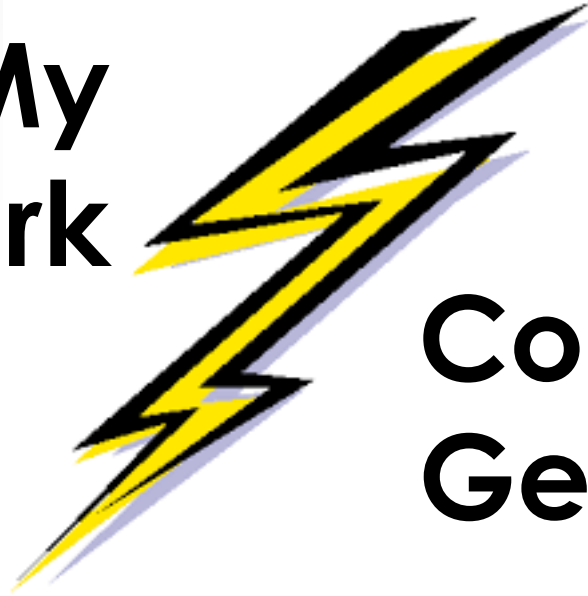


**My  
Work**



**Computational  
Geometry**

**Siu-Wing Cheng  
CSE, HKUST**

Planar point location

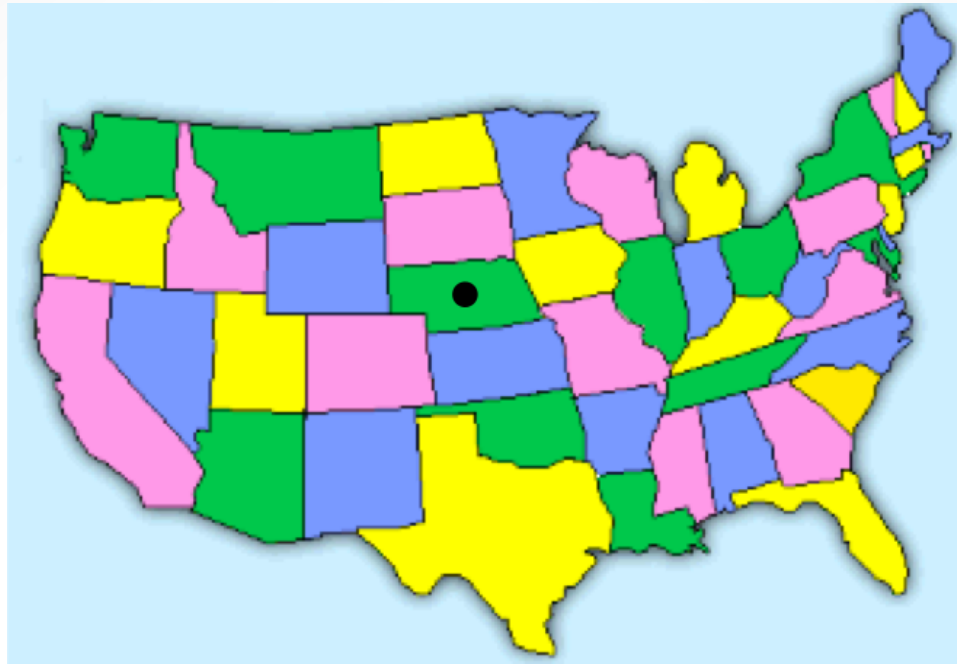
Manifold and surface reconstruction

Shape matching

Approximate shortest path

