BMI/CS 576 – Day 7

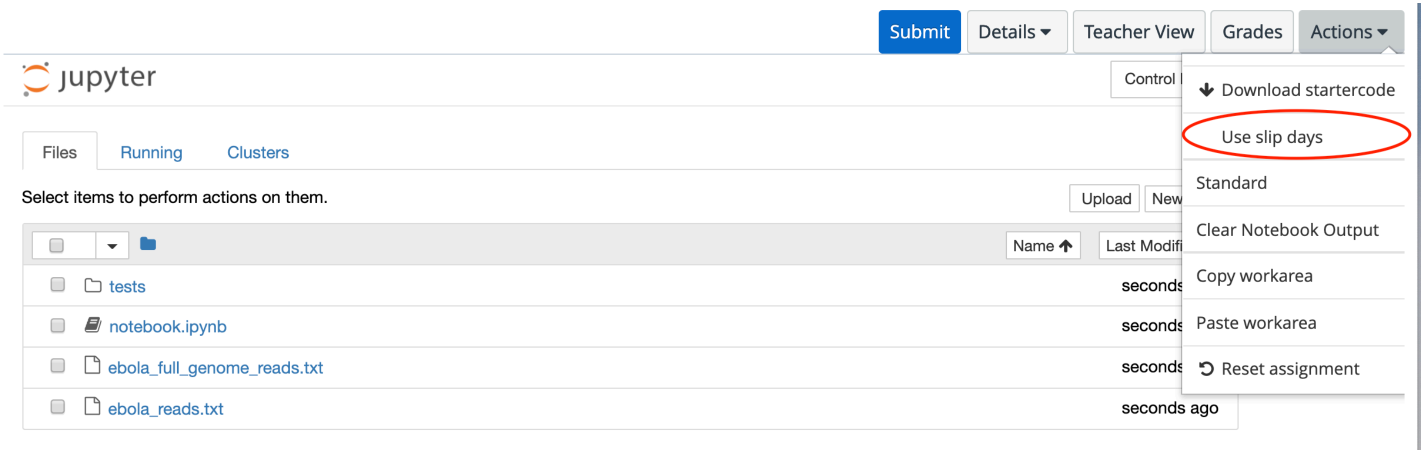
- Today
  - Pairwise sequence alignments
  - Dot plots
  - Scoring alignments
- Thursday
  - Dynamic programming
  - Global pairwise alignment

Purchase your Vocareum account

- Grace period has expired
- Don’t let this interrupt your coursework

Using late (slip) days

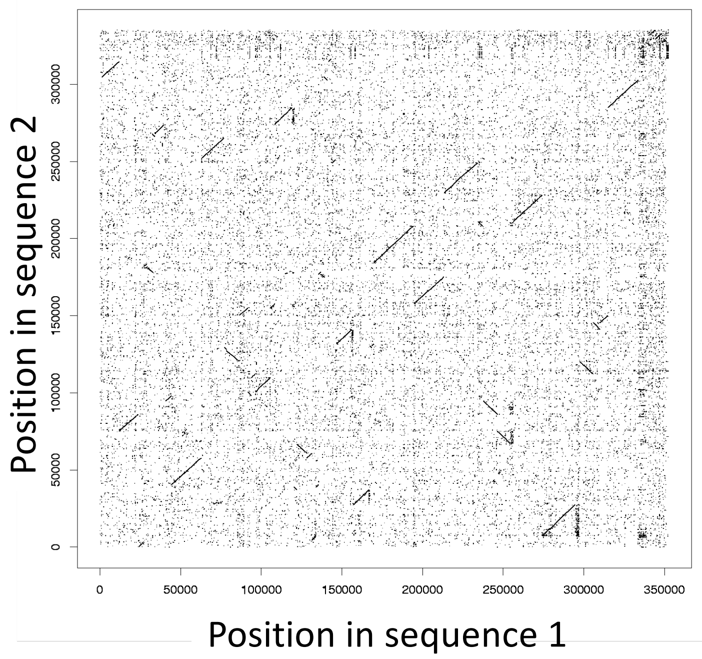
- You are allowed 4 late/slip days total across semester for HW (there will be six HWs)
- To use slip days on your HW:



Select items to perform actions on them.

