

算法与数据结构

慕课网《算法与数据结构》

讲师：liuyubobobo

版权所有 liuyubobobo

图论 Graph Theory

慕课网《算法与数据结构》

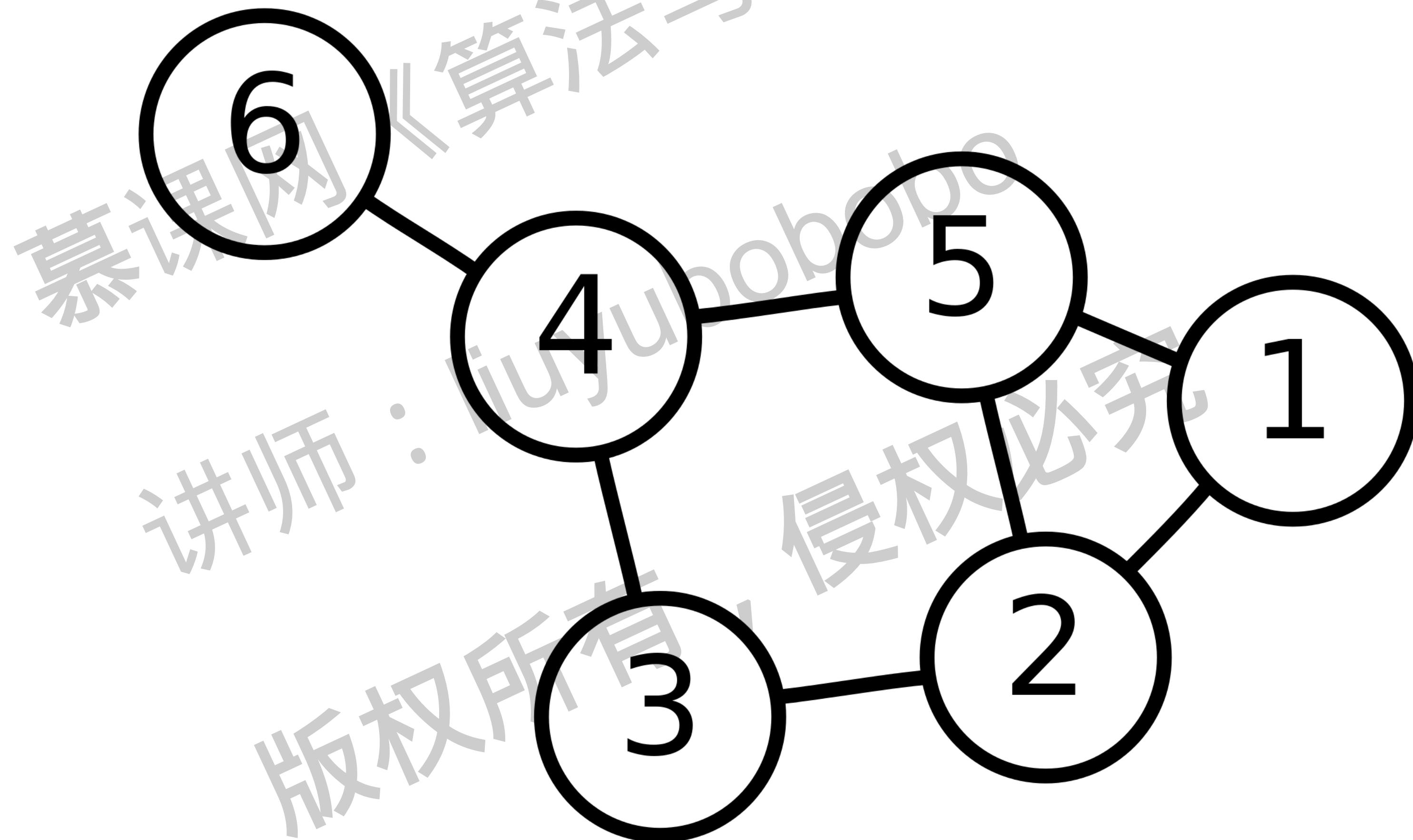
讲师：liuyunbobo

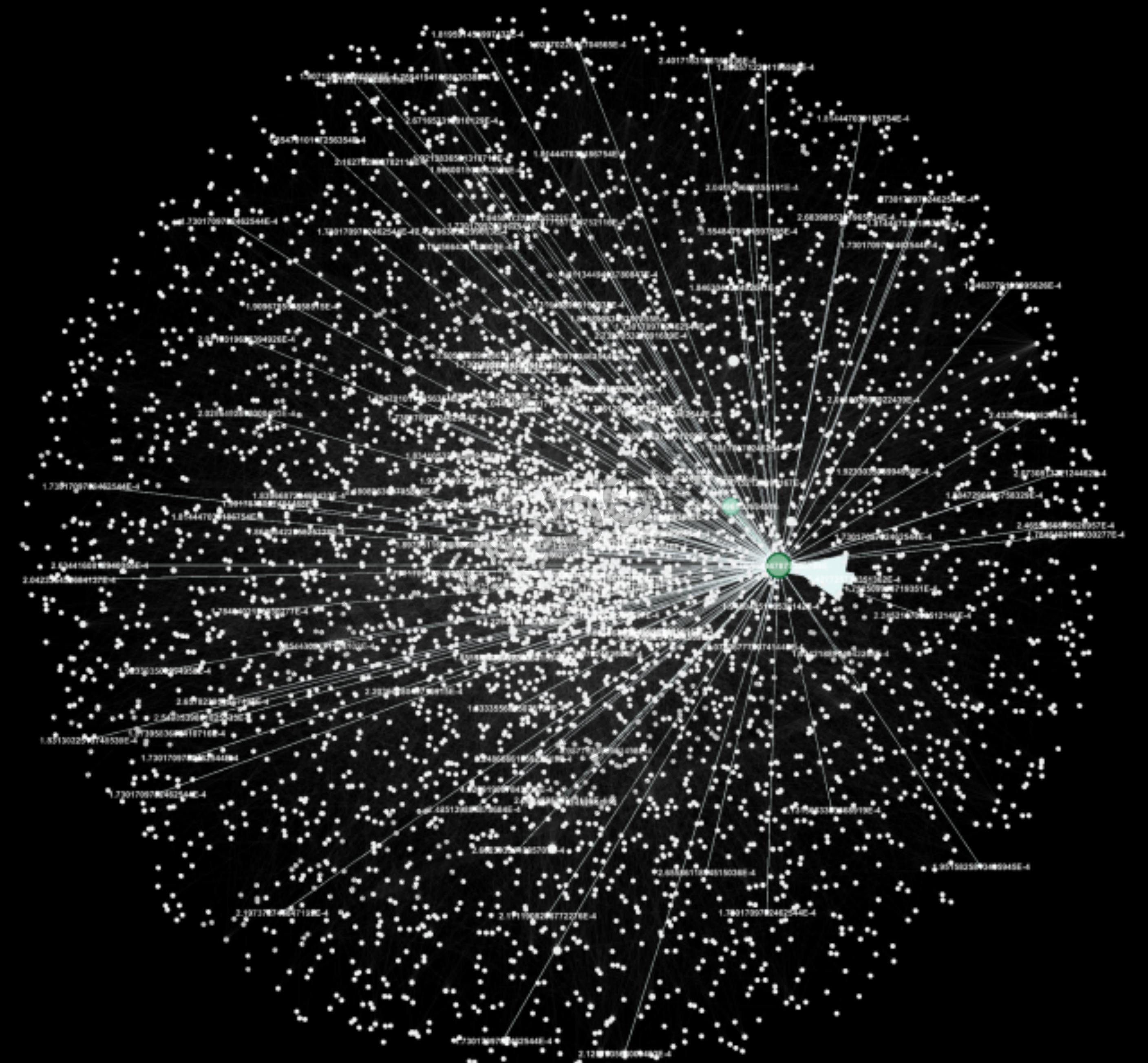
版权所有，侵权必究

Graphic Novel

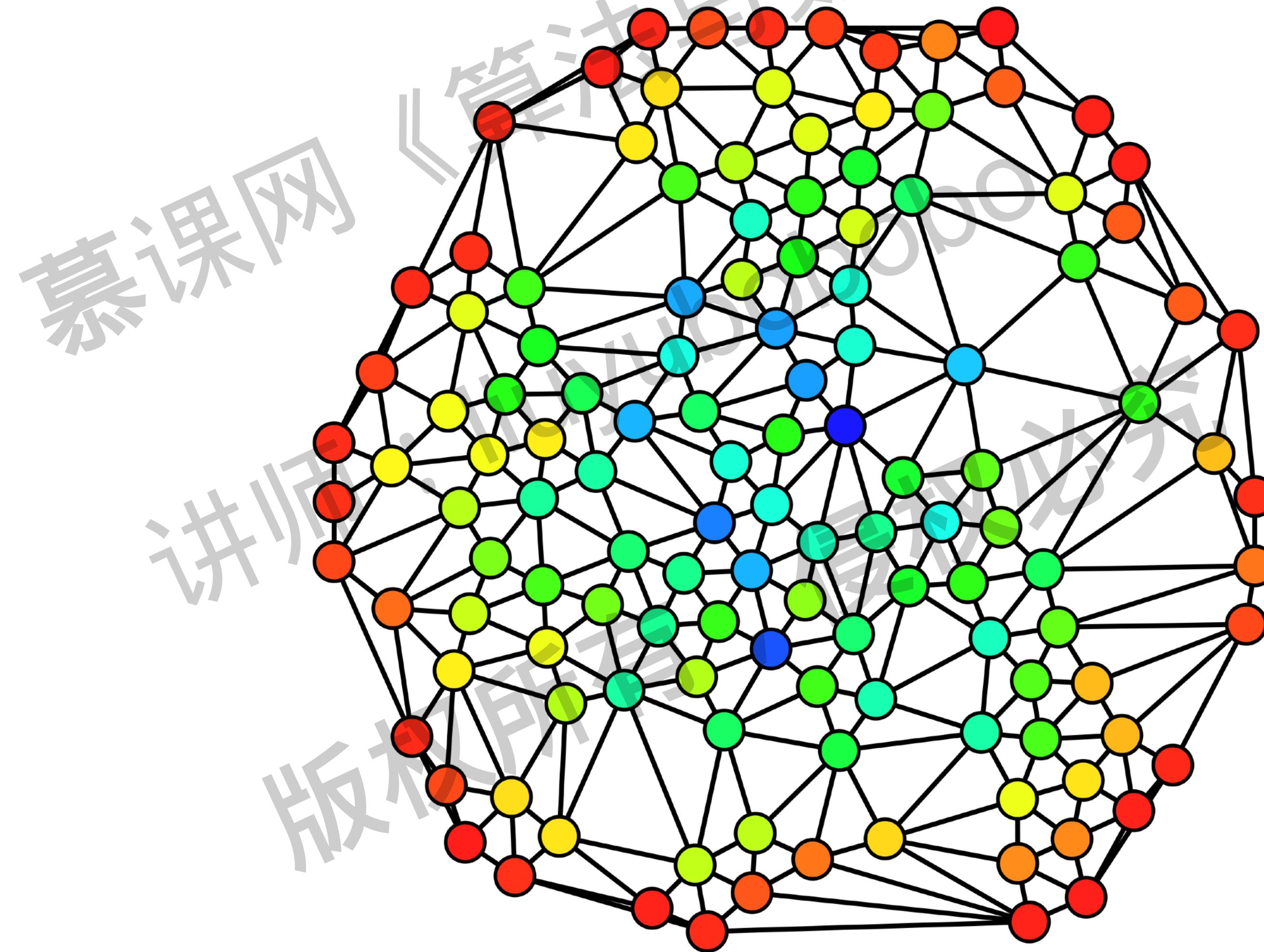


图论 Graph Theory

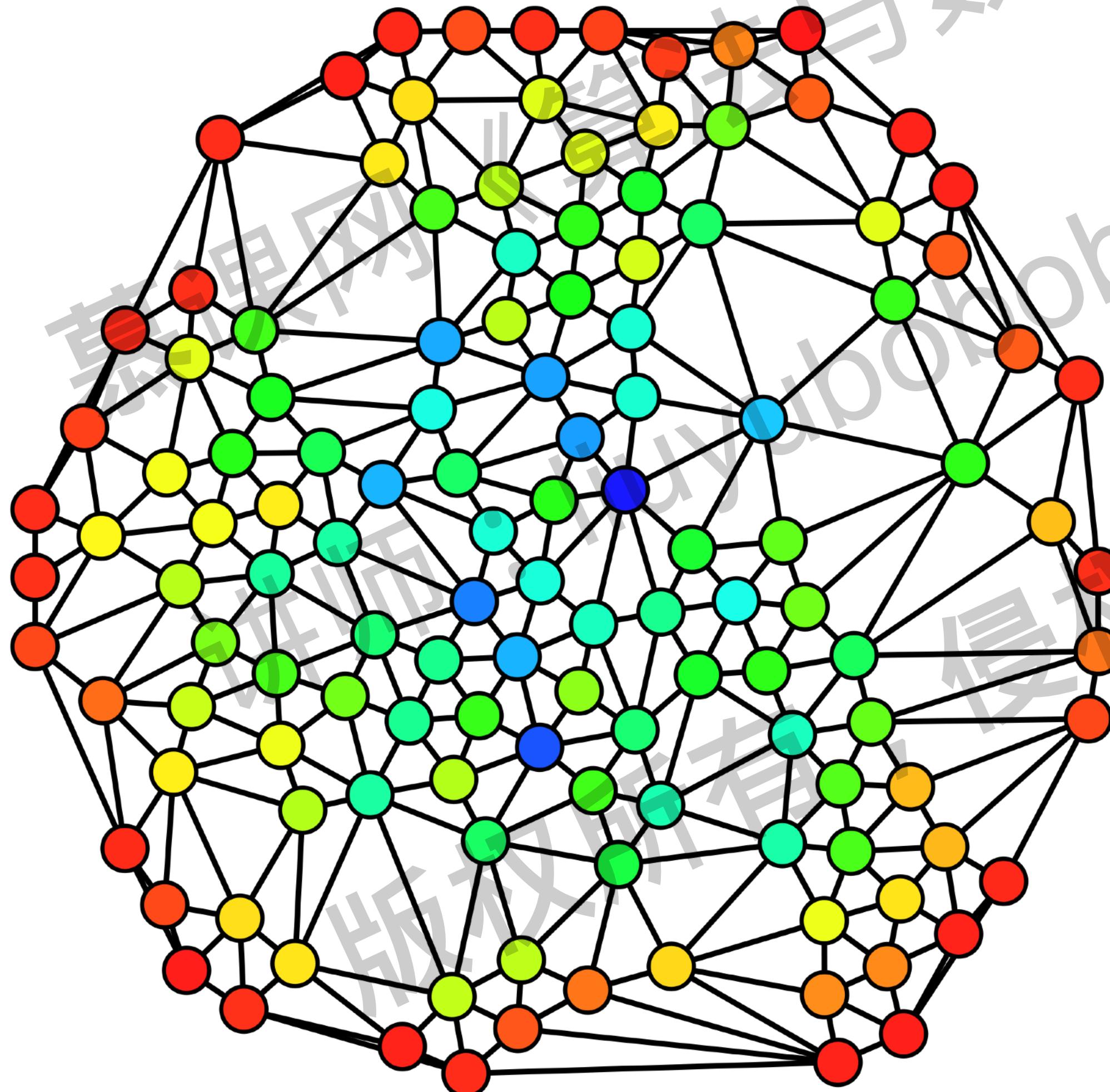




图论 Graph Theory



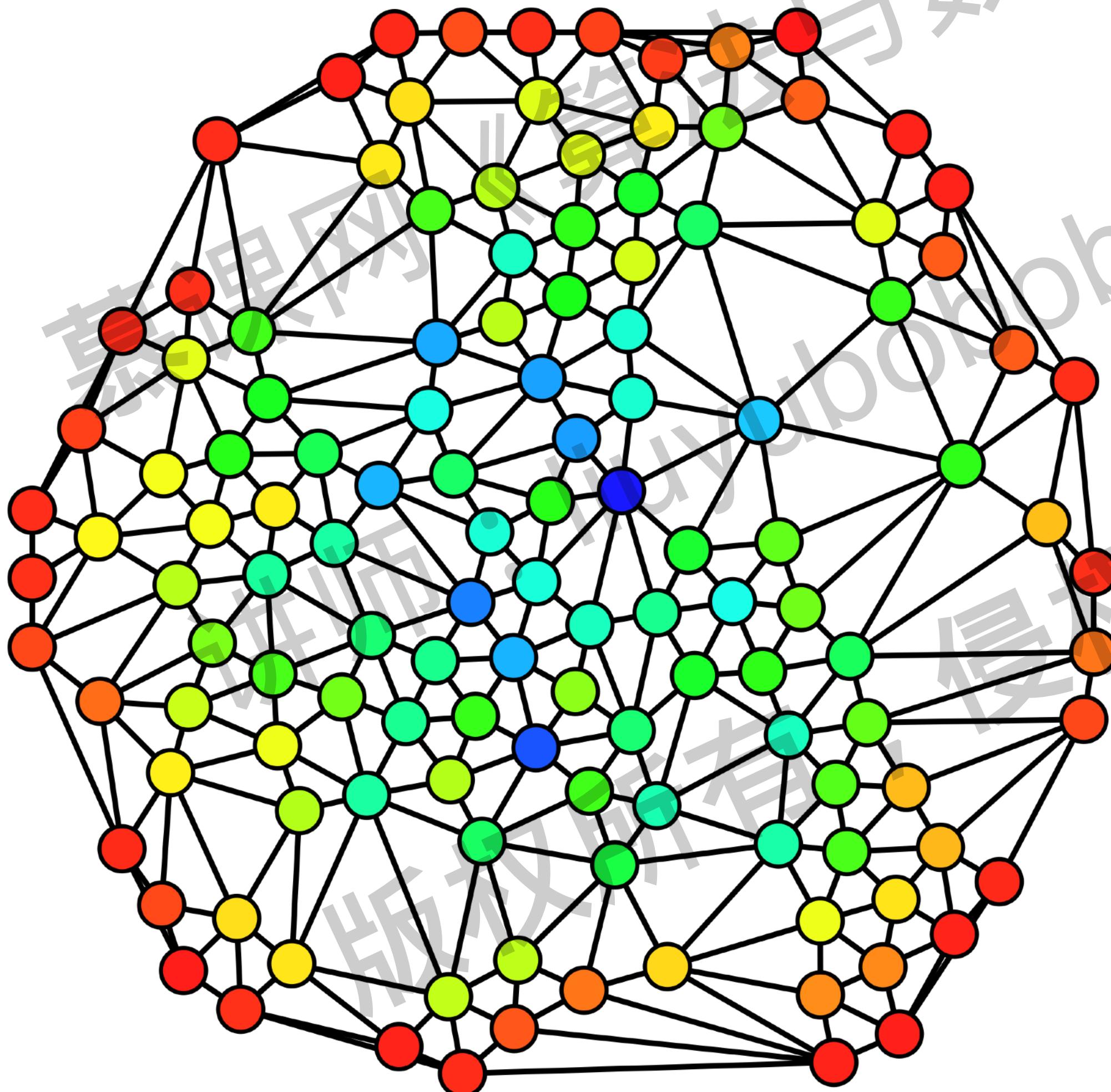
图论 Graph Theory



节点 (Vertex)

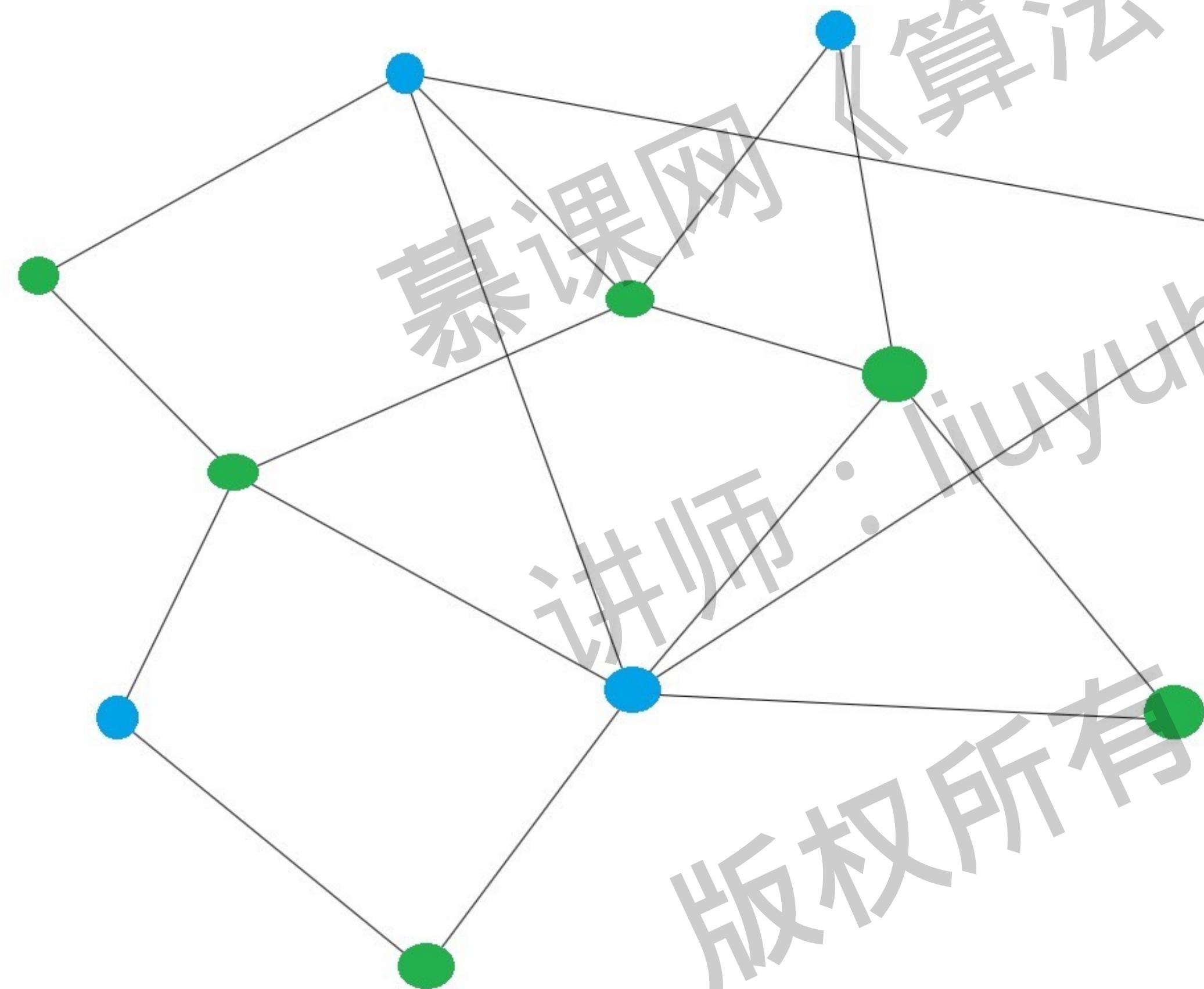
边 (Edge)