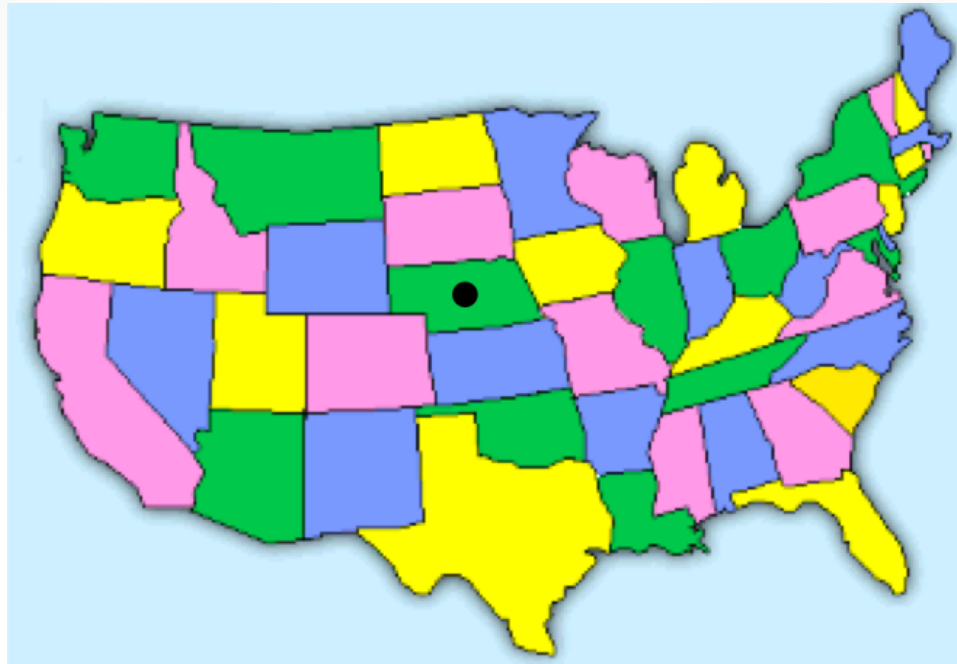
Prove theorems.

Sometimes complement the theorems  
with software.

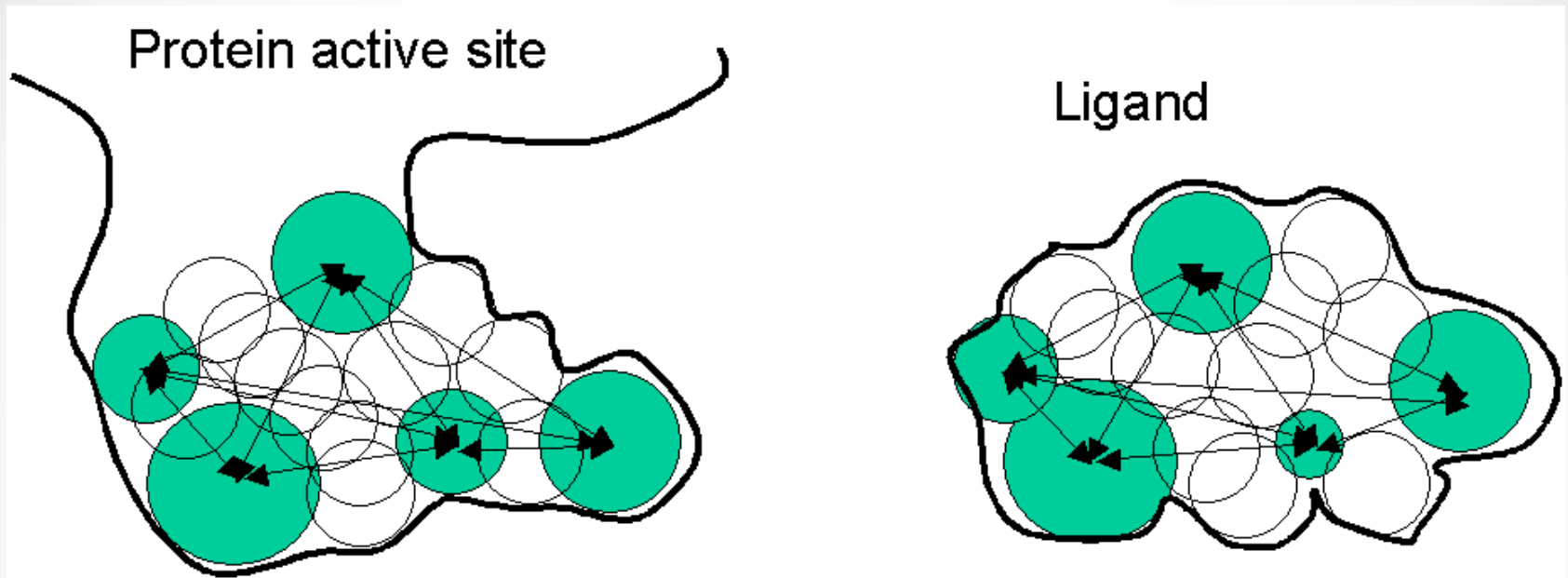


Which state am I in?

There are  $O(n)$  space and  $O(\log n)$  query time solutions.



