

Pre-cluster

.....

Main C2G

```
Initiate_Empty_Queue;
Create_Root_Node;
Queue.push(Root Node);
While Queue is not empty:
Node_id = Queue.pop();
Best_Entropy = inf;
Best_strategy = [];
    For all marker pairs:
        Compute_Best_Gate();
        Compute_Entropy();
        If entropy < Best_Entropy:
            Best_Entropy = entropy;
            Best_strategy = Current_gates;
    End
    If Best_strategy is not []:
        Create_Children_Nodes;
        Queue.push(All New Nodes);
    End
End
```

Compute_entropy

Compute_Best_Gate

```
Set: Grid_Size;

Compute: x_interval and y_interval;

Grid_X = (x-min(x))/x_interval;
Grid_Y = (y-min(y))/y_interval;
Hash_key = Grid_X*100+Grid_Y

Grid = unique(Hash_key);

Initiate Num_of_Cell_Grid;

%% Above is a n-by-m matrix. n is total number of grid and
m is total number of cell population. It's used to record
number of different cells in different grid.

For each cell:
    Add 1 to right place in Num_of_Cell_Grid;
End

Compute Adjacent Matrix;

%% overlap between 2 population is  $\sum_{All\ Grid} \sqrt{p_1 p_2}$ . Where  $p_i$  is
number of cells in population i out of all cell in
population i.

MCL clustering.

%% Each MCL cluster is one gate we want to draw.

For each MCL cluster:
    If it has no target population, skip;
    Compute grid convex hull of the cluster;
    %%The union of above convex hull is the gate;
End
```

Compute_convex_hull

%% Here, we want to ignore certain percentage of outlier cell. But the outlier level is unknown. We want to try different values.

```
Best_f_score = 0;
```

```
Best_Boundary = [];
```

```
For different ignore percentage:
```

```
    Boundary = [];
```

```
    For Each population in the cluster:
```

```
        Drop small grids;
```

```
        Compute Convex hull;
```

```
        Boundary = Union(Boundary, Convex_hull);
```

```
    End
```

```
    Compute F_score;
```

```
    If F_score > Best_f_score:
```

```
        Best_f_score = F_score;
```

```
        Best_Boundary = Boundary;
```

```
    End
```

```
End
```