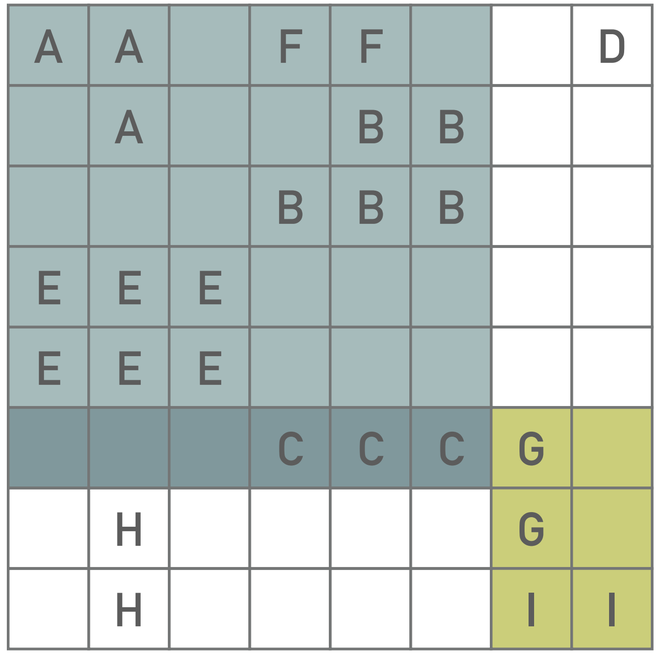
Solution

NDBI007: Practical class 6

Exercise 6.2 (Solution)

- Next, iteratively add such an object into a node which will maximize the difference in the node area enlargements if the object was inserted into the first or second node

Object	ABEF	GI	Difference
C	6x6-30=6	5x3-6=9	|6-9|=3
D	8x5-30=10	2x8-6=10	|10-10|=0
H	6x8-30=18	7x3-6=15	|18-15|=3

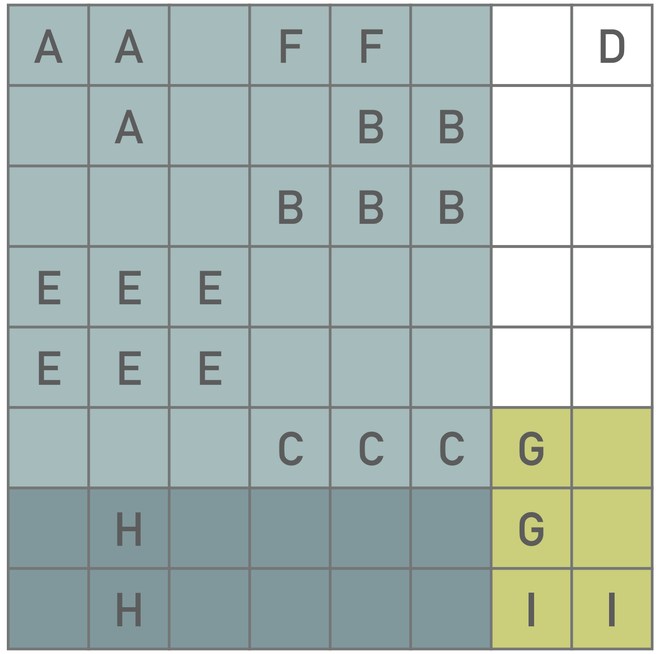


- The biggest difference shows the object C, hence it will be inserted into the node which is closer, i.e., ABEF
- Thus, we have nodes ABCEF and GI

Exercise 6.2 (Solution Continued)

- Next, iteratively add such an object into a node which will maximize the difference in the node area enlargements if the object was inserted into the first or second node

Object	ABCEF	GI	Difference
D	8x6-36=12	2x8-6=10	|12-10|=2
H	6x8-36=12	7x3-6=15	|12-15|=3



- The biggest difference shows the object H, hence it will be inserted into the node which is closer, i.e., ABCEF
- Thus, we have nodes ABCEFH and GI

Exercise 6.2 (Solution Continued)

