Jongho Jung
Nandita Jha

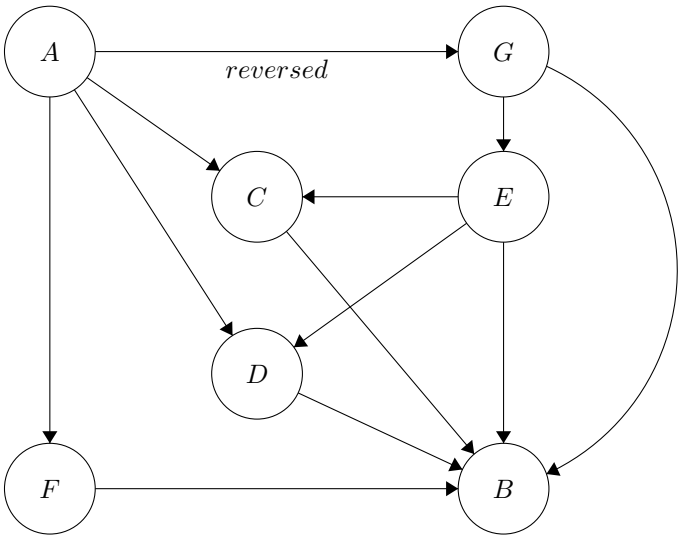
1	2	3	4	5	Σ

Assignment 3

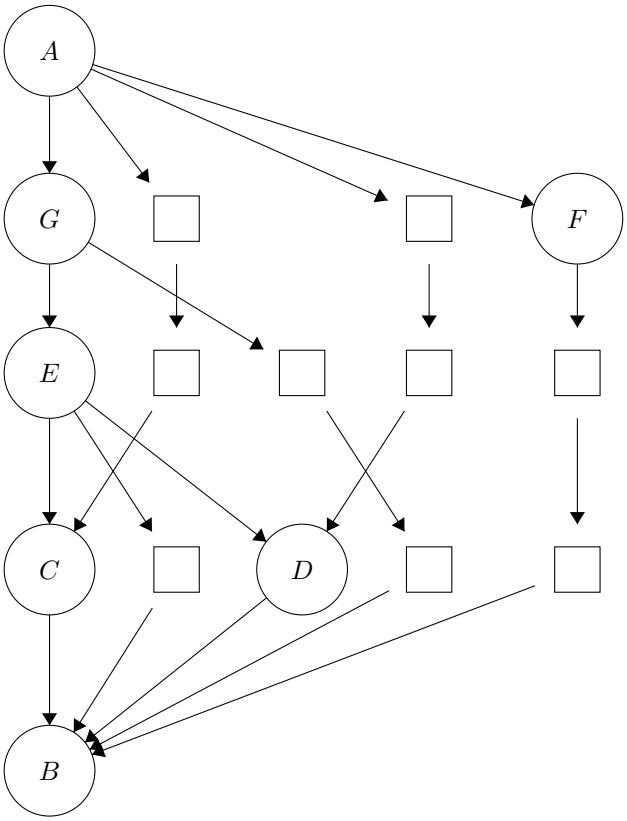
(Due: 05.12.2022)

