**CPT\_S 580 HW1**

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**1.**

**Search space #1**

Initial State: None (k empty slot for m numbers of clusters)

Successor State Function: For k times, each time generates all valid combination of clusters differs by 1 bit at kth slot

Terminal State Function: correct combination of clusters

Pros: The computation cost is low

Cons: Since it does not explore all possible combinations which could stuck on local optimal candidate. Need more restarts to train an accurate heuristic function

**Search space #2**

Initial State: None (k empty slot for each m numbers of clusters)

Successor State Function: All valid combination of clusters differs by 1 bit

Terminal State Function: correct combination of clusters

Pros: This search space explores more candidates than 1st search space within reasonable computation time

Cons: Since it does not explore all possible combinations which could stuck on local optimal candidate.

**Search space #3**

Initial State: None (k empty slot for each m numbers of clusters)

Successor State Function: All valid combination of clusters

Terminal State Function: correct combination of clusters

Pros: This search space explores all possible combinations which guarantee to find the globe optimal candidate. Thus, it trains the best heuristic function over the 3 search spaces.

Cons: The computation cost is the most expensive over the 3 search spaces, so that this search space is not practical for structure prediction of high dimensional data

**2.**

**(a)** Implemented in Java

**(b)**

**(c)**

**Nettalk dataset**

**Ocr dataset**