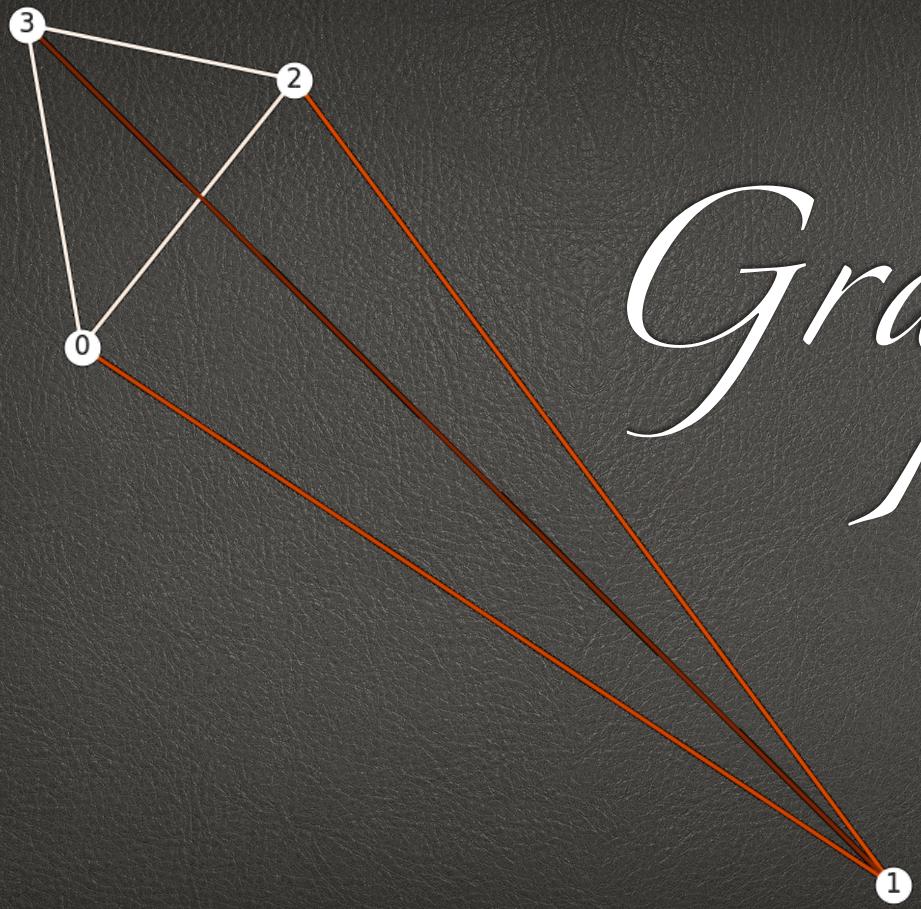


Solving hard problems

a hands-on case study

No previous knowledge required

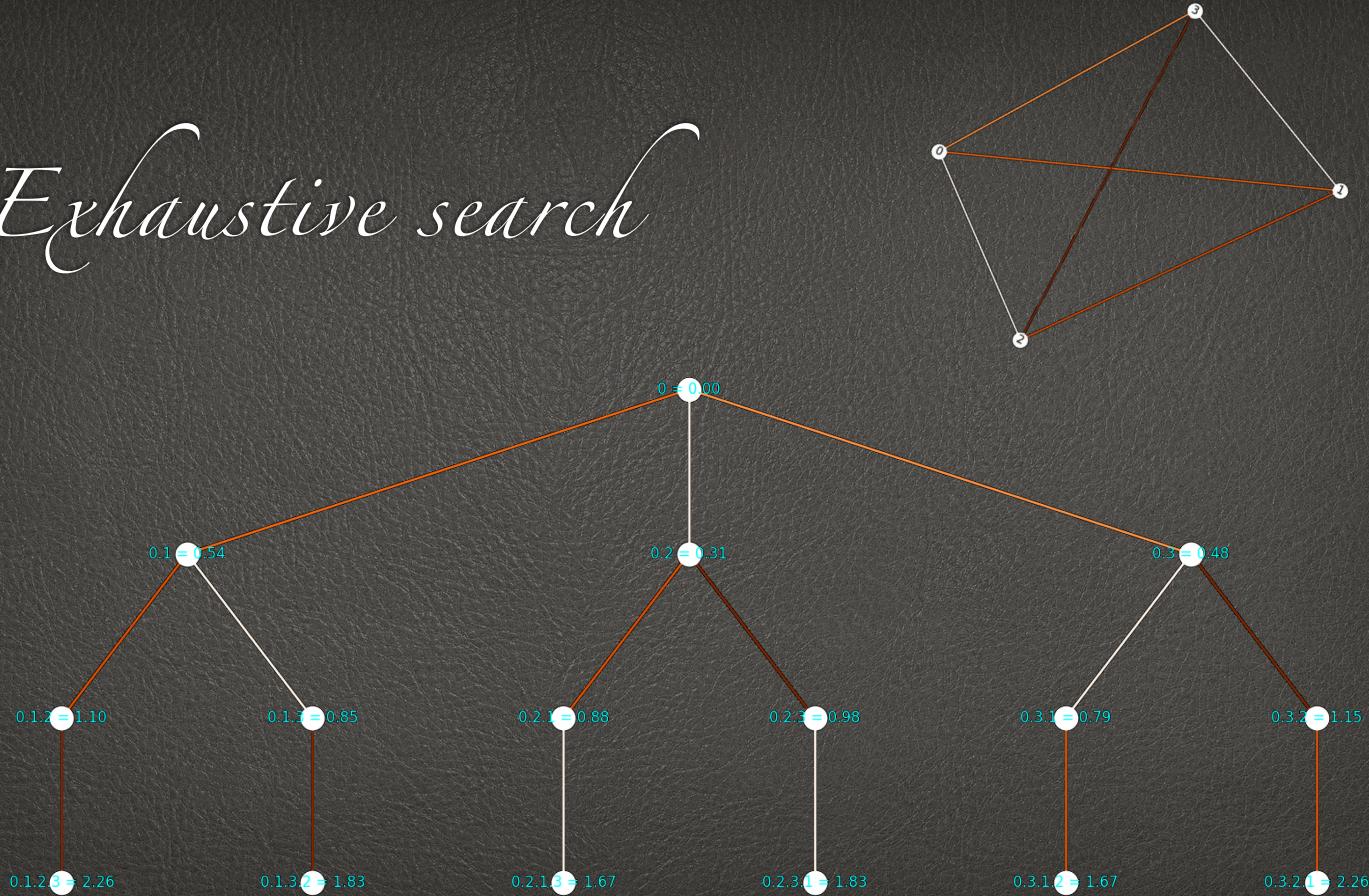


Graph

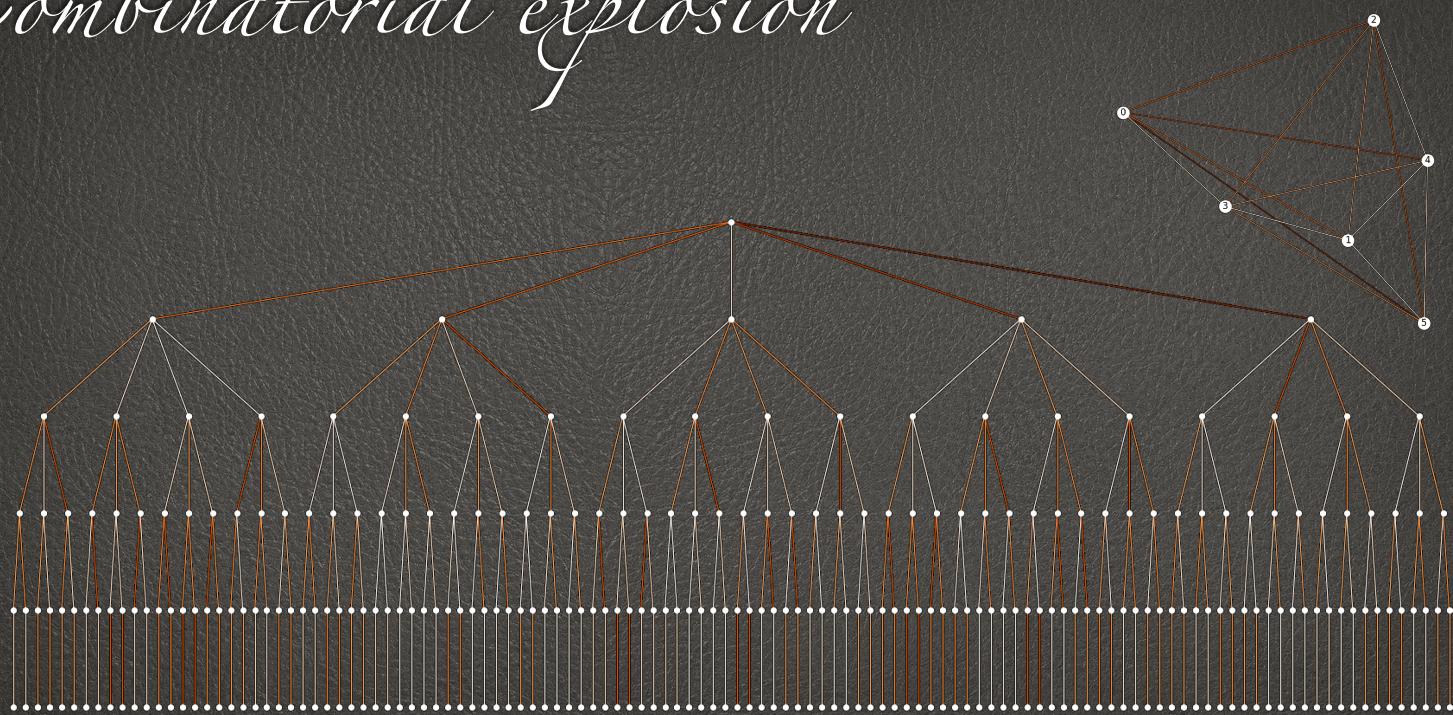


TRAVELLING SALESPERSON PROBLEM

Exhaustive search



Combinatorial explosion



With just six 🐱

Pruning helps, a little



With just six 🐱

Global optimum

Example runtime in milliseconds

n	Exhaustive	Pruned
8	88	30
9	825	264
10	9021	1371
11	<i>lost patience</i>	3234
12	<i>lost patience</i>	23815
13	<i>lost patience</i>	<i>lost patience</i>