图论 Graph Theory



- 交通运输
- 社交网络
- 互联网
- 工作安排
- 脑区活动
- 程序状态执行

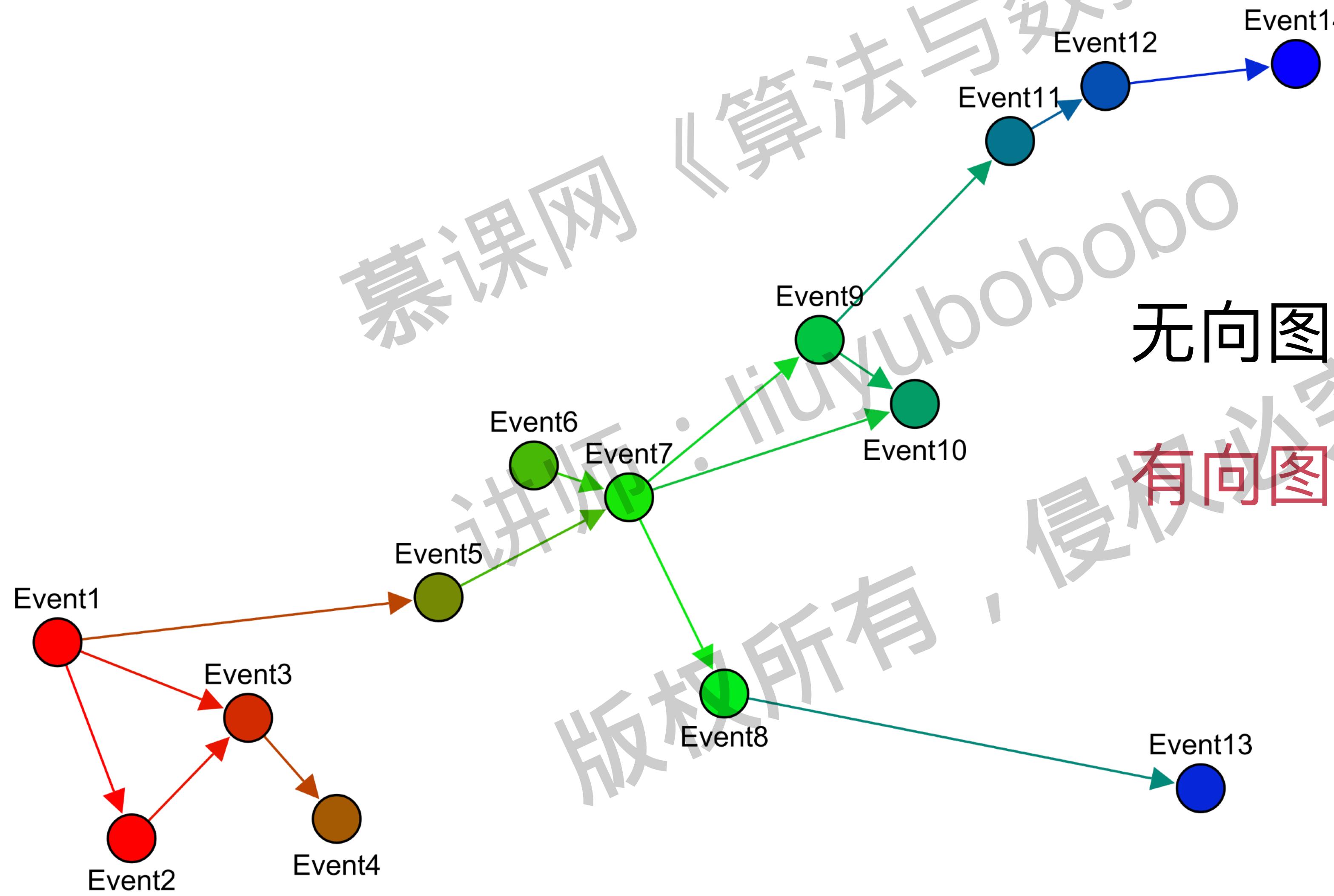
图的分类



无向图 (Undirected Graph)

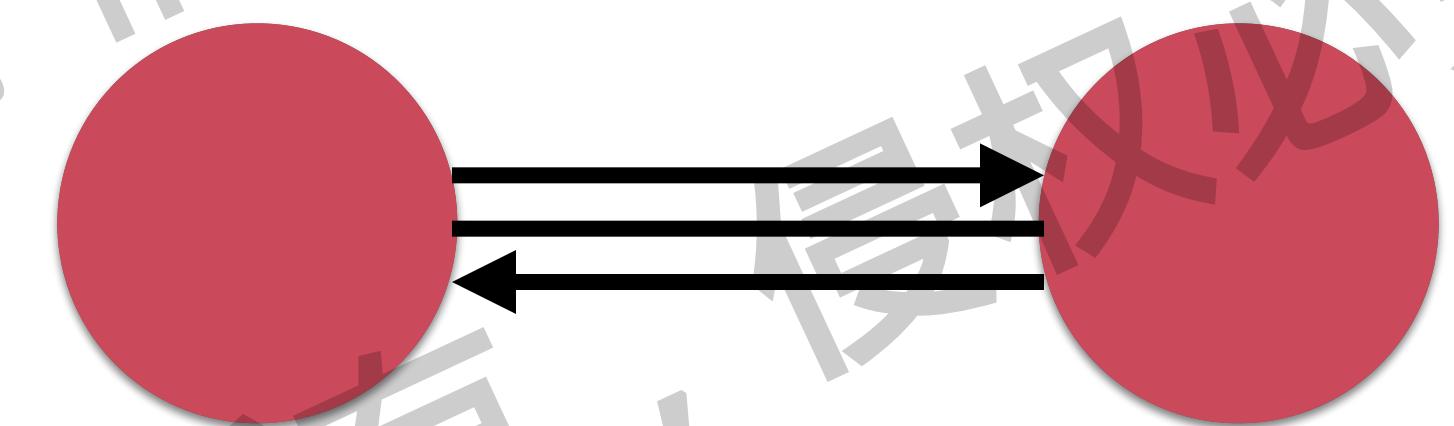
有向图 (Directed Graph)

图的分类

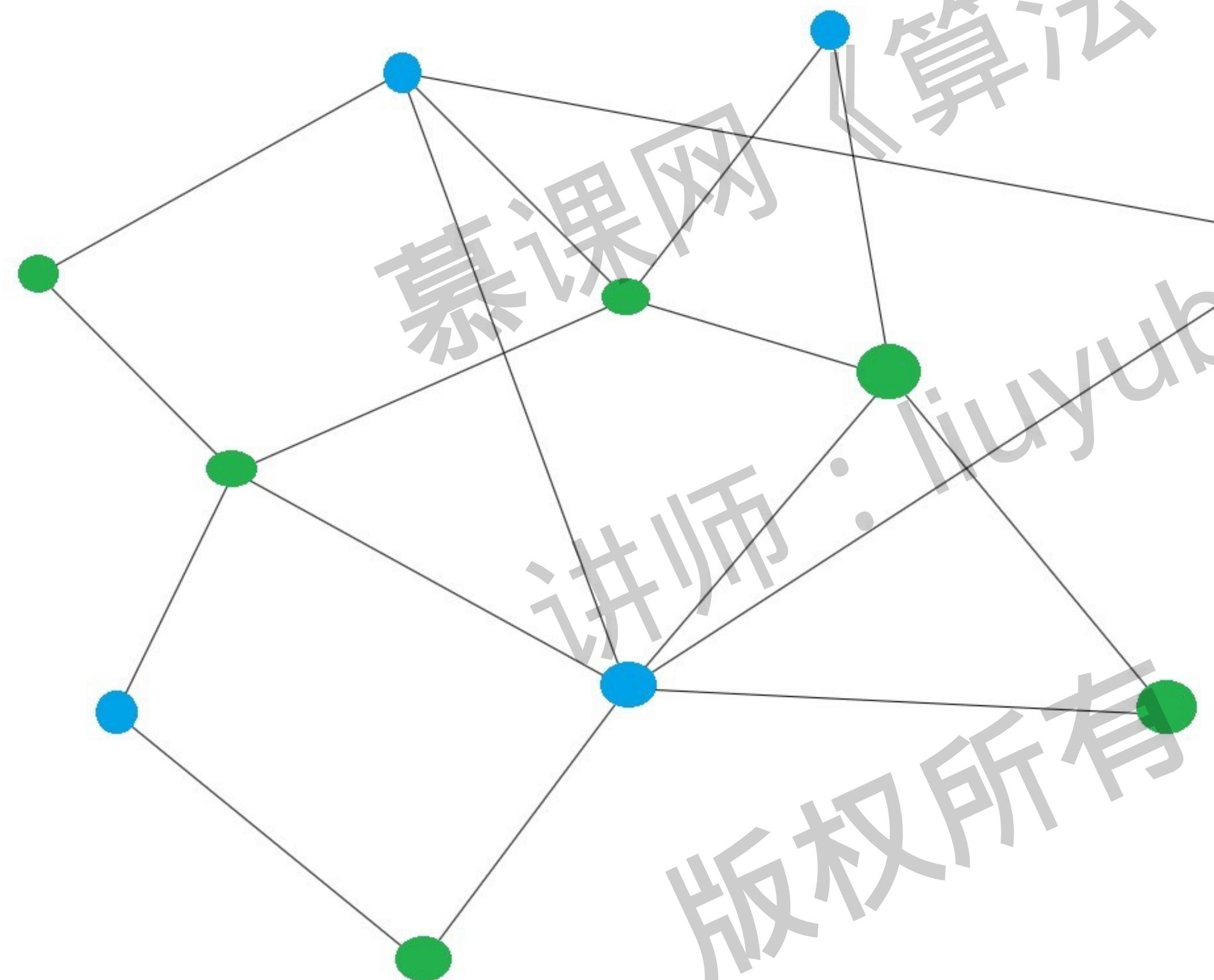


我们的课程以无向图为主

无向图是一种特殊的有向图



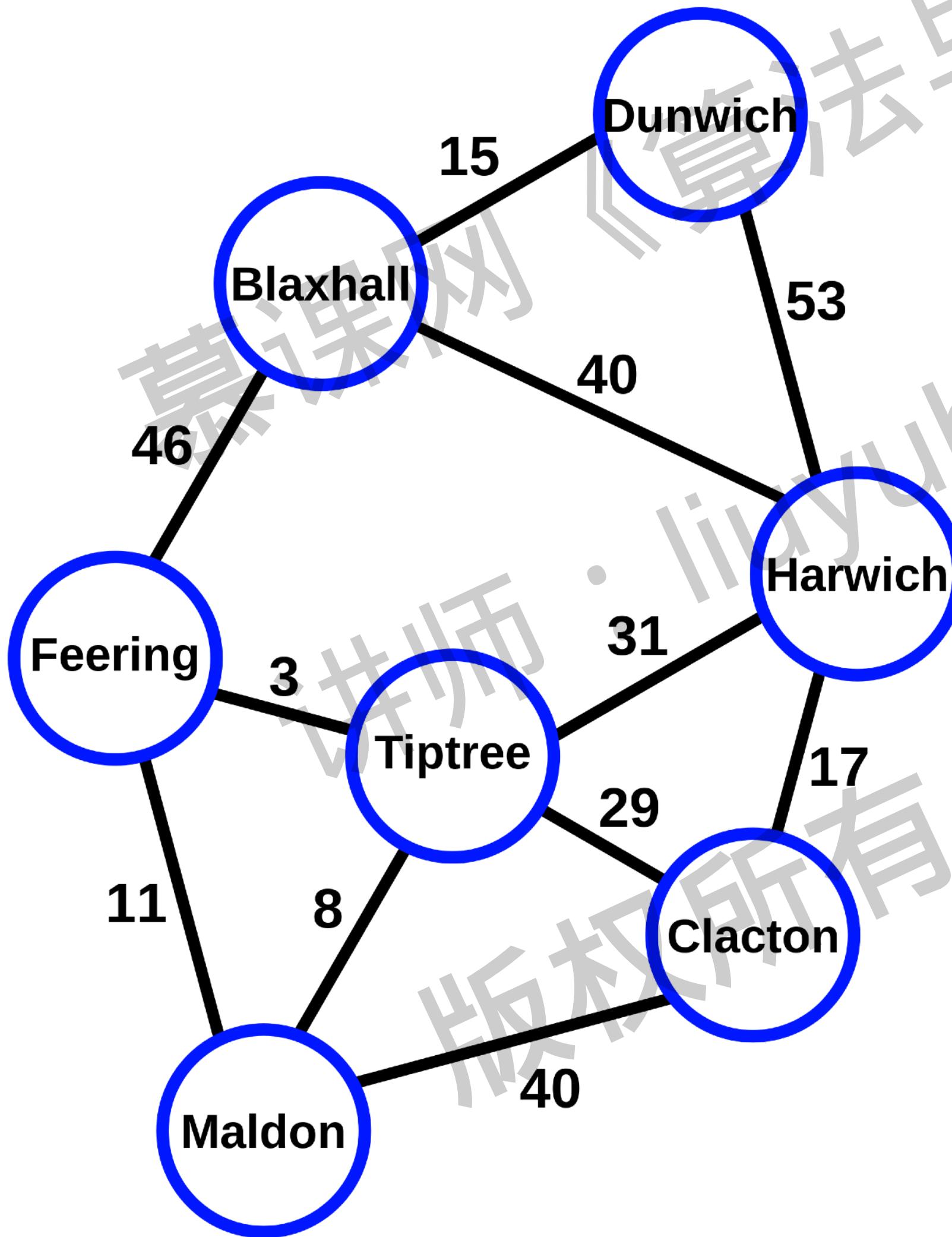
图的分类



无权图 (Unweighted Graph)

有权图 (Weighted Graph)

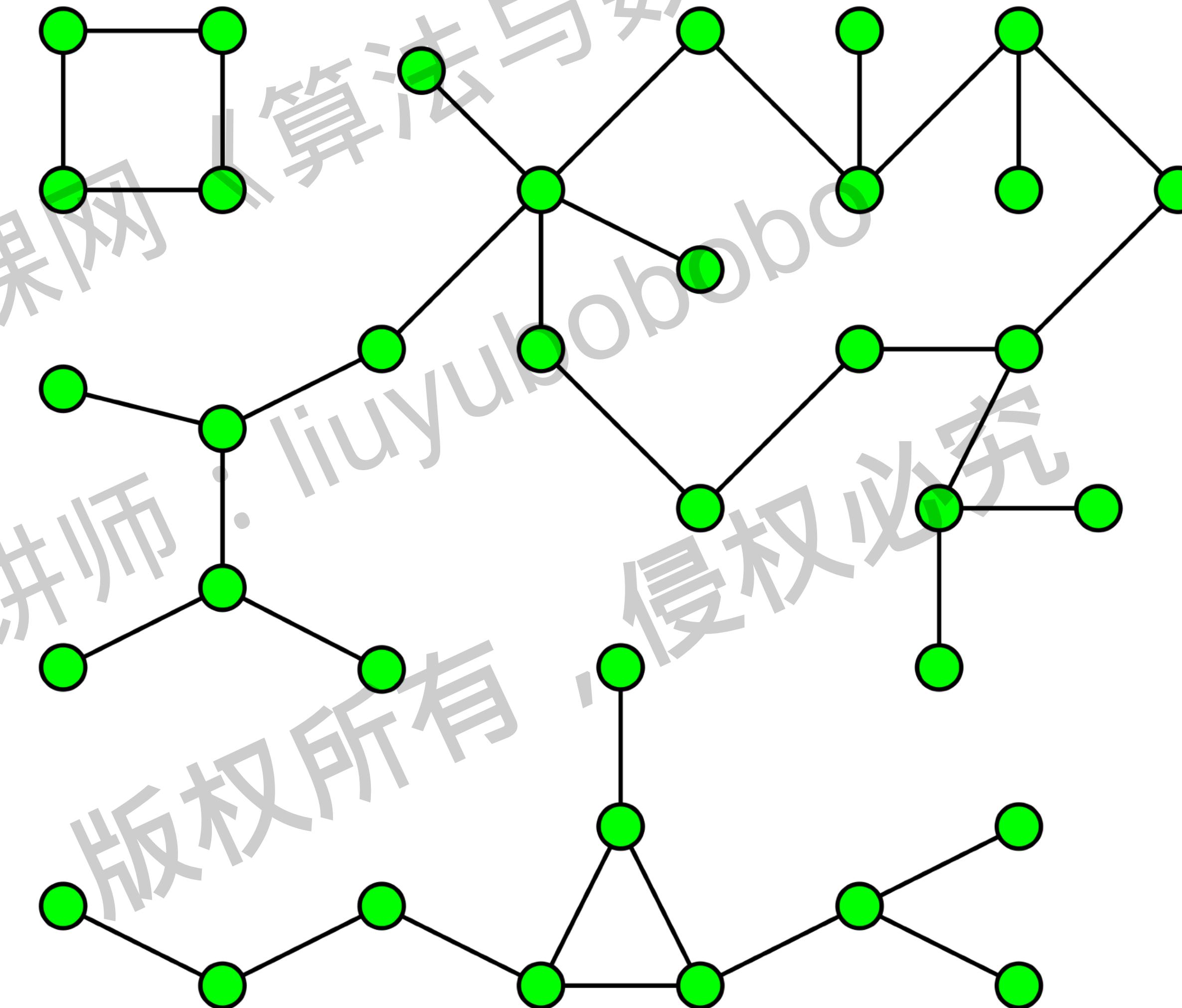
图的分类



无权图 (Unweighted Graph)

有权图 (Weighted Graph)

图的连通性

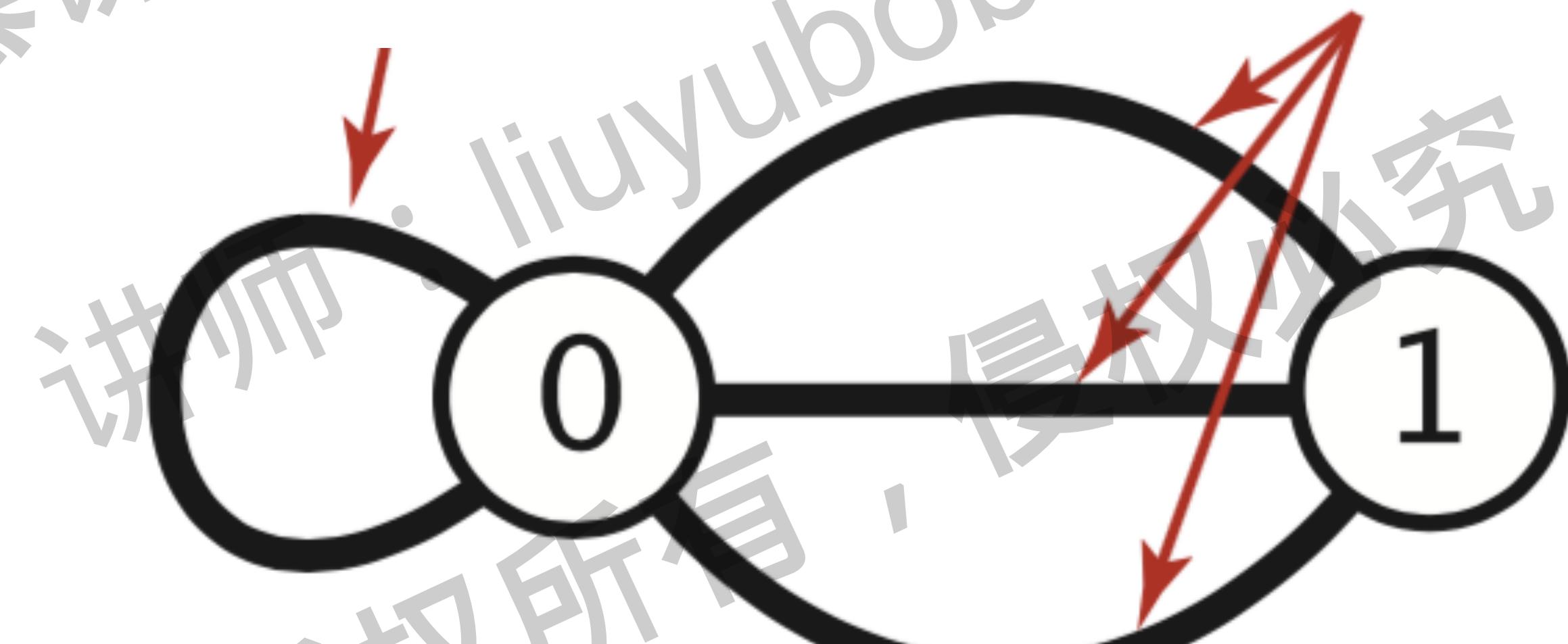


慕课网 liuyubobobo 讲师 版权所有，侵权必究

简单图 (Simple Graph)

自环边 (self-loop)

平行边 (parallel-edges)



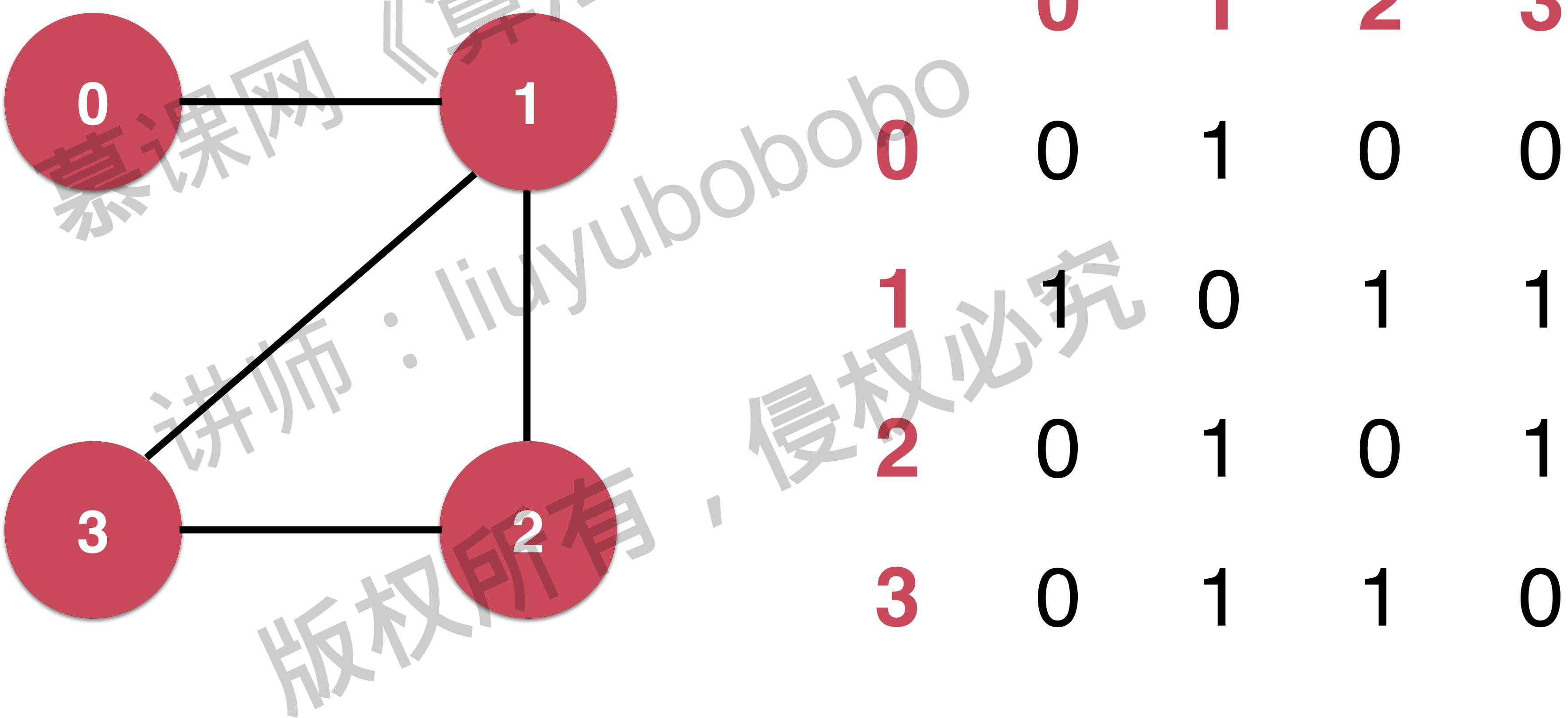
图的表示

慕课网《算法与数据结构》

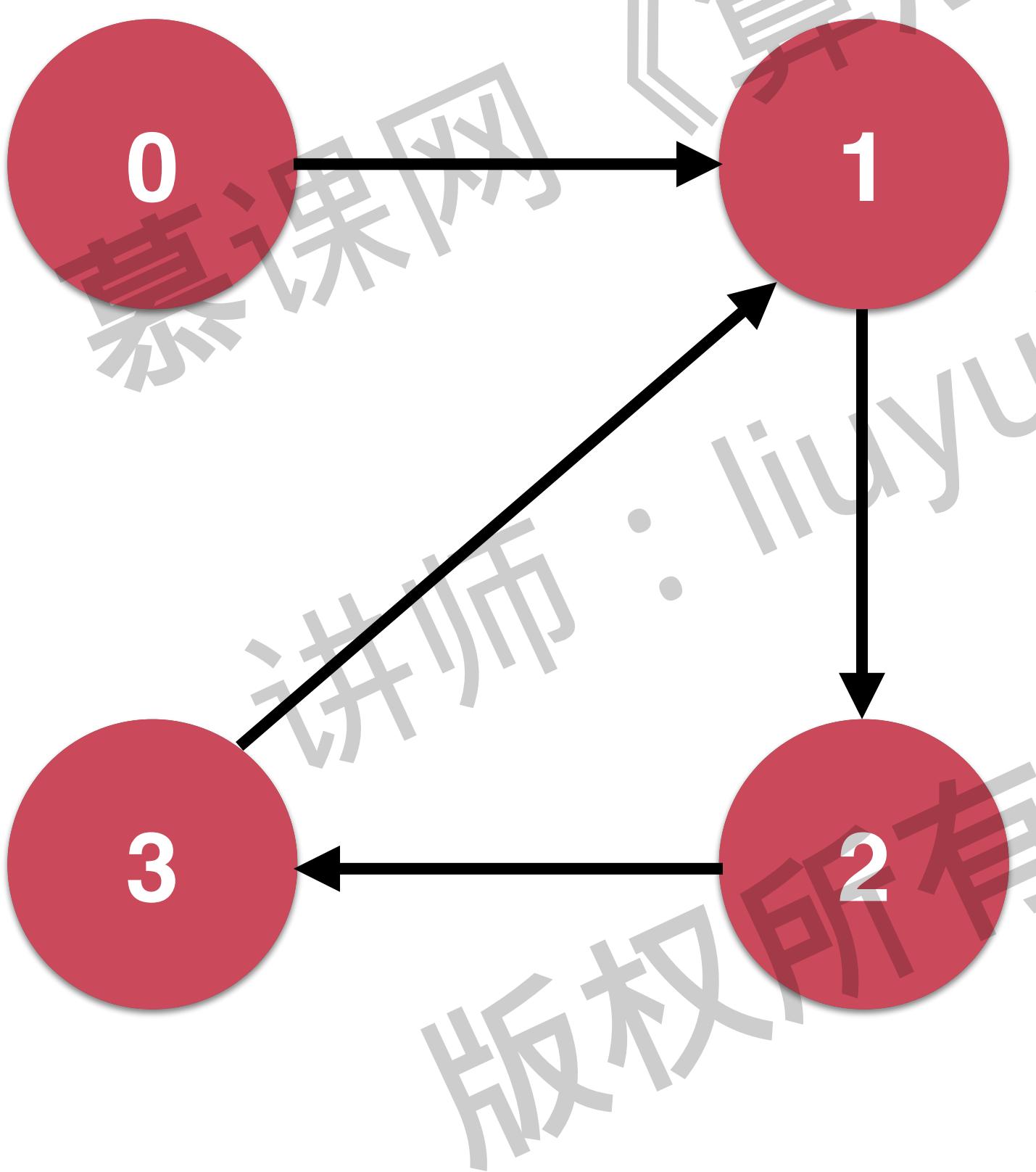
讲师：liuyu**bo**bobo

版权所有，侵权必究

邻接矩阵 (Adjacency Matrix)

