Graphs

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KTH

HT23

a linked list

- each node has atmost one link

a linked list

- each node has atmost one link
- add, remove, lookup

a linked list

- each node has atmost one link
- add, remove, lookup
- sorted, unsorted

a linked list

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- add, remove, lookup
- sorted, unsorted
- access to last node
- cirkular?

a tree

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- nodes at level n can only have links to level $n + 1$
- ergo: no cirkular paths
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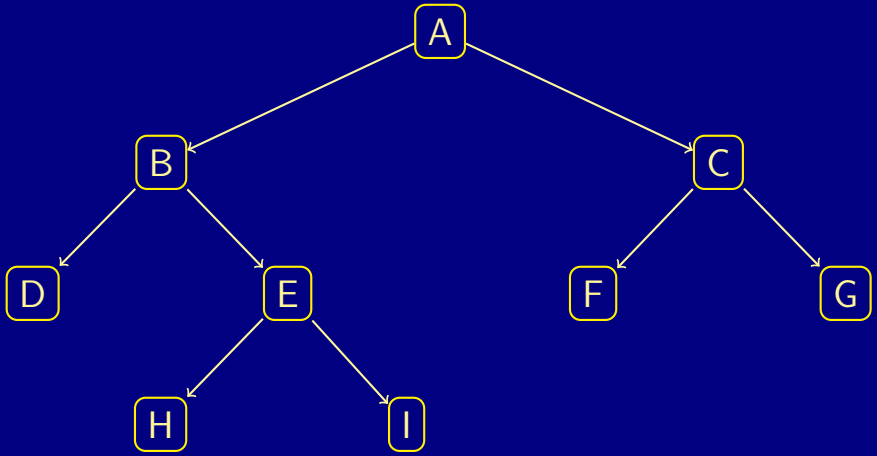
let's relax the rules

relaxing the rules



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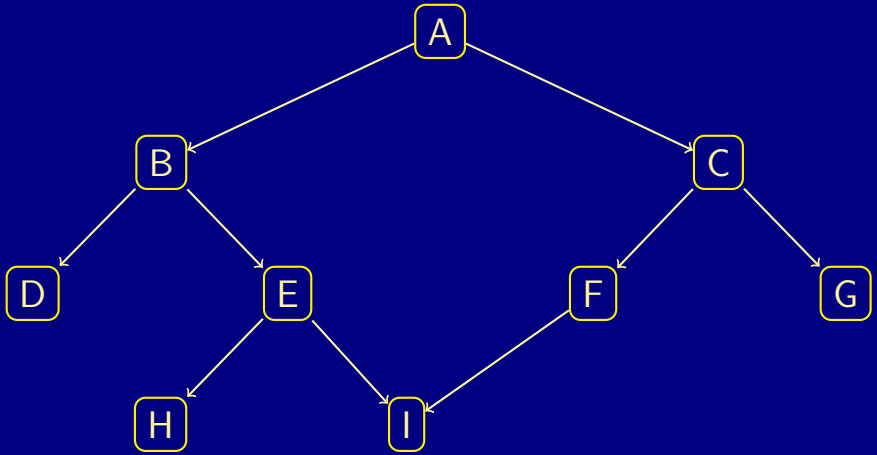

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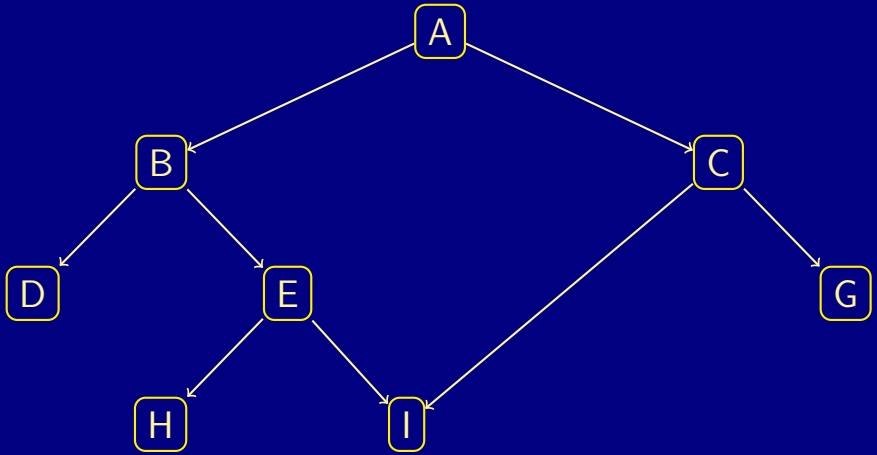

