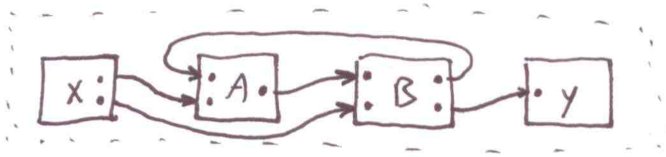
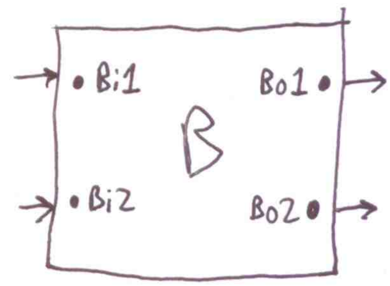
Goal: Develope a mathematical approach for representing and operating on the configurations.

1. Find an easy way to draw the configurations and write the adjacency matrices

→ Each input and output should be its own vertex but they are grouped by the analyses block.



The top-bottom position of the dot indicates its name:



Input-output matrix:

	x_1	x_2	Ao1	Bo1	Bo2	total
Ai1				•		1
Ai2	•					1
Bi1			•			1
Bi2		•				1
y_1					•	1

The input output matrix is a reduced matrix from the adjacency matrix. Using the fact that all inputs from an analysis block map to all inputs, the adjacency matrix can be found from the input-output matrix.

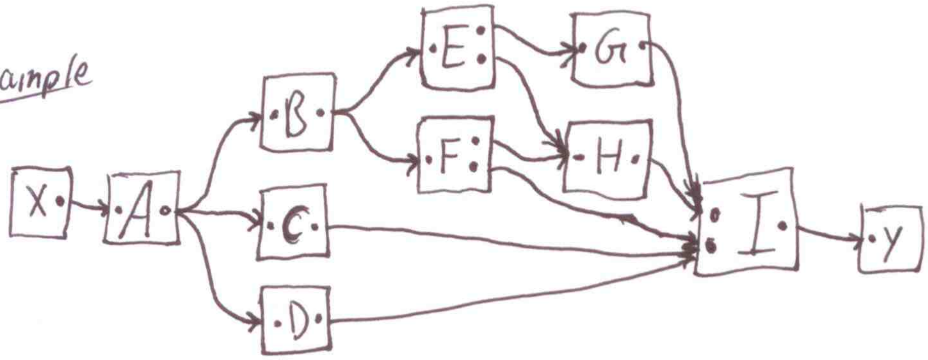
The set of edges can be partitioned into intra- and inter- analysis block edges

$$E = \{(x_1, Ai2), (x_2, Bi2), (Ao1, Bi2), (Bo1, Ai1), (Bo2, y_1)\} \cup \{(Ai1, Ao1), (Ai2, Ao1), (Bi1, Bo1), (Bi2, Bo1), (Bi1, Bo2), (Bi2, Bo2)\}$$

Only the inter-analysis blocks can cause conflicts.

Goal: Determine the number of and/or enumerate ~~the~~ all possible configurations. To start, consider only graphs without any cycles.

Example



Task: Find all subgraphs of G, the maximal connectivity graph such that all inputs are filled without any conflicts.

There are three sources of conflict, ~~each with~~ with 3, 2, and 2 choices. The total number of configurations is 12, but only 9 of them are practical. The 3 that are impractical are the ones that do not use ~~the~~ any outputs from G. The 12 comes from $12 = \binom{3}{1}\binom{2}{1}\binom{2}{1}$, where $\binom{n}{k}$ is n-choose-k notation.

Goal: Investigate techniques that do not involve considering all possible configurations.

Observation: The example problem can be divided into two independent sub problems.

1.) Find a reverse path from Ii1 to Ao1 (or x_1)
→ there are 3

2.) Find a reverse path from Ii2 to Ao1 (or x_1)
→ there are 3

$\boxed{3 \cdot 3 = 9}$ (because they are independent)

→ Filling inputs is an independent problem

→ shortest path algorithms can be used.