😺 Nothing can produce a lower cost

Those trees grow too big 😓

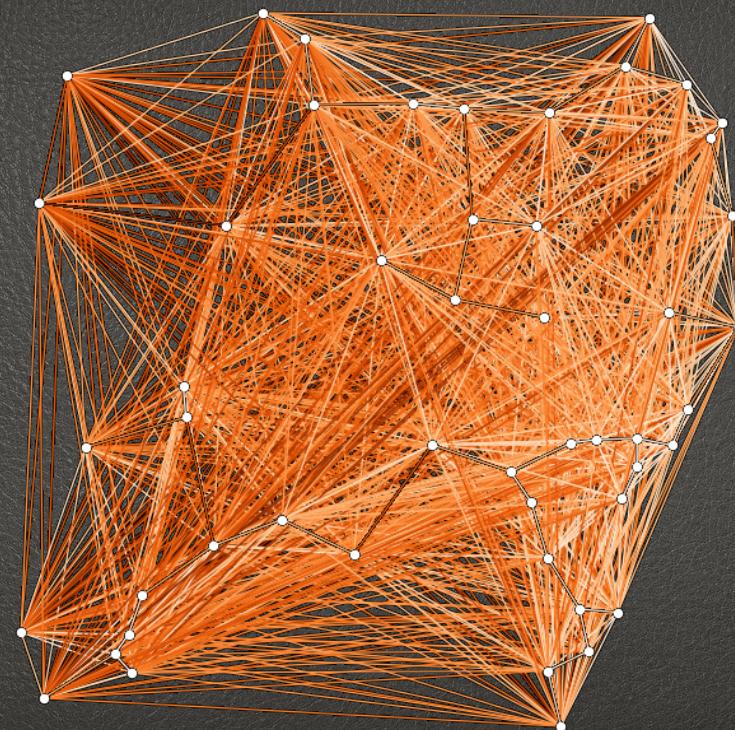


*Replicas of
self-avoiding random walks*

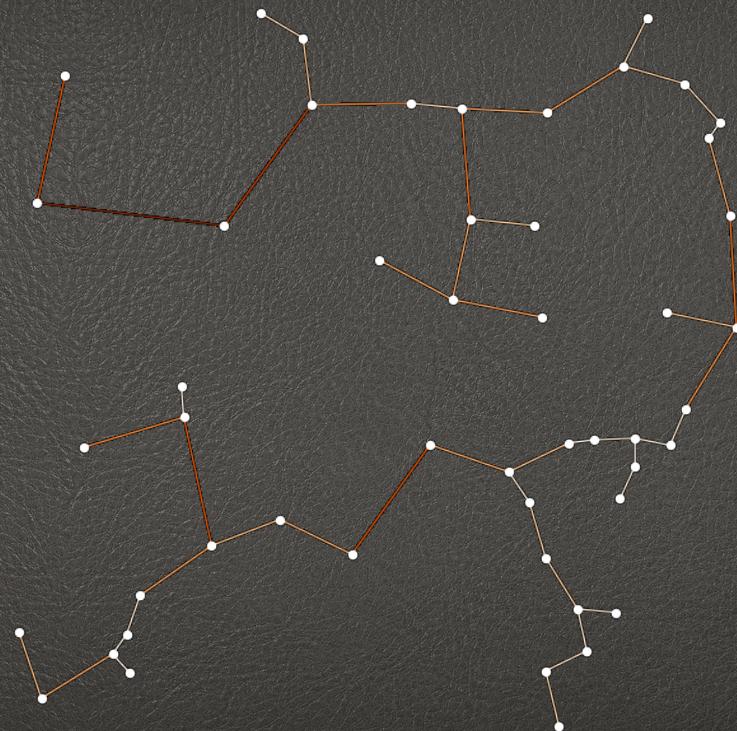
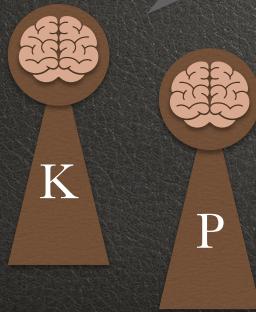