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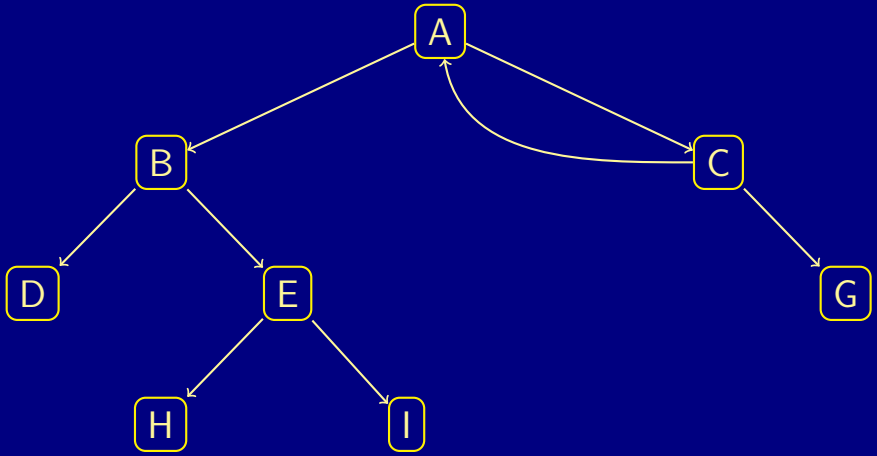
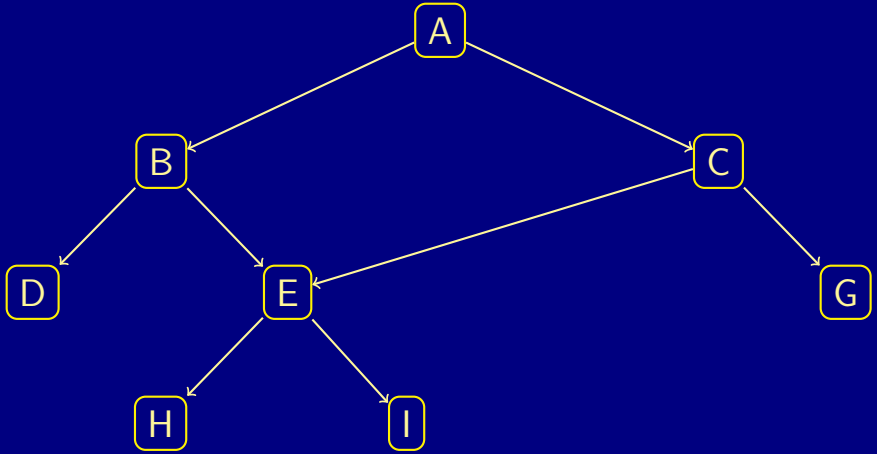