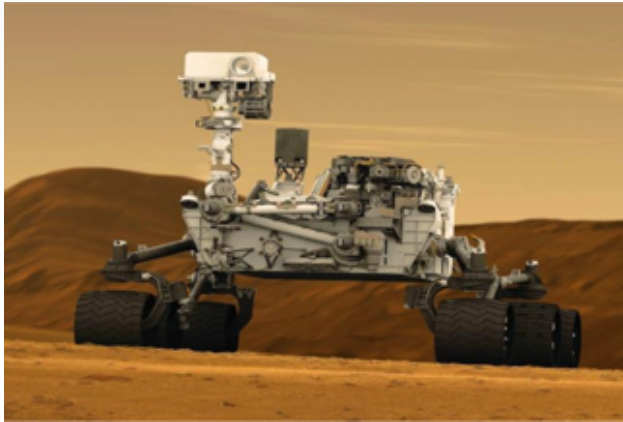
What if the access frequencies of the states are different and changing?



What are the largest subsets that can be overlaid under translation and rotation so that the bottleneck distance is smaller than  $\epsilon$ ?

Find subsets  $A$  and  $B$  such that  $|A| = |B| \geq$  optimal size such that the bottleneck distance is at most  $(1 + \eta)\varepsilon$ .

- In  $O\left(\frac{n^2 m^2}{\eta}(n + m) \log n\right)$  time for rigid motions in the plane.
- In  $O\left(\frac{nm}{\eta^5}(n + m)^{1.5} \log n\right)$  time for translations in  $\mathbb{R}^3$





Contents lists available at SciVerse ScienceDirect

## Computers & Geosciences

journal homepage: [www.elsevier.com/locate/cageo](http://www.elsevier.com/locate/cageo)

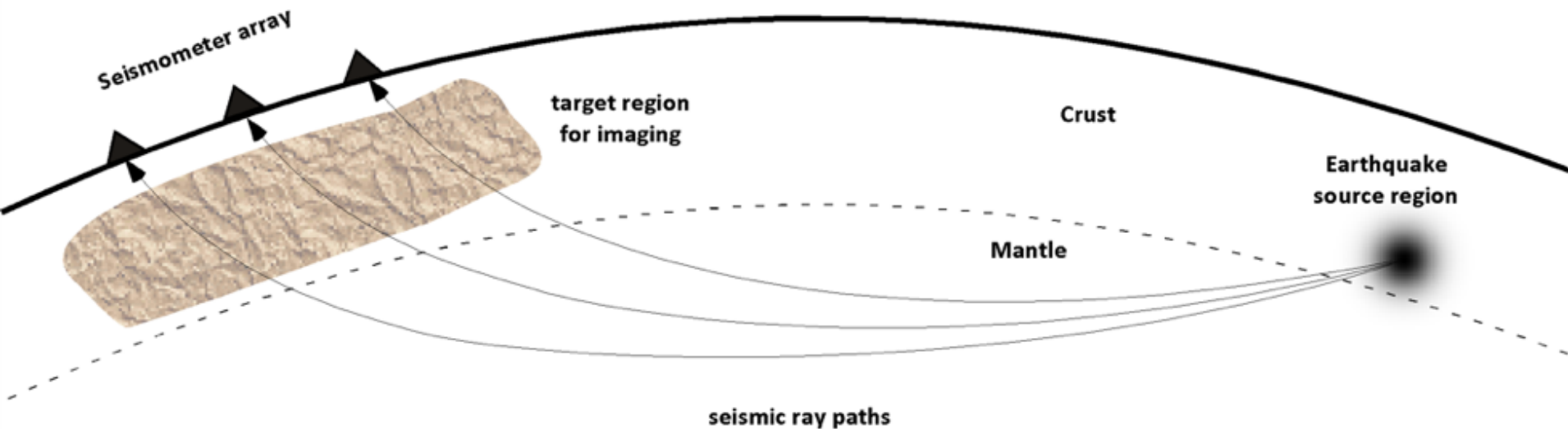


# Task-parallel implementation of 3D shortest path raytracing for geophysical applications

Bernard Giroux<sup>a,\*</sup>, Benoît Larouche<sup>b</sup>

<sup>a</sup> INRS-EYE, 490, Rue de la Couronne, Québec, QC, Canada G1K 9A9

<sup>b</sup> École Polytechnique de Montréal, Département de Génie Physique, C.P. 6079, Succ. Centre-Ville, Montréal, QC, Canada H3C 3A7





# Efficient Polynomial-Time (1+ $\epsilon$ )-Approximation Algorithms

Approx. shortest descending path, SODA13

Approx. shortest path in the plane with  
direction-dependent travel costs, SODA07

Approx. shortest path on a terrain with a linear  
combination cost of length and total ascent,  
STOC14

Approx. shortest path through weighted regions,  
SODA15