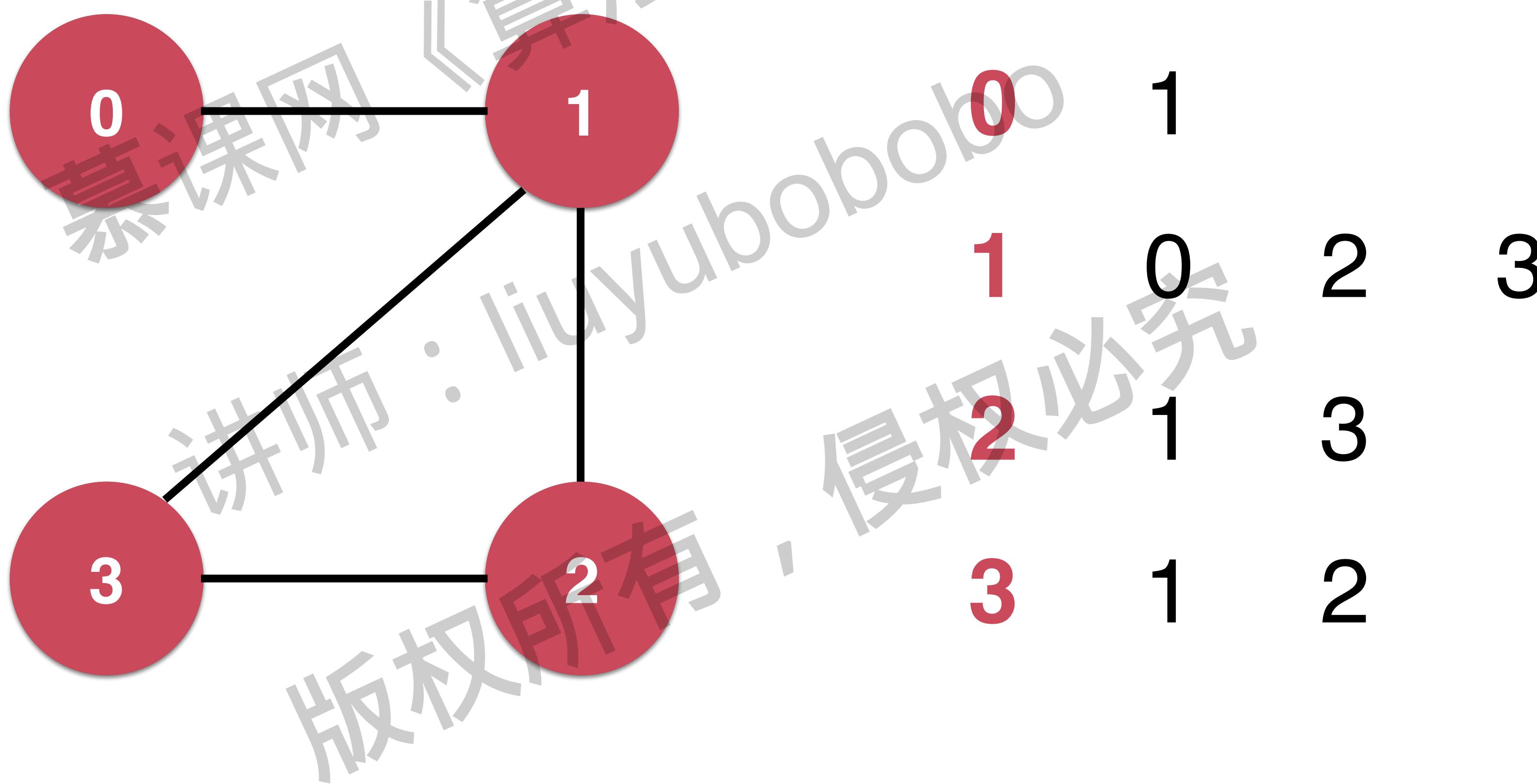


邻接矩阵 (Adjacency Matrix)

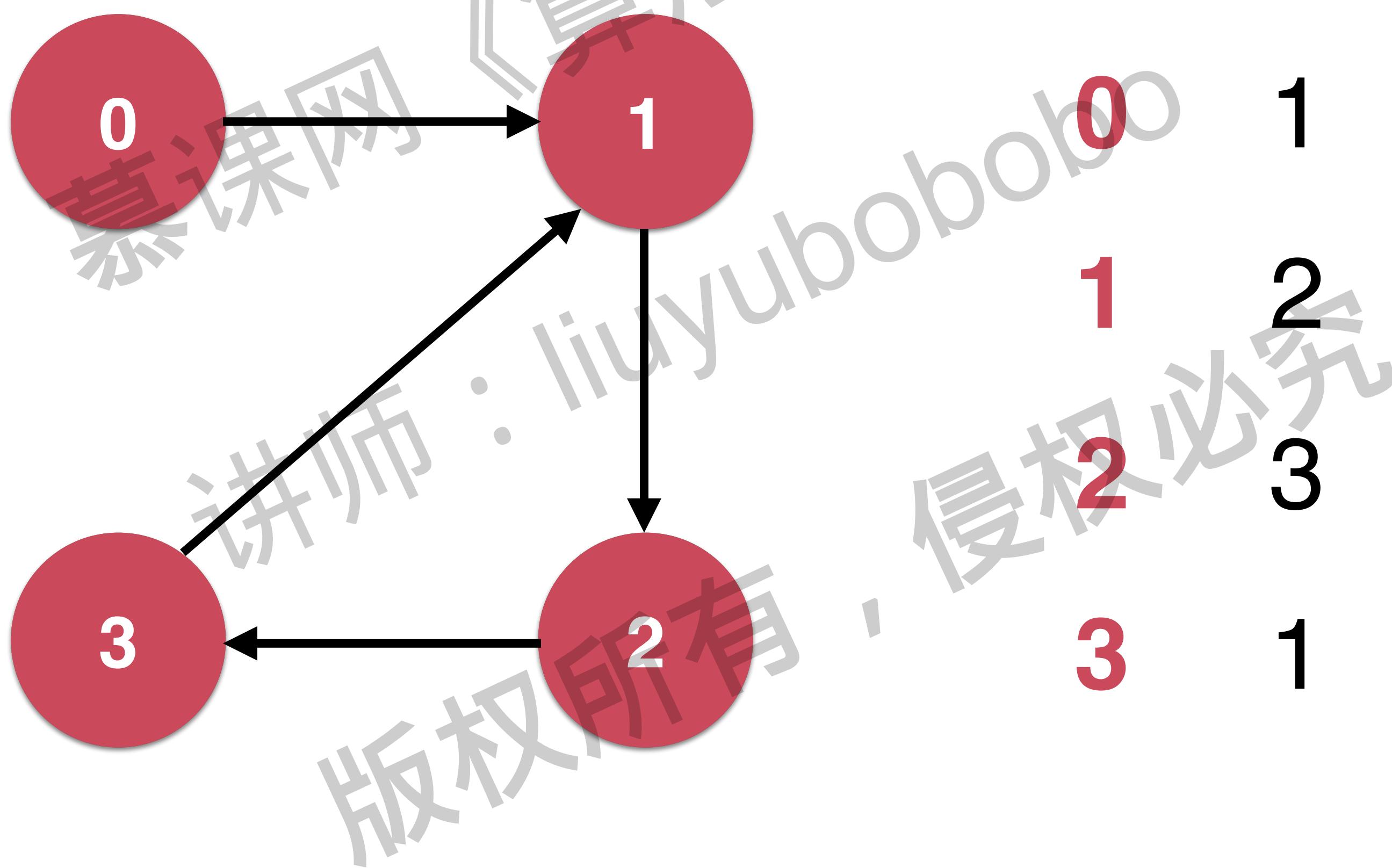


0	1	2	3
0	1	0	0
1	0	1	0
2	0	0	1
3	1	0	0

邻接表 (Adjacency Lists)



邻接表 (Adjacency Lists)

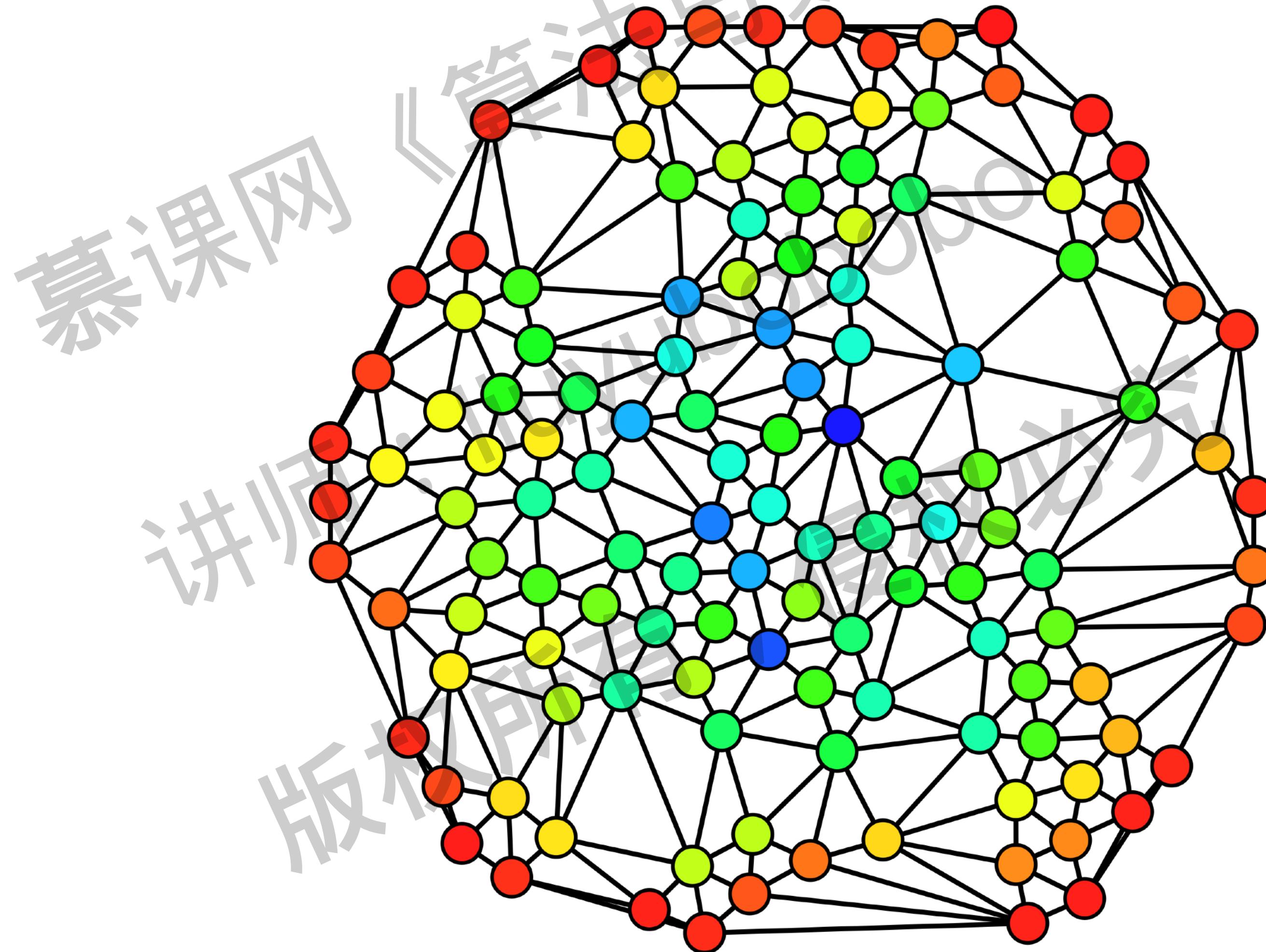


邻接矩阵和邻接表

邻接表适合表示稀疏图 (Sparse Graph)

邻接矩阵适合表示稠密图 (Dense Graph)

