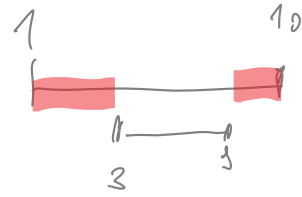


Temporal Difference Explained Example

Wednesday, October 23, 2019 8:42 AM

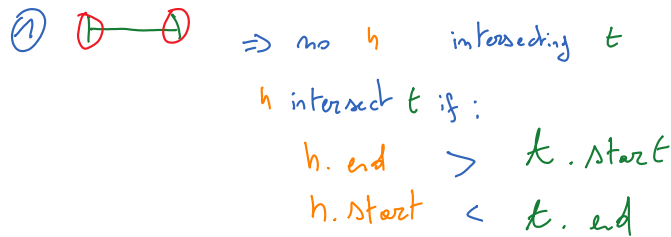
E

SSN	Role	Start	END
1	Teacher	1/1	1/10
1	HEAD	1/3	1/3
1	Teacher	1/11	1/12
1	Assistant	5/3	7/12
...

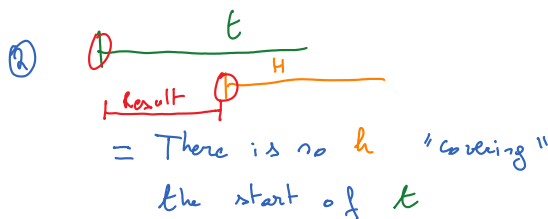


List the employees who are teachers but not head of departments

4 Cases (Some rows can match different cases!)

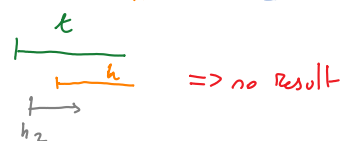


```
SELECT t.ssn, t.start, t.end
FROM E t
WHERE t.role = "Teacher"
AND NOT EXISTS (
  SELECT *
  FROM E h
  WHERE h.ssn = t.ssn AND h.role = "HEAD"
  AND h.end > t.start
  AND h.start < t.end
```

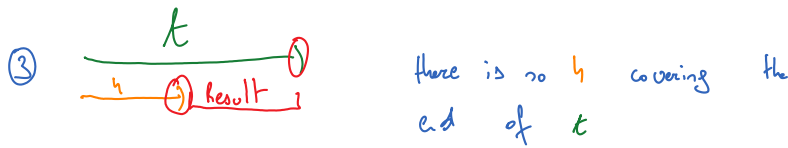


⇒ we have to find an h such that h.start > t.start and h.start < t.end

③ check that no h₂ covers h.start:

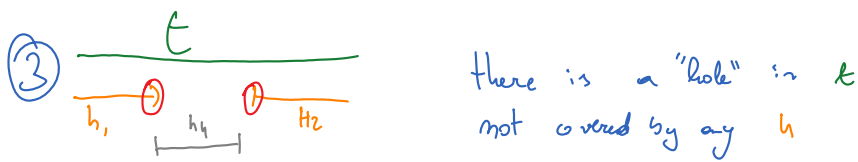


```
SELECT t.ssn, t.start, h.start
FROM E t, E h
WHERE h.ssn = t.ssn AND t.role = "Teacher" and h.role = "HEAD"
AND h.start > t.start AND h.start < t.end
AND NOT EXISTS (SELECT *
  FROM E h2
  WHERE h2.ssn = h.ssn
  AND h2.start < h.start
  AND h2.end >= h.start)
```



find h such that $t.start < h.end < t.end$
 $\exists h_2 \quad h_2.start < h.end < h_2.end$

```
SELECT t.ssn, h.end, t.end
FROM Et, Eh
WHERE h.ssn = t.ssn AND t.role = "Teacher" and h.role = "HEAD"
AND h.end > t.start AND h.end < t.end
AND NOT EXISTS (SELECT *
FROM E h2
WHERE h2.ssn = h.ssn
AND h2.start <= h.end
AND h2.end > h.end)
```



find h_1 such that $t.start < h_1.end < t.end$
 h_2 such that $h_1.end < h_2.start < t.end$

And $\exists h_3$ covering the end of h_1 or covering the start of h_2 \Rightarrow no h_3 intersecting $h_4 = [h_1.end, h_2.start]$
 \Rightarrow no h_3 such that:
 $h_3.end > h_1.end$
 $h_3.start < h_2.start$

```
SELECT t.ssn, h1.end, h2.start
FROM Et, Eh1, Eh2
WHERE h1.ssn = t.ssn AND t.ssn = h2.ssn
AND t.role = "Teacher" and h1.role = "HEAD" AND h2.role = "HEAD"
AND t.start < h1.end AND h1.end < h2.start AND h2.start < t.end
AND NOT EXISTS (SELECT *
FROM E h3
WHERE h2.ssn = h3.ssn and h3.role = "HEAD"
AND h3.end > h1.end
AND h3.start < h2.start)
```