Algoritmer og Datastrukturer 1

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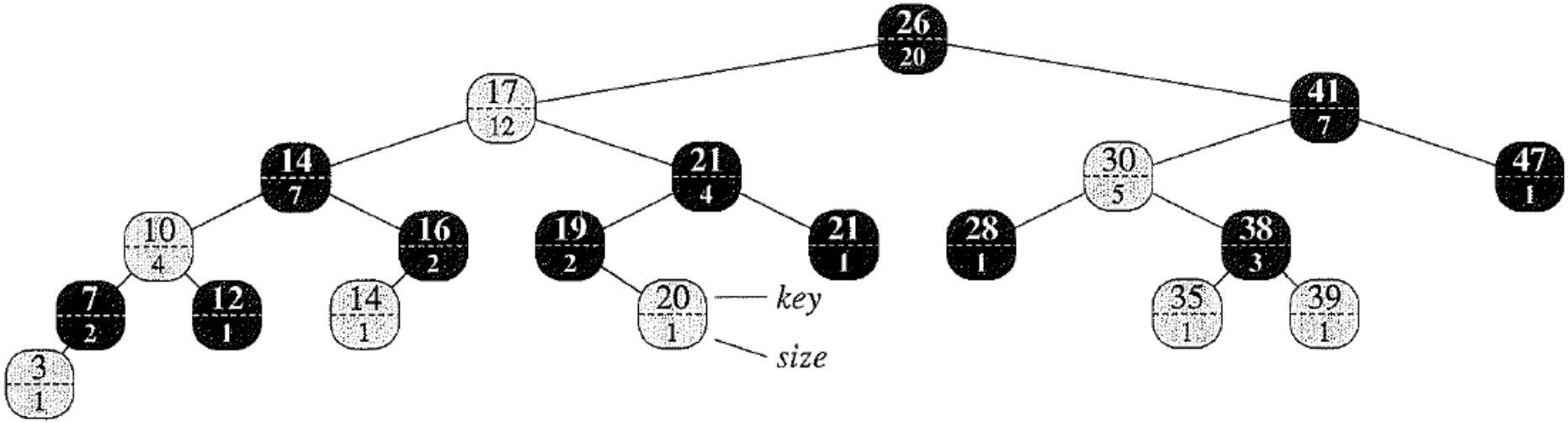
Dynamisk Rang & Interval Træer [CLRS, kapitel 14]