tests	seconds
notebook.ipynb	seconds
ebola_full_genome_reads.txt	seconds
ebola_reads.txt	seconds ago

Dot plots



- Dot indicates sequence similarity between two positions
- Diagonal lines formed by nearby dots indicate consecutive pairs of similar positions -> evidence of true homology relationship

How do we handle…

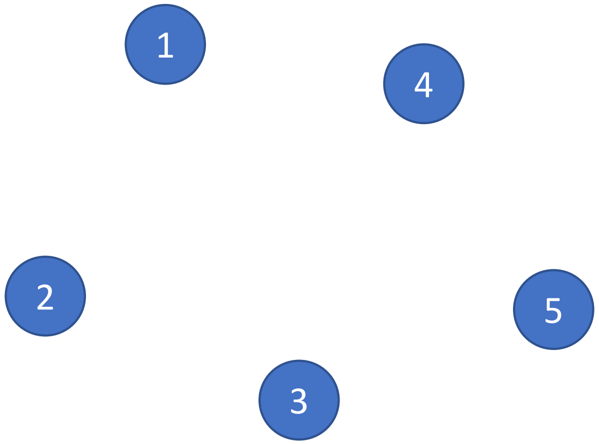
- Insertions and deletions?
  - Will need to consider all possible alignments
  - Can do so efficiently via a dynamic programming algorithm (see Thursday's material)
- Small inversions
  - In this class, we will not consider events that disrupt the order and/or orientation of positions in the sequence
  - Handling such cases requires more specialized approaches
  - Whole-genome alignment (with rearrangement events) covered in BMI/CS 776

Another Greedy Algorithm Example (for fragment assembly)

Q:

edge	weight
1 → 4	-5
2 → 3	-4
1 → 3	-3
5 → 2	-2
3 → 1	-1
.	
.	
.	

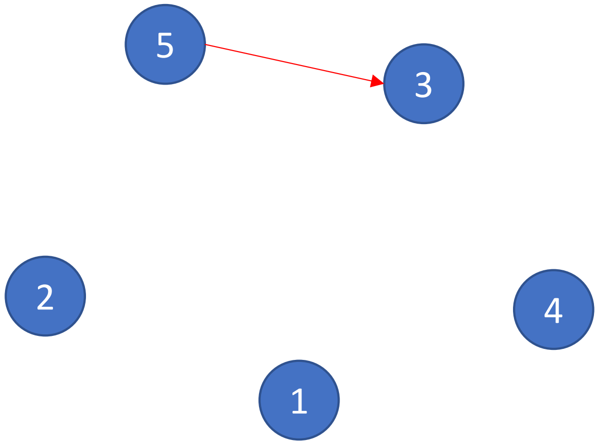
Sorted by edge weights



Another Greedy Algorithm Example – Iteration 1

Q:

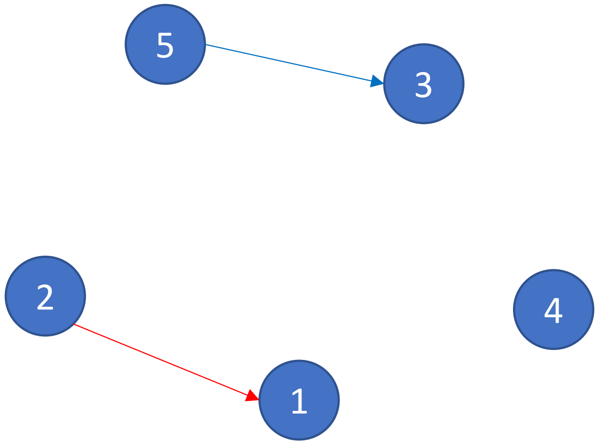
edge	weight
5 → 3	-5
2 → 1	-4
5 → 1	-3
4 → 2	-2
1 → 5	-1
.	
.	
.	



