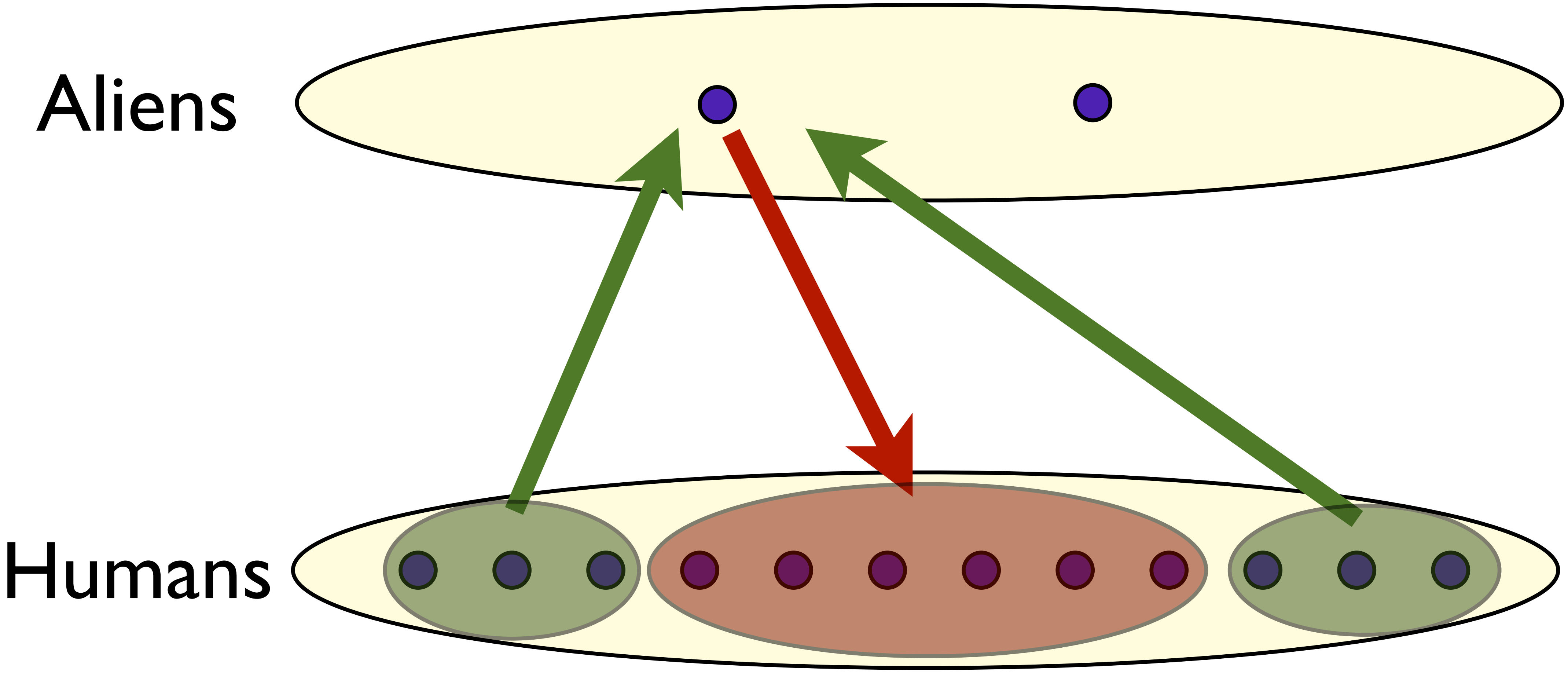
Algorithms Lab

Aliens

Aliens

Goal: find the number of aliens which can reach any other alien/human within at most 3 steps!