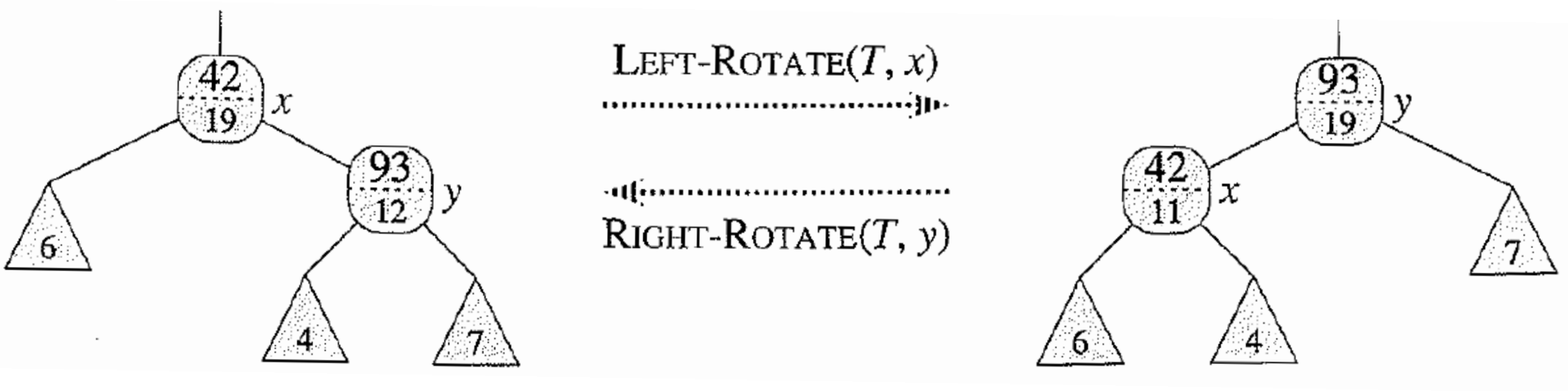
AARHUS UNIVERSITET

Dynamisk Rang



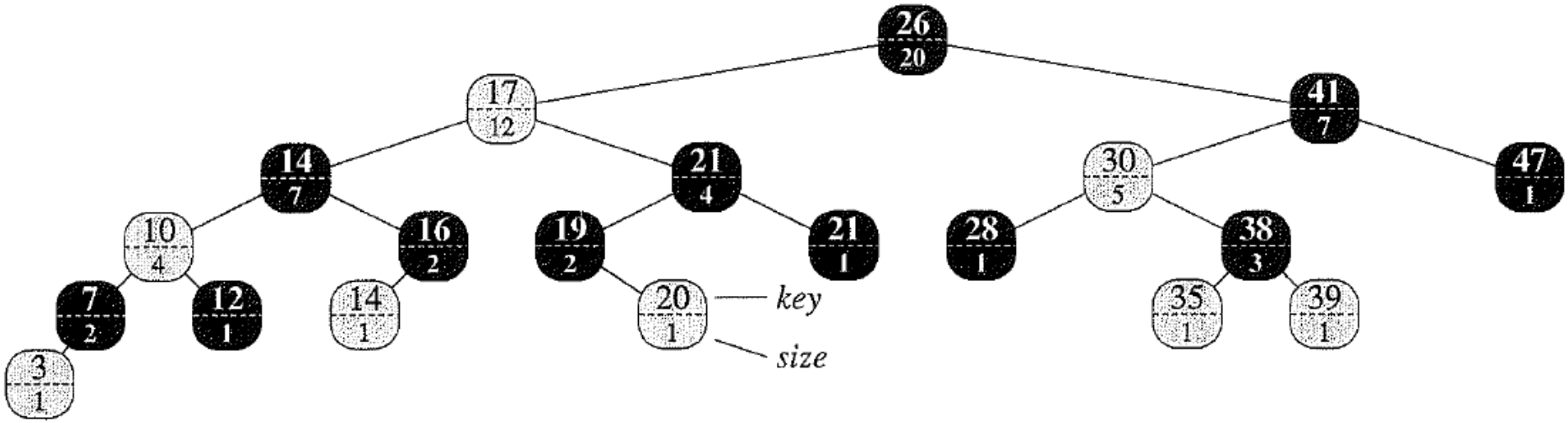
- Find det *i*'te mindste, indsættelser, slettelser
- Vedligehold i rød-sort søgetræ
- Udvid hver knude med størrelse af undertræerne

Dynamisk Rang



- Indsættelse/slettelse: opdater size på stien til roden
- Under rebalancering af det rød-sorte træ, vedligehold size under rotationer

Dynamisk Rang




```
OS-RANK(T, x)
1  r = x.left.size + 1
2  y = x
3  while y ≠ T.root
4       if y == y.p.right
5            r = r + y.p.left.size + 1
6       y = y.p
7  return r
```

