Syllabus for "A Random Walk Through North America" Summer 2022

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1 Main Objectives

We wish to "solve" the traveling salesman problem for visiting all the states and provinces in the United States, Canada, and Mexico which are in continental North America. We will also talk about random walks on graphs and how to implement them in multiple computing langauges.

2 Daily Goals

2.1 Before we Meet

Get Setup with Julia. Best method is to download Julia 1.7 from the website and we'll be running in either JuPyter notebooks with iJulia, and for the more sophisticated coder, VSCode. Recently Atom has foregone the development of Juno REPL and VSCode has taken it over.

2.2 Monday

Morning

- Basics of Monte Carlo Methods
- How to draw a sample from a distribution
- Calculating π
- Markov Chains
- Predicting weather for the rest of the week

Afternoon

- Random Walks on Graphs
- How to perform a random walk on a graph

2.3 Tuesday

Morning

- The Simulated Annealing Algorithm
- Solving a random TSP

Afternoon

- How to Set up the North America TSP
- Taking our first shot at solving the big one

2.4 Wednesday

Morning

- How to get a better solution
- solving smaller problems
- Competing Models
- Coupled Models (Instructor's Own algorithm)

Afternoon

- Running our solvers
- Intro to Quantum Walks on graphs
- Starting our presentation for Coffee talks

2.5 Thursday

Morning

- Computing properties of the North America Graph Walk via Monte Carlo Methods
- Quantum Walking Through North America

Afternoon

- Quantum Walking
- Preparing our presentation Saturday

2.6 Friday

- Random Topics
- Working on Presentation