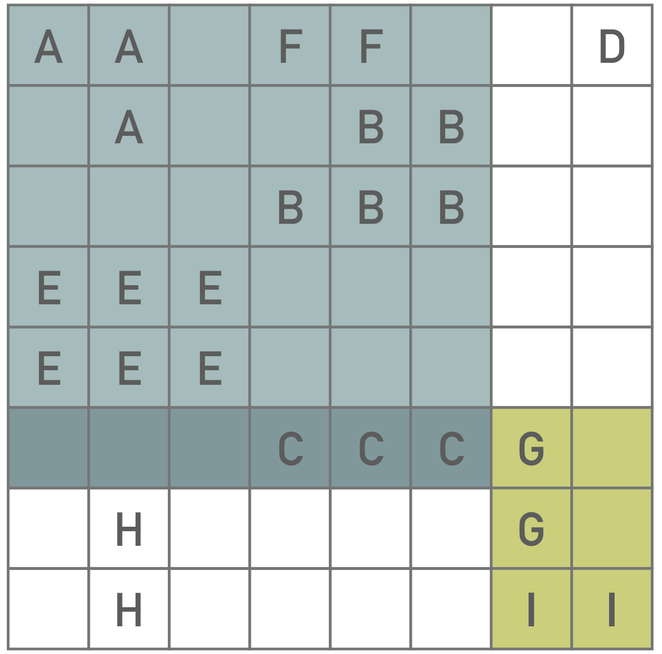
- Finally, object D must be placed in the node GI because the minimum number of items per node is $m = 3$ and $GI = 2$, that is $GI < m$
  - As a result, we have nodes ABCEFH and DGI

A	A		F	F			D
	A			B	B		
			B	B	B		
E	E	E					
E	E	E					
			C	C	C	G	
	H					G	
	H					I	I

Exercise 6.3 (Solution)

- Next, iteratively add such an object into a node which will maximize the difference in the node area enlargements if the object was inserted into the first or second node

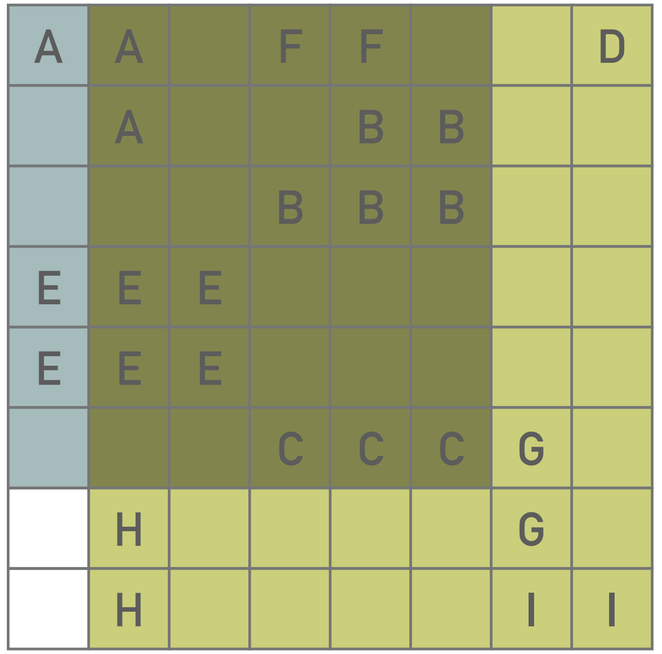
Object	ABEF	GI	Difference
C	6x6-30=6	5x3-6=9	|6-9|=3
D	8x5-30=10	2x8-6=10	|10-10|=0
H	6x8-30=18	7x3-6=15	|18-15|=3



- The biggest difference shows the object C and H, yet we choose C being inserted into the node which is closer, i.e., ABEF
- Thus, we have nodes ABCEF and GI

Exercise 6.3 (Solution Continued)

- Finally, objects H and D must be places in the node GI because the minimum number of items per node is $m = 4$ and $GI = 2$, i.e., $GI < m$
  - As a result, we have nodes ABCEF and DGHI
  - There is a smaller death space in node ABCEF but for a price of a huge overlapping area, therefore it is already better to use smaller value of m in this particular case



Exercise 6.5 (Solution)

