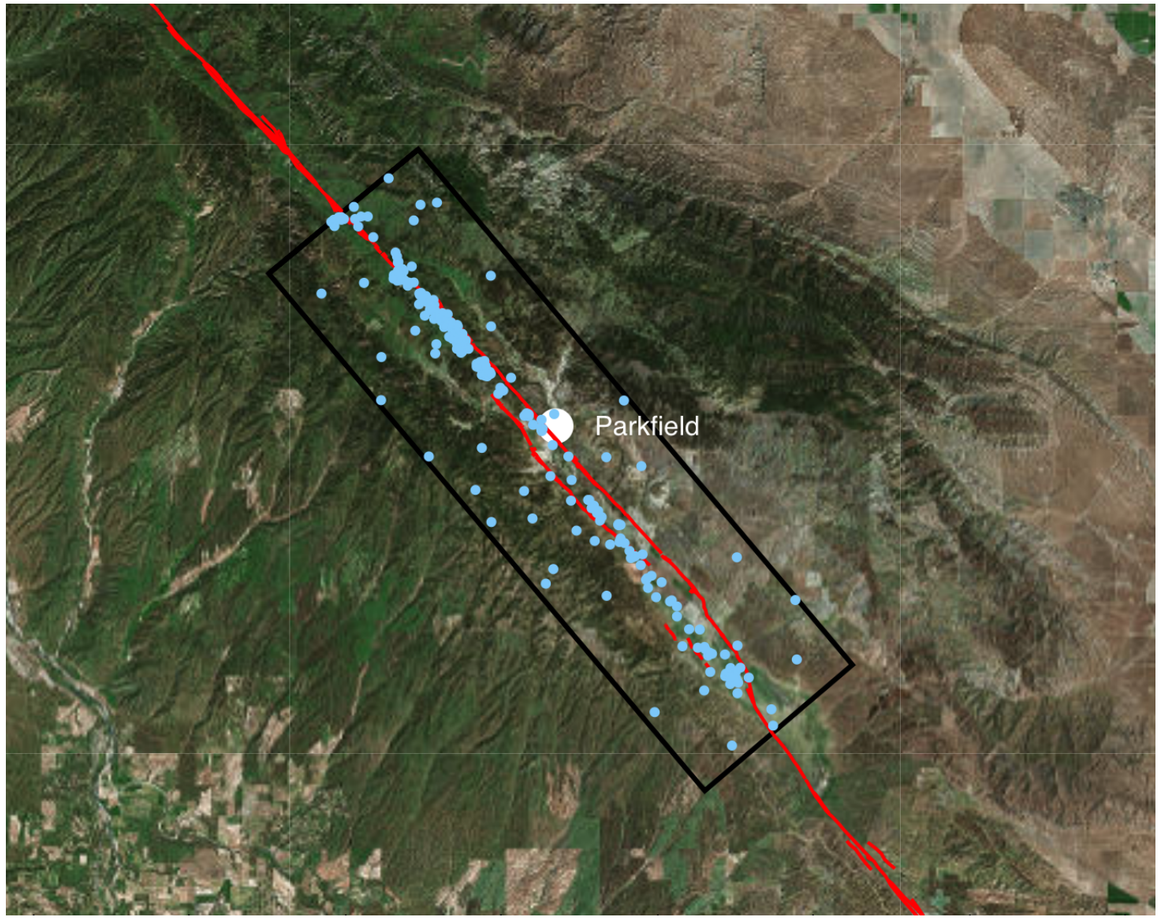
Movements along faults cause earthquakes

