

Joint Session: Measuring Fractals

Diversity in Mathematics, 2019

Tongou Yang

The University of British Columbia, Vancouver

toyang@math.ubc.ca

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Let's Talk Geography

- Which country has the longest coastline?
- What is the longest river on earth?

Which country has the longest coastline?

List of countries by length of coastline

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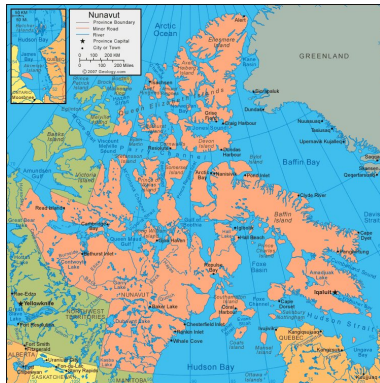
(a) Map of Canada

Which country has the longest coastline?

List of countries by length of coastline



(a) Map of Canada



(b) Map of Nunavut

What's the Longest River on Earth?

A Youtube Video

Measuring a Smooth Curve

Example: use a rope

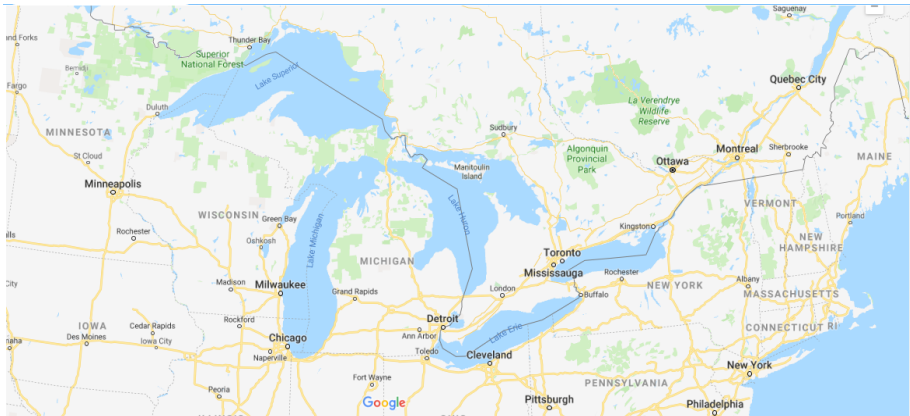