DAG



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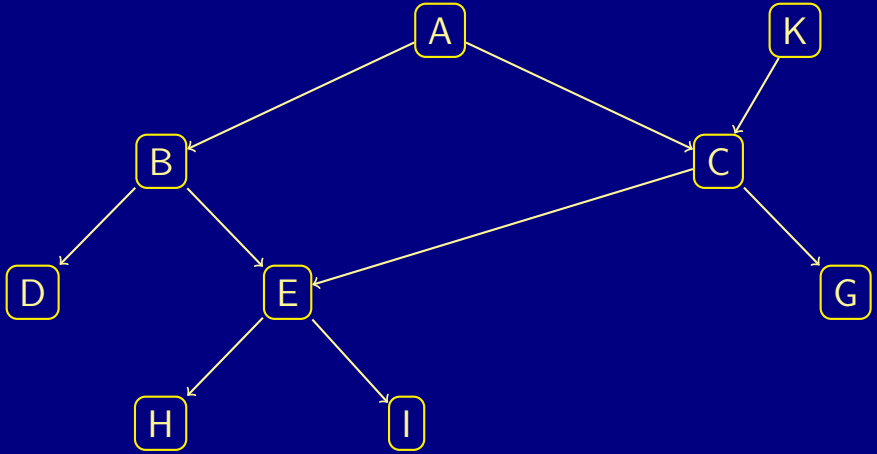
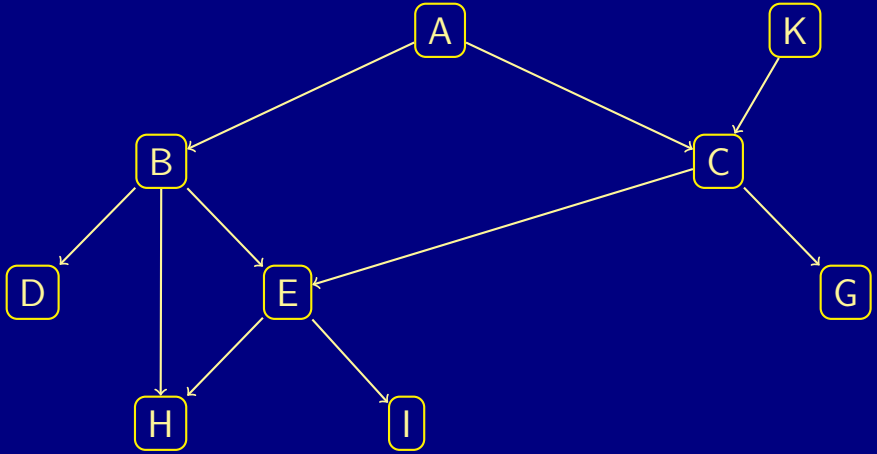


DAG



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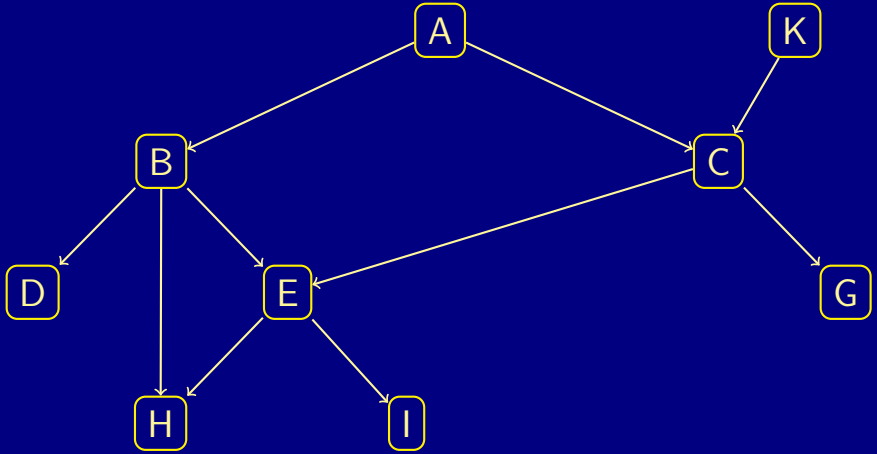


Directed Acyclic Graph

rivers

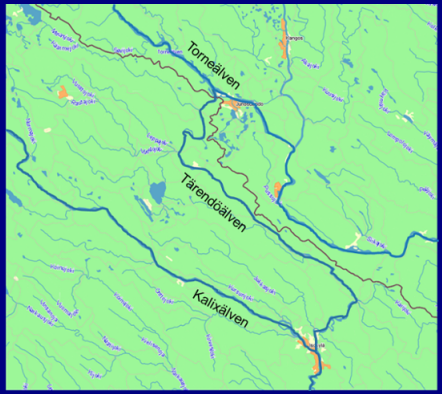
Is a river a DAG?

rivers

Is a river a DAG?
Is a river a tree?