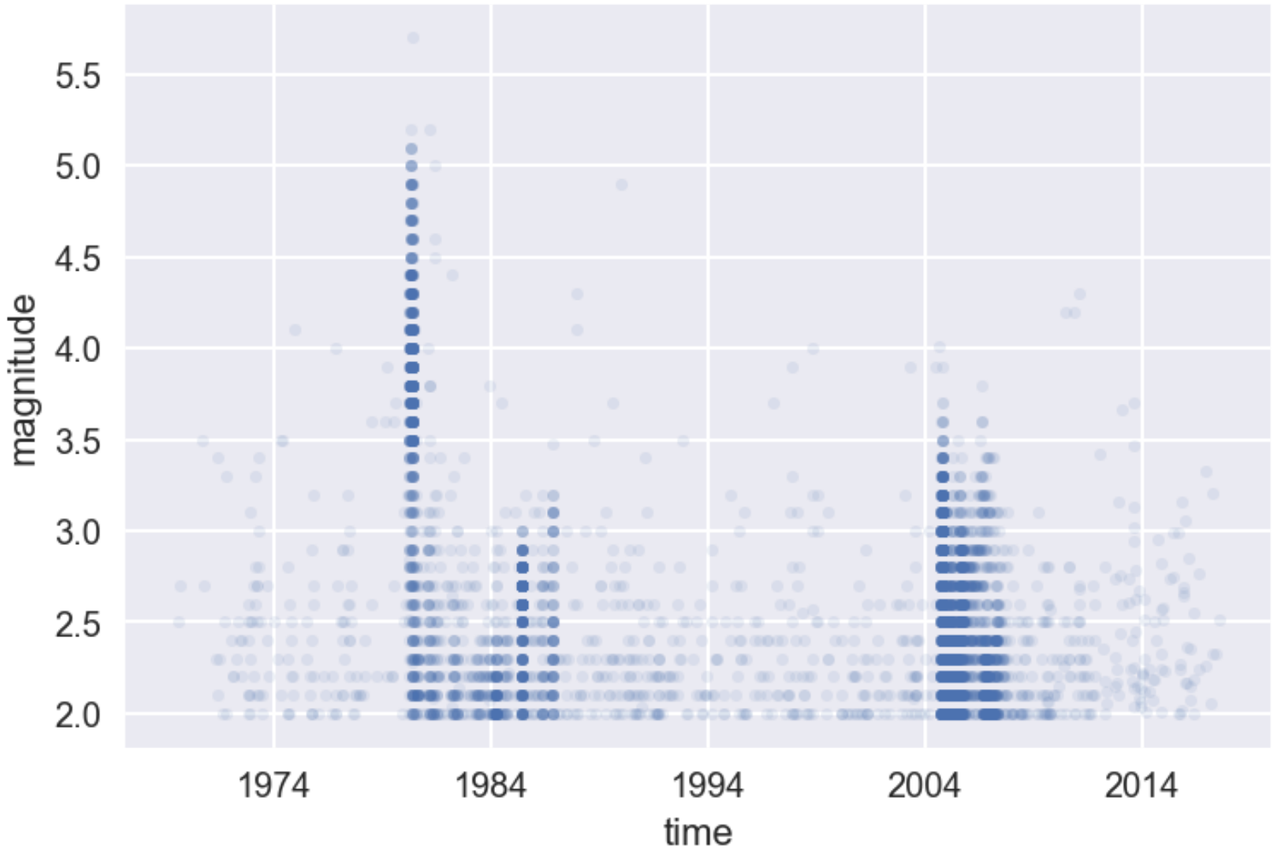


[1] Fault data: USGS Quaternary Fault Fault and Fold Database of the United States [2] Earthquake data: USGS ANSS Comprehensive Earthquake Catalog

Mt. St. Helens

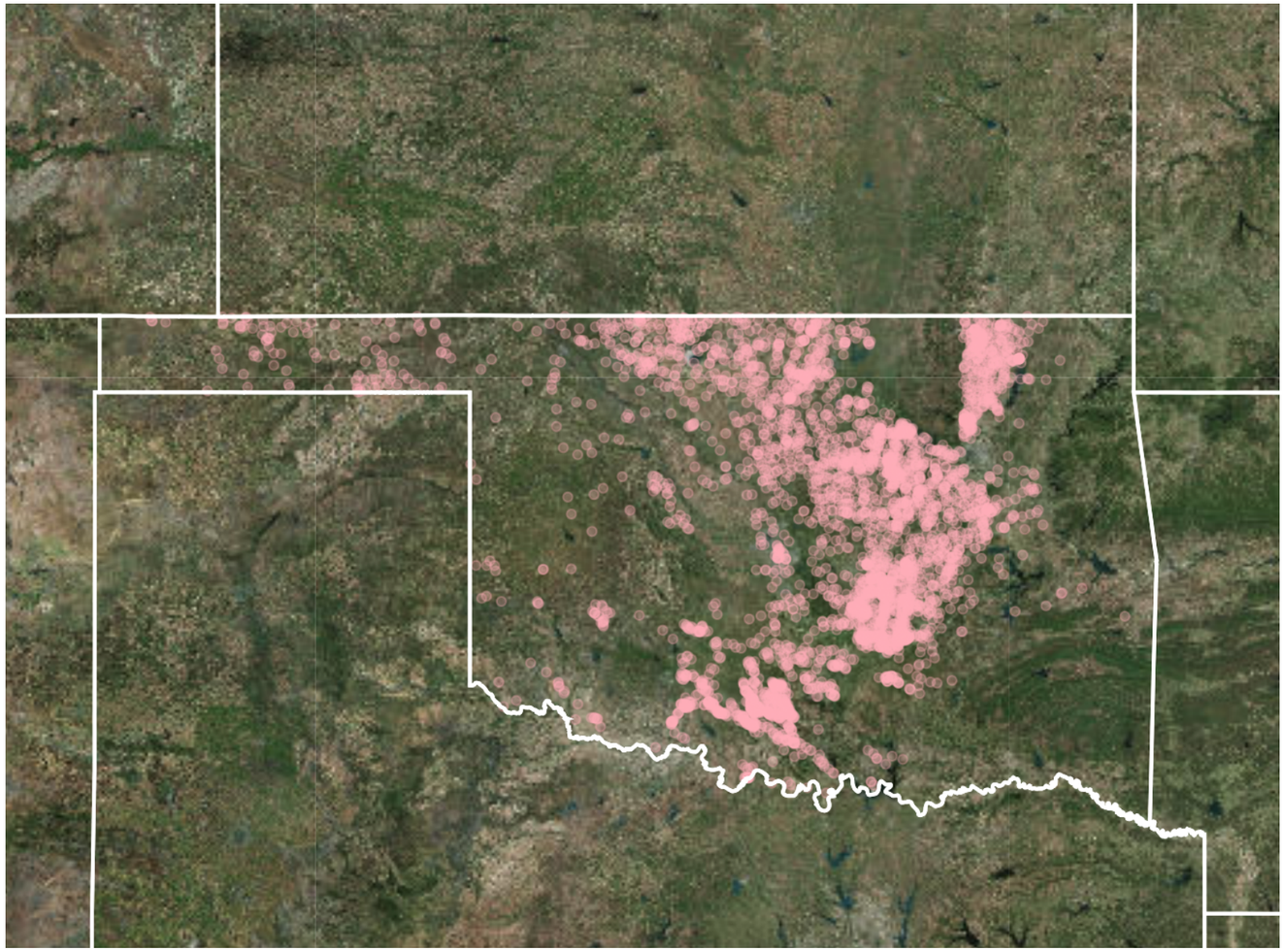
[1] Photo: Austin Post, USGS, public domain