Task 1 Graph Layout

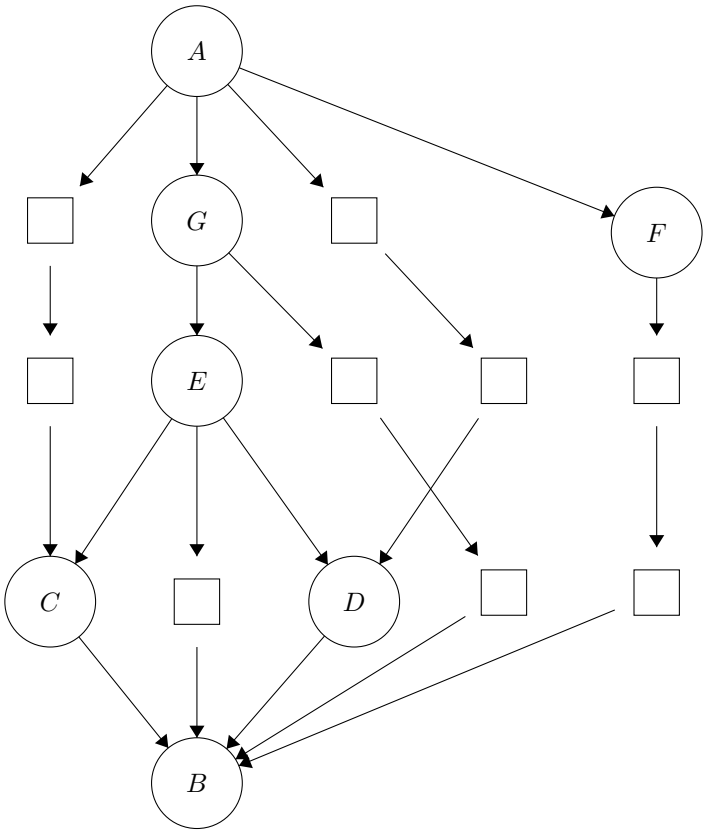
(a) 1. Cycle removal : Find minimum set E* of edges which are not upward with feedback set. Remove E* and insert reversed edges. E* = e(G,A).



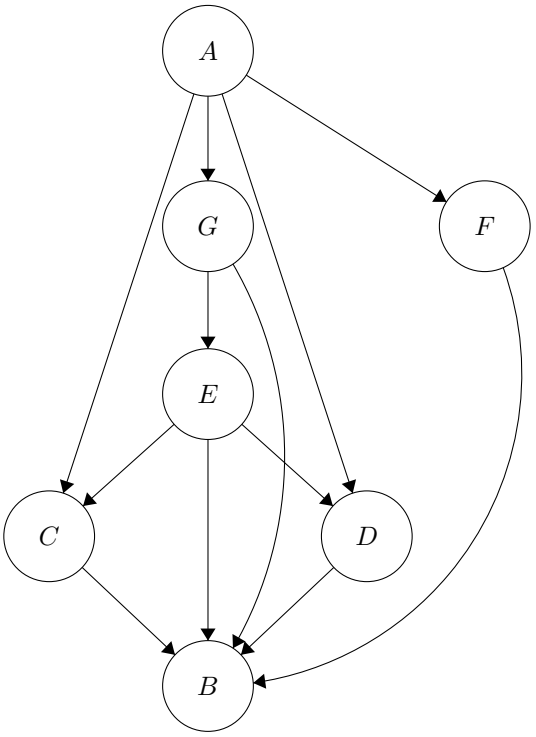
2. Layer assignment : Assign vertices to layers so that all edges flow from lower to higher layers.



3. Horizontal vertex ordering : Find a vertex ordering with minimum number of crossings

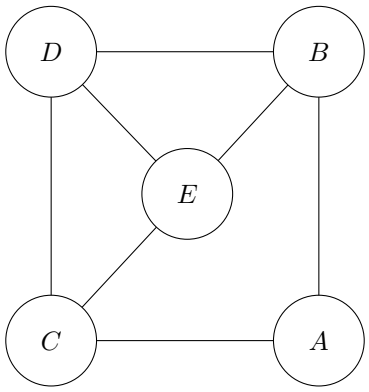


4. Coordinate assignment : Remove dummies. Straighten edges.



(b) If directed edge is added from C to G in the graph, then there will be no nodes with no incoming nodes and therefore $layer_k$ will 0.

Task 2 Visual Clutter



- Cross minimization : The Crosses of the edges were removed by modifying the position of the vertices.
- Bend minimization : The curved edges were straightened.
- Area minimization : Appropriately reduced Area that was too large.
- Length optimization : Unnecessarily long edges were shortened.
- Angle maximization : The narrow angle of edges was widened.
- Symmetries : The vertices became symmetrical.

Task 3 Impl Force-directed Graph Layouts

- implemented

- **Bonus** The cooling function returns a large cooling parameter at the start and gradually decreases. Cooling parameters scale the amount of displacement. Without the cooling function, the shape of the graph is not fixed and continues to change greatly.