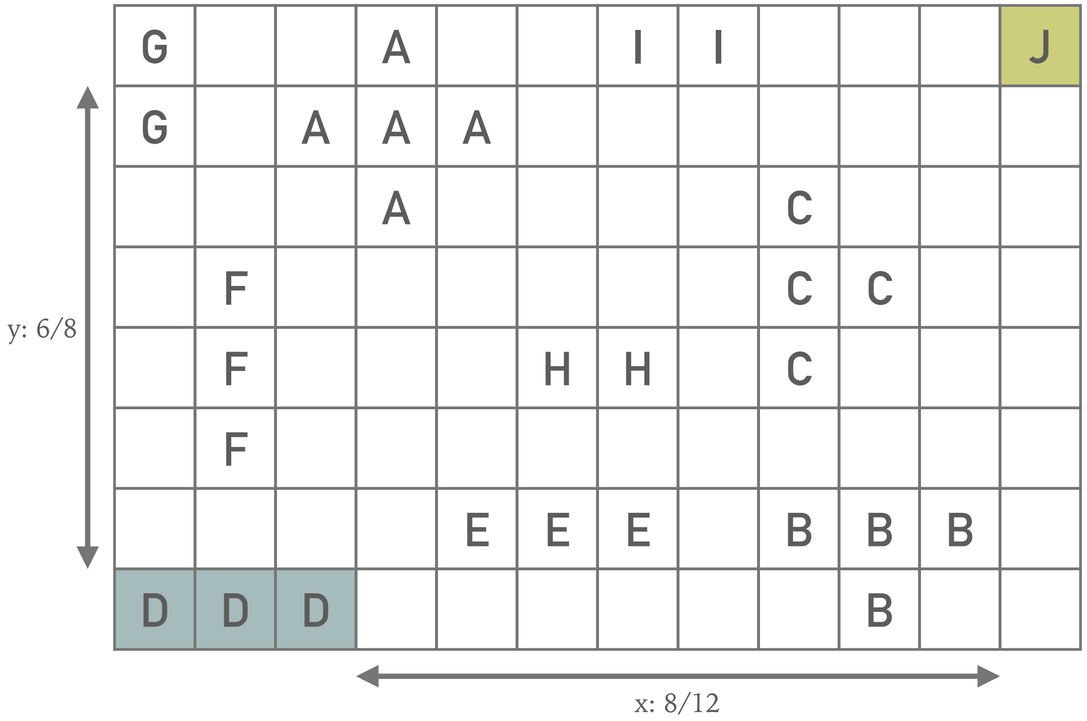
- PickSeeds
  - The largest dead space has DJ thus those will be the seeds of the splitting method

Pair	Overall area	Area of the objects	Dead space
AB	9x8=72	5+4=9	72-9=63
AC	8x5=40	5+4=9	40-9=31
…			
BG	11x8=88	4+2=6	88-6=82
…			
DJ	12x8=96	3+1=4	96-4=92
…			
IJ	6x1=6	2+1=3	6-3=3

G			A			I	I				J
G		A	A	A							
			A					C			
	F							C	C		
	F				H	H		C			
	F										
				E	E	E		B	B	B	
D	D	D							B		

Exercise 6.5 (Solution Continued)