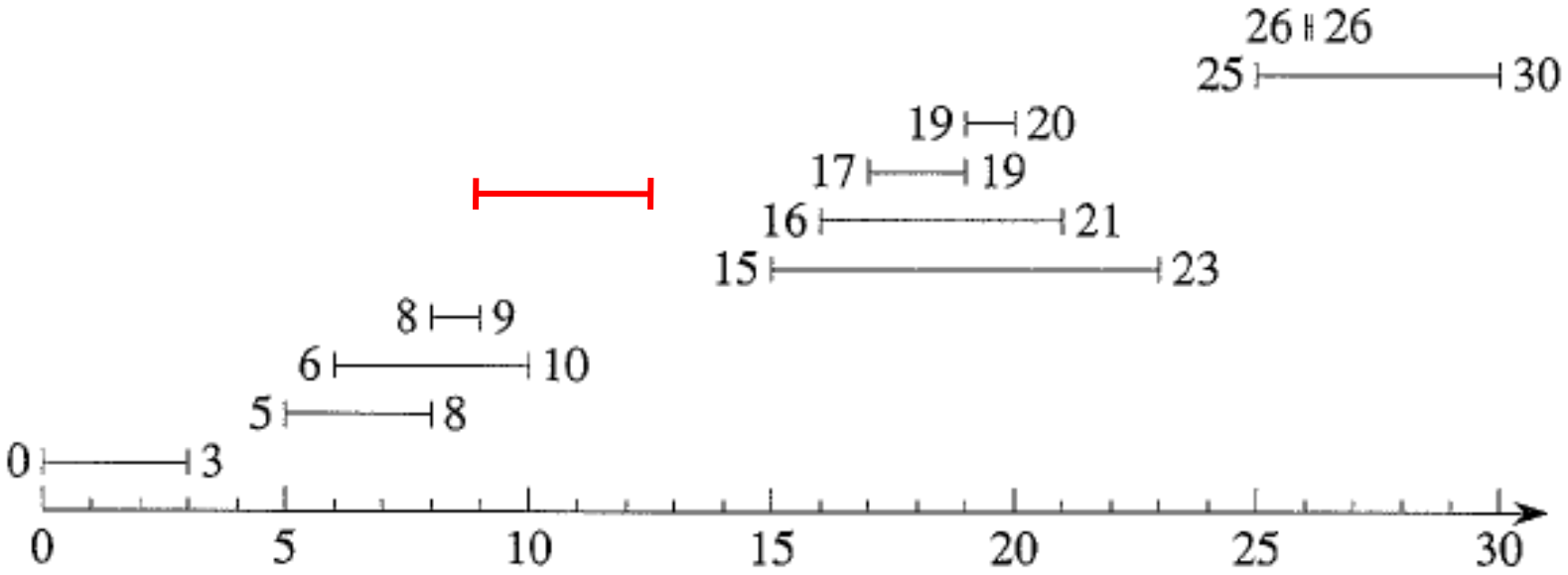
```
OS-SELECT(x, i)
1  r = x.left.size + 1
2  if i == r
3       return x
4  elseif i < r
5       return OS-SELECT(x.left, i)
6  else return OS-SELECT(x.right, i − r)
```