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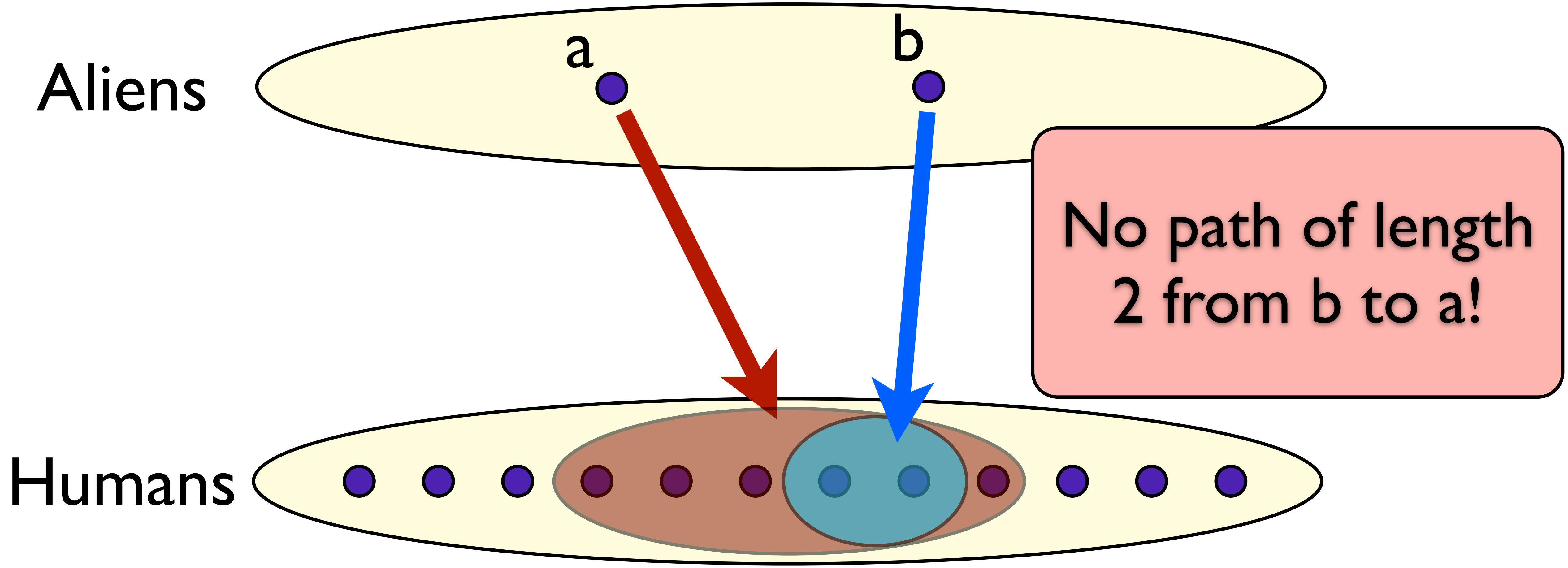
Let's look at the hint :



No path of length 2 from b to a!