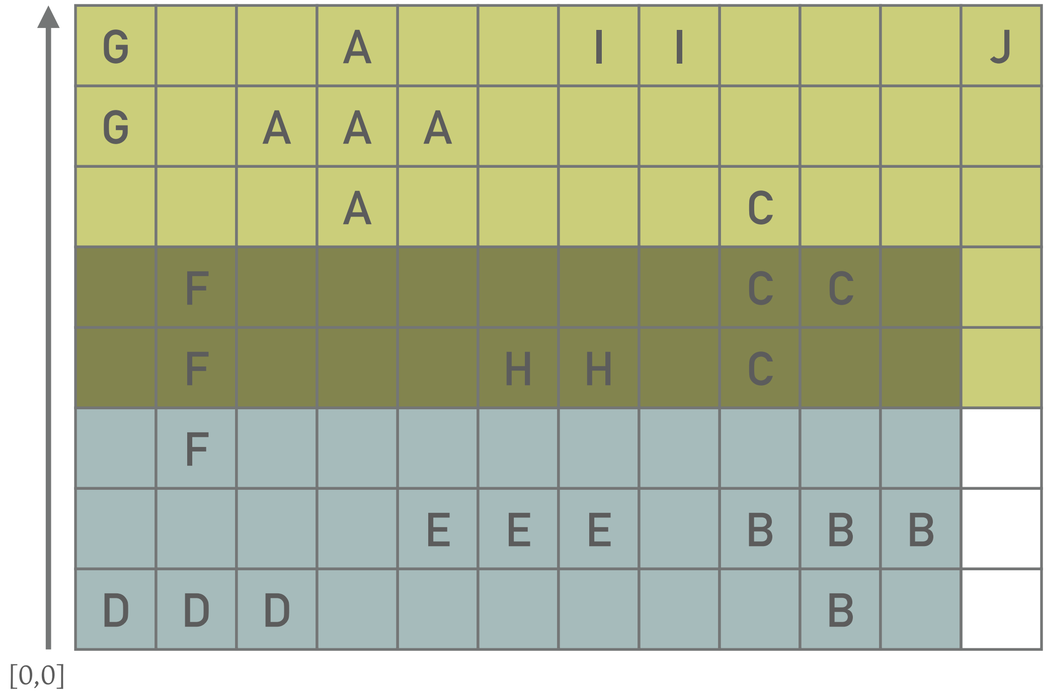
- ChooseAxis
  - x: 8/12 = 0.667
  - y: 6/8 = 0.750
  - In this particular case, the axis y is better separating D and J



Exercise 6.5 (Solution Continued)

- Distribute according to axis y

Object	D	B	E	F	H	C	A	G	I	J
Start	0	0	1	2	3	3	5	6	7	7
end	0	1	1	4	3	5	7	7	7	7

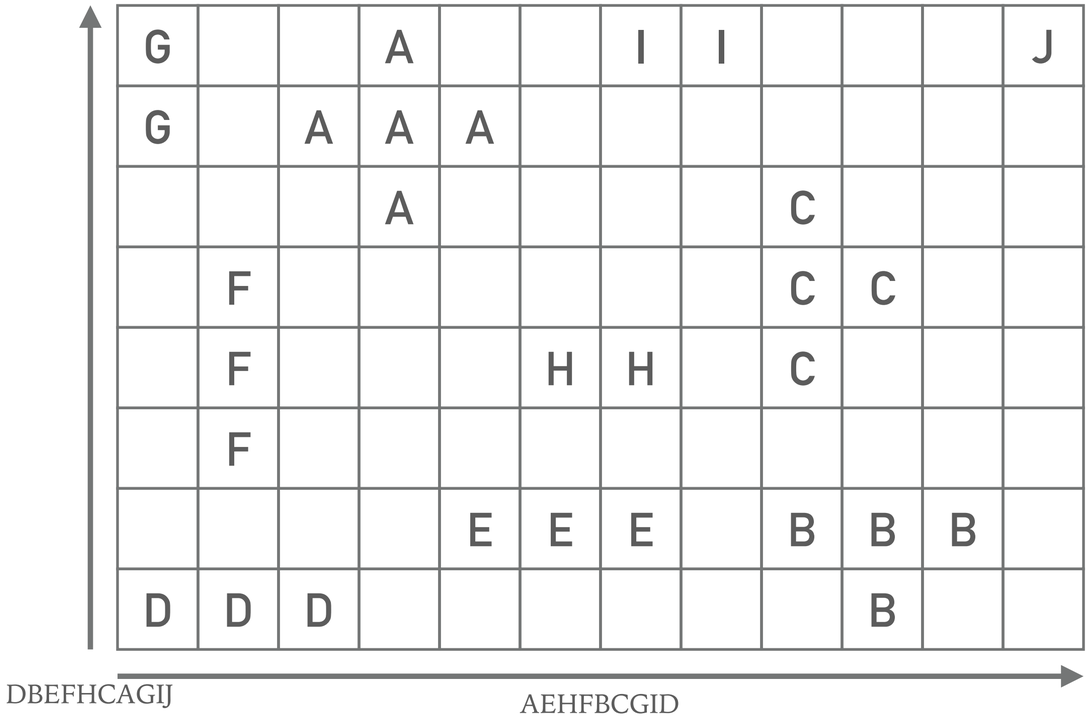


- The solution:
  - BDEFH || ACGIJ

Exercise 6.7 (Solution)