Mt. St. Helens earthquakes



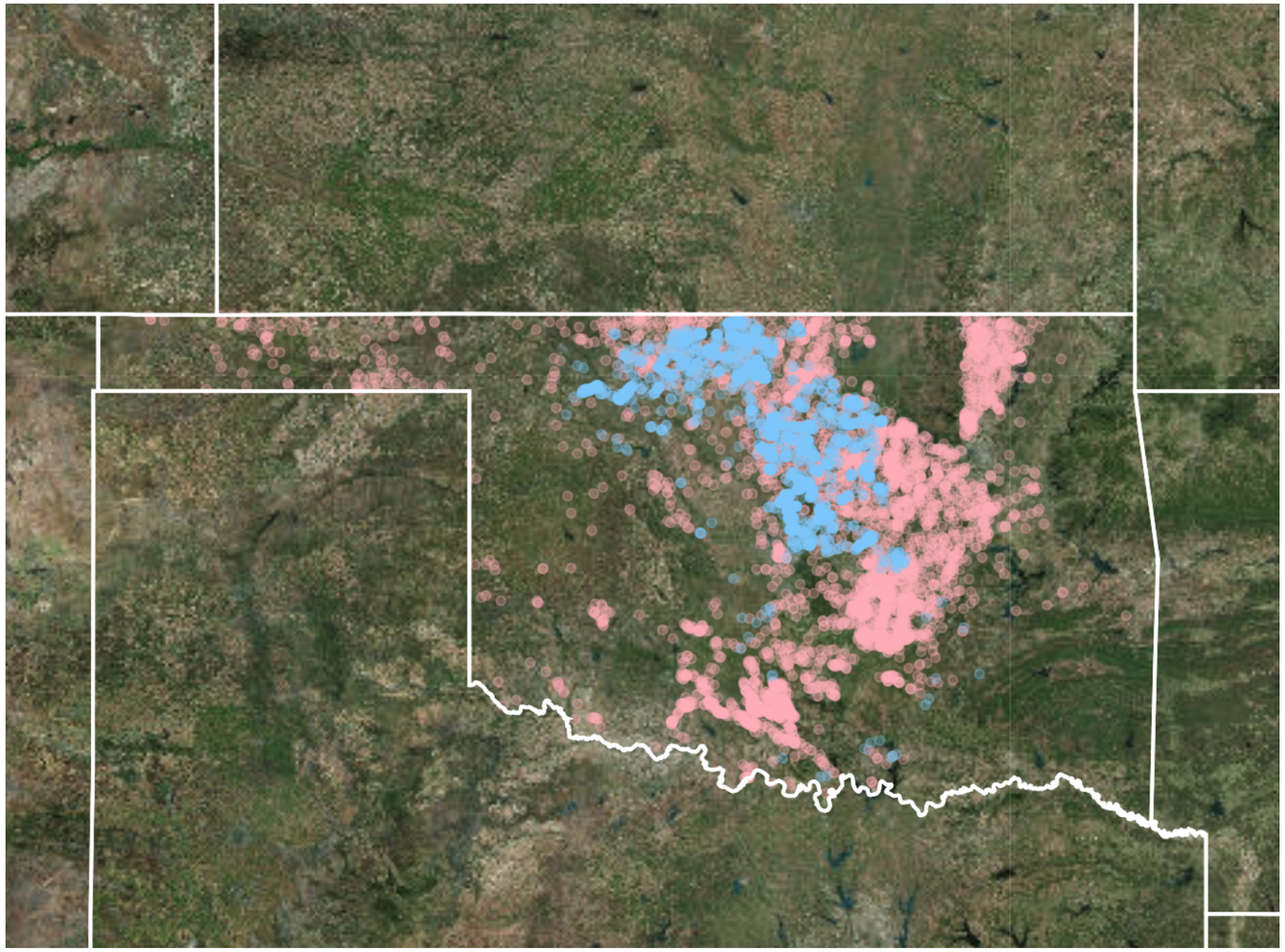
[1] Data source: USGS ANSS Comprehensive Earthquake Catalog (ComCat)

Wastewater injection in Oklahoma



[1] Data source: Oklahoma Corporation Commission Oil and Gas Division

Seismic Oklahoma



[1] Data source: USGS ANSS Comprehensive Earthquake Catalog (ComCat)

Let's practice!

