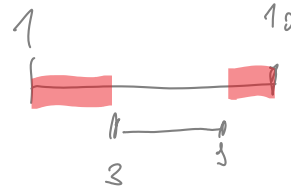


Temporal Difference Explained Example

Wednesday, October 23, 2019 8:42 AM

E

| SSN | Role | Start | END |
|-----|-----------|-------|------|
| 1 | Teacher | 1/1 | 1/10 |
| 1 | HEAD | 1/3 | 1/9 |
| 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!)

① \Rightarrow no h intersecting t
 h intersect t if $\max(\text{start}) < \min(\text{end})$

```
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)
```

\Leftrightarrow
 $t.start < h.end$
 $h.start < t.end$
 } only this because obviously
 $t.start < t.end$
 $h.start < h.end$

②
 $=$ There is no h "covering" the start of t

\Rightarrow we have to find an h such that $h.start > t.start$ and $h.start < t.end$

③ check that no h_2 intersects $[t.start, h.start]$

\Leftrightarrow
 $h_2.start < h.start$
 $t.start < h_2.end$

```
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.role = "HEAD"
  AND h2.start < h.start
  AND t.start <= h2.end)
```



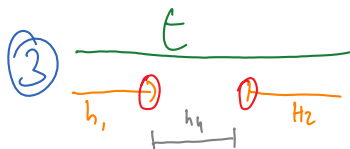
there is no h covering the end of t

find h such that $t.start < h.end < t.end$

$\exists h_2$ that intersects $[h_1.end, t.end]$

$\Leftrightarrow h_2.start < t.end$
 $h_1.end < h_2.end$

```
SELECT t.ssn, h.end, t.end
FROM E t, E h
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.role = "HEAD"
AND h2.start <= t.end
AND h.end < h2.end)
```



there is a "hole" in t not covered by any h

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 $\exists h_3$ intersecting $h_4 = [h_1.end, h_2.start]$

\Rightarrow no h_3 such that:
 $h_1.end < h_3.end$
 $h_3.start < h_2.start$

```
SELECT t.ssn, h1.end, h2.start
FROM E t, E h1, E h2
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 h1.end < h3.end
AND h3.start < h2.start)
```