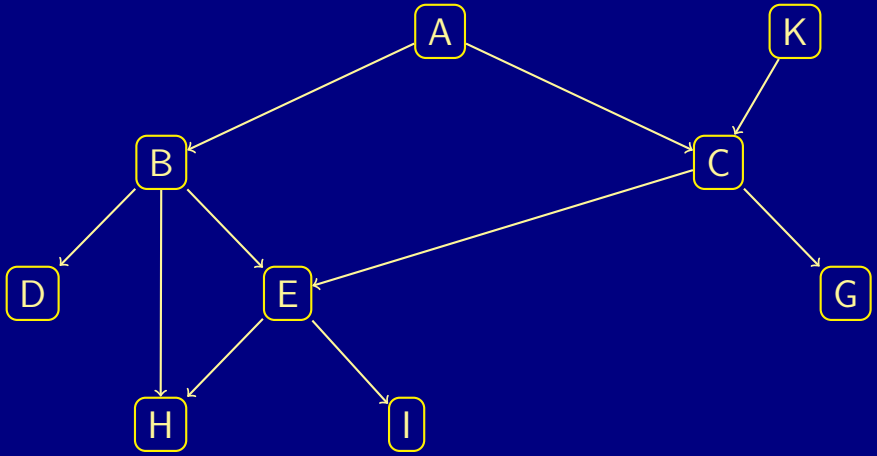
rivers

Is a river a DAG?
Is a river a tree?