CASE STUDIES IN STATISTICAL THINKING

Earthquake magnitudes in Oklahoma

CASE STUDIES IN STATISTICAL THINKING

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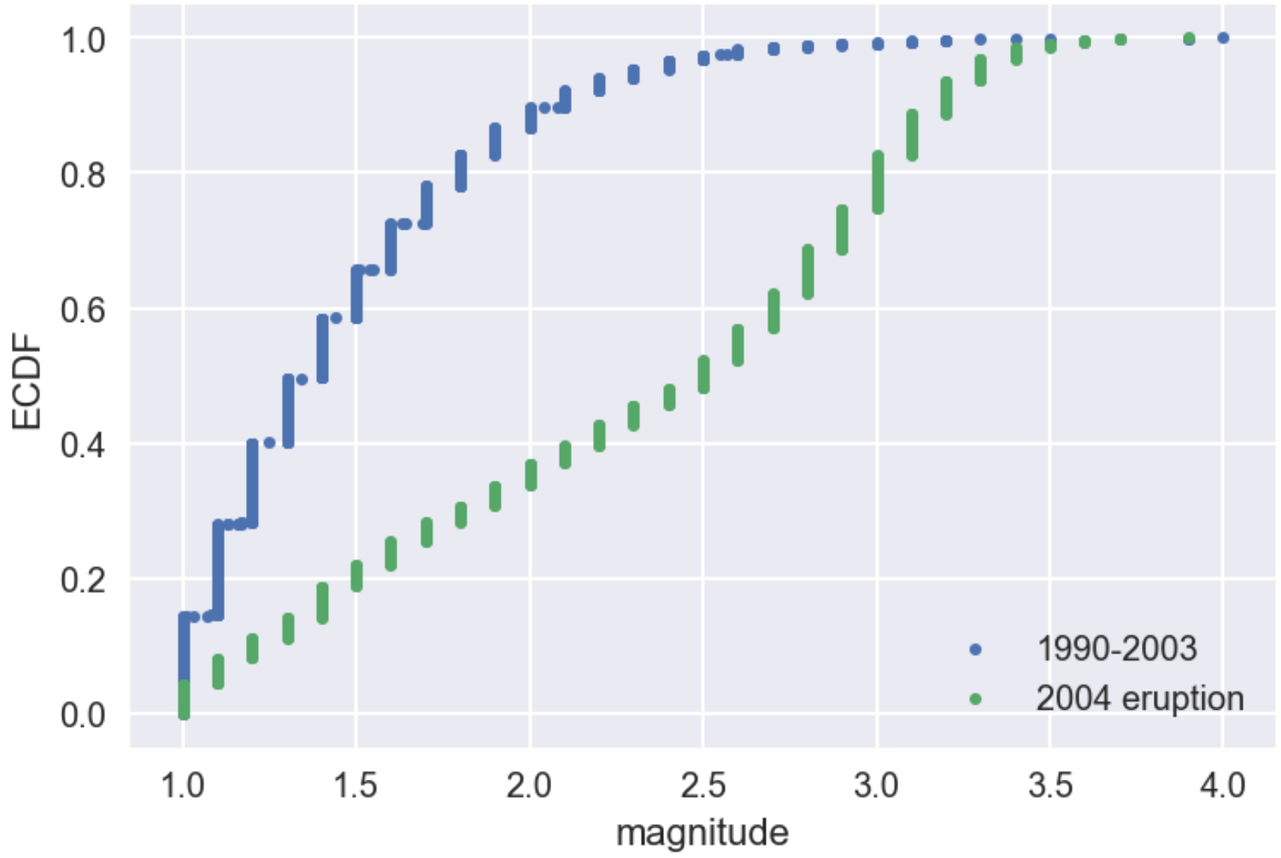
datacamp

Seismicity around Mt. St. Helens

[1] Photo: Steve Schilling, USGS, public domain

ECDF of Mt. St. Helens earthquakes



[1] Data source: USGS ANSS Comprehensive Earthquake Catalog (ComCat)

Magnitudes in Oklahoma

- Verify that the Gutenberg-Richter Law holds before and after 2010
- Compute *b*-values
- Perform hypothesis test

Let's practice!