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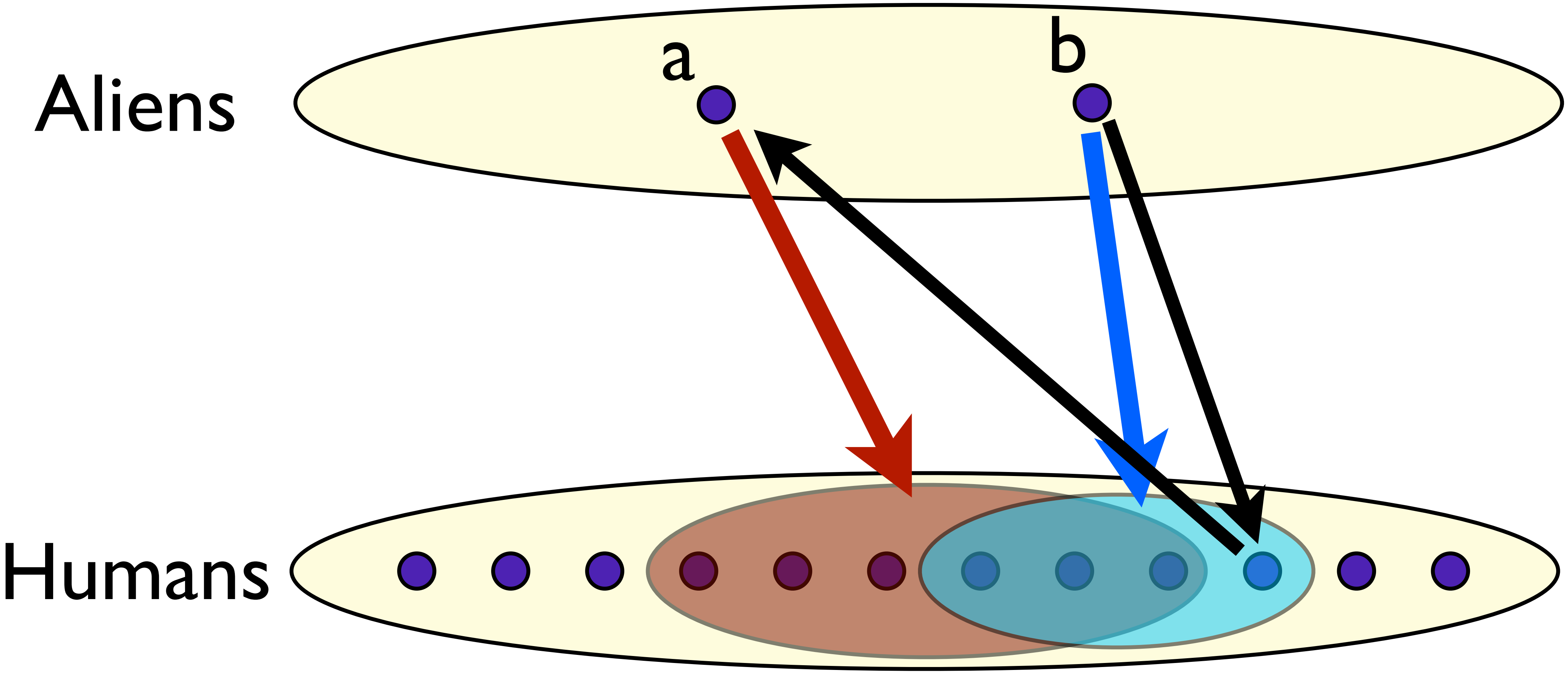

Aliens

Goal: find the number of aliens which can reach any other alien/human within at most 3 steps!

Conclusion: if the interval of an alien *a* is not contained in the interval of any other alien

↓

a can reach any other alien in two steps!

Aliens

Goal: find the number of aliens which can reach any other alien/human within at most 3 steps!

Assume: alien *a* can reach any other alien in two steps

If for each human there exists an alien which wounds him

↓

by assumption, the alien *a* can reach each human in at most three steps!!!

Aliens

Goal: find the number of aliens which can reach any other alien/human within at most 3 steps!

Summary:

- if for each human there exists an alien which wounds him
- if the interval of an alien *a* is not contained in any other interval

→ alien *a* satisfies our goal!

Aliens

Algorithm details

1. Check whether for each human there exists an alien which wounds him - if not then the answer is 0!

```
sort intervals according to the left end;
rightmost = 0;
for i = 1 to n;
  if left(interval i) > rightmost + 1 then
     output “human rightmost+1 is not wounded”;
  else rightmost = max(rightmost, right(interval i));

if right < m then
     output “human m is not wounded”;
else output “every human is wounded!”;
```

Aliens

Algorithm details

2. Find the number of intervals which are not contained in any other interval

```
sort intervals according to the left end;
rightmost = 0;
for i = 1 to n;
  if right(interval i) <= rightmost then
     output “alien i is not part of the solution”;
  else rightmost = max(rightmost, right(interval i));
```

This code works if all left ends of intervals are distinct. Otherwise you have to be a bit more careful!