- Ordering* based on the x-axis: GDFAEHICBJ
  - margin-value (GDF || AEHICBJ) = (3+8)*2+(10+8)*2=22+36=58
  - margin-value (GDFA || EHICBJ) = (5+8)*2+(8+8)*2=26+32=58
  - margin-value (GDFAE || HICBJ) = (7+8)*2+(7+8)*2=30+30=60
  - margin-value (GDFAEH || ICBJ) = (7+8)*2+(6+8)*2=30+28=58
  - margin-value (GDFAEHI || CBJ) = (8+8)*2+(4+8)*2=32+24=56
  - Sum = 58+58+60+58+56 = 290

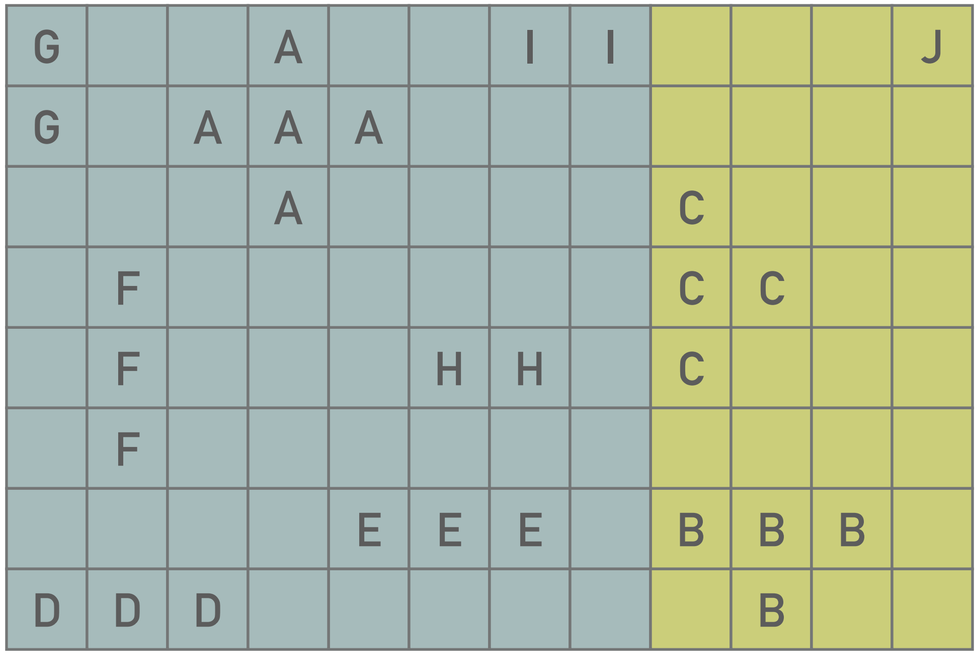
- Ordering* based on the y-axis: DBEFHCAGIJ
  - margin-value (DBE || FHCAGIJ) = (11+2)*2+(12+6)*2=26+36=62
  - margin-value (DBEF || HCAGIJ) = (11+5)*2+(12+5)*2=32+34=66
  - margin-value (DBEFH || CAGIJ) = (11+5)*2+(12+5)*2=32+34=66
  - margin-value (DBEFHC || AGIJ) = (11+6)*2+(12+3)*2=34+30=64
  - margin-value (DBEFHCA || GIJ) = (11+8)*2+(12+2)*2=38+24=62
  - Sum = 62+66+66+64+62 = 320



* If two objects start at the same level, we select first the one that ends at lower level. Or if two or mode objects starts and ends at the same level, the order is arbitrary.

Exercise 6.7 (Solution Continued)

- We chose splitting along the x-axis (smaller sum)
  - overlap-value (GDF || AEHICBJ) = 8 (column AD)
  - overlap-value (GDFA || EHICBJ) = 8 (column AE)
  - overlap-value (GDFAE || HICBJ) = 16 (columns HE; IHE)
  - overlap-value (GDFAEH || ICBJ) = 8 (column IHE)
  - overlap-value (GDFAEHI || CBJ) = 0



- There is only one distribution having the smallest overlap, therefore the area-value does not have to be computed

- The result is: GDFAEHI || CBJ