CASE STUDIES IN STATISTICAL THINKING

Closing comments

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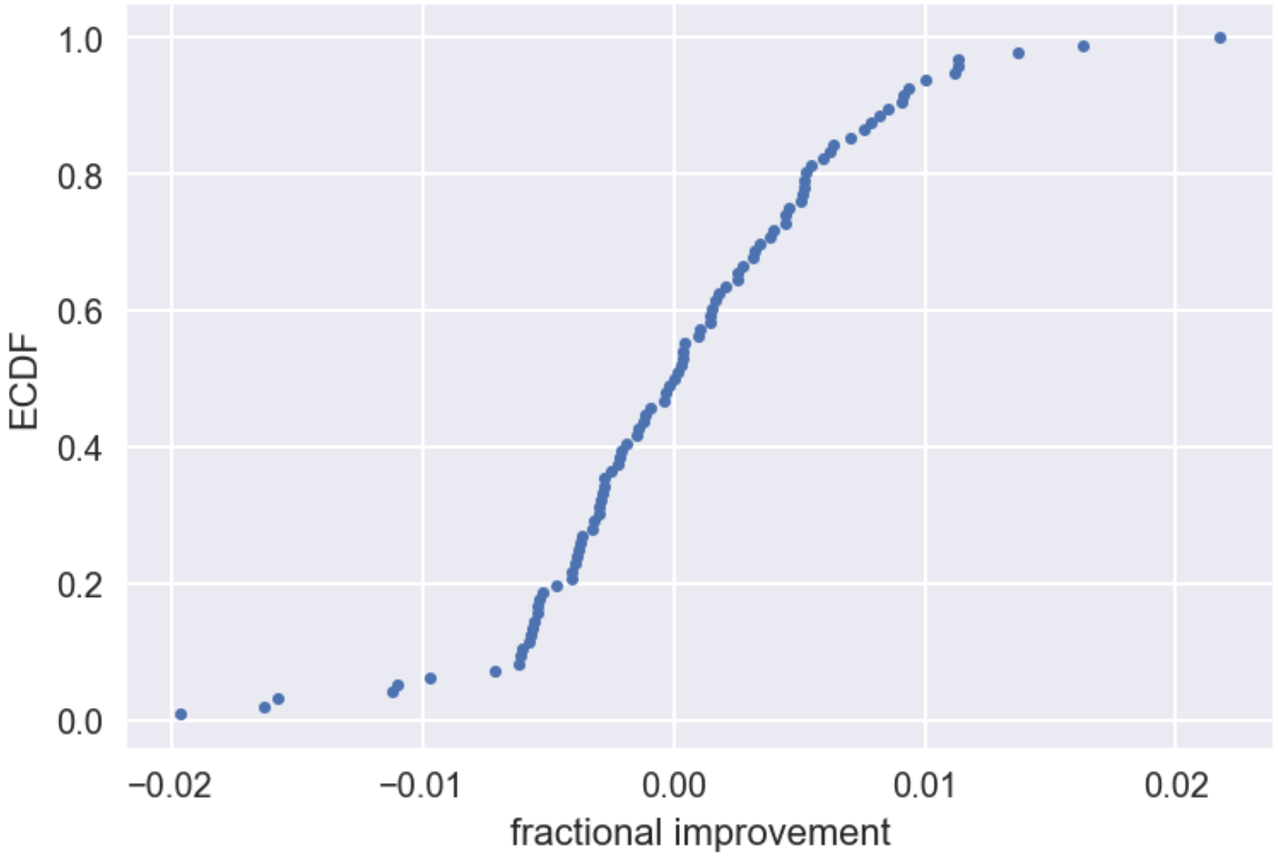
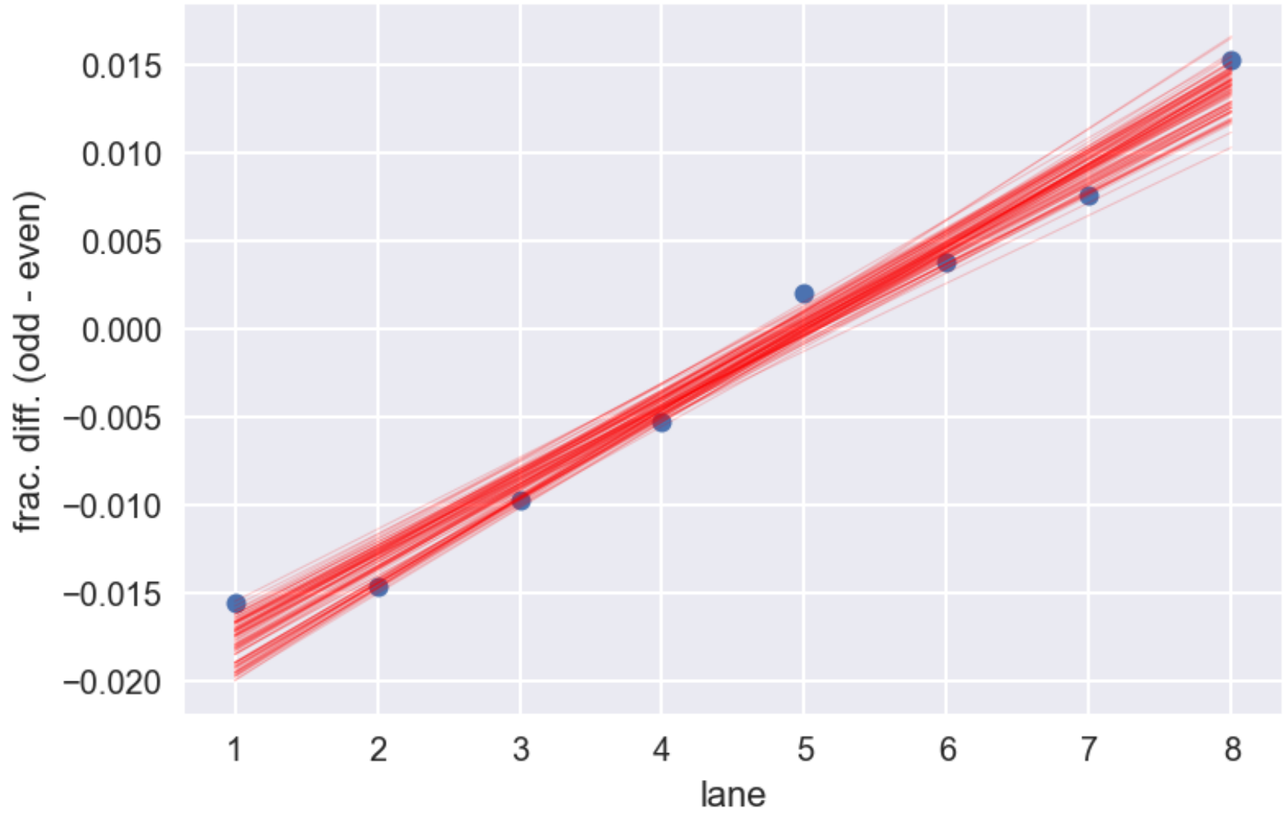
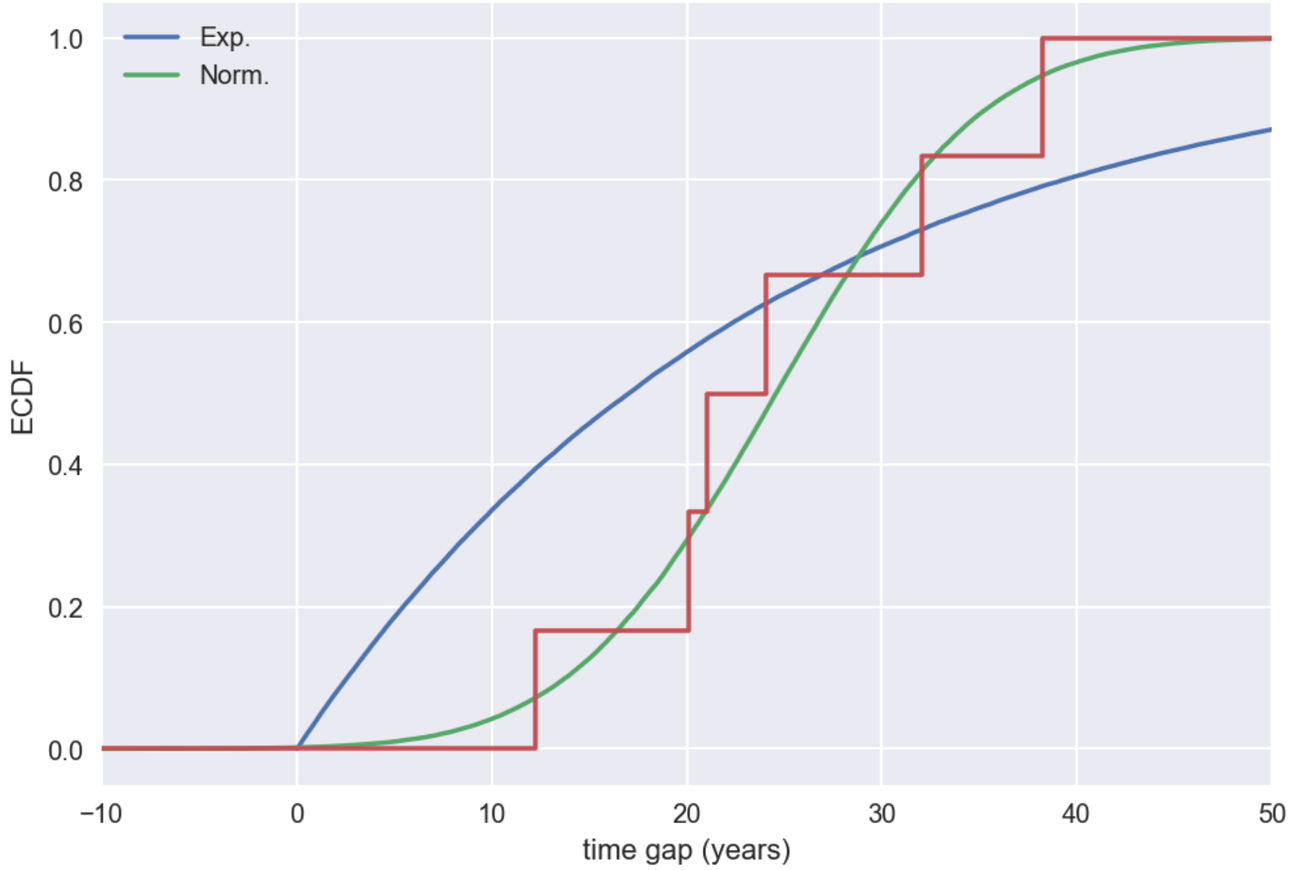
Fractional improvment in finals