稀疏图



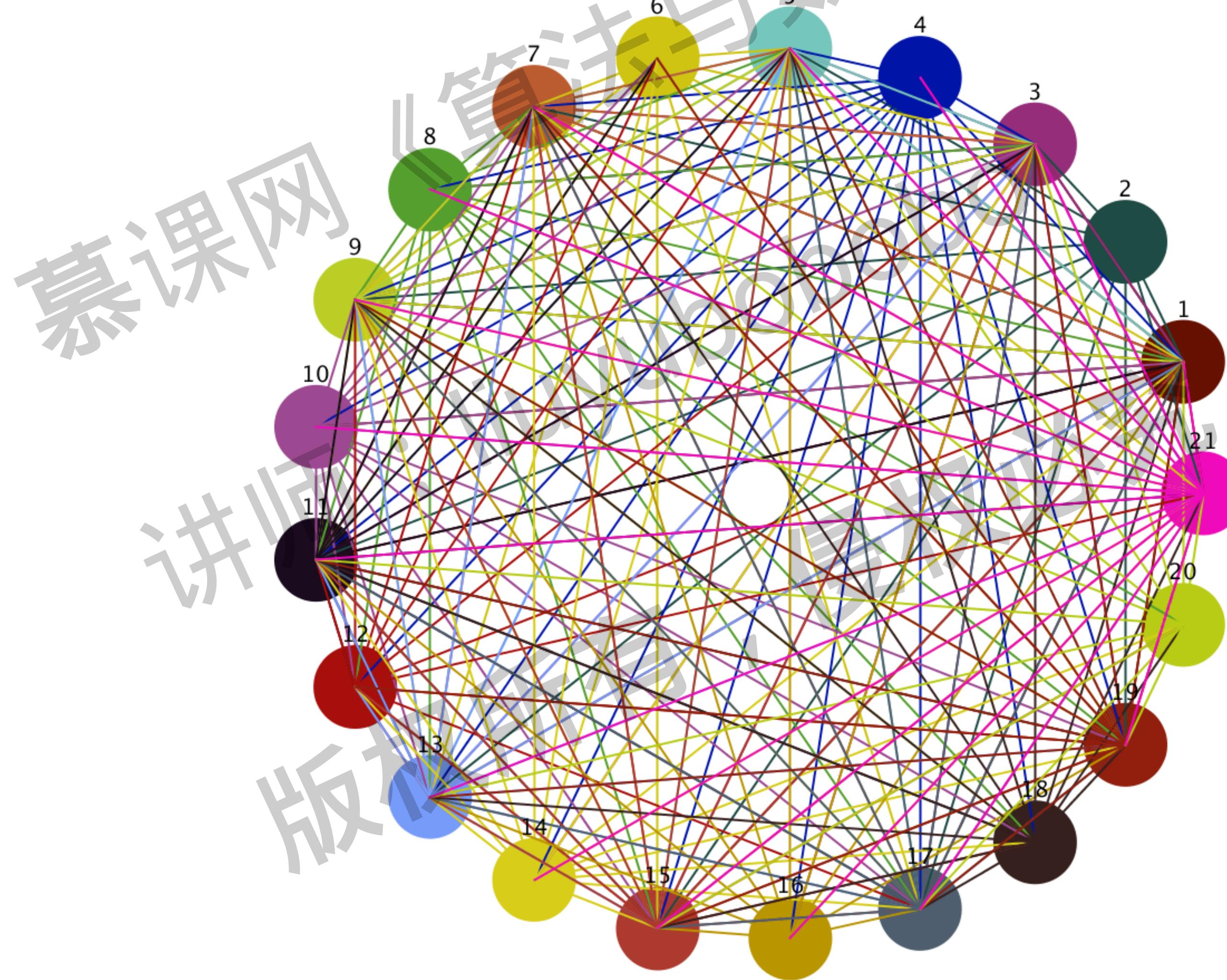
慕课网

讲义

版本

《算法设计与分析》

稠密图 和 完全图



操作：图的两种表示

慕课网《算法与数据结构》

讲师：liuyubo

版权所有，侵权必究

遍历邻边 - 图算法中最常见的操作



相邻结点迭代器

慕课网《算法与数据结构》
讲师：liuyanbo
bobo
版权所有，侵权必究

操作：相邻结点迭代器

慕课网《算法与数据结构》

讲师：liuyujie@bobo

版权所有，侵权必究

图算法框架

慕课网 《算法与数据结构》

讲师：

版权所有，侵权必究

图的读取

慕课网《算法与数据结构》

讲师：liuyubo
版权所有，侵权必究

操作：图的读取

慕课网《算法与数据结构》

讲师：liuyubobobo

版权所有，侵权必究

图的遍历

慕课网《算法与数据结构》

讲师：liuyu**bobobobo**

版权所有，侵权必究

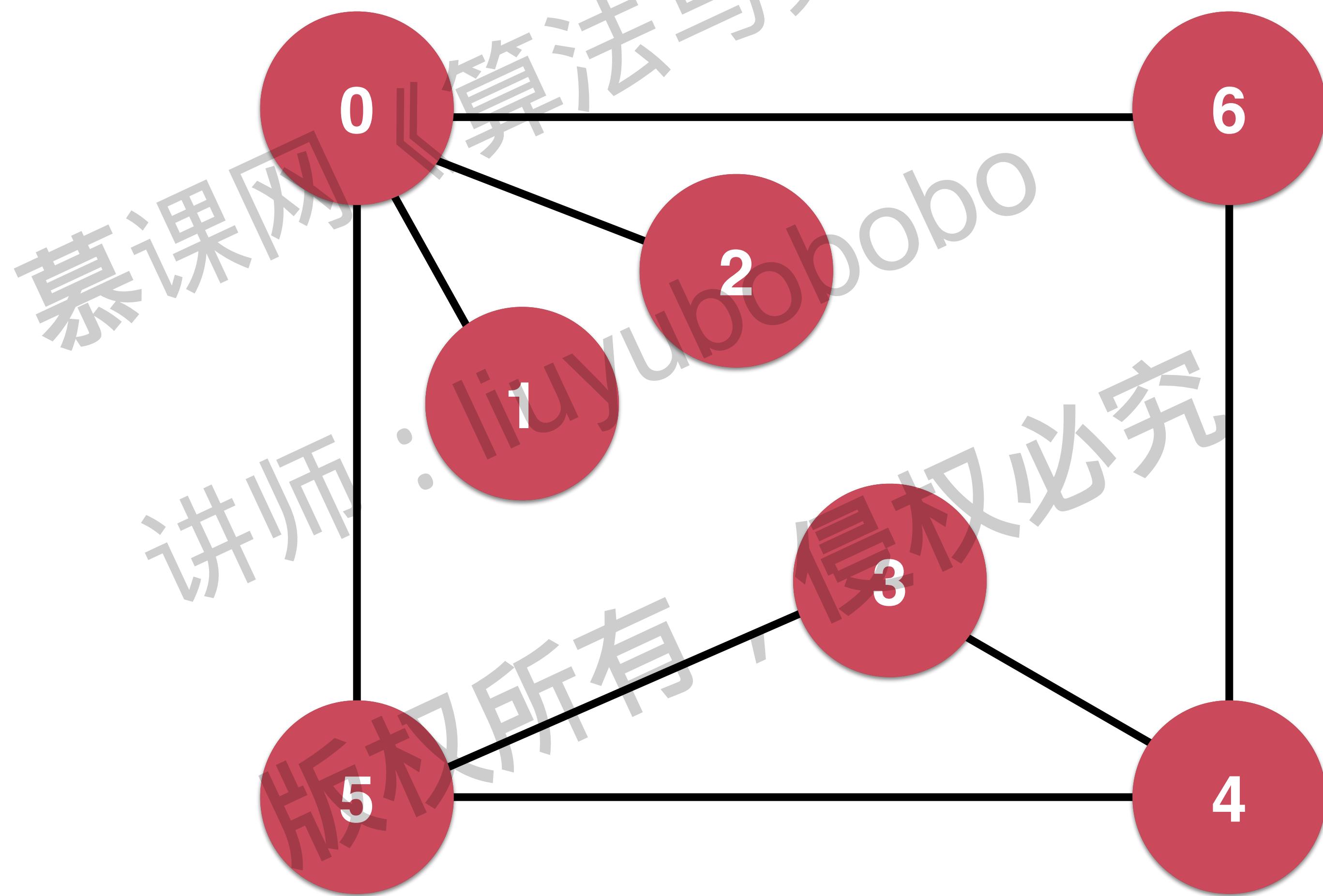
深度优先遍历

慕课网《算法与数据结构》

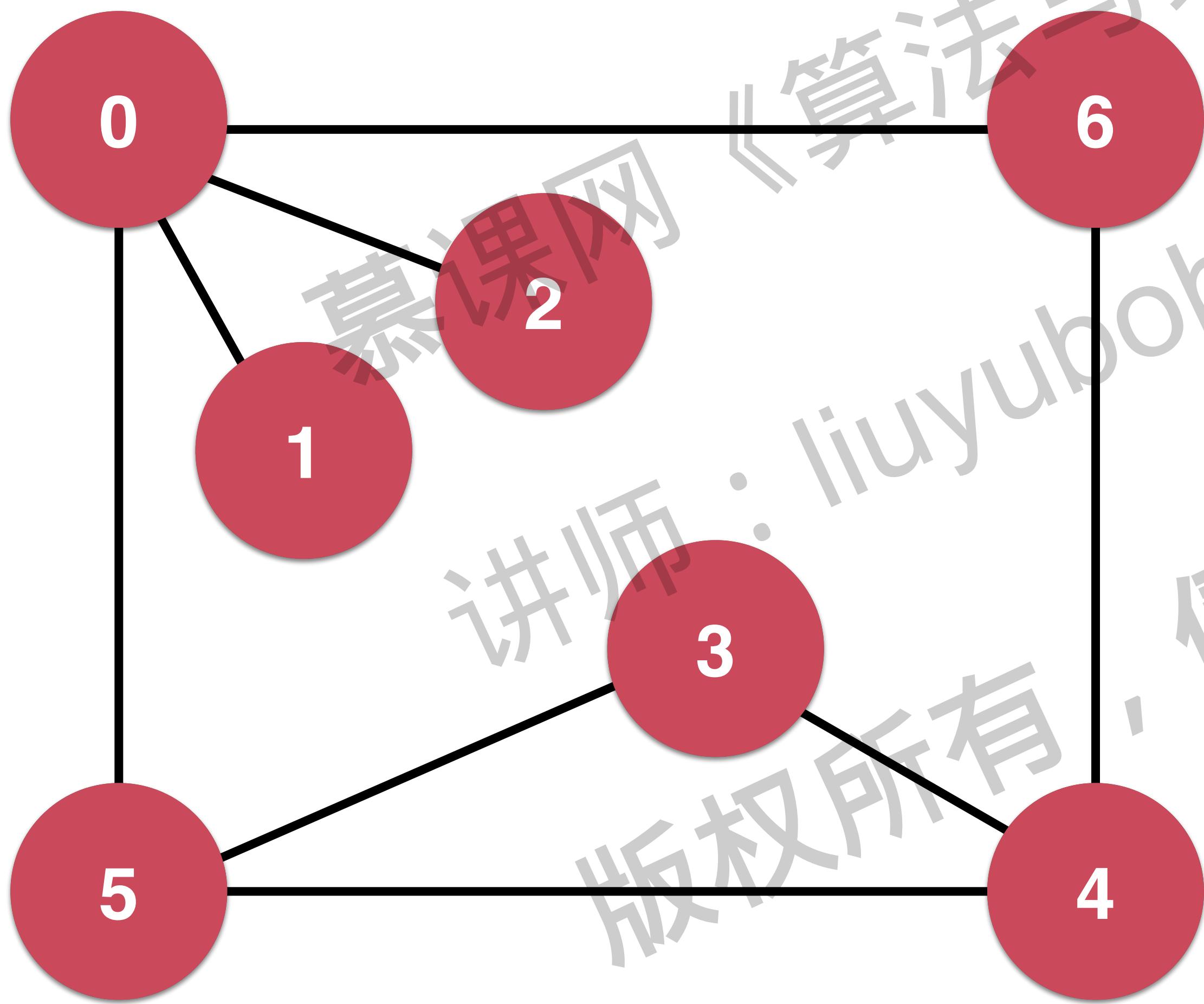
