

## **Energetic Evolution**

Input: pointer to Gene array ,the source gene, the target gene, and an amount of energy,  
(Gene \*dna, string source, string tg, int energy, int num\_nodes)

Output: Boolean, indicating whether mutation with energy is possible

### Base cases:

If source gene does not have mutations then it can't mutate

Ex: ene AGAA AAAA 6 (AGAA does not mutate into anything)

Return false: AGAA cannot evolve into AAAA with at most 6 evolutionary cost

If the source or target genes are the same,

the energy is greater than or equal to cost, the function returns true (evolution is possible with the given energy)

EX: ene TGCC TACC 7

Return true: TGCC can evolve into TACC with at most 7 evolutionary cost

If the cost is greater than energy return false

EX: ene TGCC TACC 5

Return false: TGCC cannot evolve into TACC with at most 5 evolutionary cost

### Recursive case:

Then, let new src be the gene src can mutate into

EX: ene GTAT TTAT 10

Return true: GTAT can evolve into TTAT with at most 10 evolutionary cost

EX: ene GTAT TTAT 1

Return false: GTAT cannot evolve into TTAT with at most 1 evolutionary cost

## **Evolutionary Path**

Input: pointer to Gene array ,the source gene, the target gene,  
(Gene \*dna, string source, string tg, int num\_nodes)

Output: String

### Base case:

If src cannot mutate into another gene, there is no sequence

EX: path AGAA AAAA

Output: There is no path from AGAA to AAAA

If src can mutate into tgt, then it can evolve into tgt in one step

EX: path TGAC TAAC

Output: TGAC -> TAAC

If src was already "seen", then tgt is reachable from src via mutations.

EX: path AGCC AGAA

Output: AGCC -> AGAC -> TGAC -> TAAC -> AAAC -> AAAA -> AGAA

### Recursive case:

In all other cases, since we have just "seen" src, we need to remember that fact. Then, let new src be the gene src can mutate into.

EX: path AGCC AGAA

Output: AGCC -> TGAC -> TGAC -> AAAC -> AAAC -> AGAA

It took me all of Friday and Saturday to finish this assignment, so about 24-30 hours.