CS314 - Network Flow

Announcements

- HW up & due next Friday
- Final is May 7, 12-2pm
  (so far, no conflicts)

Using circulations: Survey Design (7.8)

A company wants to poll customers about their products.

- each customer gets asked about a subset of products they buy

- don't want to ask too many questions

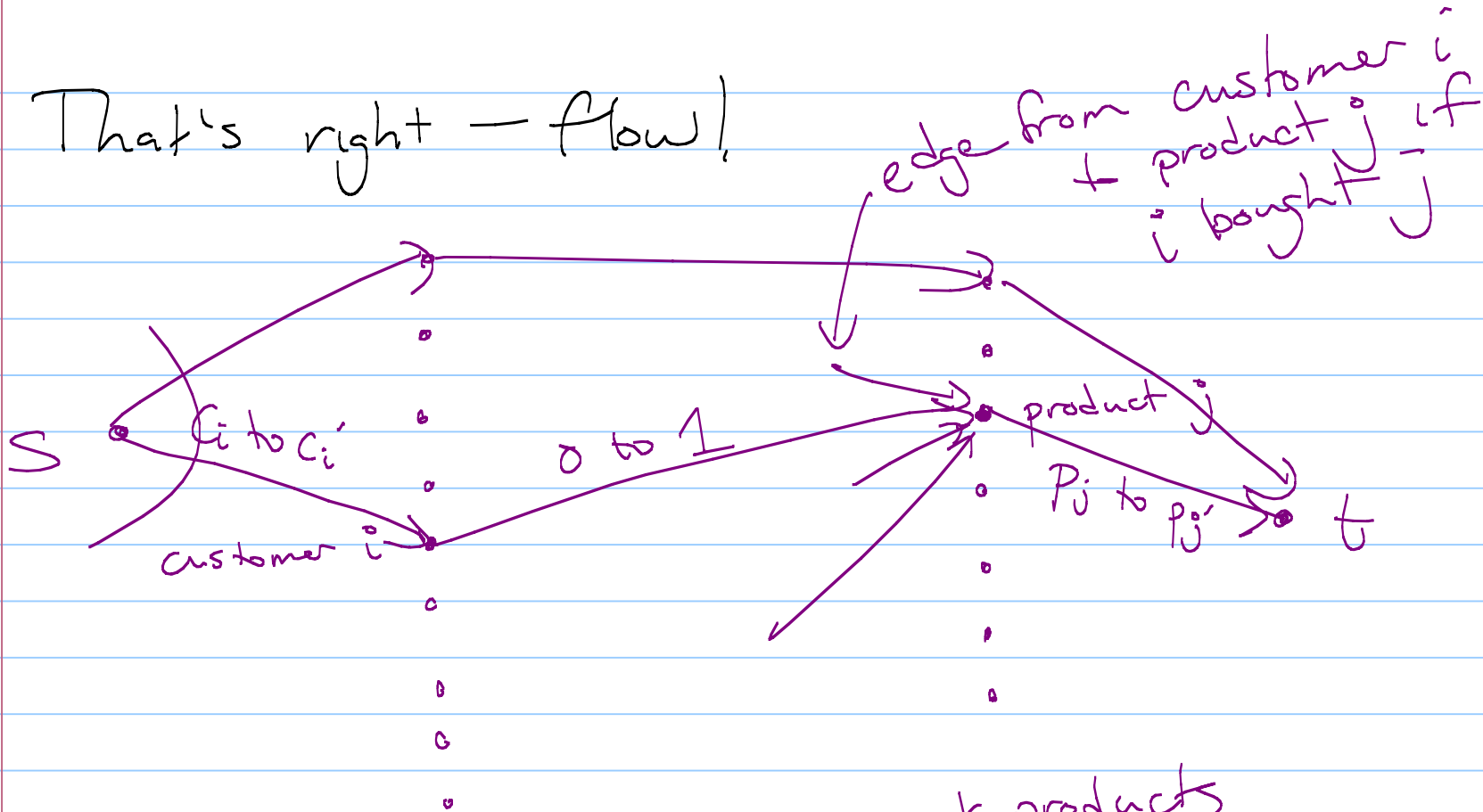- each product needs to have sufficient data collected

Formally: n customers, k products

- ask each customer about c_i to c_i' products

- for each product, ask between p_j & p_j'
  different customers for opinion

- for each customer, have a list of
  products that they have bought

How can we solve?

That's right — flow!

edge from customer i
$\to$ product j if
i bought j

S

c_i to c_i'

customer i

0 to 1

product j

P_j to P_j'

t

use
circulations

n customers

k products

Graph setup:

- create $n+k+2$ vertices

- draw $O(nk)$ edges (according to list)

- draw k edges to sink + label n edges from source

- call our circulation algorithm

Runtime:

Graph setup: $O(nk)$

Use flow: flow on graph with
n' vertices + m' edges

$$\left[\begin{array}{l} O((n')^3) \\ O(m'n') \end{array} \right. \quad \begin{array}{l} O(m'C) \leftarrow \\ O(m'^2 \log_2 C) \end{array}$$

$n' = n + k + 2 = O(n+k)$
$m' \leq nk + n + k = O(nk)$

$\boxed{O(nk(n+k))}$ or $O((n+k)^3)$

Remainder of Ch 7:

- Airplane scheduling
- Baseball elimination
- Image segmentation
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