

HD EDUCATION

FIT2004 – Network Flow, Suffix Tree

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关于 HD EDUCATION

海道教育 (HD·EDUCATION) 成立于2018年，是一家专注于留学后市场的教育科技公司，是腾讯重点孵化项目，曾获得蓝色光标、险峰长青等知名机构千万级融资。

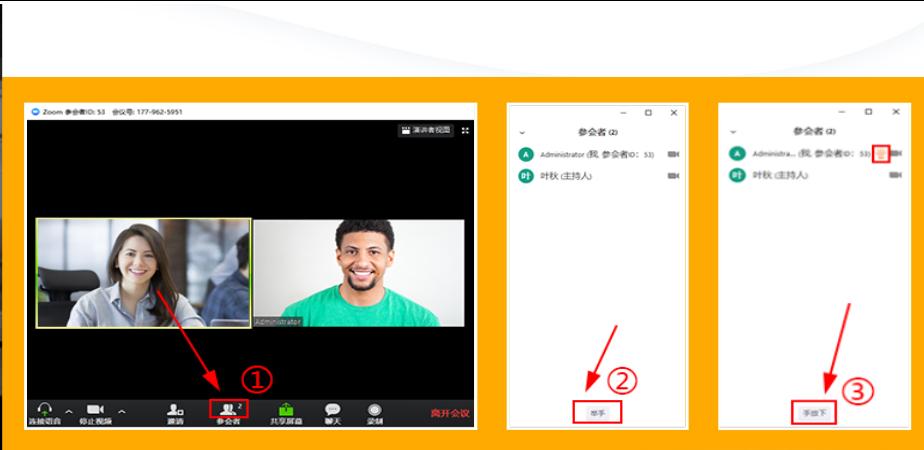
作为一个坚持让年轻人成为知识的创造者、传播者及受惠者的教育组织，我们日夜朝着一个目标努力，那就是成为最受年轻人喜爱的教育品牌。

HD·EDU的成长有你陪伴

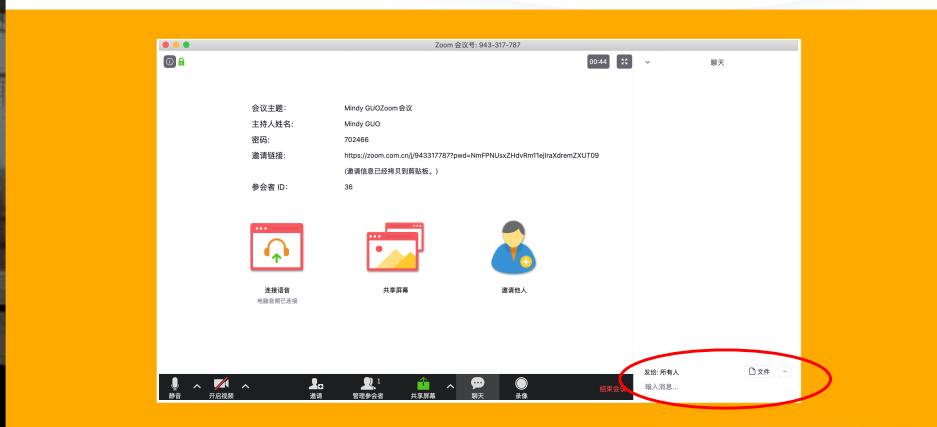
成立四年以来，海道教育一直秉持着“提升中国留学生核心竞争力”的信念，围绕留学生的多阶段需求进行产品布局，打造出符合留学生全生命周期的三大业务模块：课业同步辅导(HD Class 和 HD 1v1)、职场规划(HD Career)、申研考学(HD Offer)。目前海道教育业务已覆盖英国、美国、澳大利亚、新西兰4大主流留学国家40多所院校，已为超30万中国留学生提供高品质教育产品服务。