😺 Super fast even for large graphs

No guarantee of optimality 🐱

WHAT ELSE CAN WE DO THAT IS FAST TO COMPUTE?

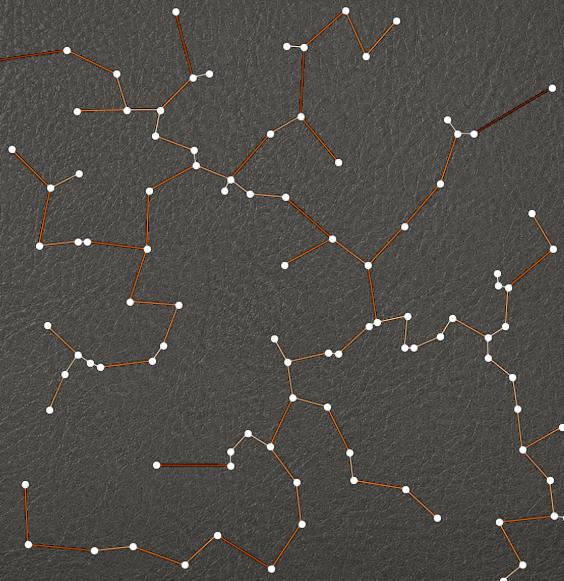
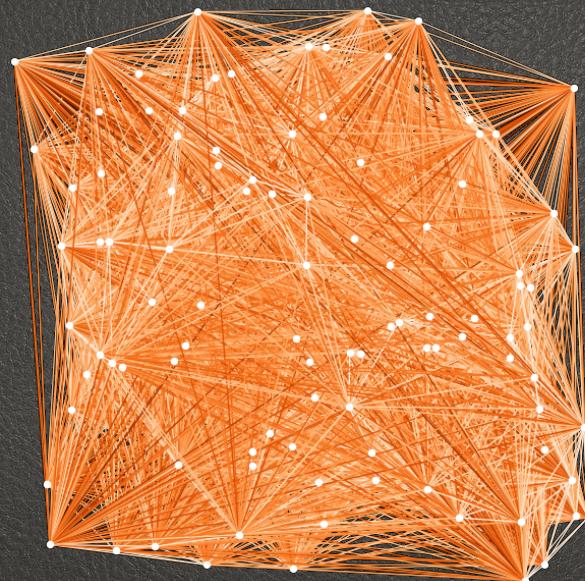


WHAT ELSE CAN WE DO THAT IS FAST TO COMPUTE?