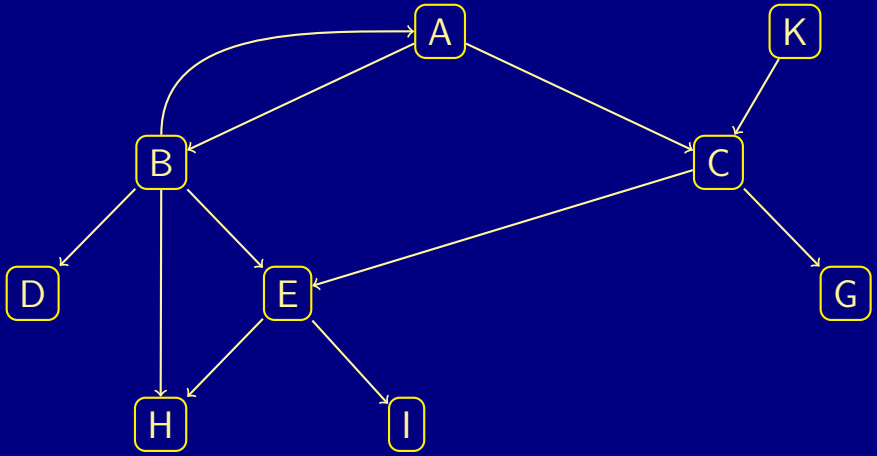


Bifurcation

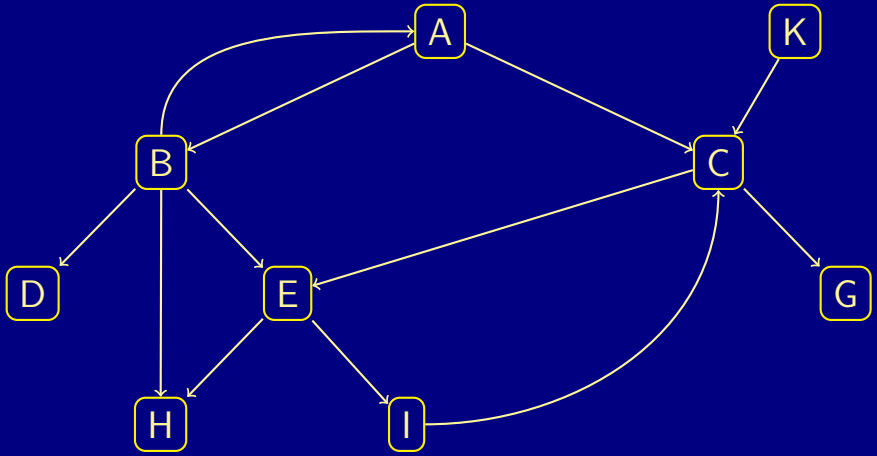
Directed graph



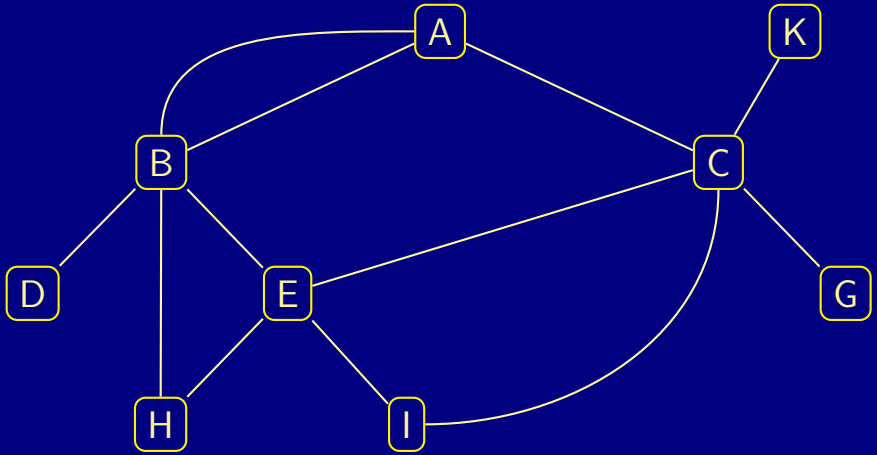
Directed graph



Directed graph



undirectional graph



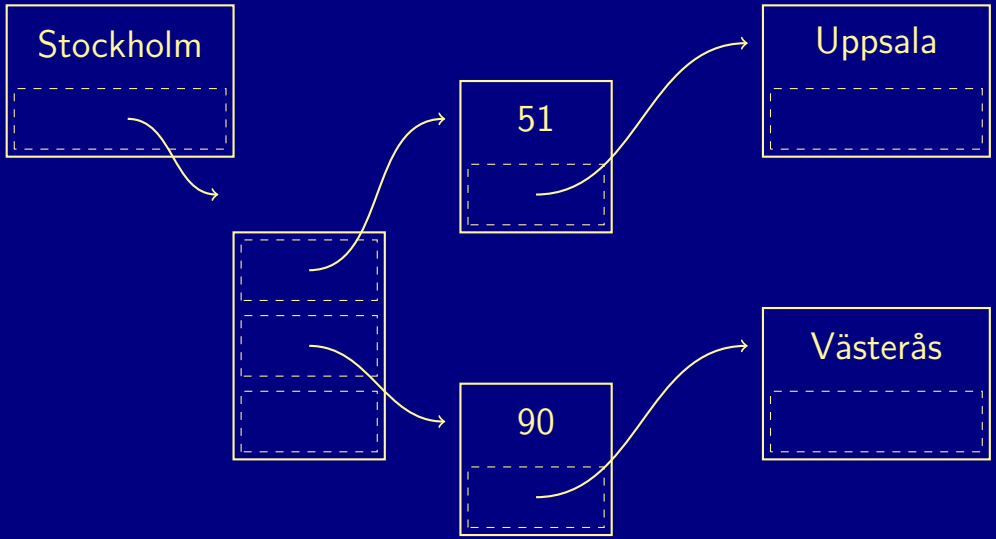
trains in Sweden

represent the graph

```
public class City {
  String name;
  Connection[] neigbours;
     :
}
```

```
public class Connection {
  City city;
  Integer distance;
     :
}
```

the graph



the naive solution

What is the shortest path from Malmö to Stockholm?

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Set a maximum distance of the path.

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- Do we have more time left?

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- Return the shortest distance found (or null).

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the path solution

the path solution

As before but keep a trail of cities that you have past.

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As before but keep a trail of cities that you have past.

- Do we have more time left?
- Are we at the destination?
- Is the city in the path?

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As before but keep a trail of cities that you have past.

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  :

improvement

improvement

If you have found a path with a distance d,

improvement

If you have found a path with a distance d,
then any other path should be shorter than the found.

assignment

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- build the graph from specificaton

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- naive search given max distance

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- preventing loops using path

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- improve search by remember found distance

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- build the graph from specificaton
- naive search given max distance
- preventing loops using path
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- realizing that something needs to be done