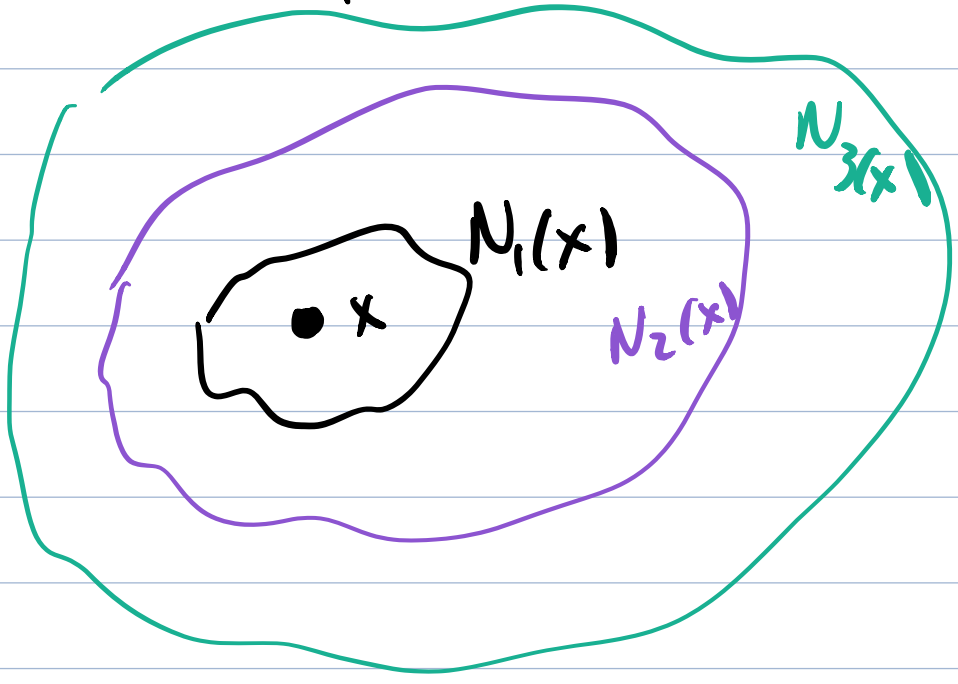
Friday, April 23

* Homework 6 due last day of class (2 weeks from today)

Variable Neighborhood Search 8.33914
8.27478

$N_1(x)$, $N_2(x)$, $N_3(x)$, ..., $N_d(x)$



k-opt
delete k edges, reconnect in cheapest way

For VNS with TSP, set

$$N_k(x) = (k+1)\text{-opt}$$

The way we described VNS before:
random → 2-opt

We'll instead repeat each nbhd a certain # of times before giving up and moving to the next one

Iterated Local Search

Idea: Climb to the top of a hill (using any "local search" method), then try to jump off the hill, to a point nearby, but far enough away that you're on a different hill, then repeat.

The hope is that we will basically walk from local max to local max, exploring the space of local maxes.

We need:

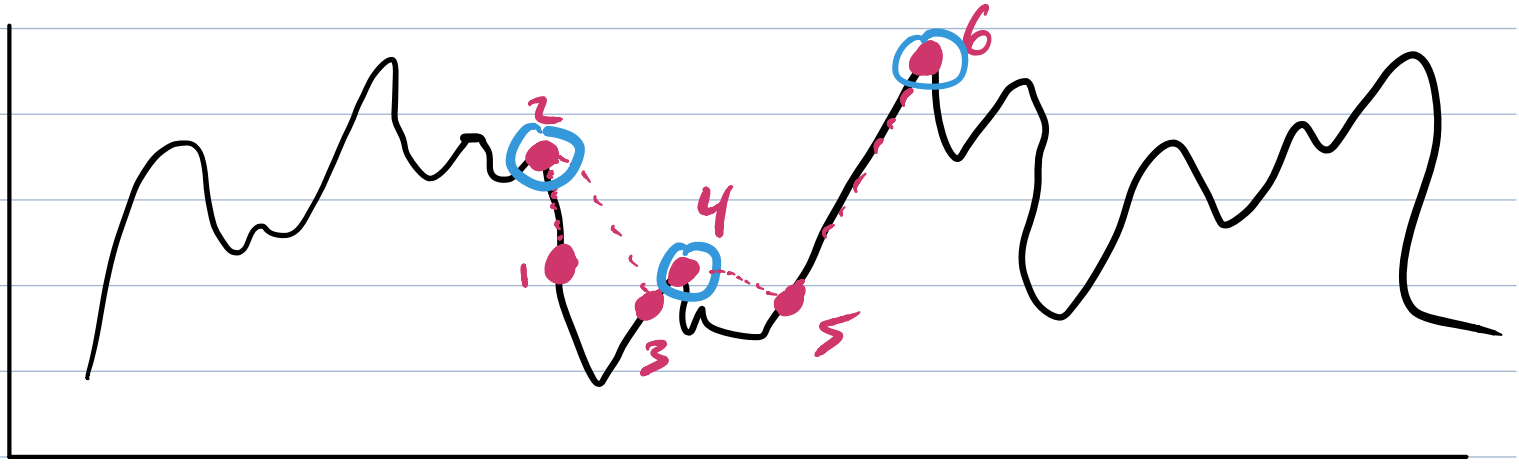
* a way to hill-climb (a normal small tweak)
* a way to jump off the

top of a hill (a bigger tweak, a "perturbation").

* a way to decide, once we reach the top of a new hill, whether to stay there or go back to the top of the old hill

[perturbation
hill-climb] 1 step

local search on the space of [tops of hills]

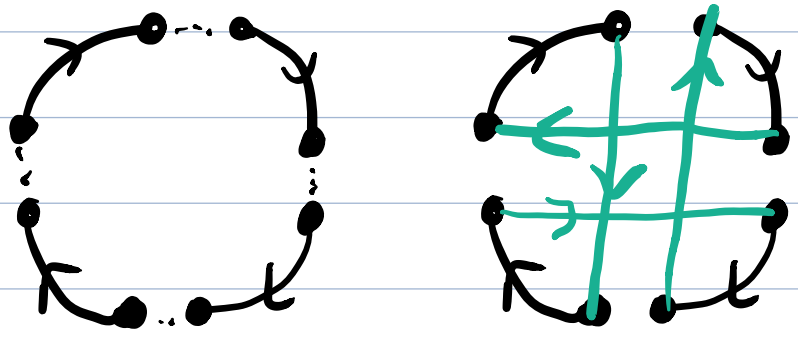


Ex: Continuous Functions

Tweak - lots of options
Perturbation - any tweak, but a bigger step

Ex: Tweak - remove 1 item, then greedily add some items
Perturbation - remove some percentage of the items

Ex: TSP
Tweak - 2-opt or 3-opt
Perturbation - removing 4 edges and reattaching with a "double bridge"



this cannot be undone with 2-opt or 3-opt moves

Acceptance Criterion:
After you perturb and H-C, should you stay at the new location?

Option 1: Accept the new max only if it's better (hill-climbing)

Option 2: Always accept the new maximum (random walk)

Option 3: Anything else, simulated annealing, tabu search, etc.

VNS vs. ILS

ILS only has two nbhds, VNS has many

ILS has options for acceptance, VNS always accepts better solutions.

Can you combine these? Sure!