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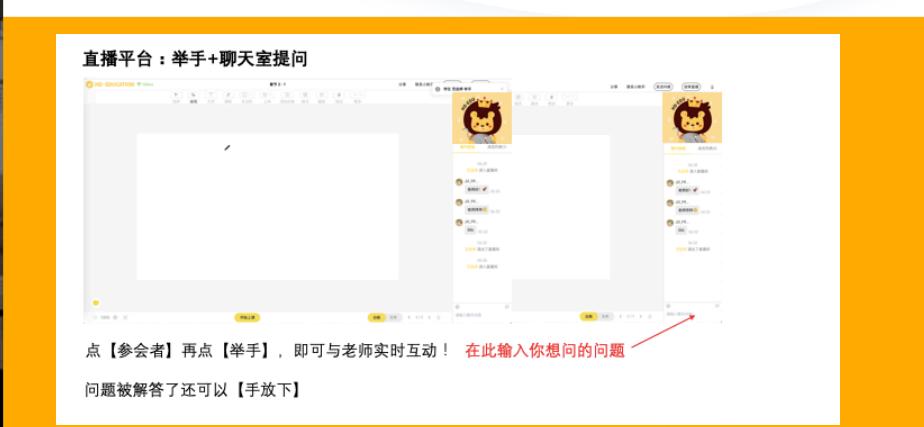




1. 点【参会者】
2. 点【举手】即可与老师实时互动
3. 问题被解答了还可以【手放下】



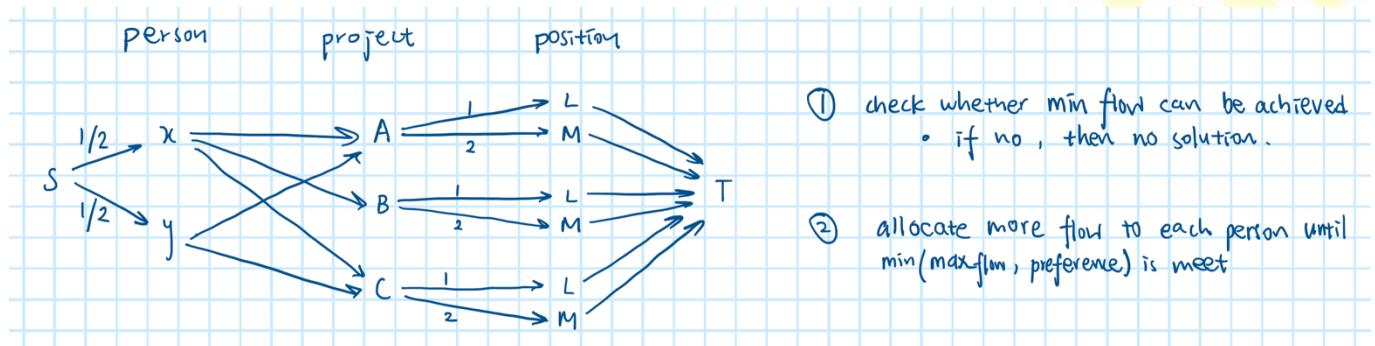
红圈处输入问题提问



Task 1: Network Flow

You want to allocate Person X and Y to project A, B, and/or C with the following constraints:

- Each project must have 1 and only 1 leader.
- Each project can 0 to 2 teammates.
- Each person needs to be assigned to 1 to 2 projects.
- A person cannot be the leader and teammate of the same project.



- ① check whether min flow can be achieved
 - if no, then no solution.
- ② allocate more flow to each person until $\min(\max(\text{flow}, \text{preference}))$ is meet

This problem combine the idea of bipartite graph and circulation with demand and lower bound.

Bipartite: allocate each person to project and position

Circulate with demand and lower bound:

- Every job requires (demand) 1 to 3 people;
 - 1 is the lower bound
 - 3 is the capacity
- Each person can be assigned (supply) to 1 to 2 projects.
 - 2 is the capacity
 - 1 is the lower bound

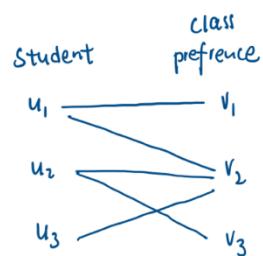
Hint:

1. Convert the flow network to a residual network
2. In the first round, see if we can saturate all outgoing edges from the sink if their capacity is set to lower bound.
3. Reset edges of the sink
 - a. Outgoing edges = $\max_{\text{project}} - \min_{\text{project}} = 1$
 - b. Incoming edges = 0
4. Run Ford-Fulkerson Algorithm again to maximize the flow.