讲师：

版权所有，侵权必究

深度优先遍历

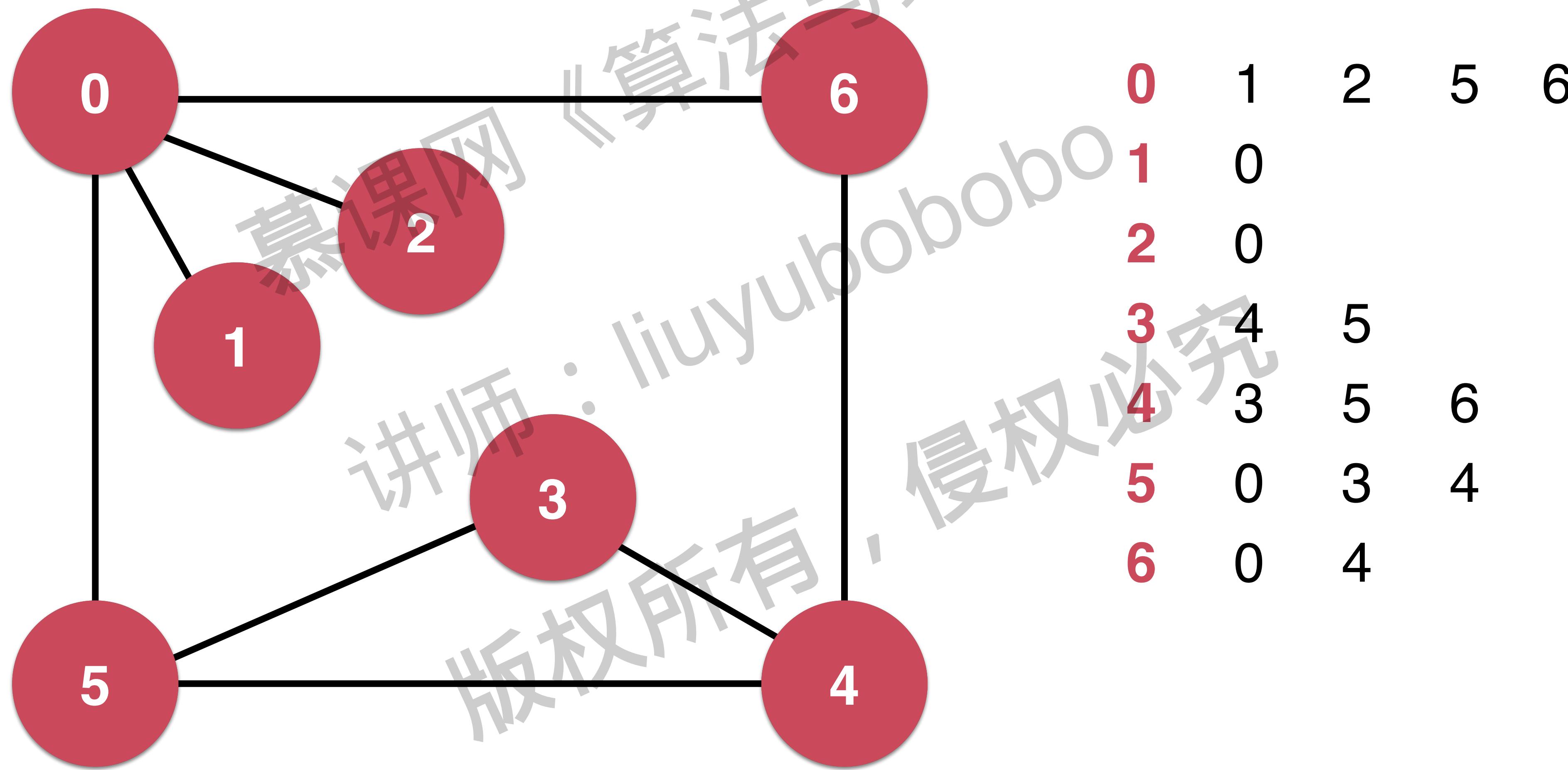


深度优先遍历

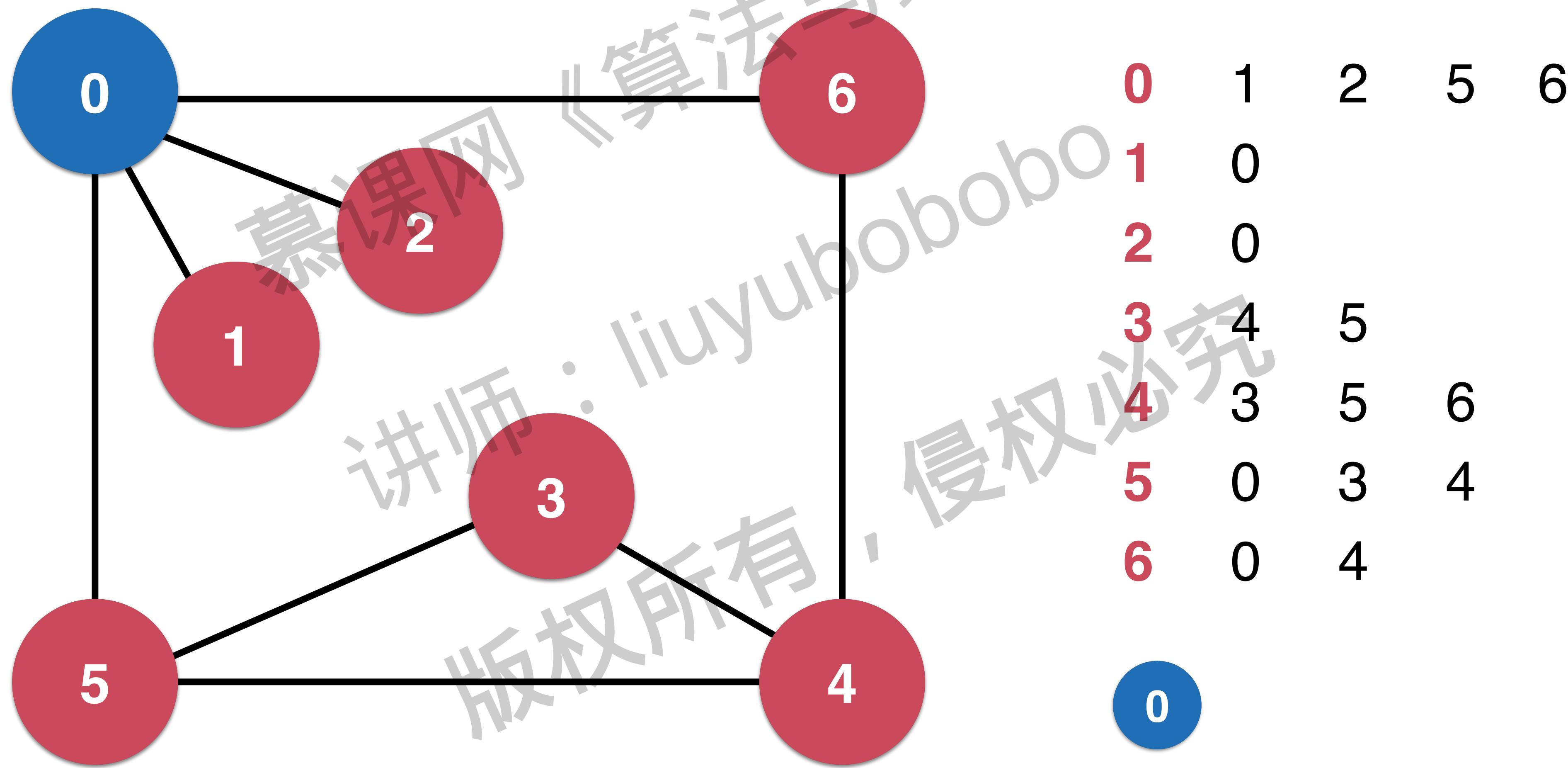


讲师: liuyubobobo
版权所有, 侵权必究
慕课网

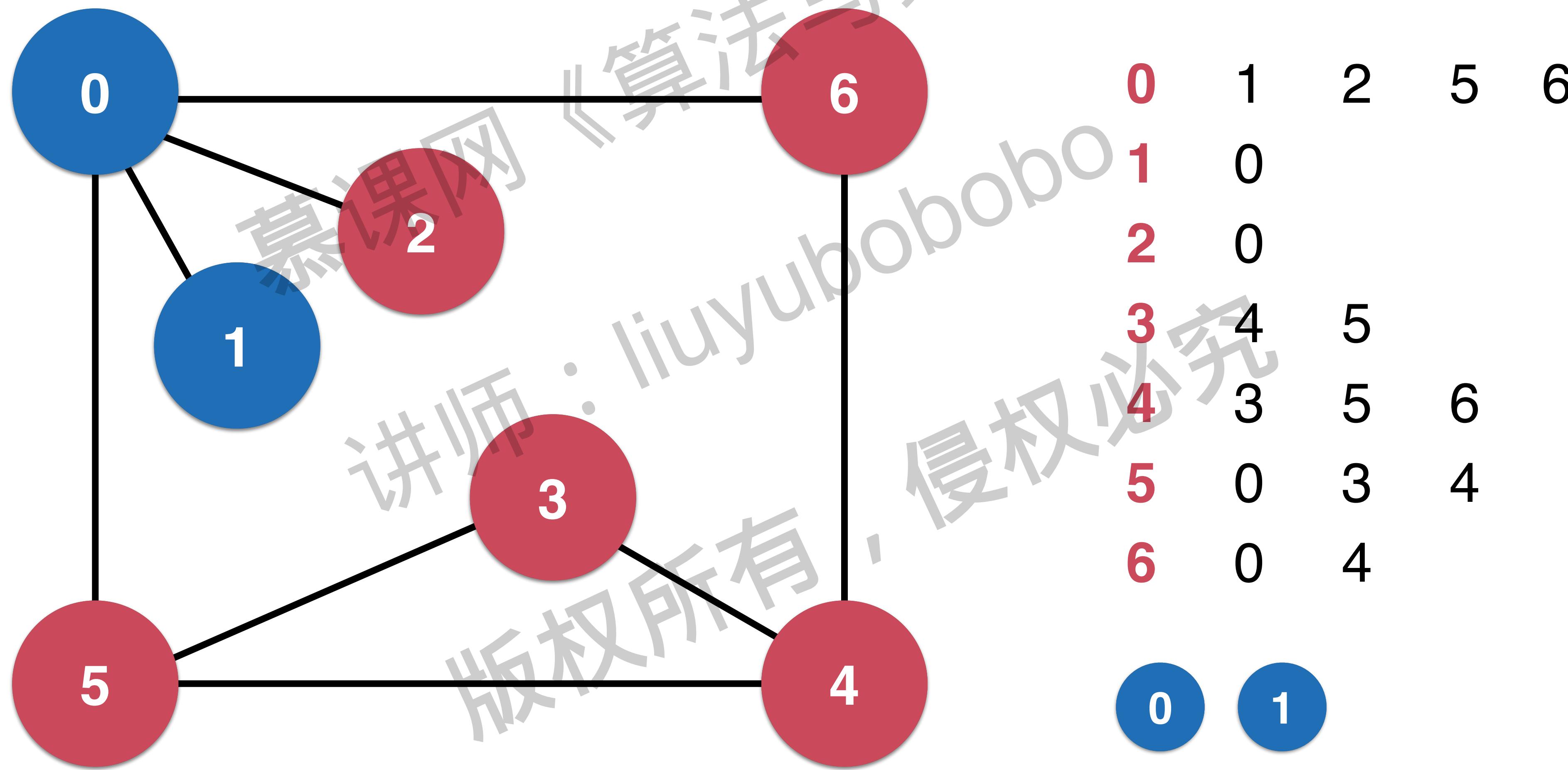
深度优先遍历



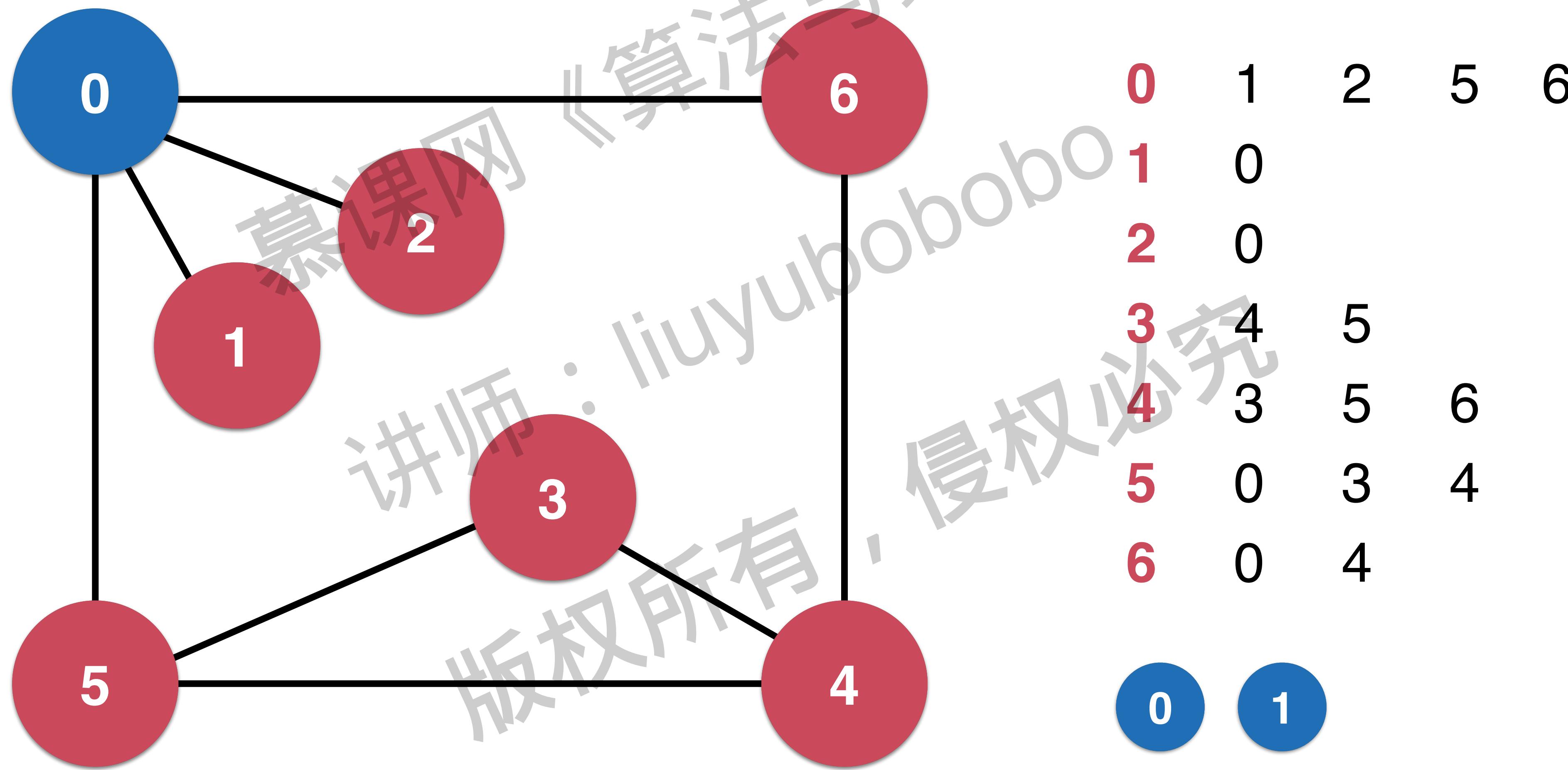
深度优先遍历



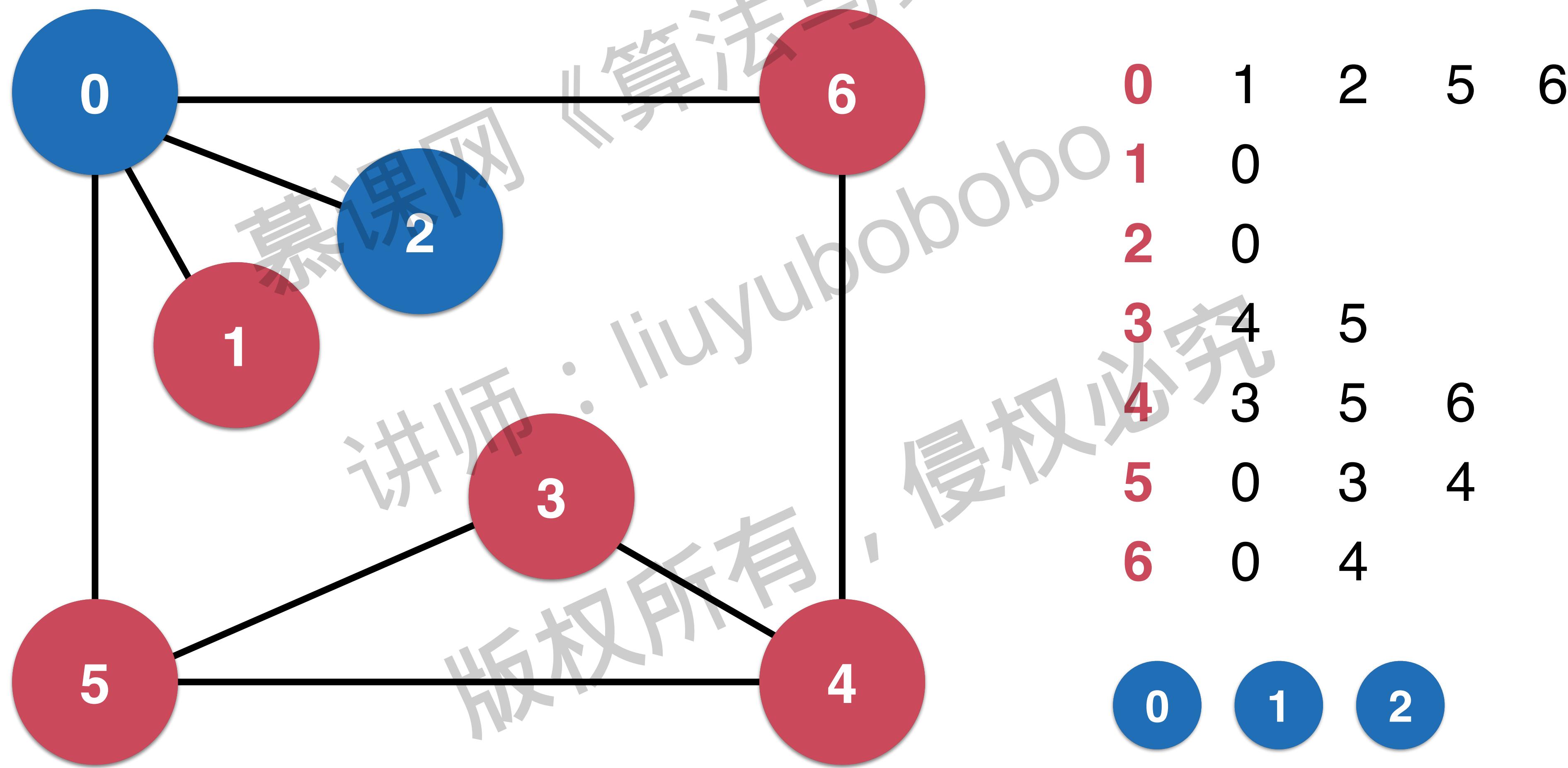
深度优先遍历



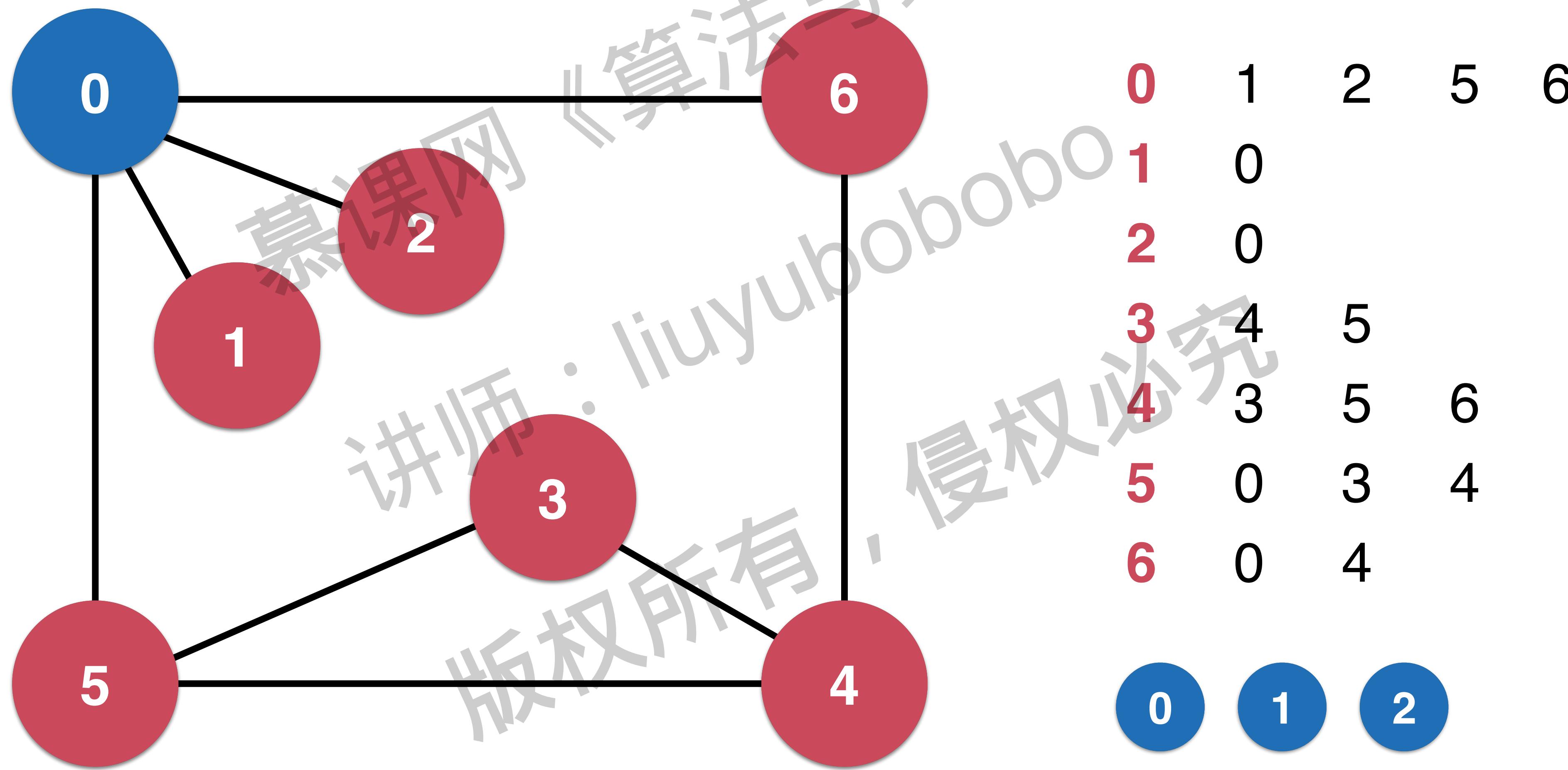
深度优先遍历



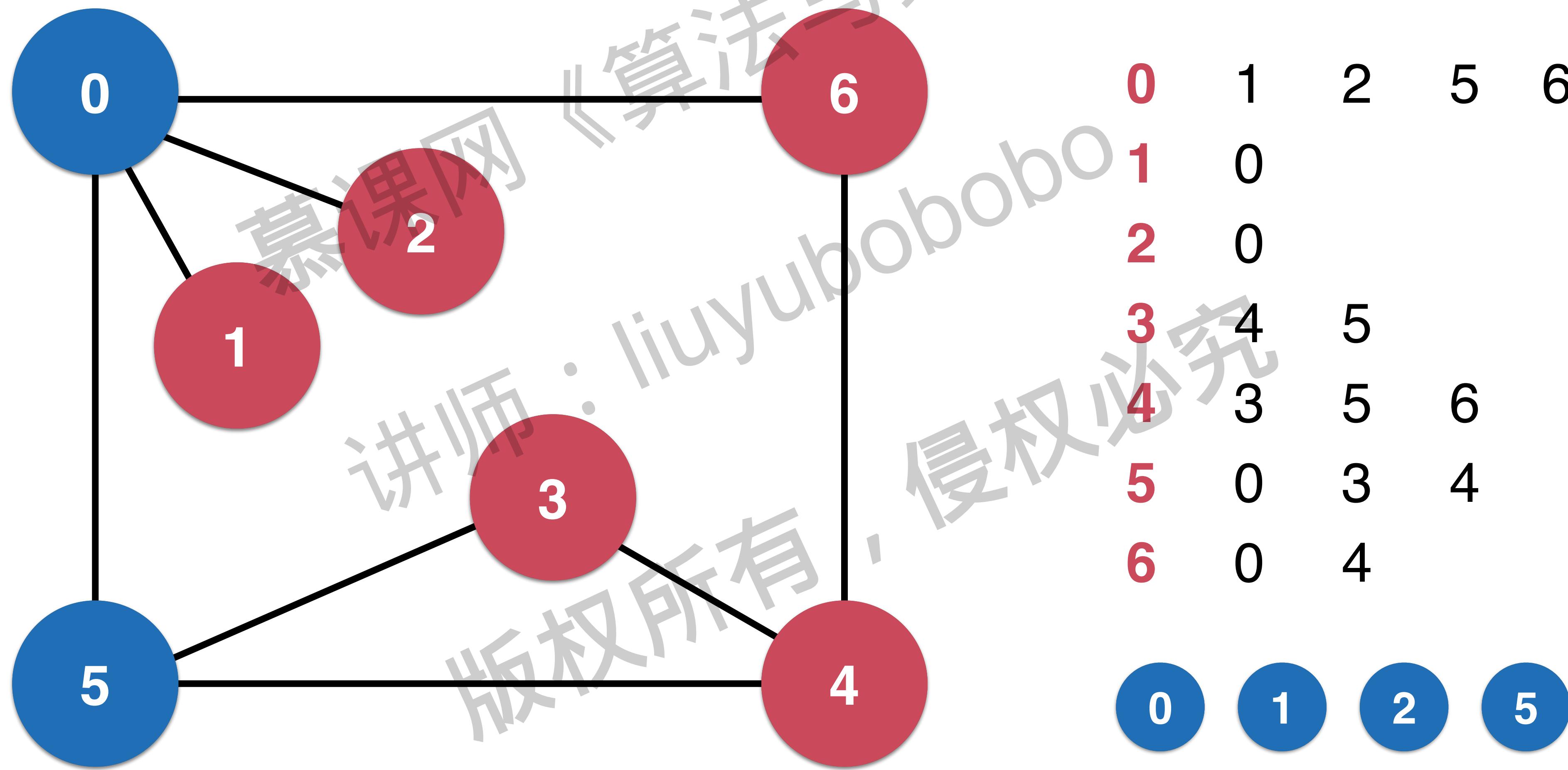
深度优先遍历



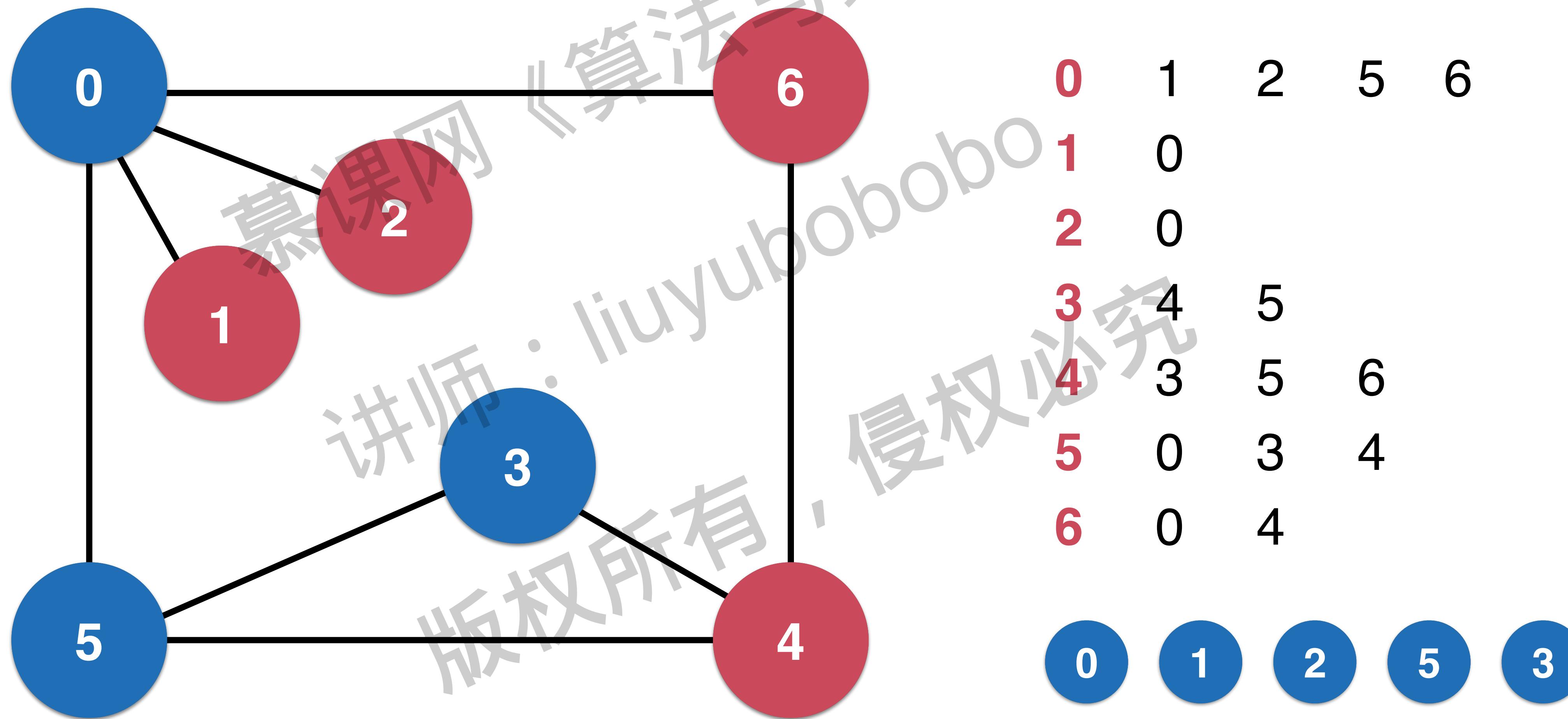
深度优先遍历



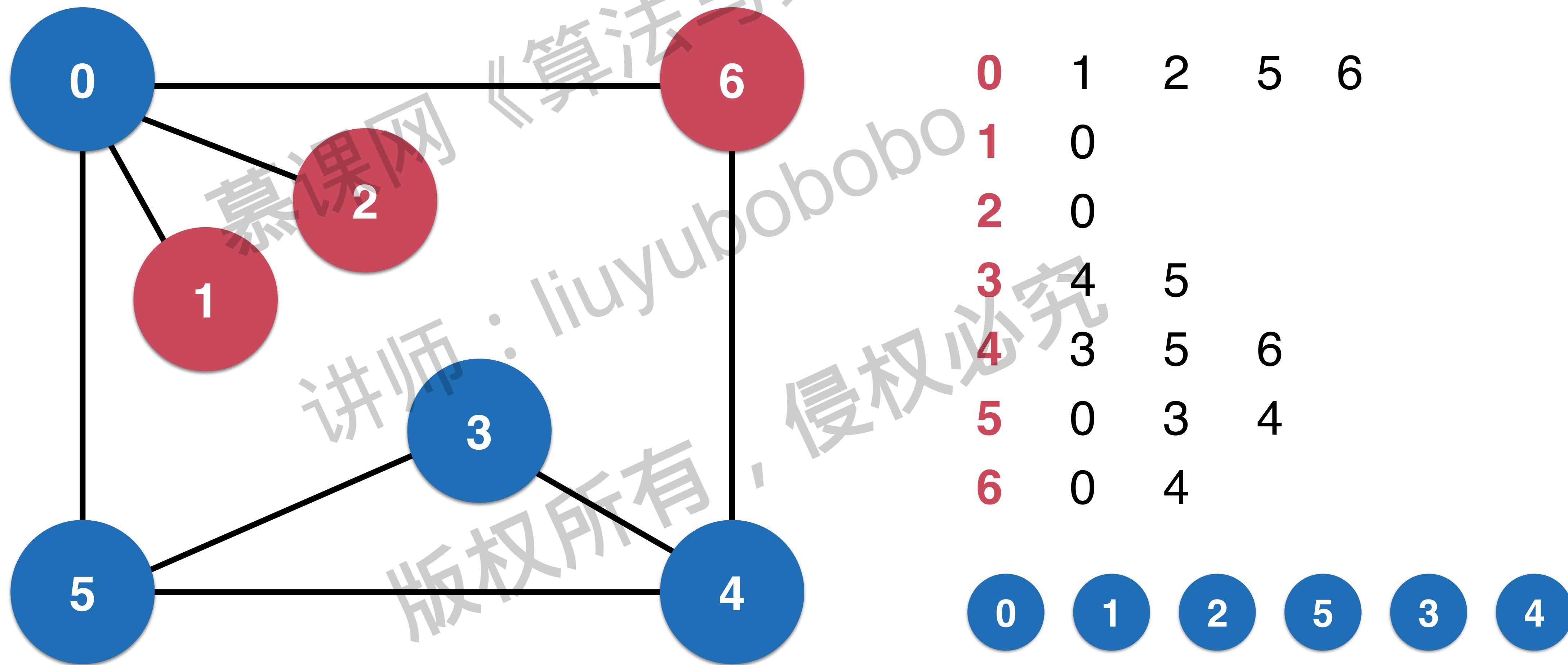
深度优先遍历