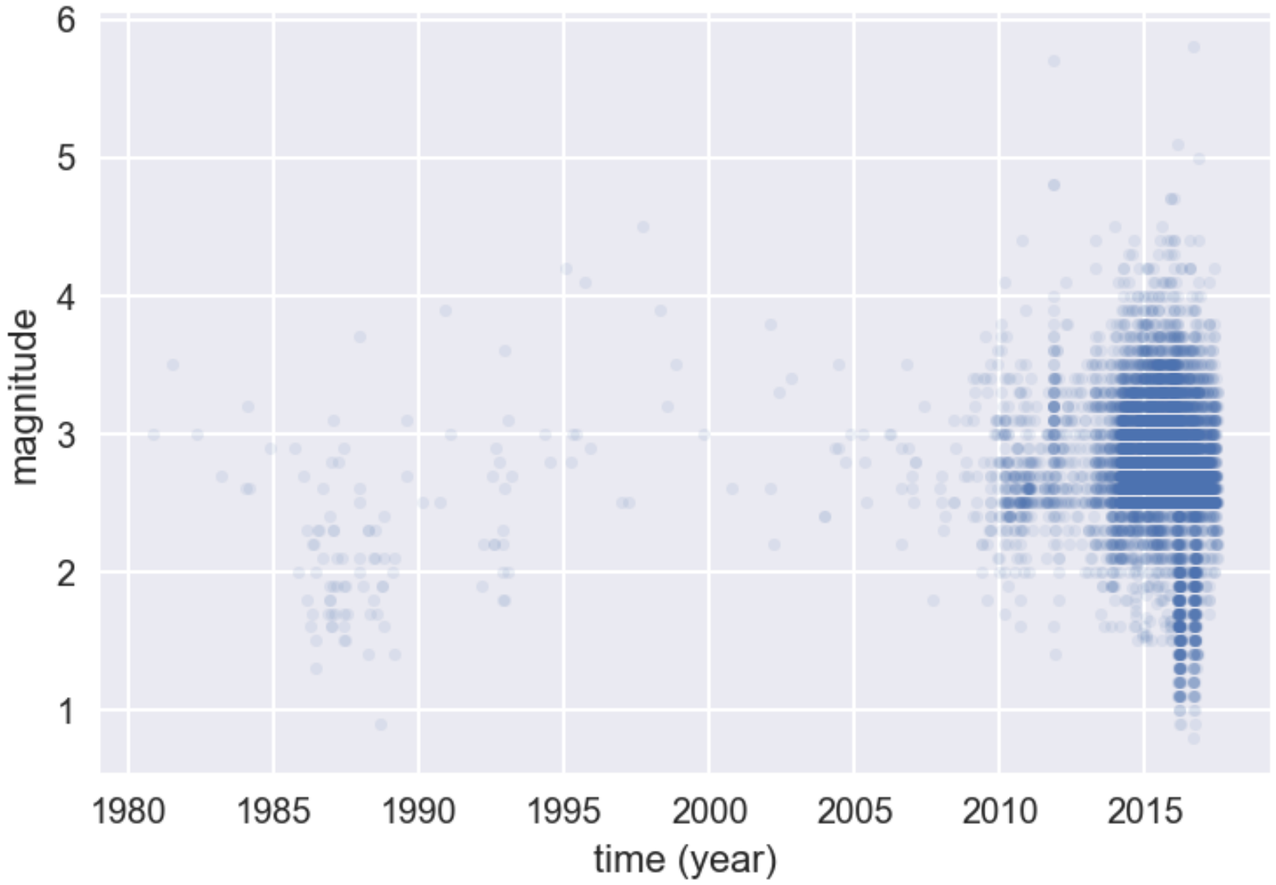
Quantifying the Current Controversy



Inter-earthquake times of the Parkfield sequence

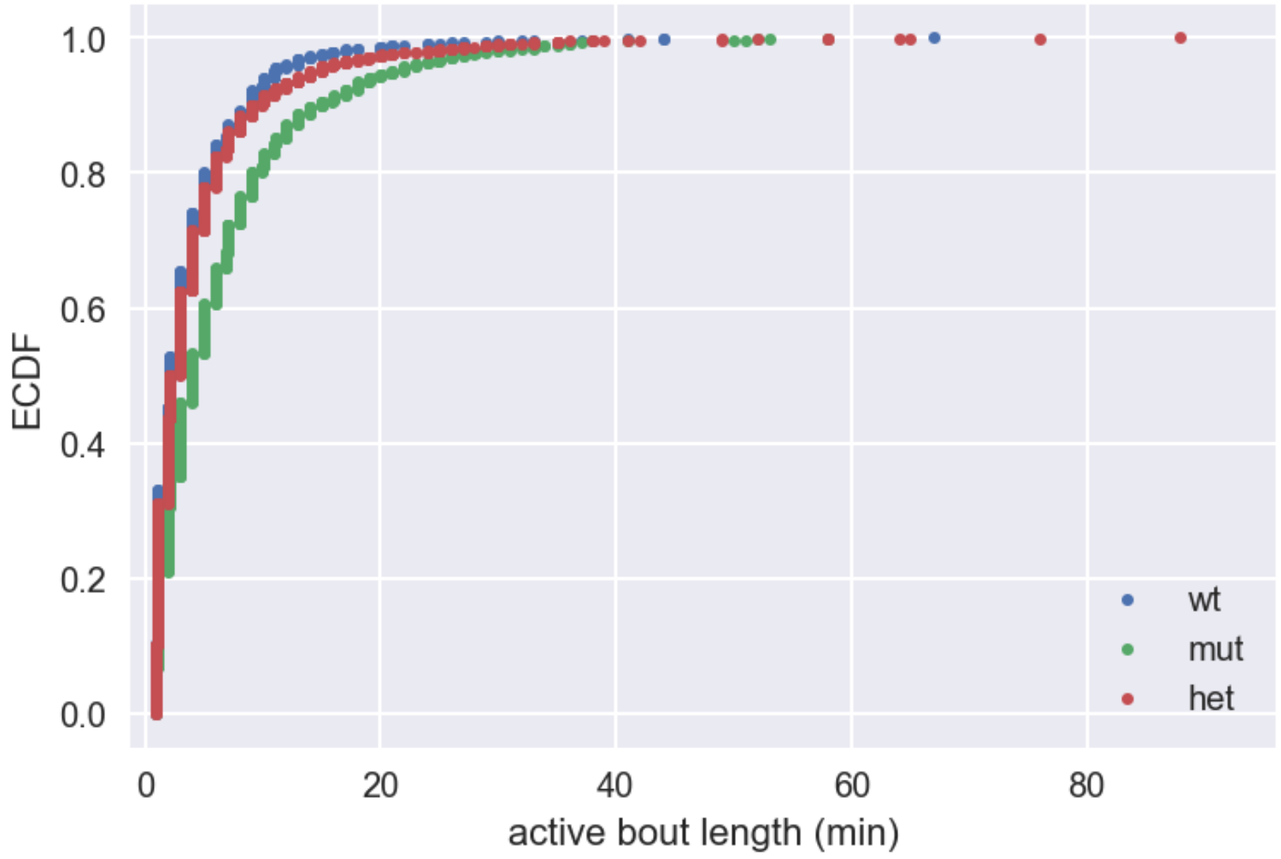