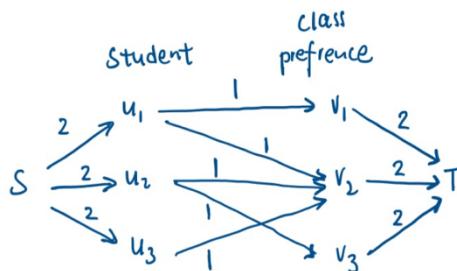
知识点1. From Bipartite Graph to Network Flow Problem

You are trying to assign 3 students (u_1 , u_2 , and u_3) to class v_1 , v_2 or v_3 . Every student can select a maximum of 2 preferred classes. If the capacity of each class is 2, what can we do to allocate most students to their preferred class?

Bipartite Graph



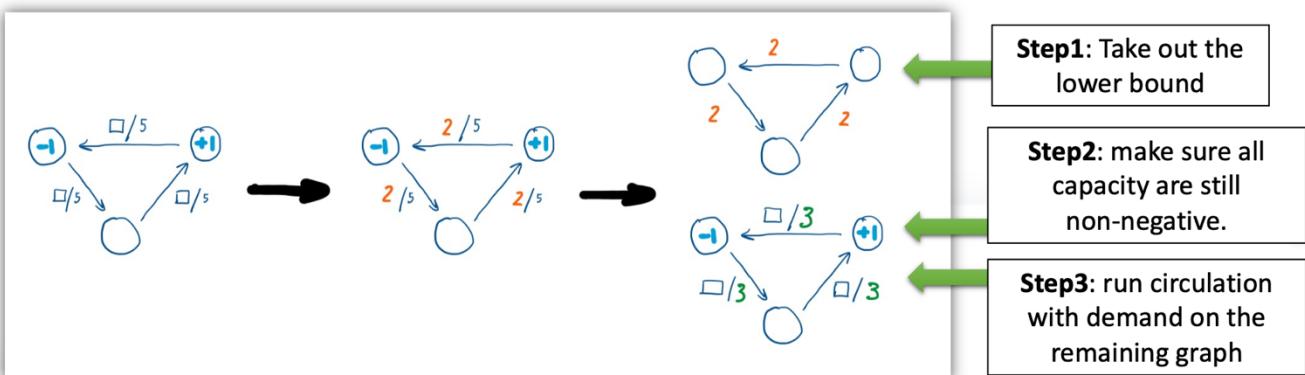
Network Flow



知识点3. Circulation with lower bound

Often time, a circulation problem can have multiple solutions. Therefore, sometimes we need to specify a lower bound and/or upper bound.

i.e. if the lower bound is 2, then every edge must have a minimum flow of 2.

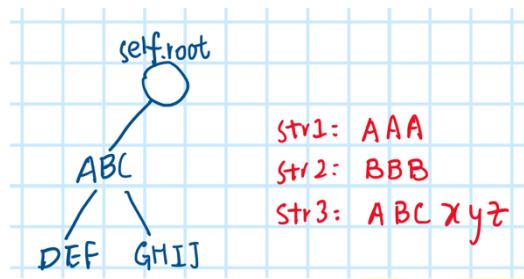


Task 2: Suffix Tree

Let current = self.root

To insert str1 or AAA:

1. current = current.A
2. split current into node A and node BC
3. create node AA and inset under node A