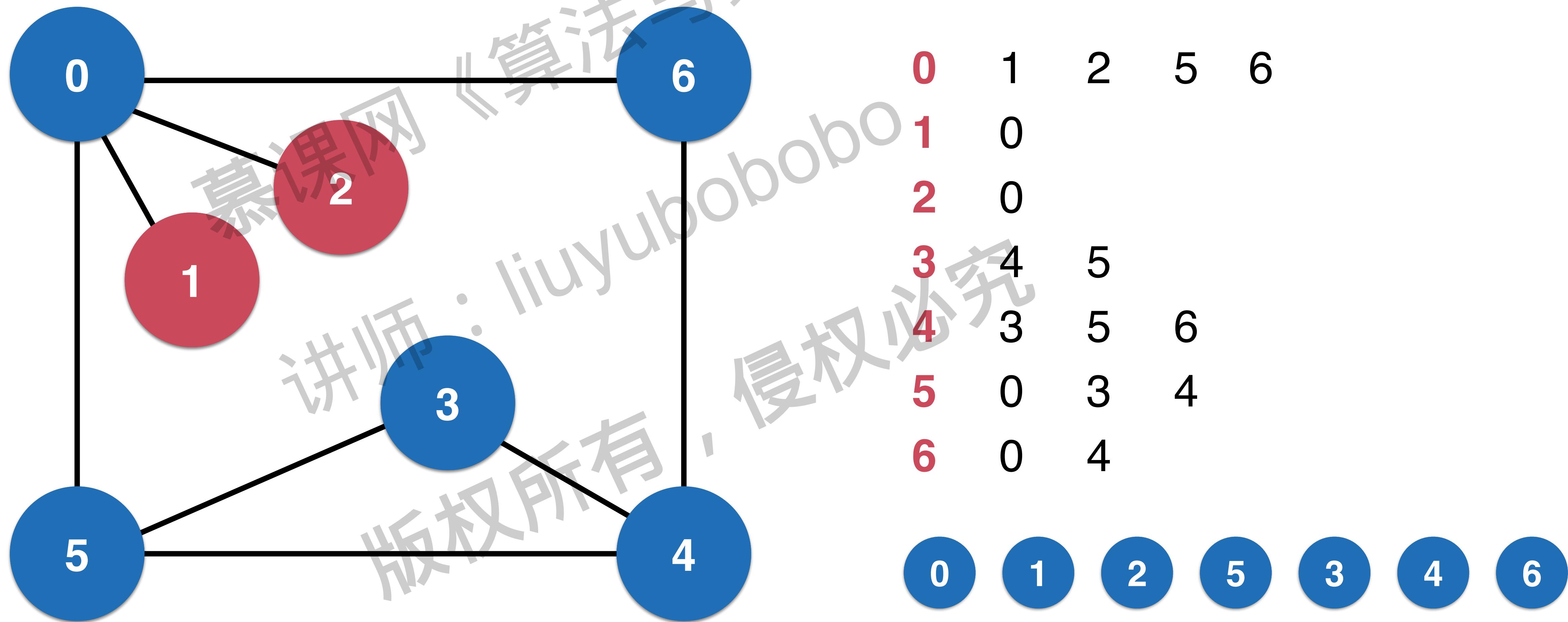
深度优先遍历



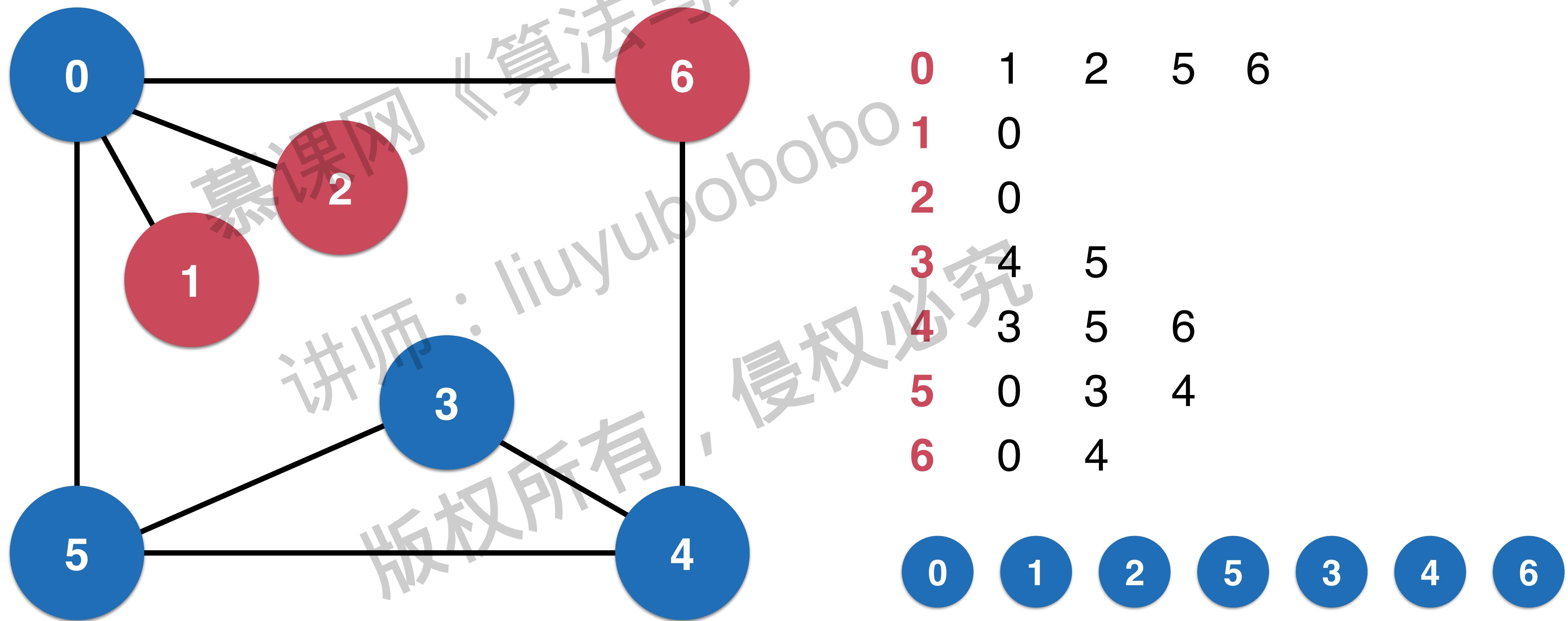
深度优先遍历



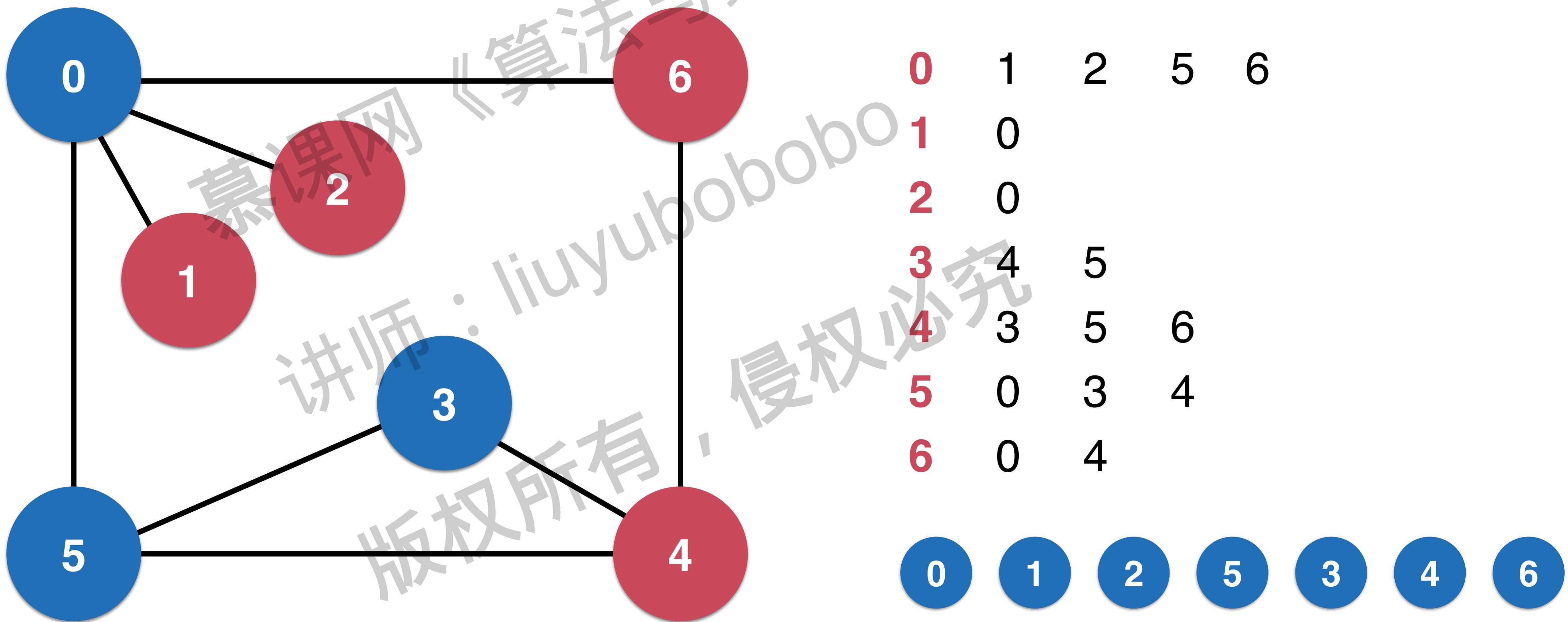
深度优先遍历



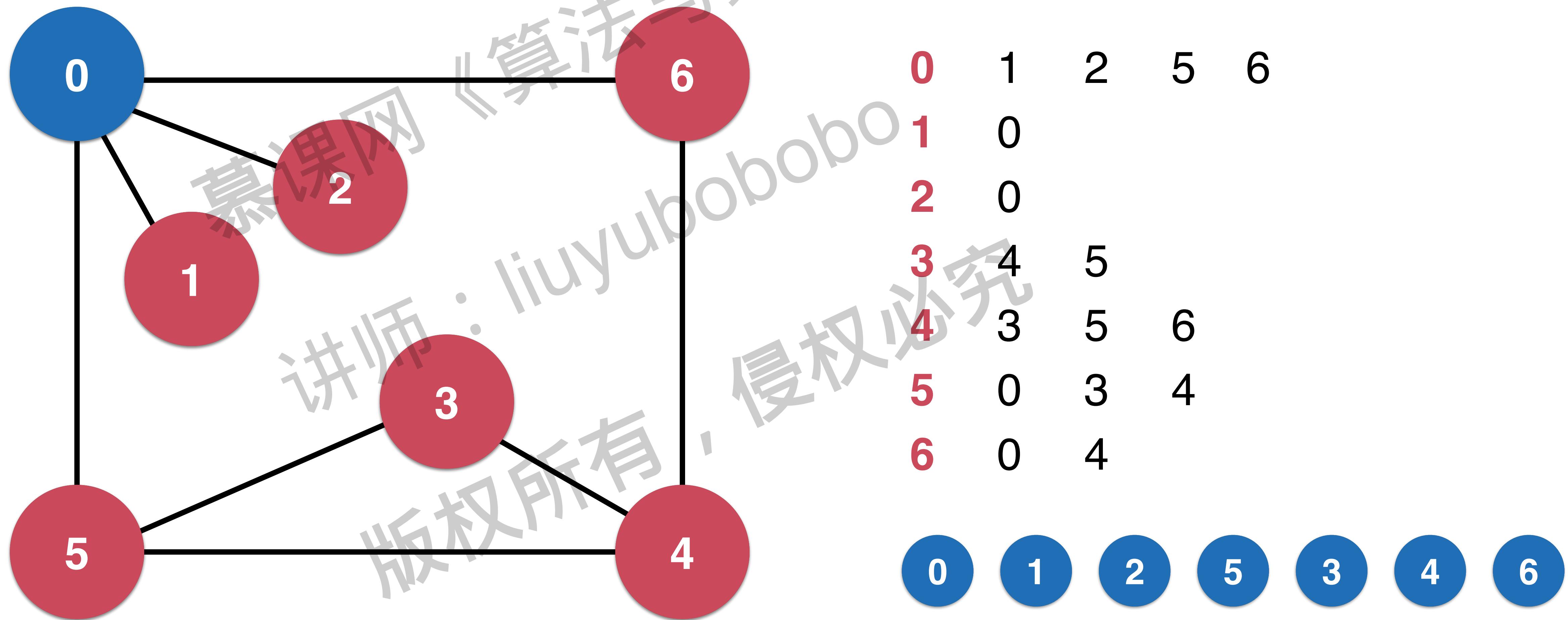
深度优先遍历



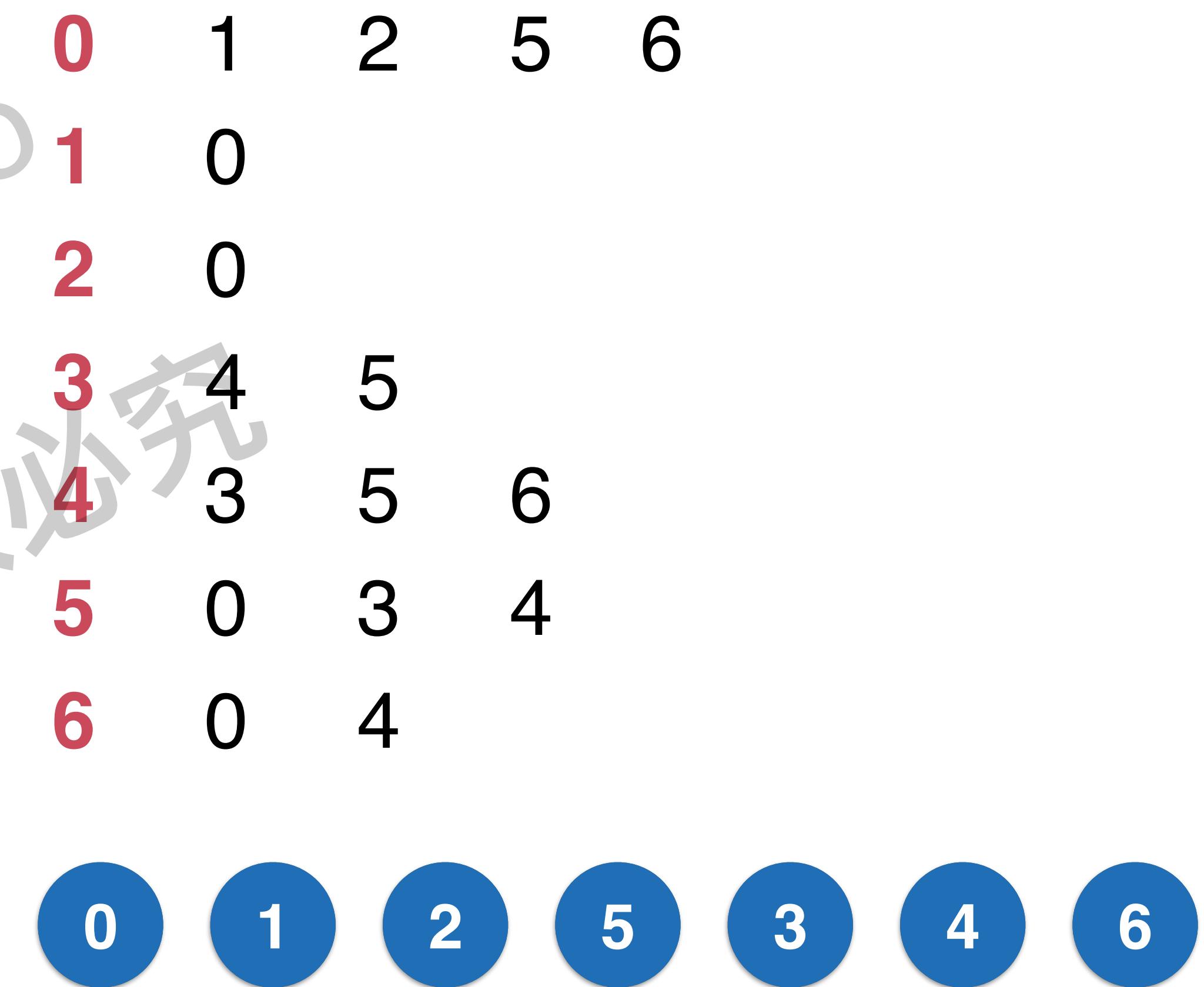
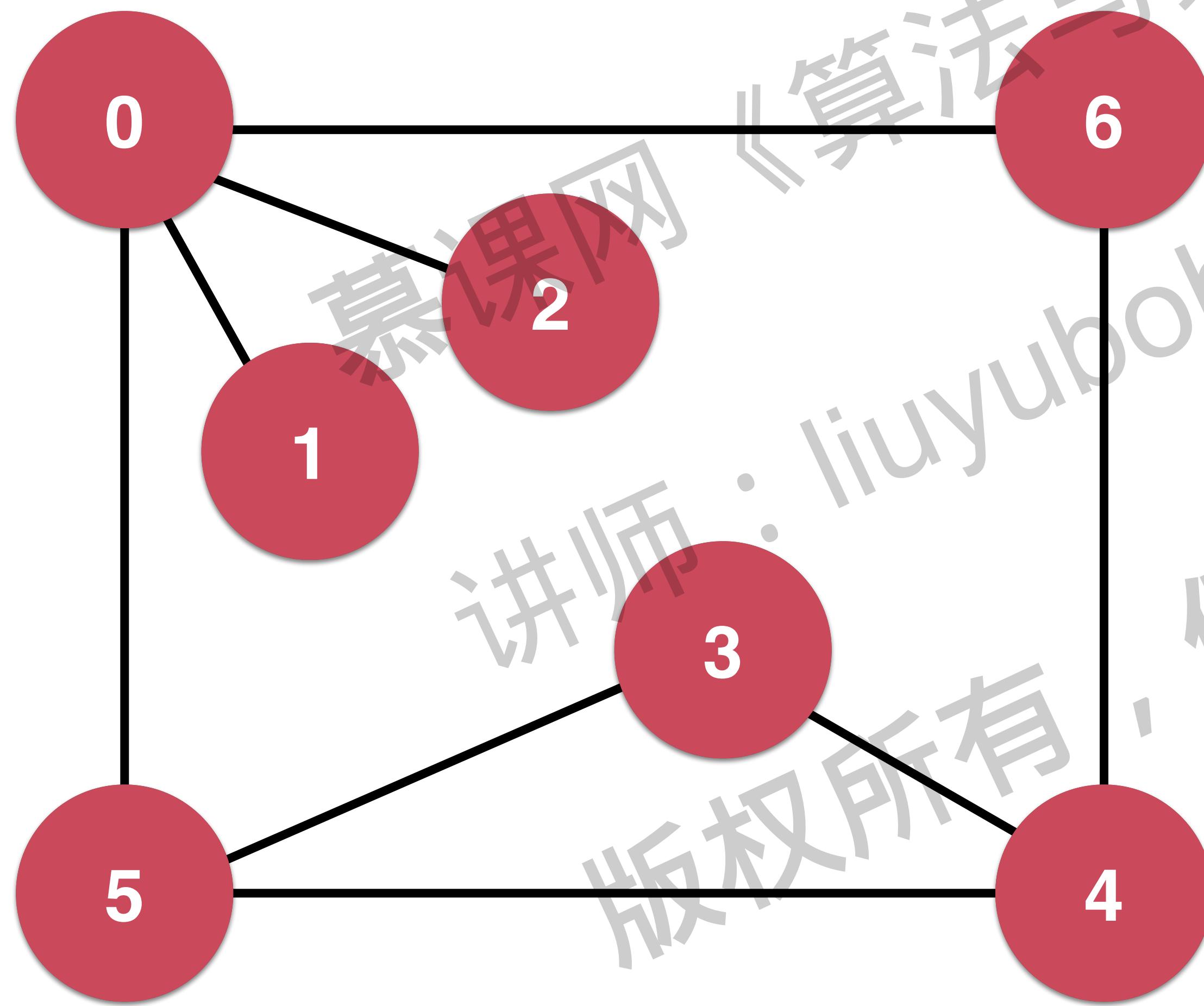
深度优先遍历



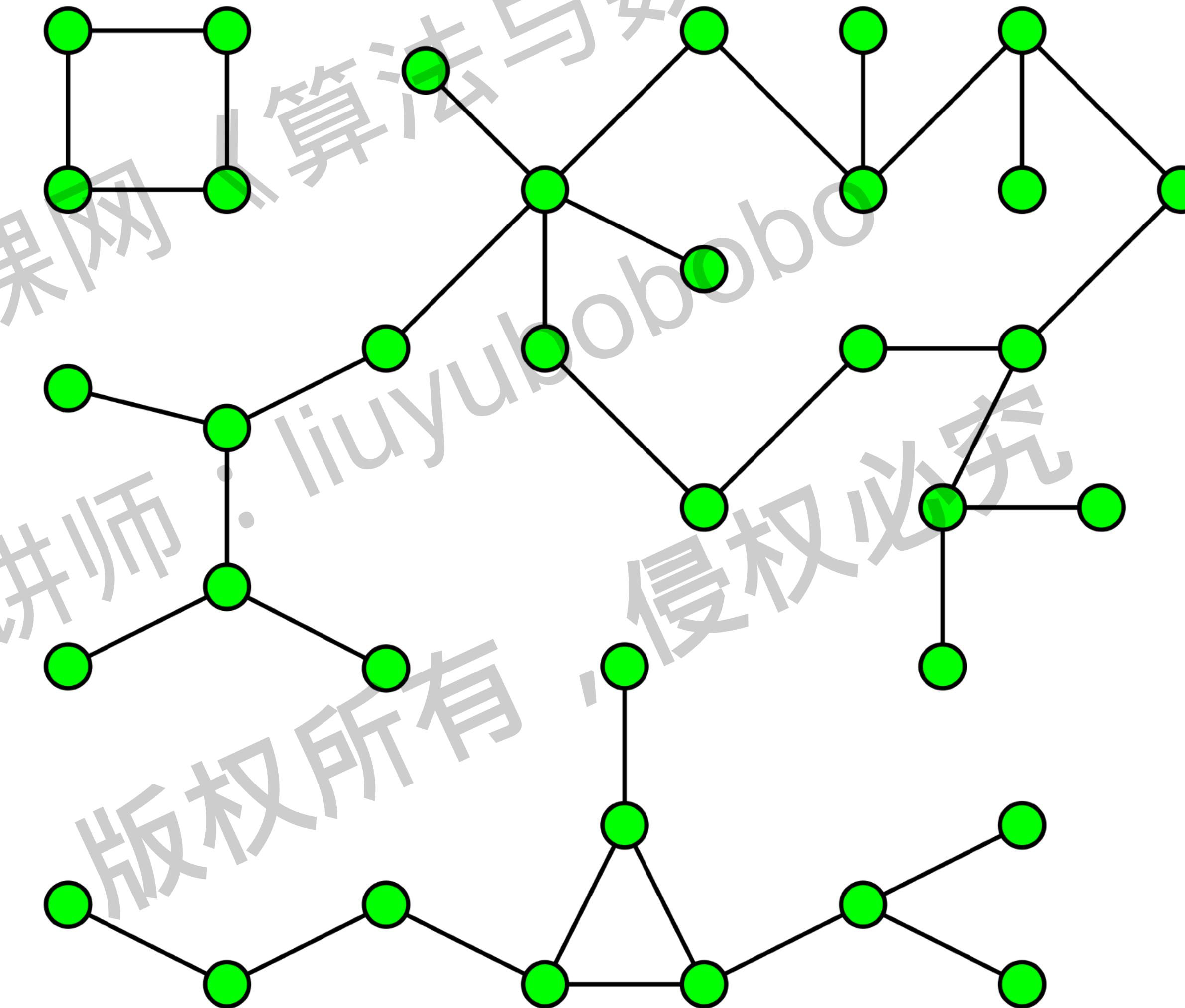
深度优先遍历



深度优先遍历



连通分量



慕课网 liuyubobobo

讲师 版权所有

《算法与数据结构》

操作：Component

慕课网《算法与数据结构》
讲师：liuyubobobo
版权所有，侵权必究

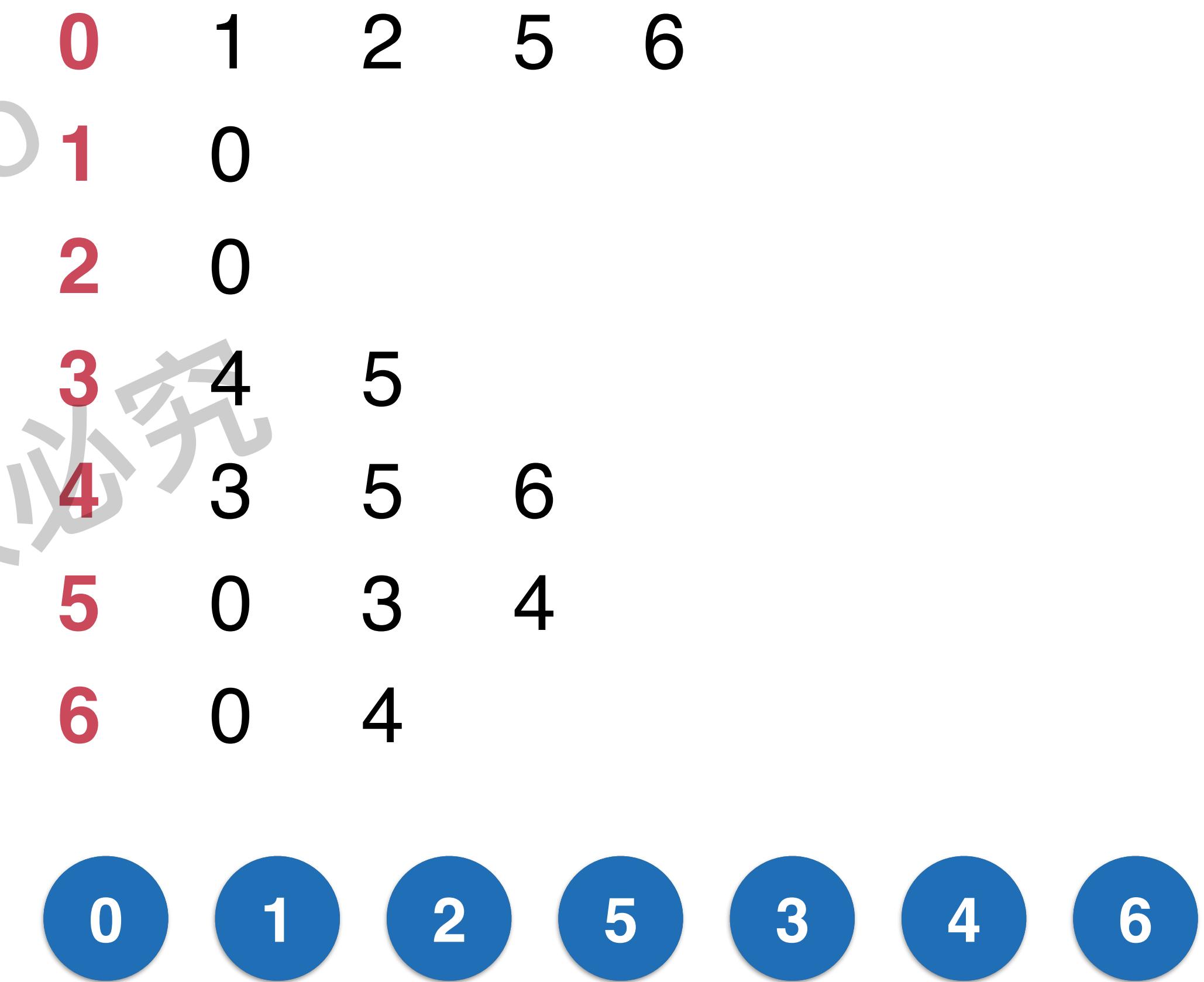
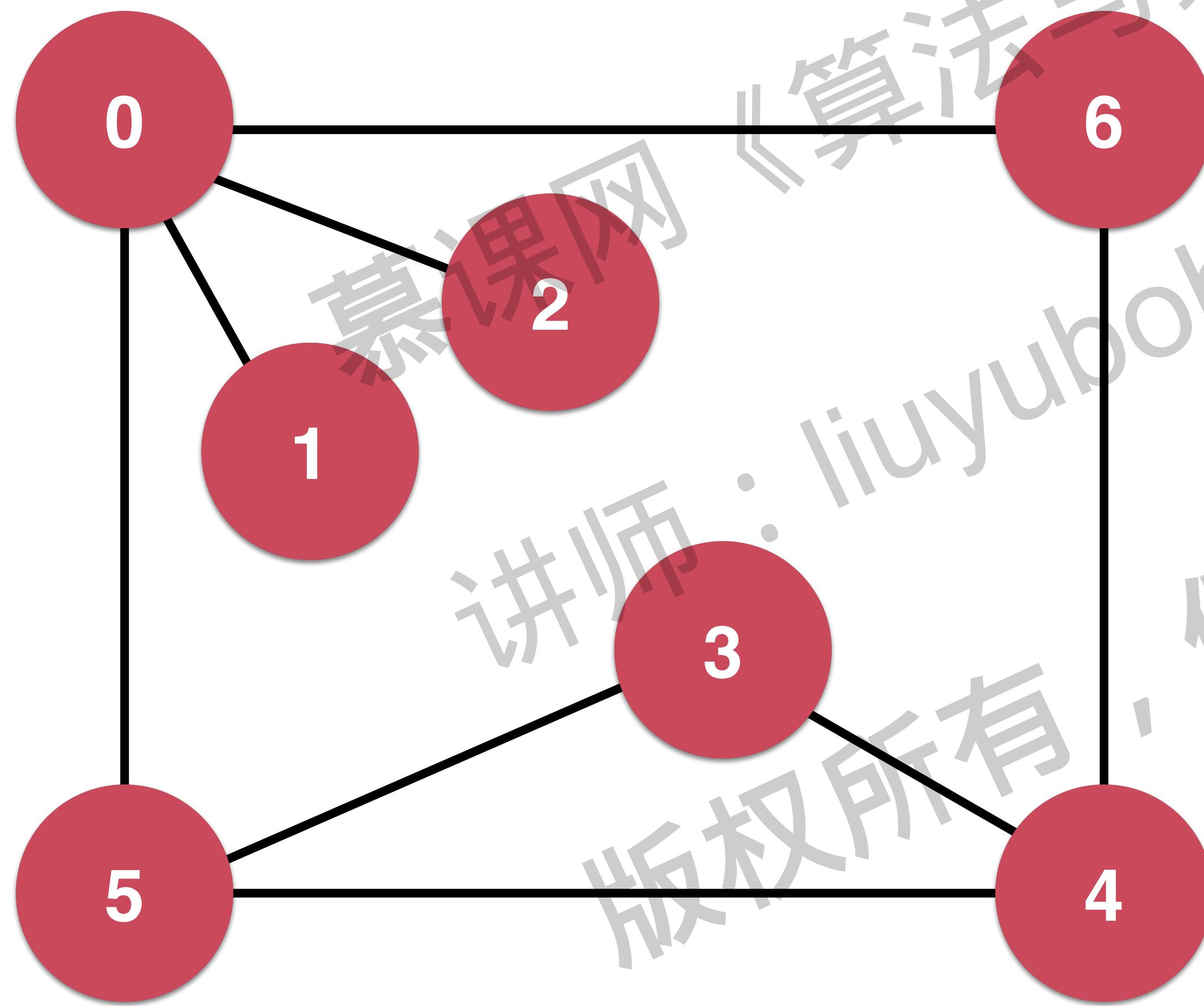
操作：测试连通性