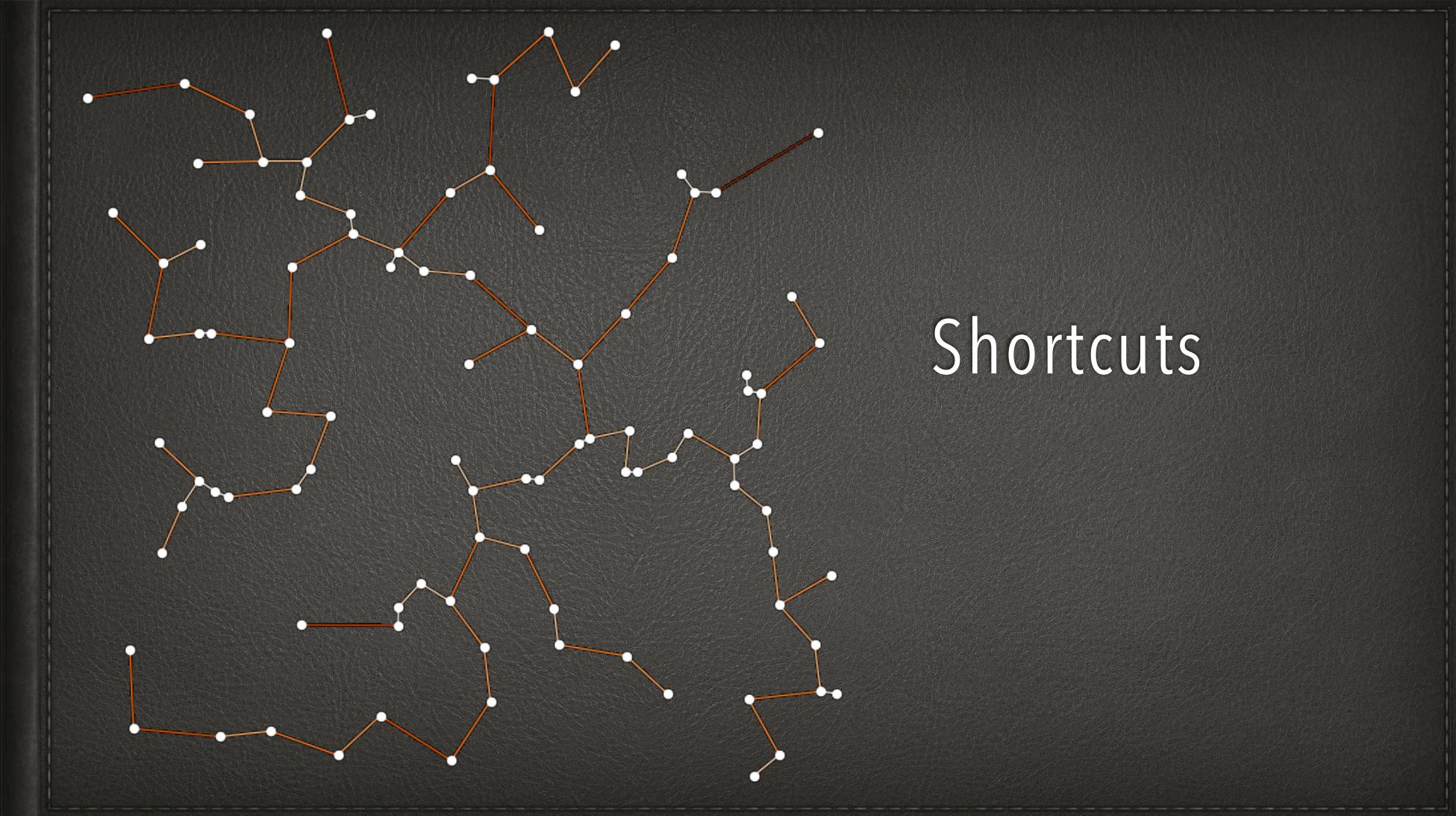
That's not a cycle, fellas 😺

Minimum spanning tree



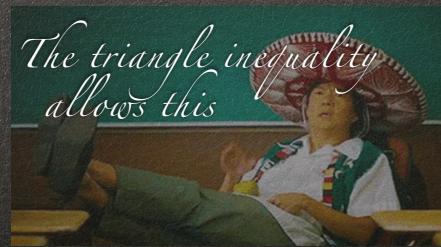
😺 This is quick to build and we can traverse it back and forth with a cost at most twice the optimum