Another Greedy Algorithm Example – Iteration 2

Q:

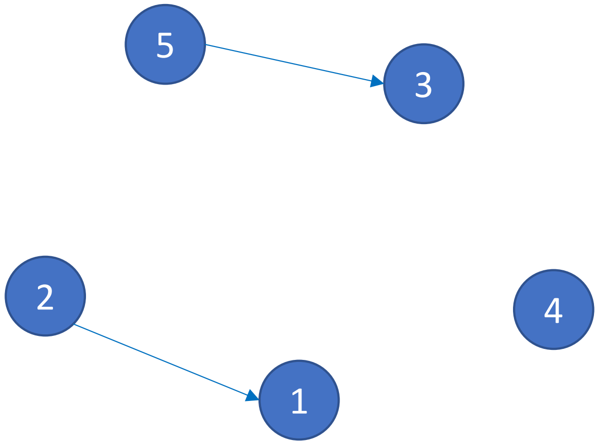
edge	weight
5 → 3	-5
2 → 1	-4
5 → 1	-3
4 → 2	-2
1 → 5	-1
. . .	



Another Greedy Algorithm Example – Iteration 3

Q:

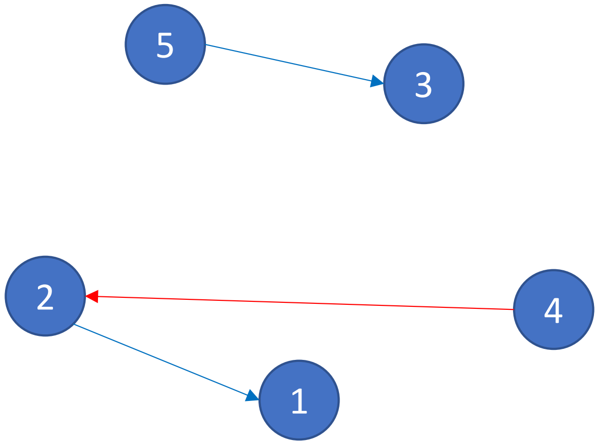
	edge	weight	
	5 → 3	-5	
	2 → 1	-4	
➡	5 → 1	-3	🚫
	4 → 2	-2	
	1 → 5	-1	
	.		
	.		
	.		



Another Greedy Algorithm Example – Iteration 4

Q:

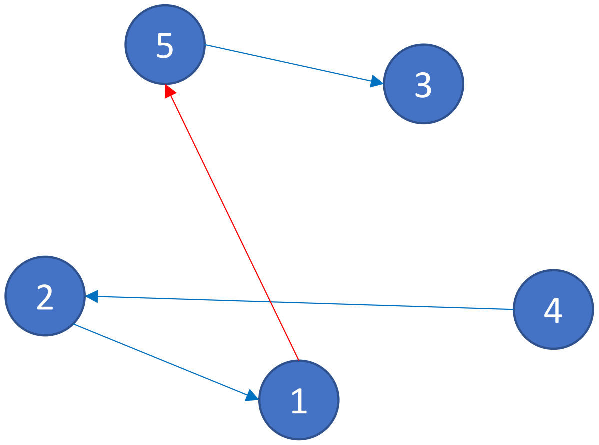
edge	weight
5 → 3	-5
2 → 1	-4
5 → 1	-3
➡ 4 → 2	-2
1 → 5	-1
.	
.	
.	



Another Greedy Algorithm Example – Iteration 5

Q:

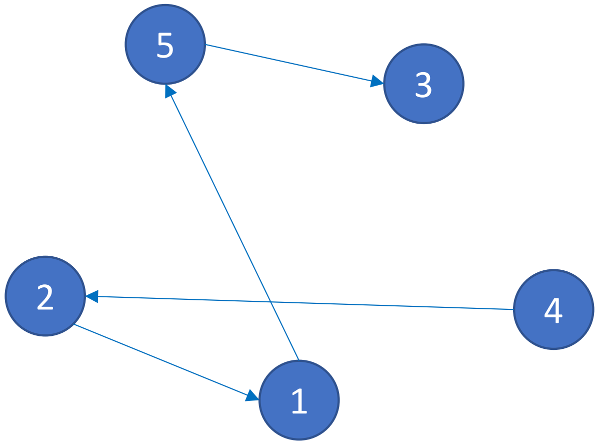
edge	weight
5 → 3	-5
2 → 1	-4
5 → 1	-3
4 → 2	-2
1 → 5	-1
.	
.	
.	



Another Greedy Algorithm Example – Termination

Q:

edge	weight
5 → 3	-5
2 → 1	-4
5 → 1	-3
4 → 2	-2
1 → 5	-1
.	
.	
.	



Path completed: [4, 2, 1, 5, 3]

For assembly, convert to superstring, given vertex labels