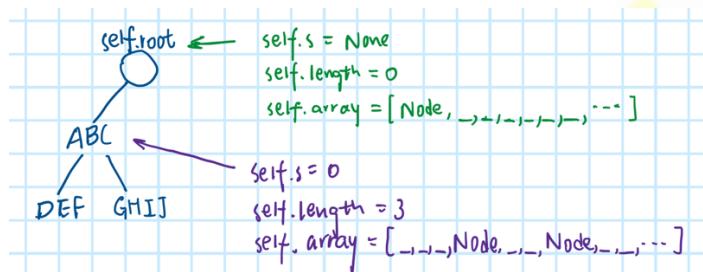
To insert str2 or BBB:

1. First, we realized that the current node does not have a branch that starts with B
2. So we simply add a new node to current. current.B = BBB

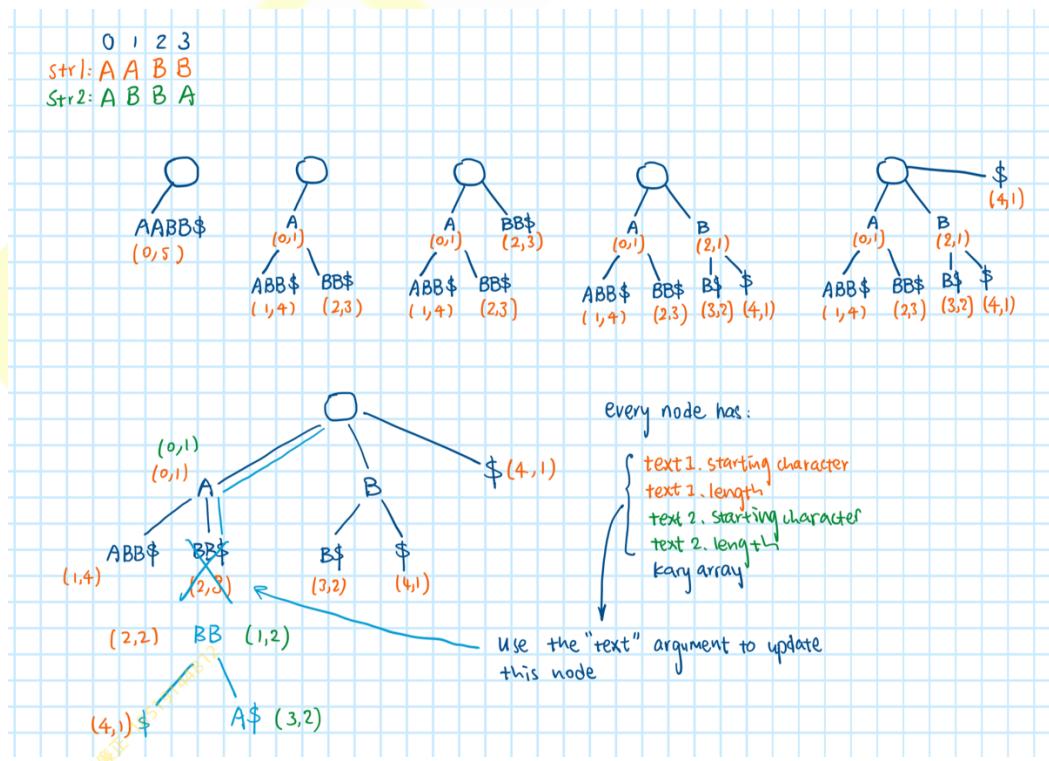
To insert str3 or ABCXYZ:

1. current = current.A
2. we realized that ABC = current, so we do not split this node.
3. But now, currentnode does not have a branching that starts with X
4. So we add new node (current.X) to current.

Basic representation of a node:



Hint:



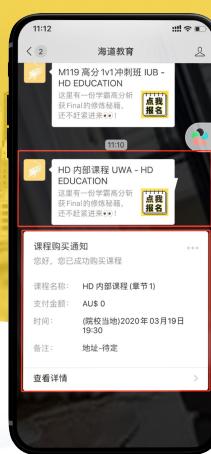


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请给予我们提高和改进的机会，感谢您对 HD · EDUCATION 课程和服务的信任！

· 填写问卷操作流程 ·



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