Oklahoma earthquakes



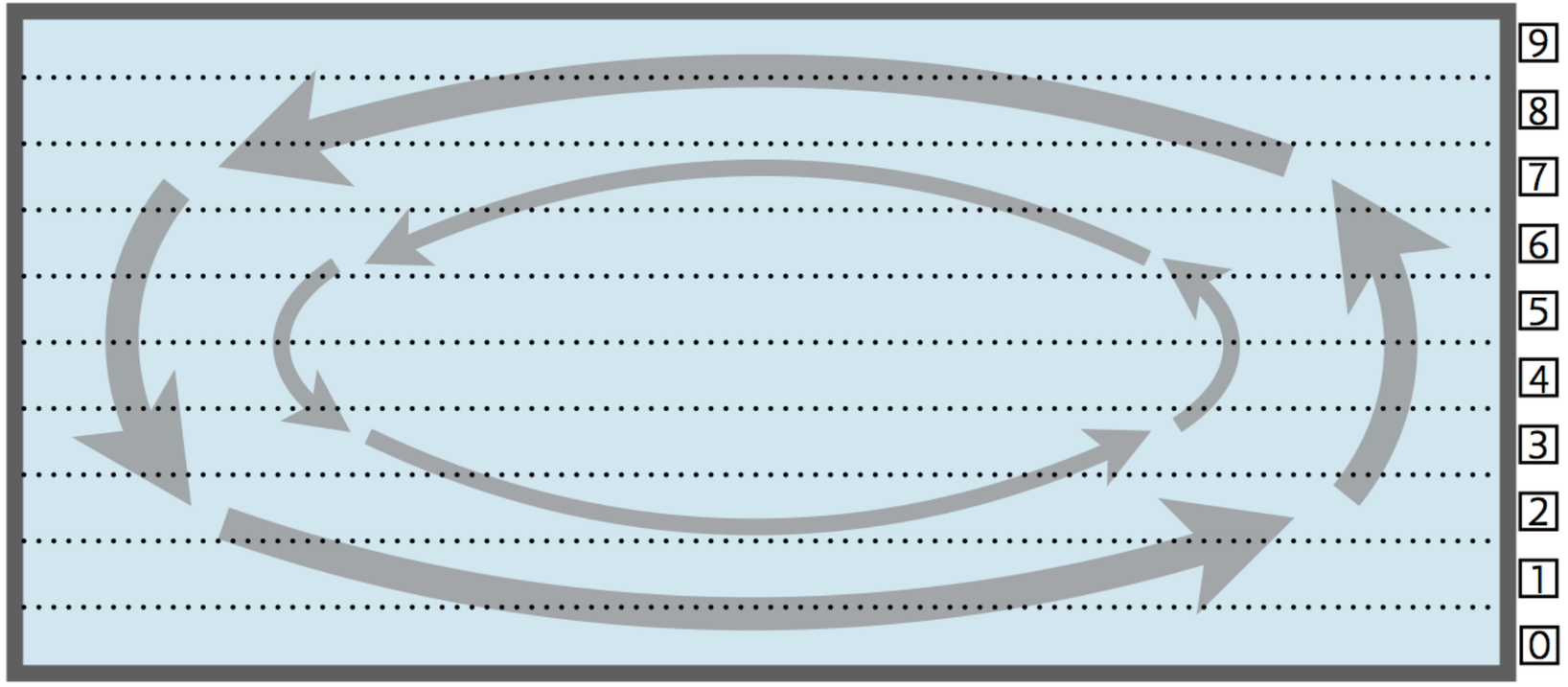
[1] Data source: USGS ANSS Comprehensive Earthquake Catalog (ComCat)