That's a cycle, yes, but it is still infeasible 😞



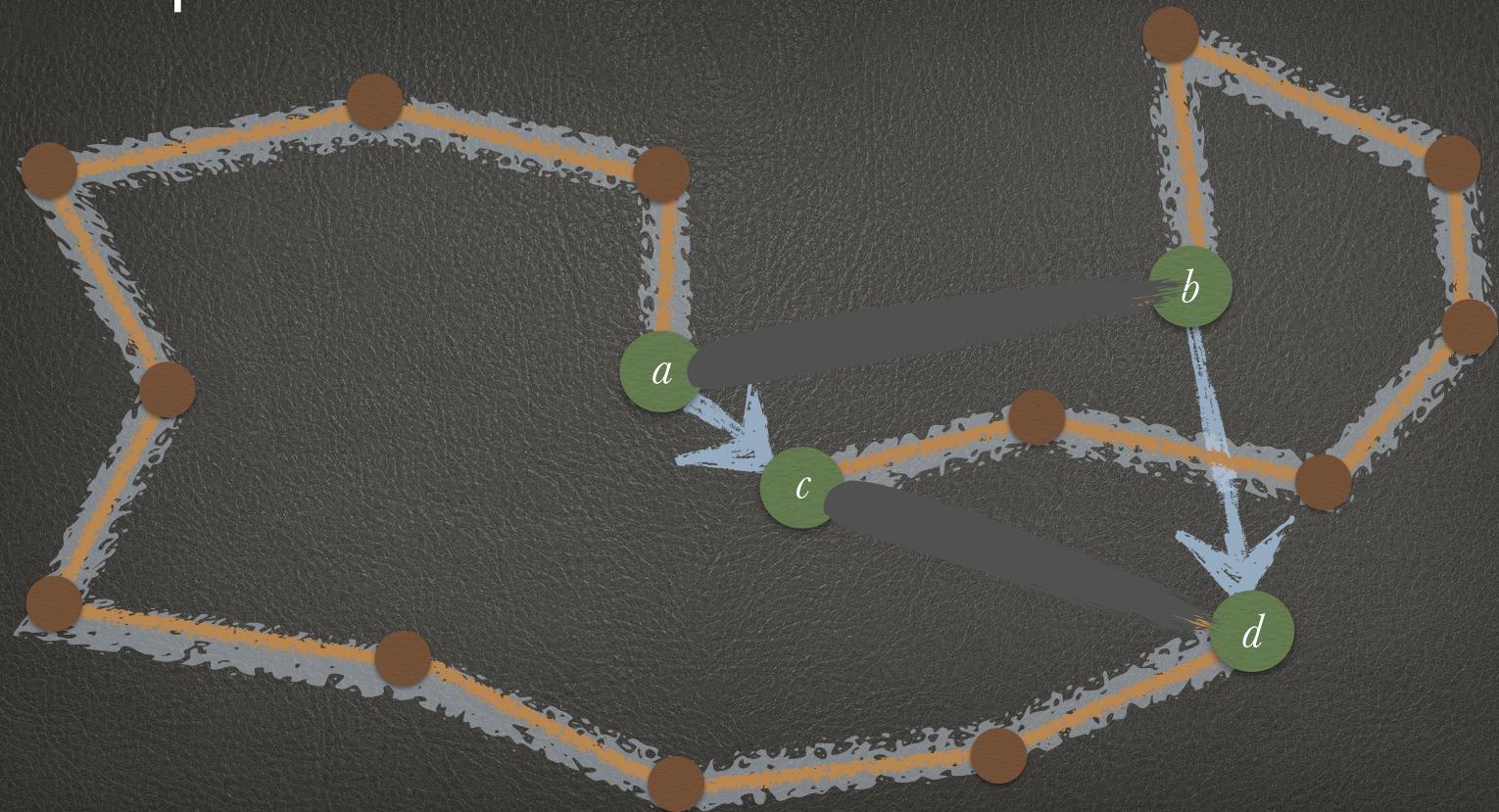
Shortcuts

Shortcuts



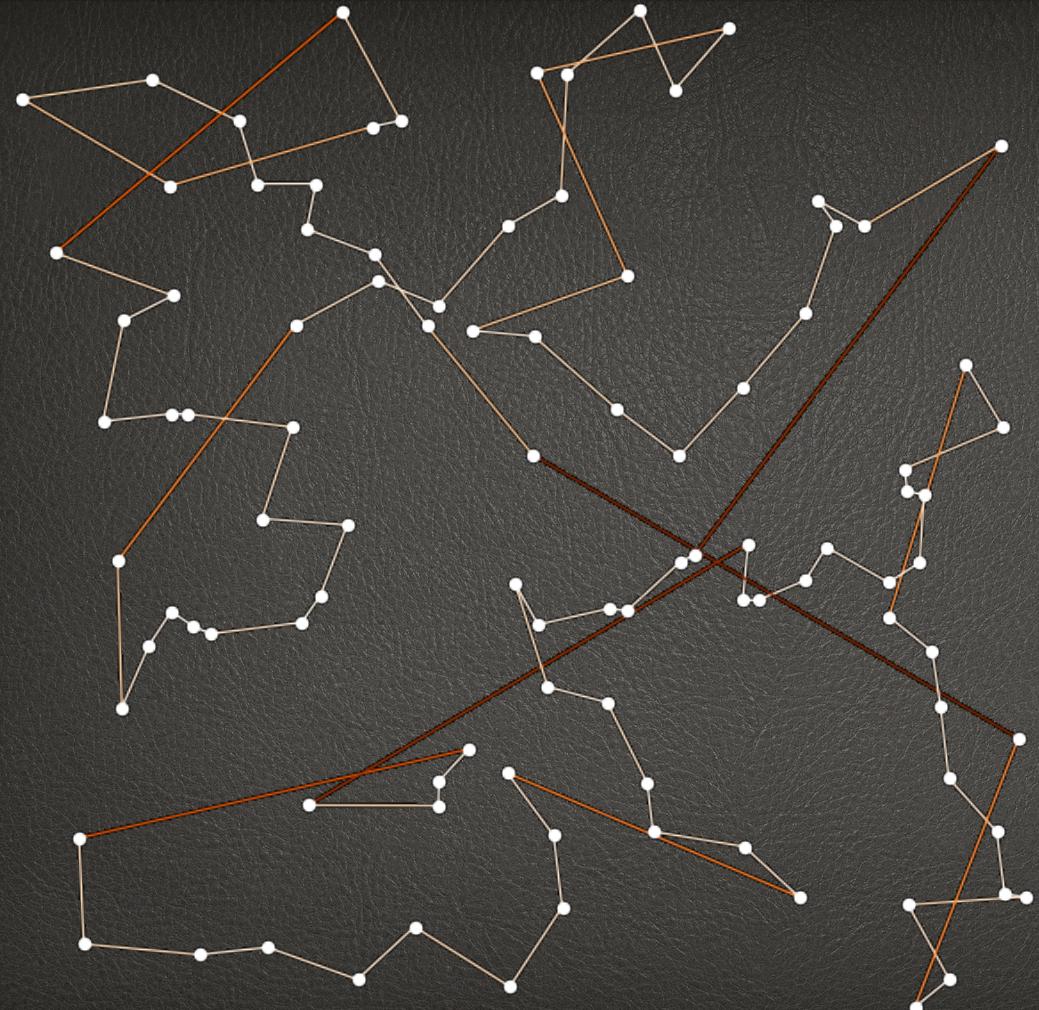
*The triangle inequality
allows this*

2-opt



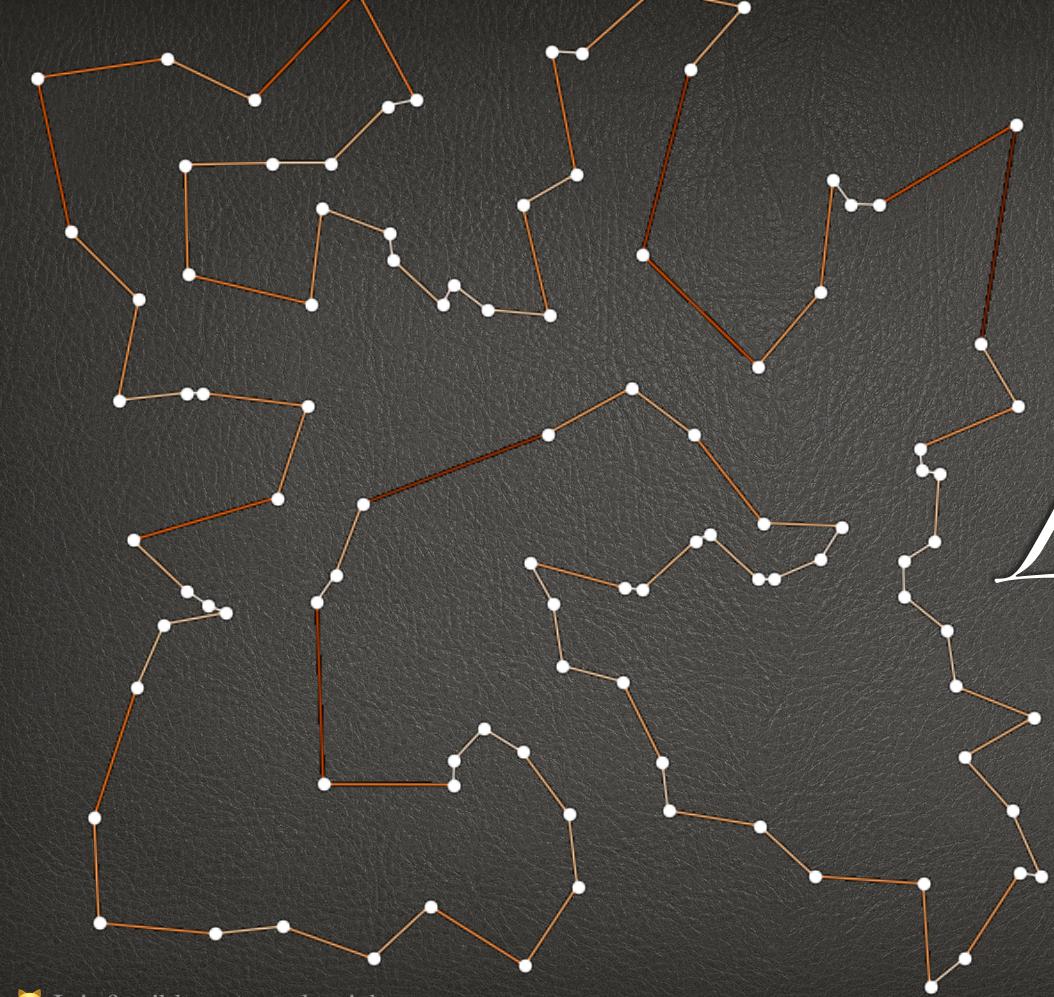
😺 That could be cheaper then before

This was obviously never an MST, but just bear with me



😺 It is feasible now and quick to compute

Those shortcuts are not all that short 😺



Local search

😺 It is feasible now and quick to compute

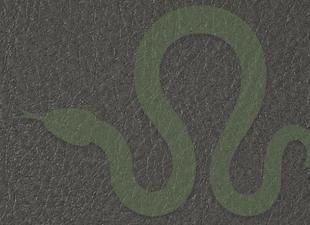
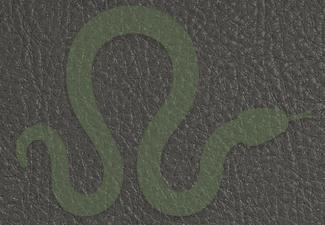
Those shortcuts are not all that short 😺



Simulated annealing

😺 Run it as long as you like

Those parameters, thou 🐱



<https://tinyurl.com/tspdемоcode>

*Just write
satuelisa
in your preferred search engine
if you need to get in touch*