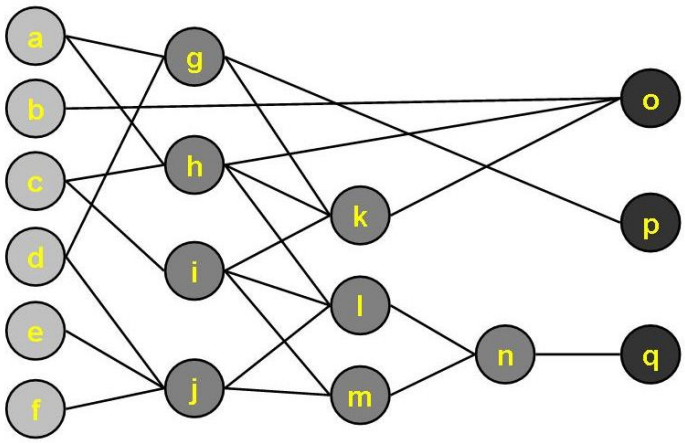
CAD Design Project 4 – Resource-Constrained Scheduling
Due: 23:59, Dec. 4, 2024

In this project, you are required to implement two versions of scheduling algorithms for minimizing the latency under given resource constraints (ML-RCS). (1) A heuristic algorithm (ex: list scheduling). (2) Based on the result of your heuristic algorithm, formulate the same problem as an integer linear programming (ILP) problem and use an ILP solver (ex: Gurobi) to obtain the exact result. Your program would be evaluated in a Linux environment according to the following requirements.

1. For simplicity, there are only 3 types of Boolean operations: *AND*, *OR*, and *NOT*.
2. Assume that every operation takes 1-cycle latency. (The PI node is not an operation.)
3. Read a BLIF file and the corresponding resource constraints.
4. For the heuristic algorithm, use the option "-h".
5. For exact ILP formulation, use the option "-e".
6. Upload your source code tarball (*.tgz) to Moodle (including your Makefile).
   (NOTE: The uploaded file name should be the same as your student ID.)
7. Generate one "test case" with two different latencies when you use the -h and -e options, respectively. Prepare a ReadMe file illustrating your observations of such a discrepancy.

BLIF Example: sample02.blif

```
.model sample02
.inputs a b c d e f
.outputs o p q
.names a d g
1- 1
-1 1
.names a c h
11 1
.names c i
0 1
.names d e f j
1-- 1
-1- 1
--1 1
.names g h i k
1-- 1
-1- 1
--1 1
.names h i j l
111 1
.names i j m
11 1
.names l m n
11 1
.names b h k o
111 1
.names g p
0 1
.names n q
0 1
.end
```



SYNOPSIS for ML-RCS

```
%> mlrcs -h/-e BLIF_FILE AND_CONSTRAINT OR_CONSTRAINT NOT_CONSTRAINT
```

Run-time Example:

```
%> mlrcs -h sample02.blif 2 1 1
Heuristic Scheduling Result
1: {h} {j} {i}
2: {l m} {g} {}
3: {n} {k} {p}
4: {o} {} {q}
LATENCY: 4
END
```

Run-time Example:

```
%> mlrcs -e sample02.blif 2 1 1
ILP-based Scheduling Result
1: {h} {j} {i}
2: {l m} {g} {}
3: {n} {k} {p}
4: {o} {} {q}
LATENCY: 4
END
```