Dynamisk Rang

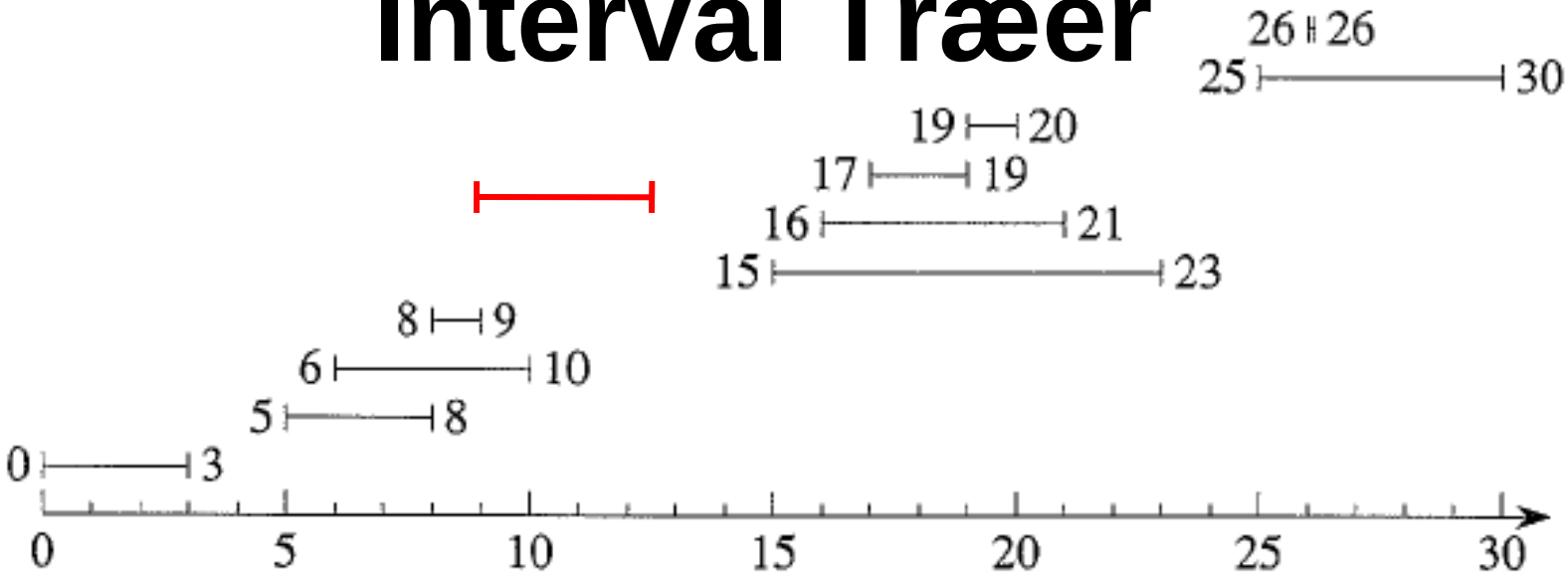
Select(S, i**)**	$O(\log n)$
Rank(S, x**)**	
Insert(S, x**)**	
Delete(S, x**)**	