慕课网《算法与数据结构》

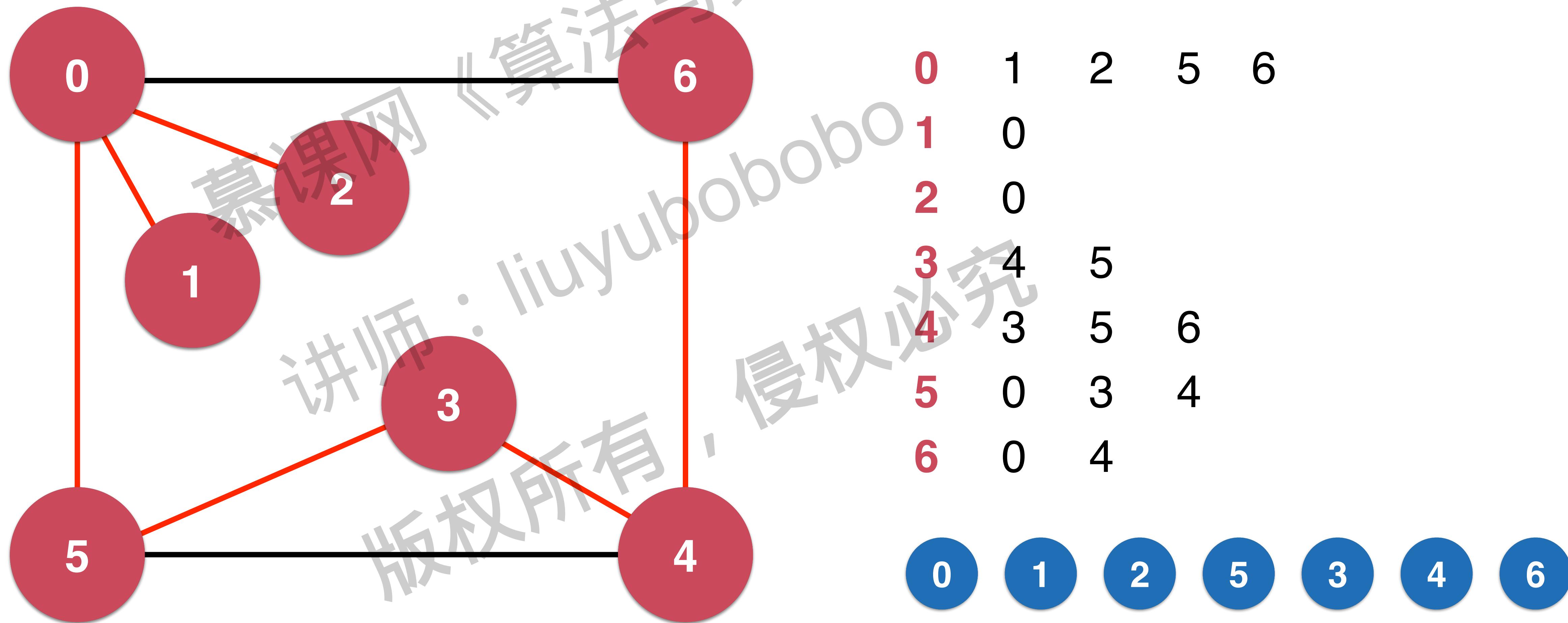
讲师：liuyubo

版权所有，侵权必究

深度优先遍历



获得两点间的一条路径



图的深度优先遍历-复杂度

稀疏图 (邻接表) : $O(V + E)$

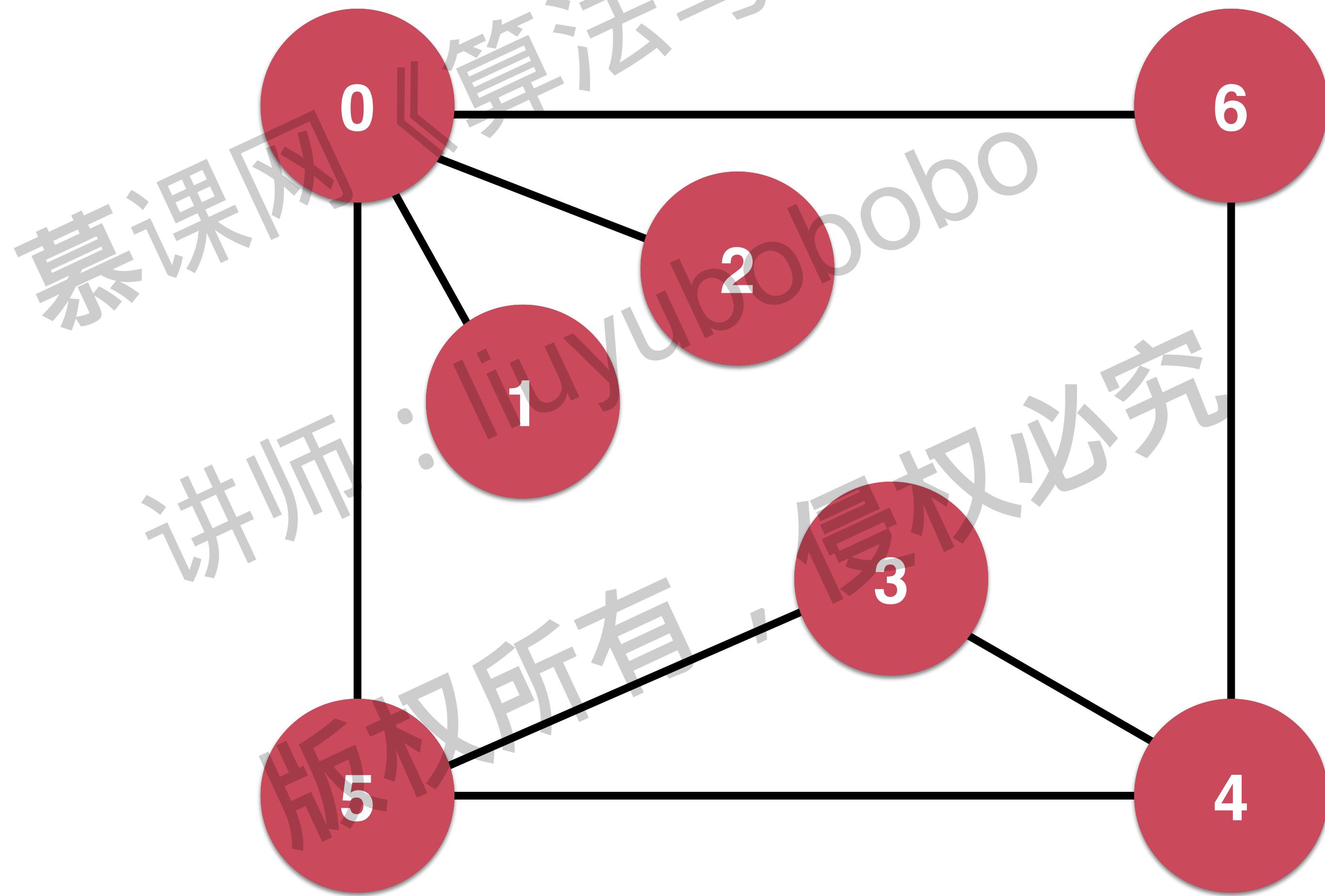
稠密图 (邻接矩阵) : $O(V^2)$

深度优先遍历算法对有向图依然有效

讲师: liuyubobobo
版权所有, 侵权必究

深度课网《算法与数据结构》

查看图中的环



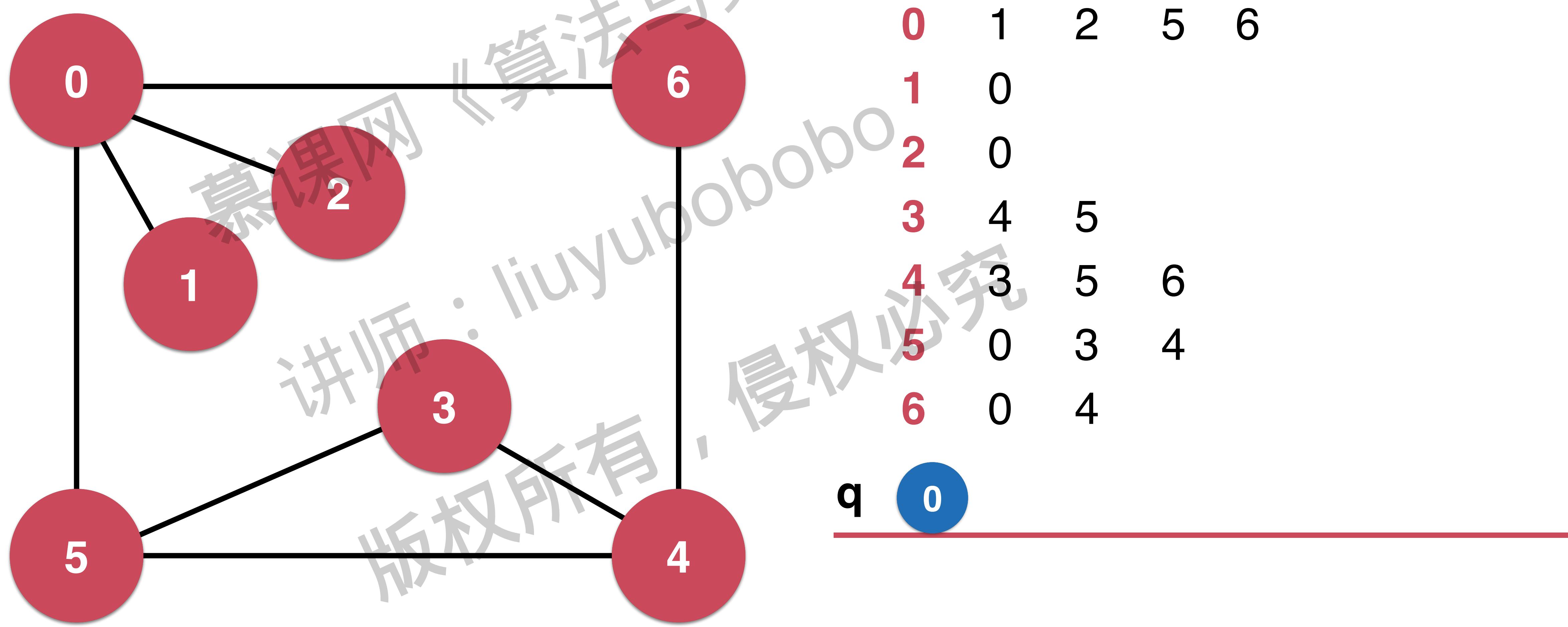
广度优先遍历

慕课网 《算法与数据结构》

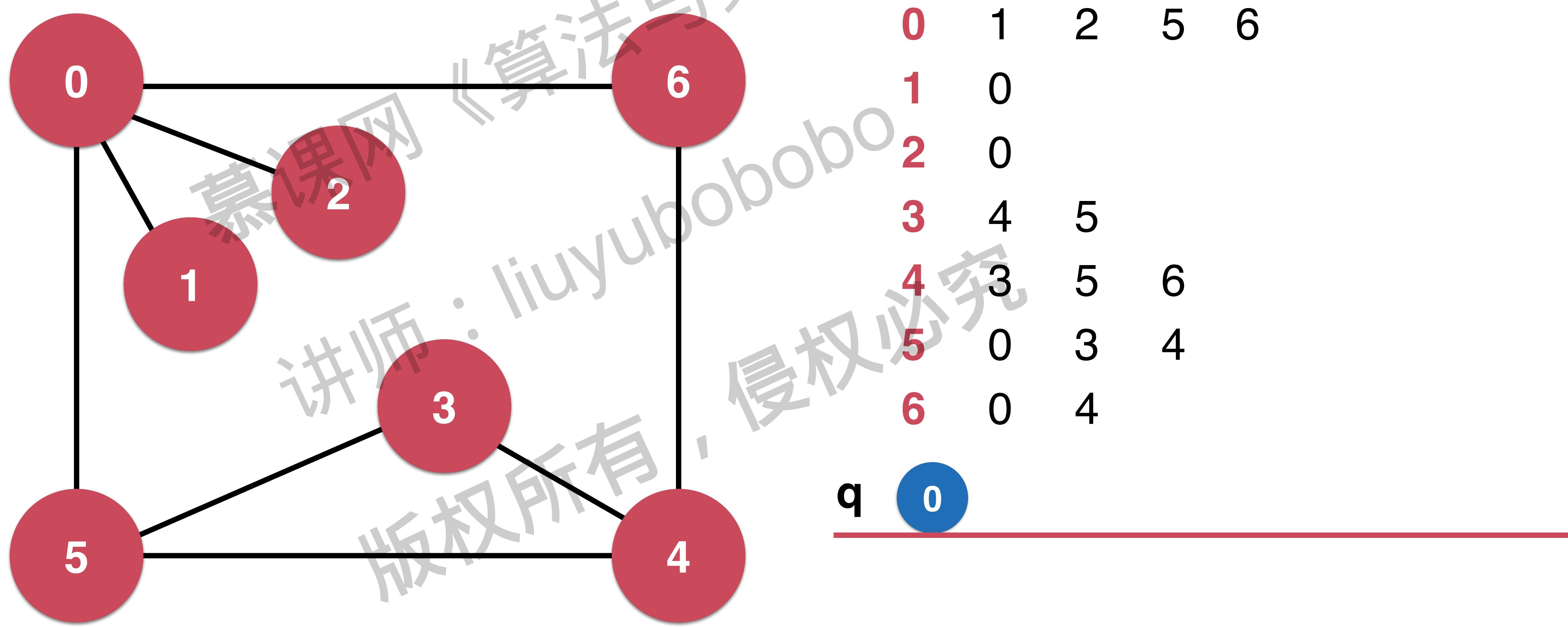
讲师：

版权所有，侵权必究

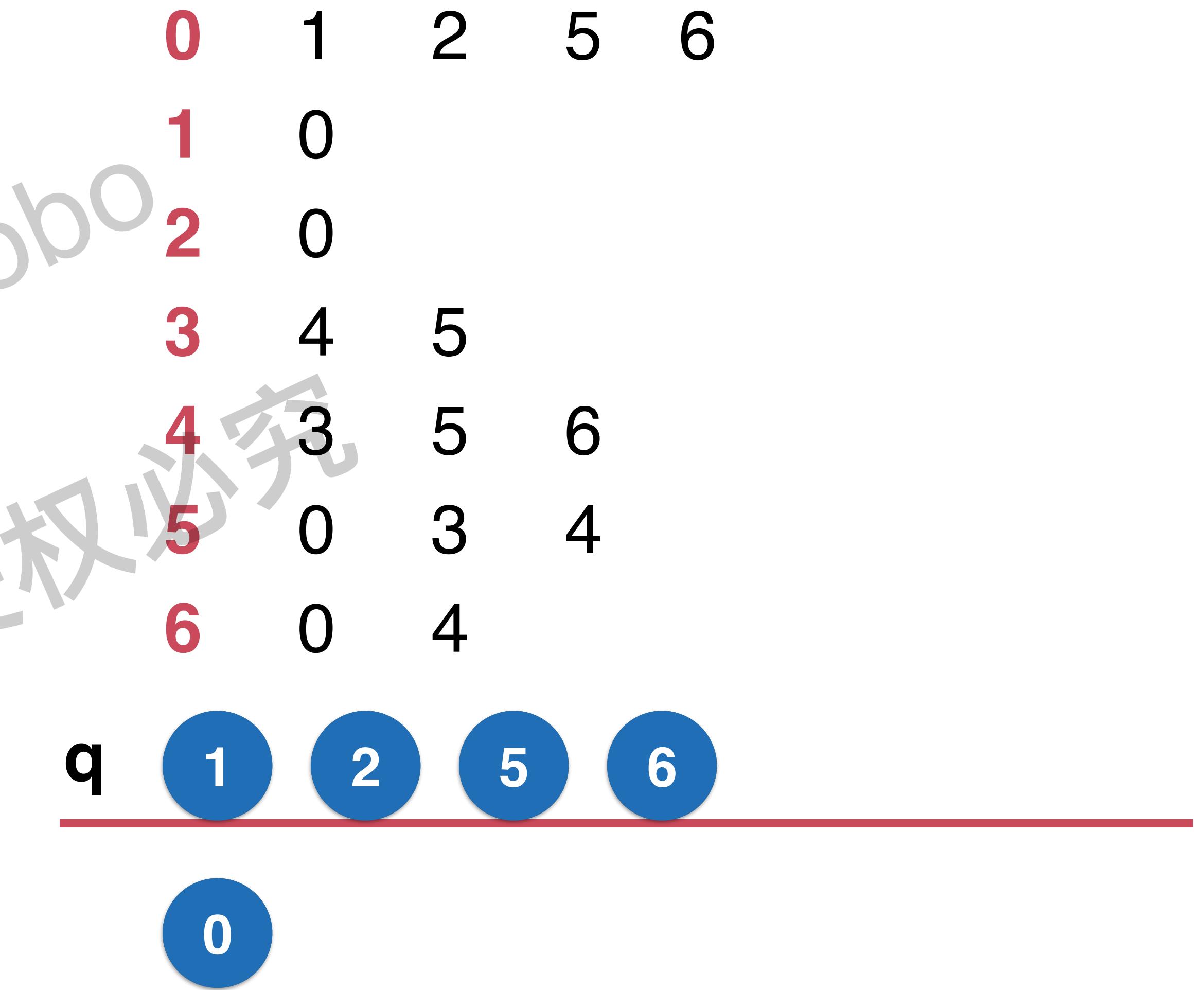
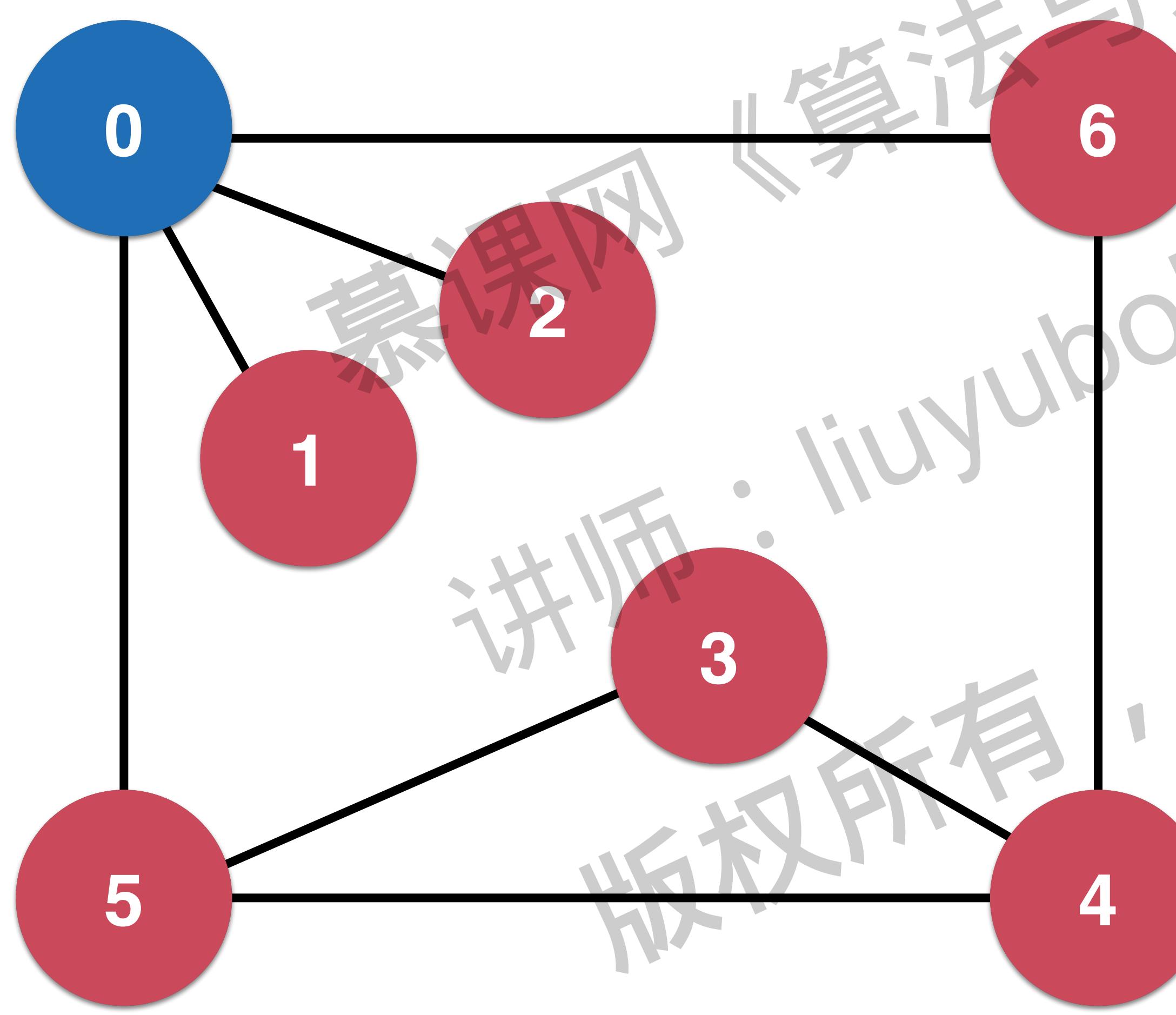
广度优先遍历



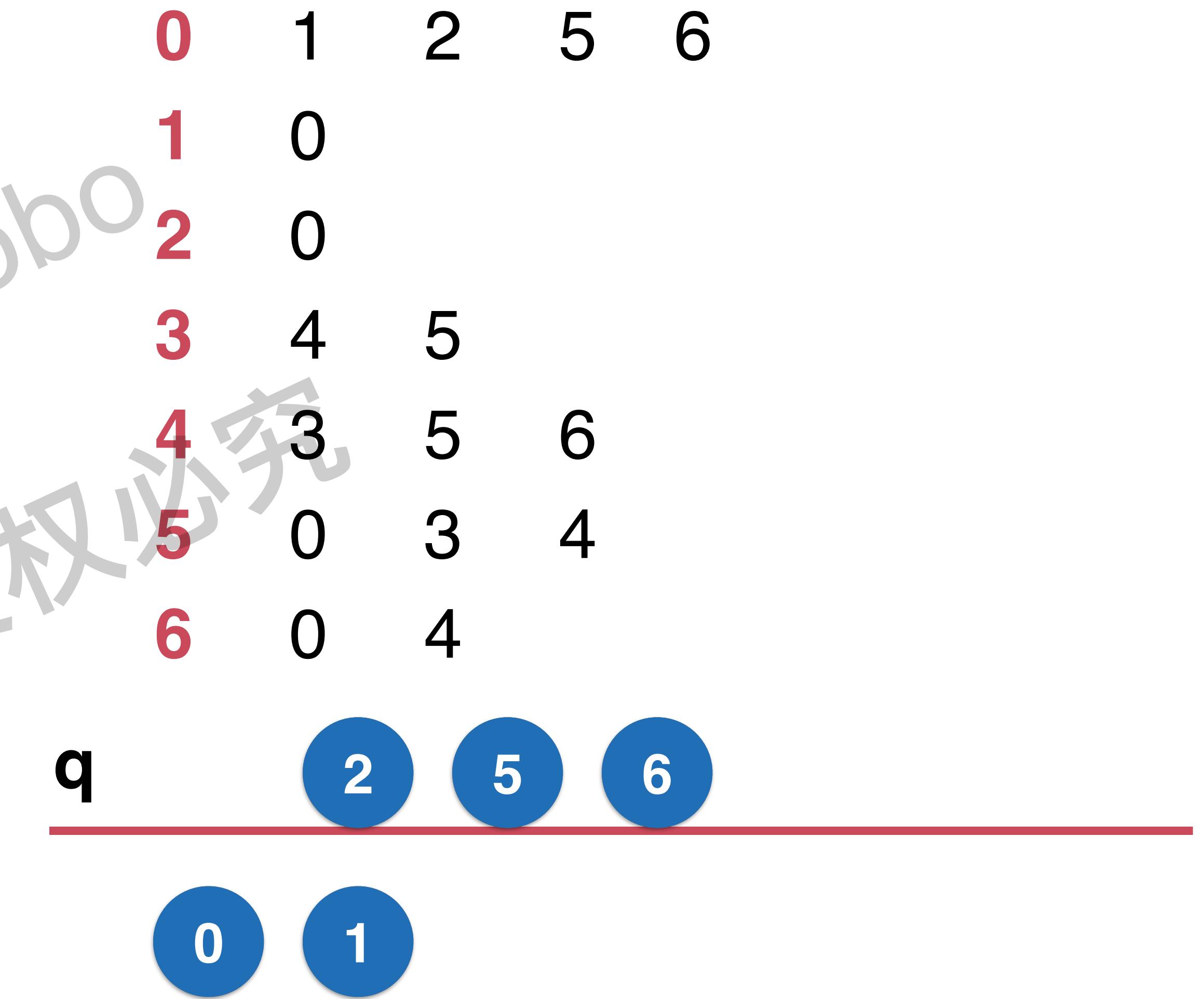
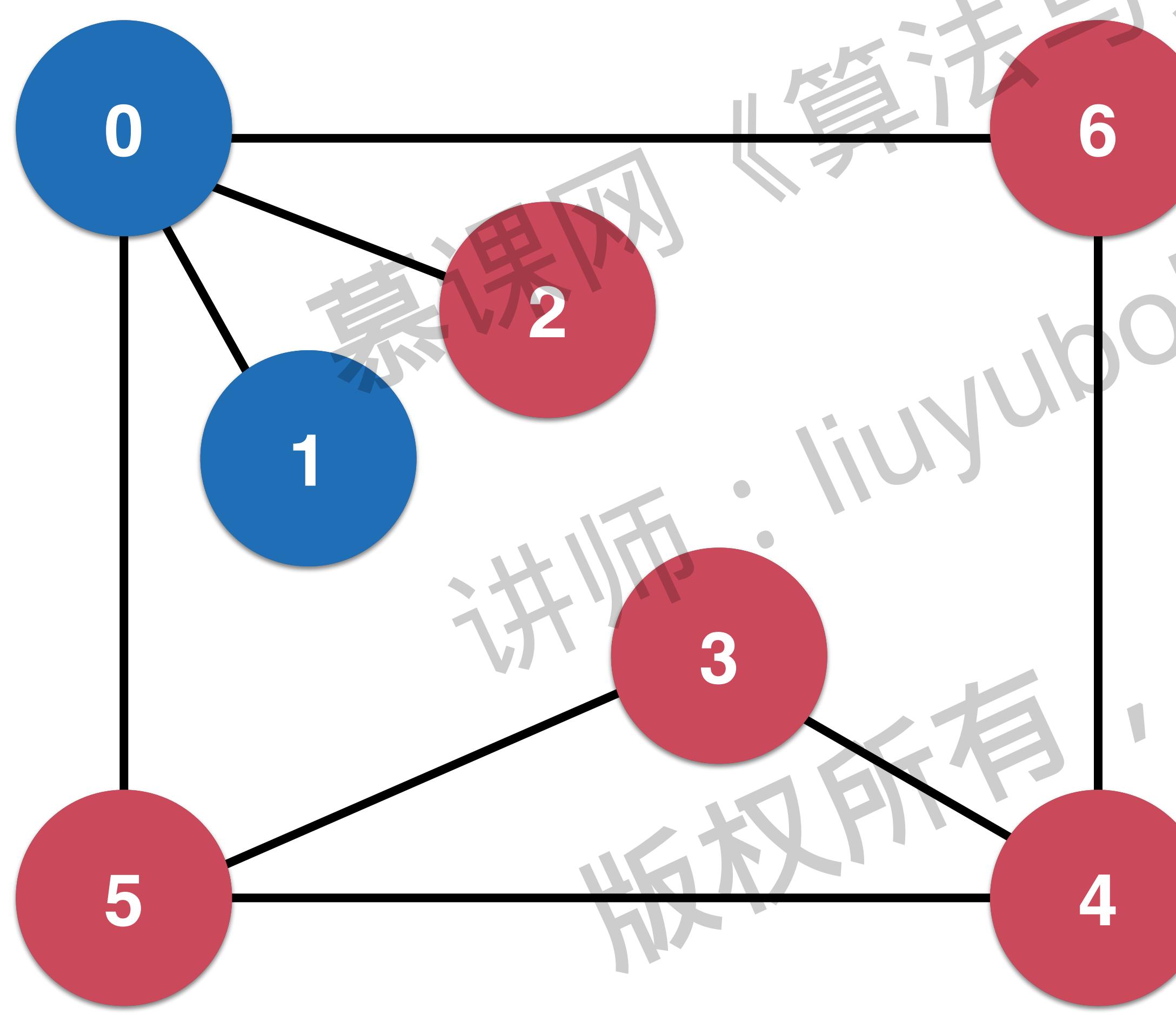
广度优先遍历