Figure: Boundary between CA and US on the Great Lakes

Measuring a Rugged Coastline

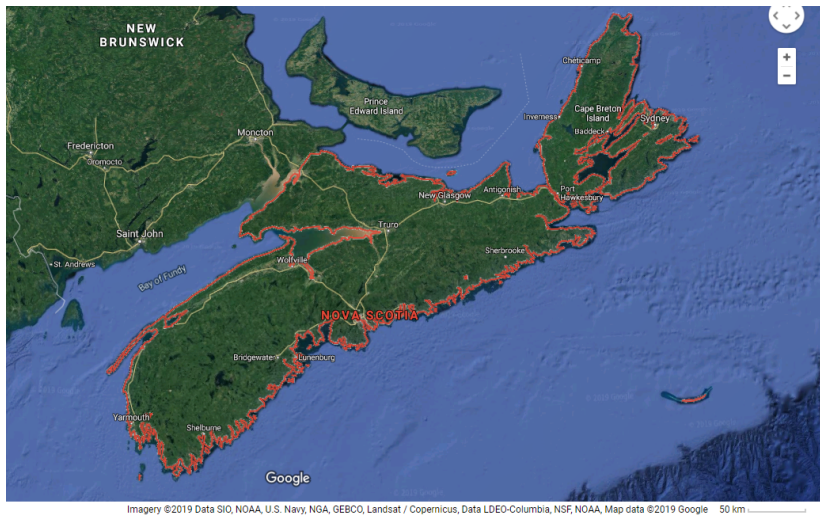
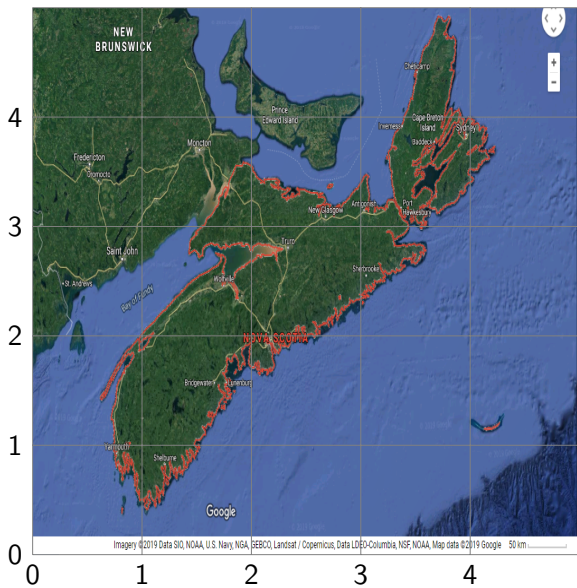
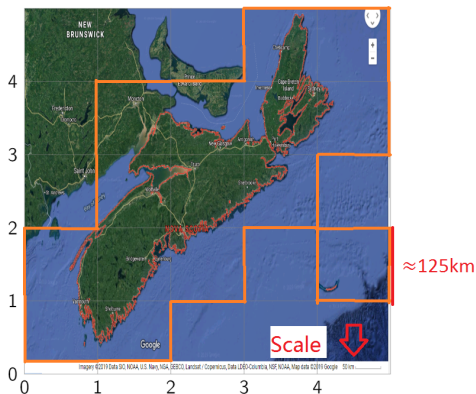


Figure: Coast of Nova Scotia

Covering by Grids

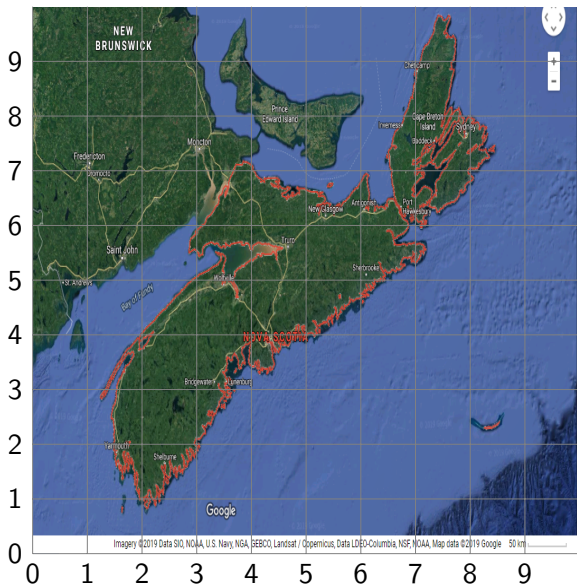


Counting Grids

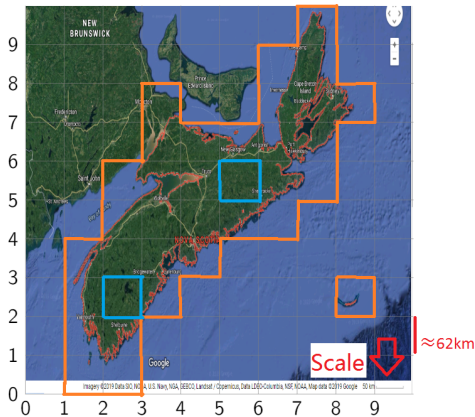


- Number of Grids=15
- Side Length $\approx 125\text{km}$
- Coastline $\approx 15 \times 125 = 1845\text{km}$.

Covering by Finer Grids



Counting Grids



- Number of Grids=34
- Side Length $\approx 62\text{km}$
- Coastline $\approx 34 \times 62 = 2108\text{km}$.

The Coastline Paradox

In general, finer grids lead to "longer" coastlines, and in theory, many fractal has infinite length!

Practice Time!