Active bout lengths

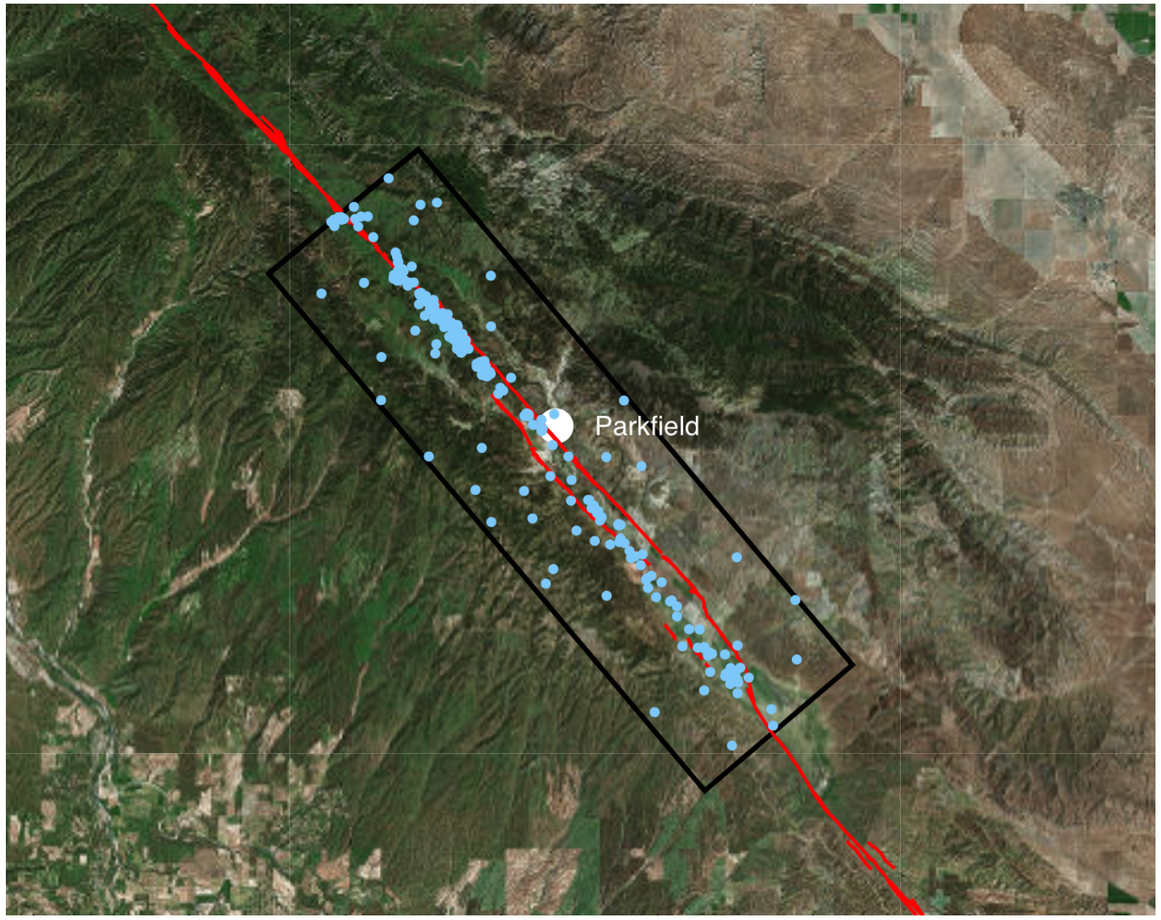


[1] Data courtesy of Avni Gandhi, Grigorios Oikonomou, and David Prober, Caltech

Each data set offers unique challenges



Each data set offers unique challenges



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My goals for you

- Recognize your opportunity to learn and contribute

My goals for you

- Sharpen hacker stats skills
  - Bootstrap confidence intervals
  - Permutation and bootstrap hypothesis tests
  - Kolmogorov-Smirnov test
  - Location parameters
  - Log-linear regression

My goals for you

- Statistical inference pipeline
  - EDA
  - Parameter estimation/confidence intervals
  - Hypothesis test

My goals for you

- Ability to frame precise questions

Go forth and data!

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