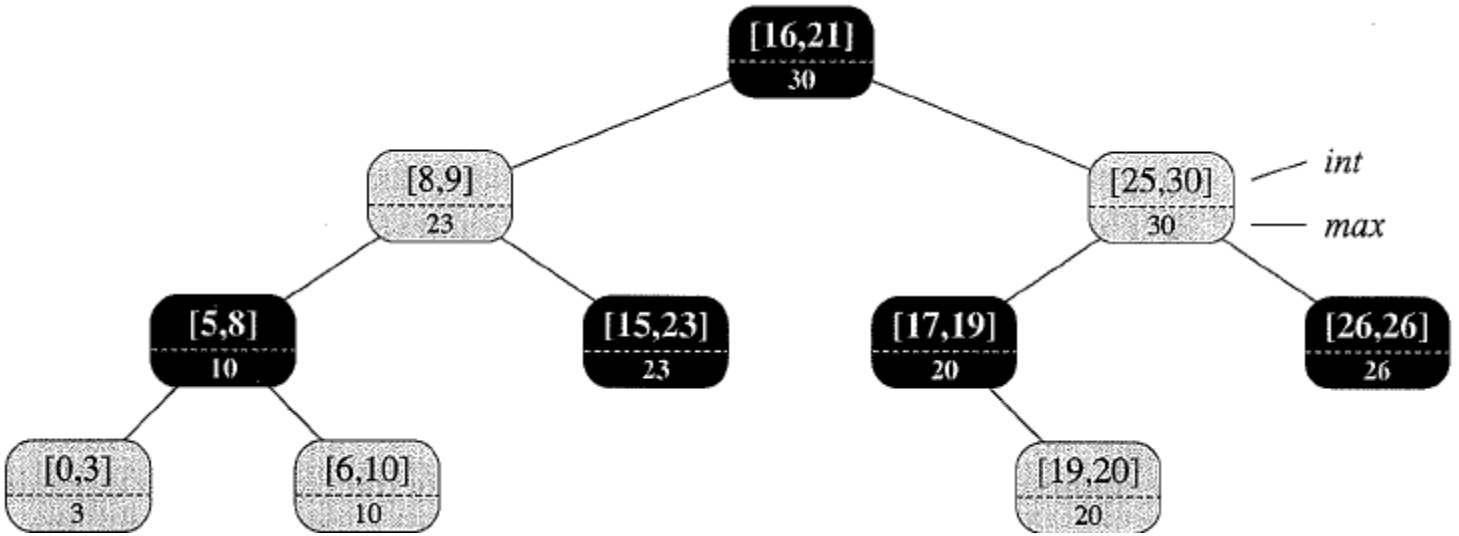
Interval Træer

- Vedligehold en mængde af intervaller
- Indsæt og slet indsatte intervaller
- Find et interval der overlapper med et givet interval



Interval Træer

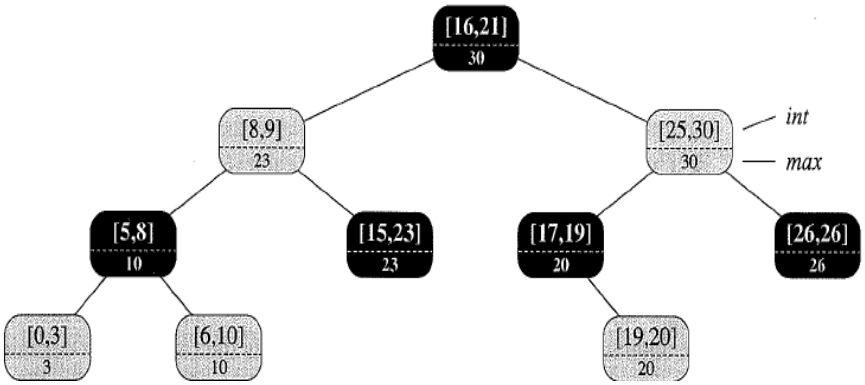


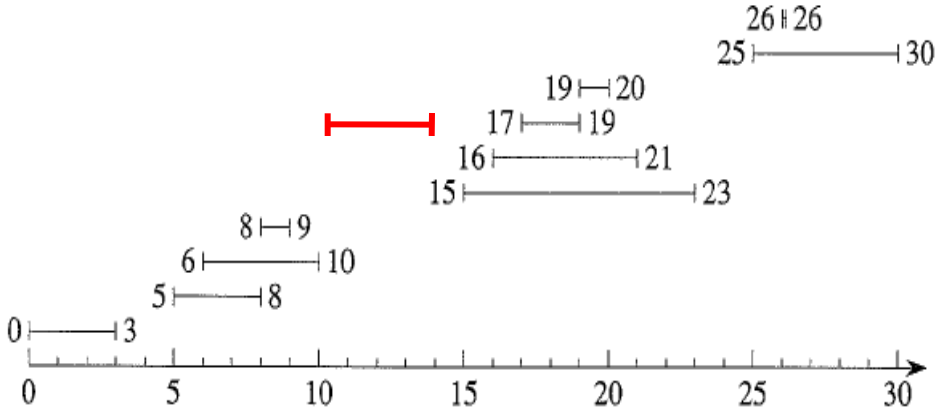


- Søgetræ over intervallernes **venstre endepunkt**
- Hver knude gemmer yderligere **maximum højre endepunkt** for et interval i undertræet

Interval Træer

```
INTERVAL-SEARCH(T, i)
1  x = T.root
2  while x ≠ T.nil and i does not overlap x.int
3      if x.left ≠ T.nil and x.left.max ≥ i.low
4          x = x.left
5      else x = x.right
6  return x
```





Interval Træer

Search(T, i**)**	$O(\log n)$
Insert(T, i**)**	
Delete(T, i**)**	