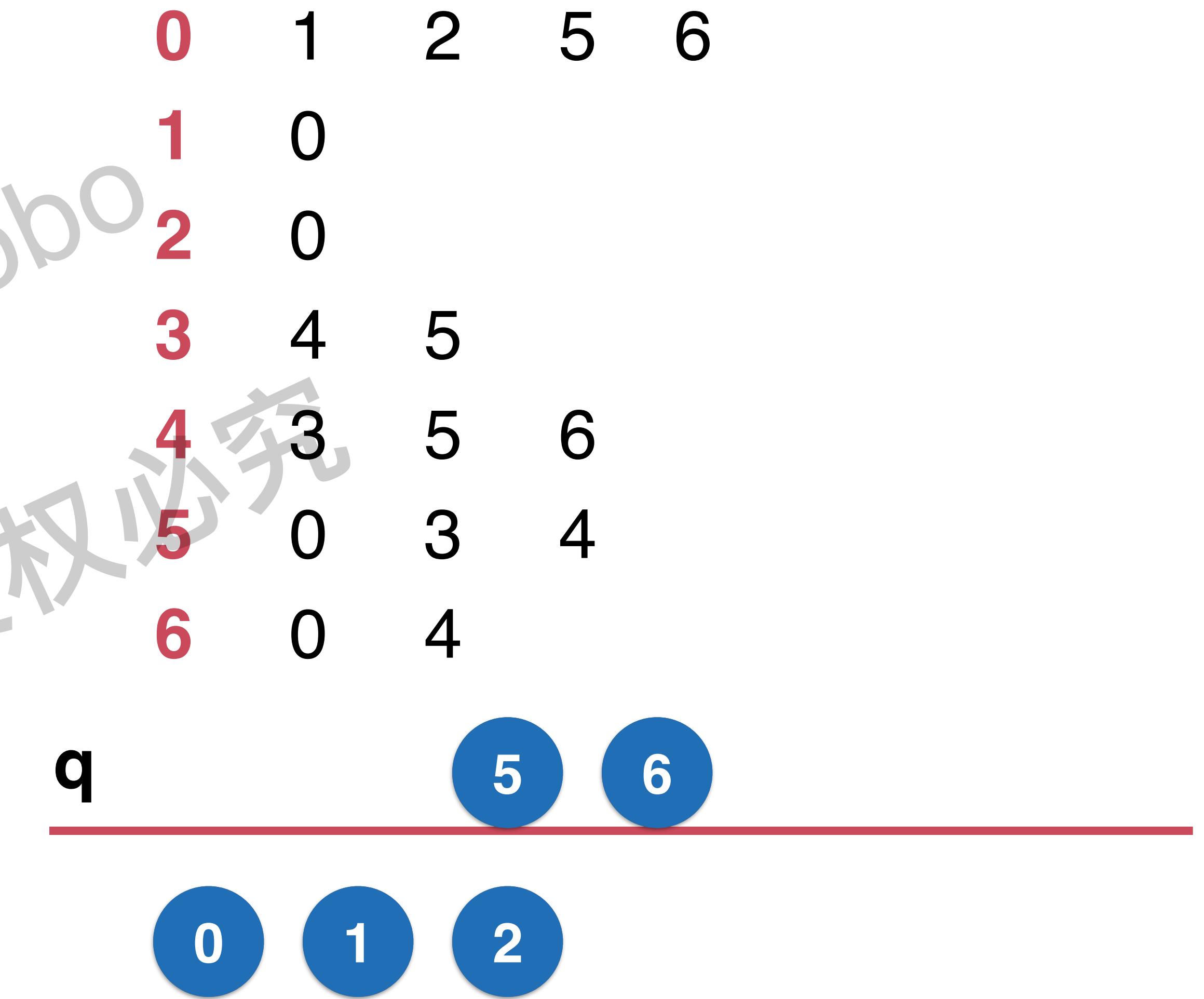
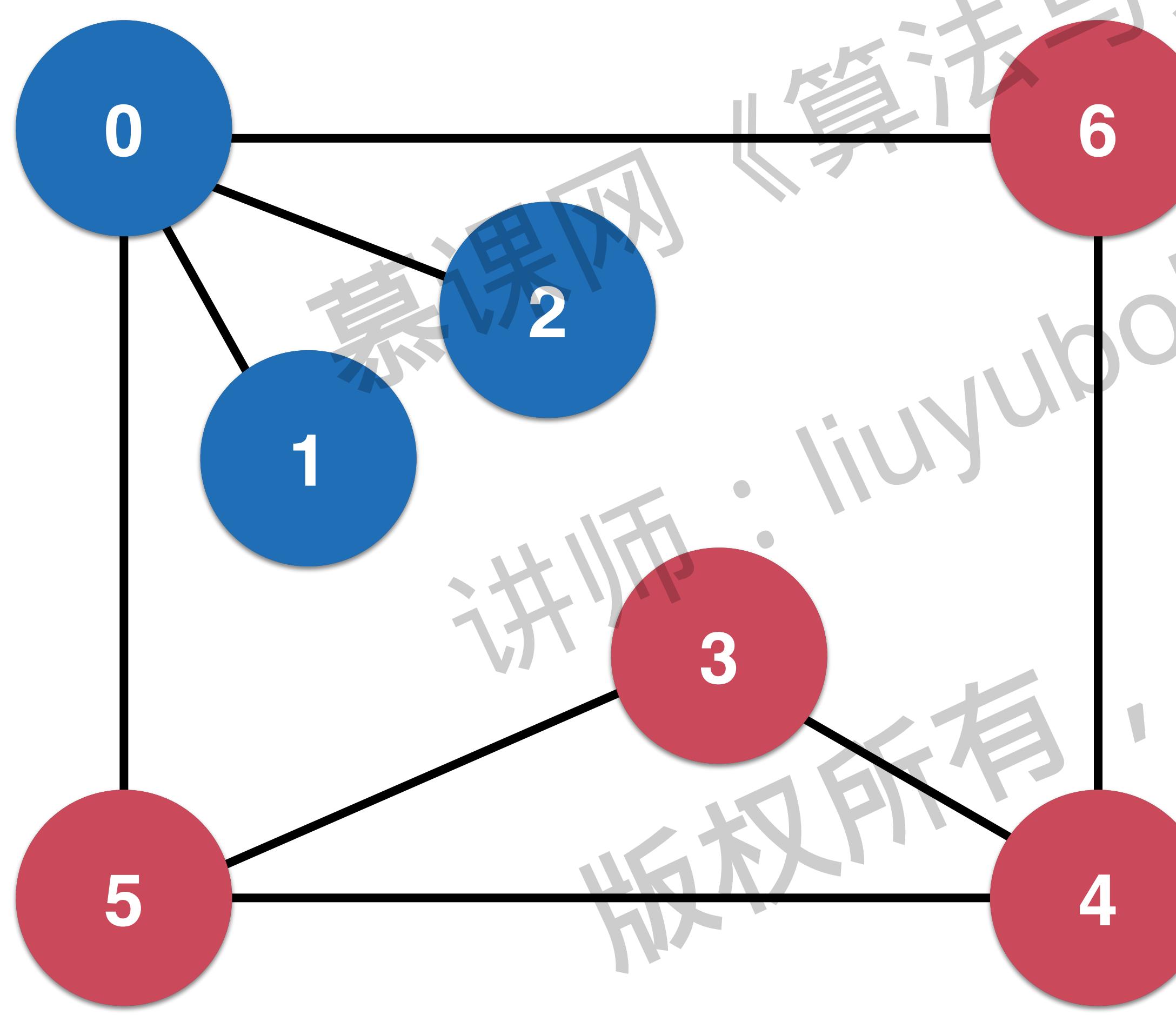
广度优先遍历



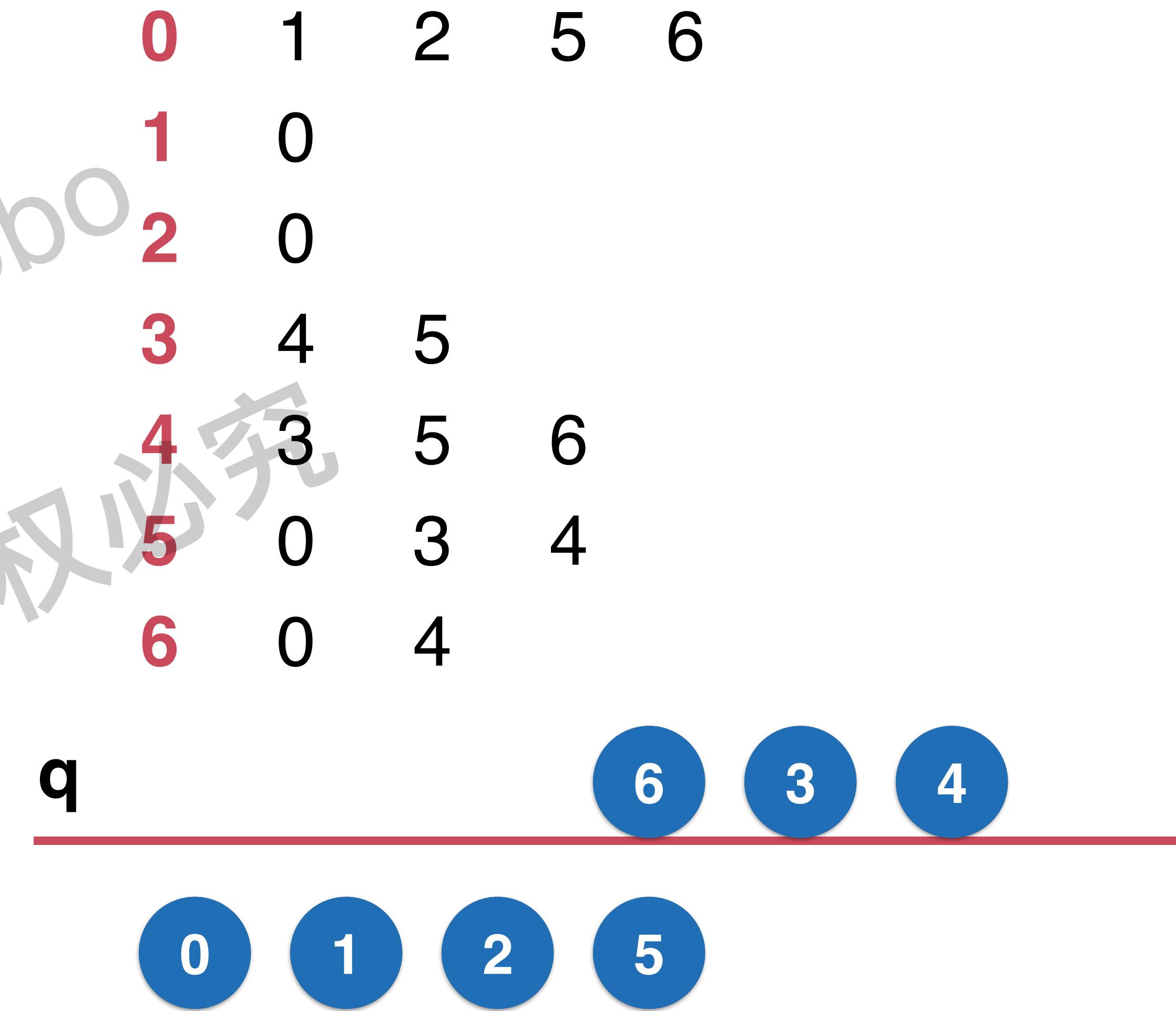
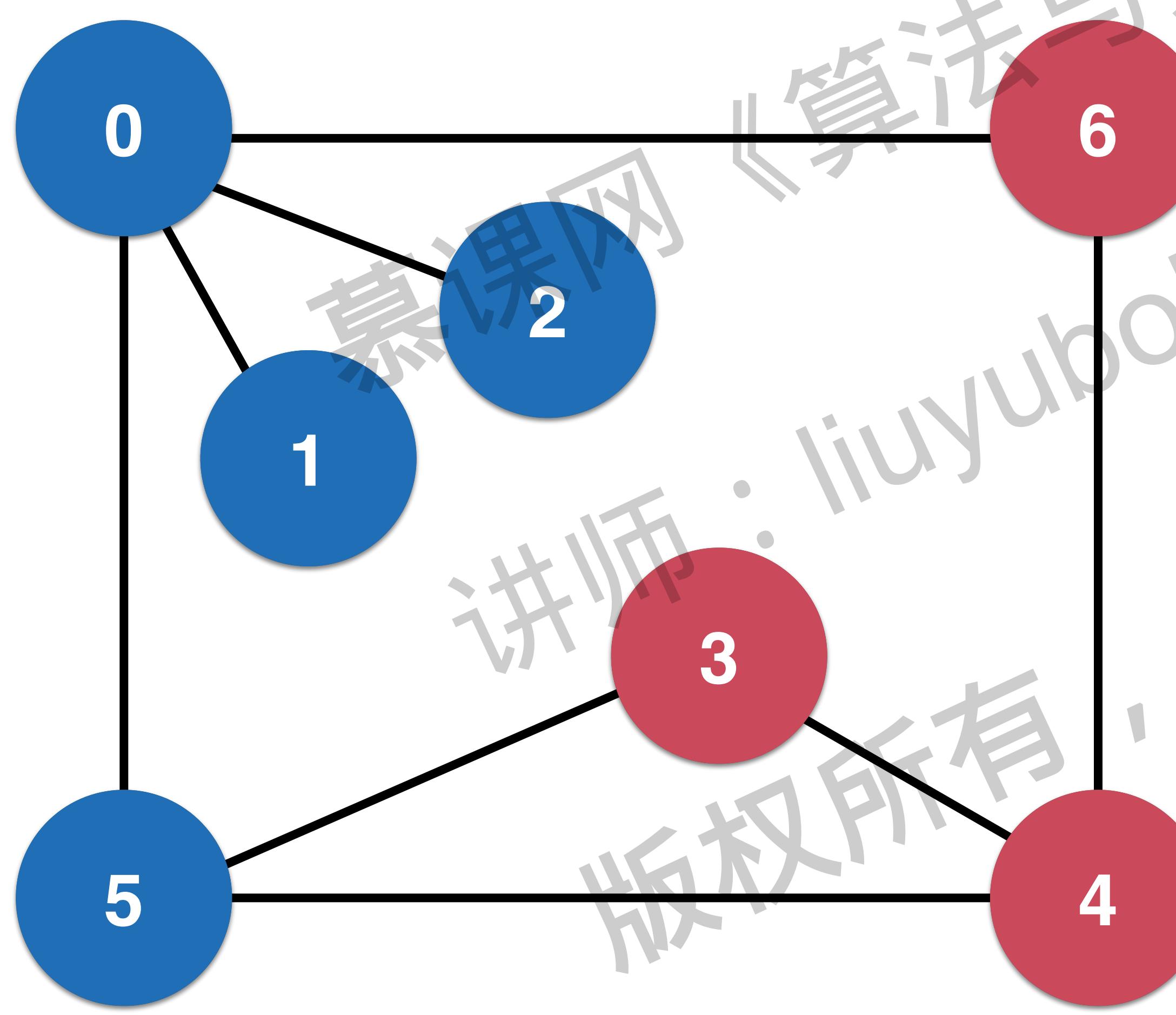
广度优先遍历



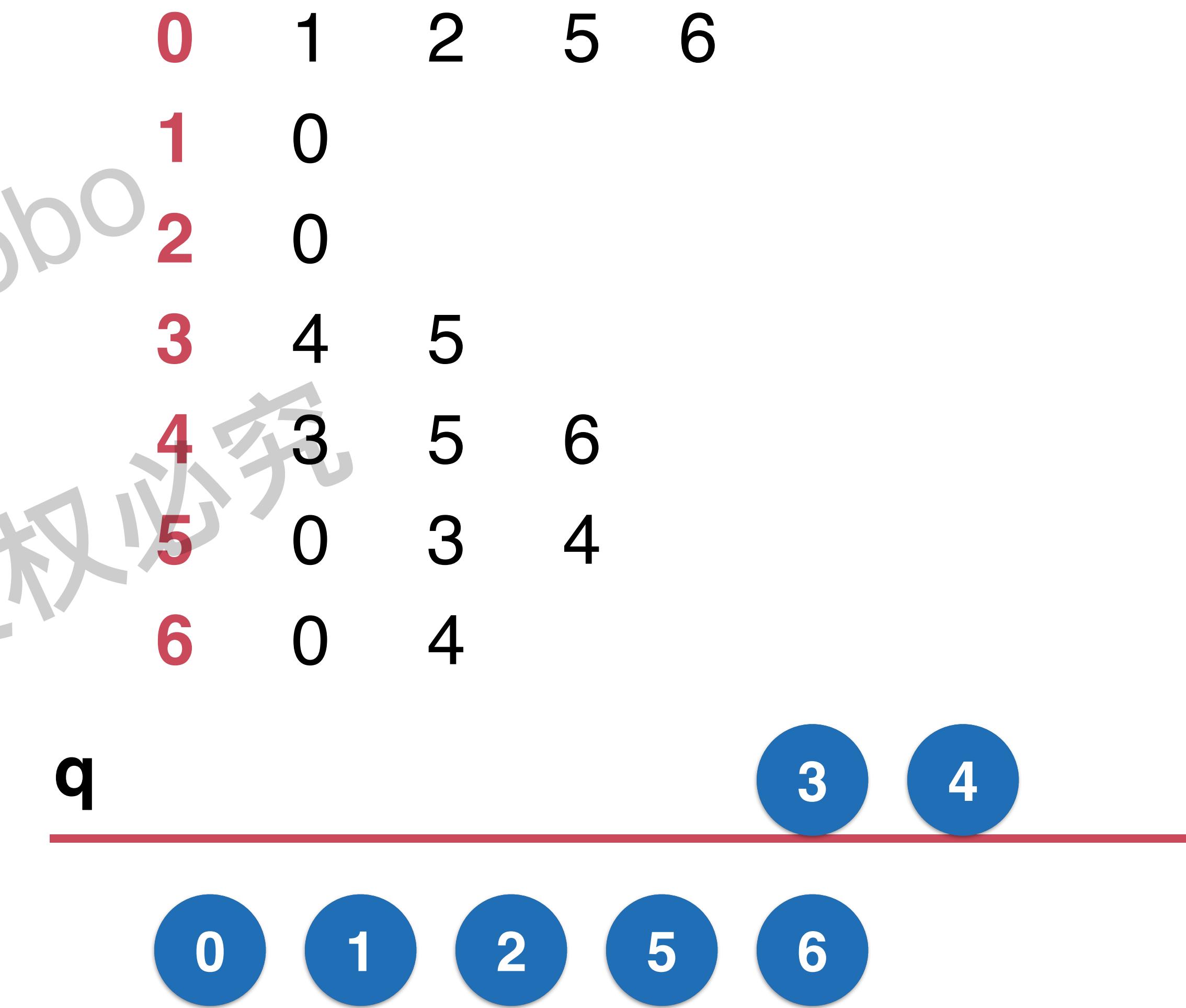
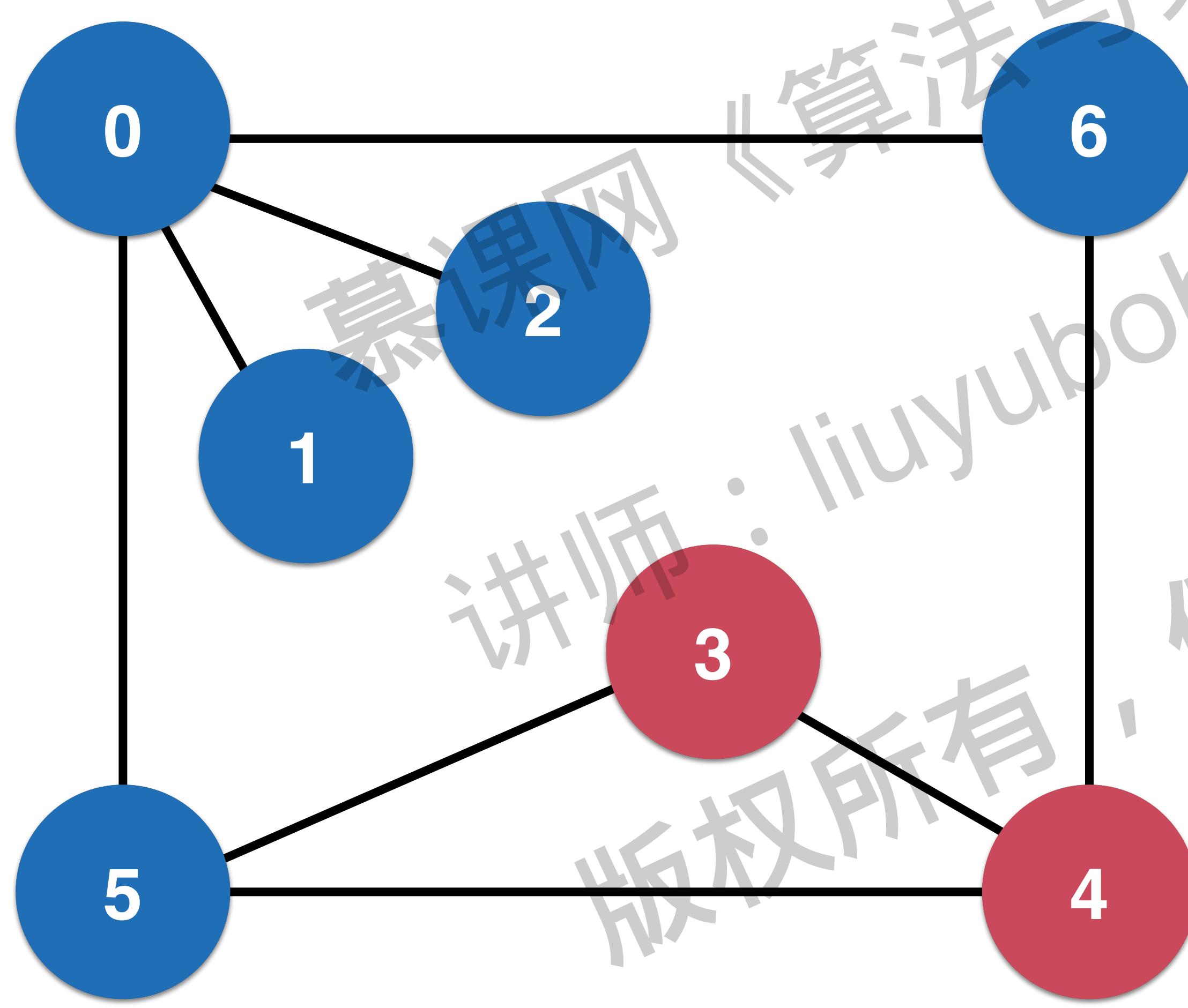
广度优先遍历



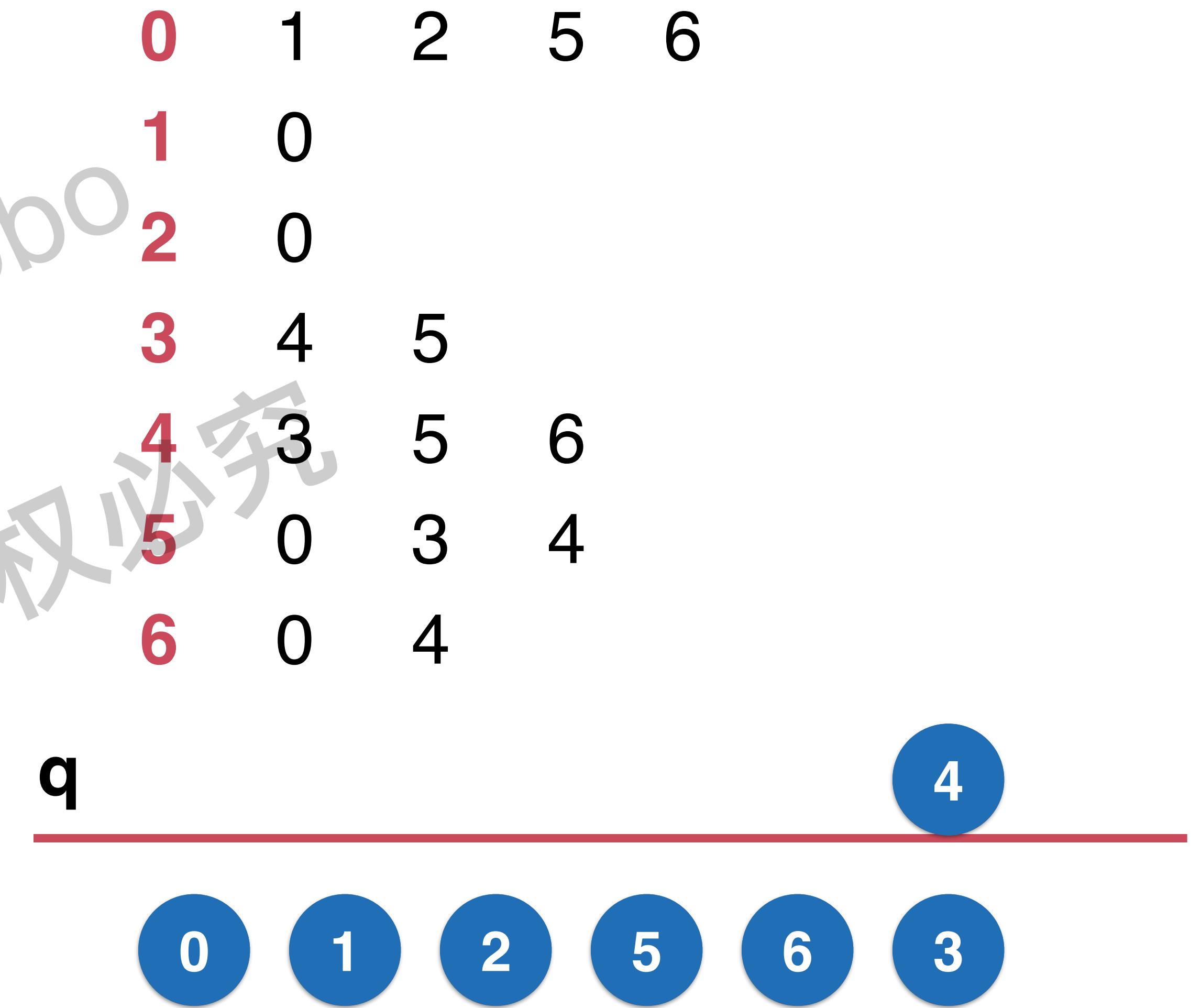
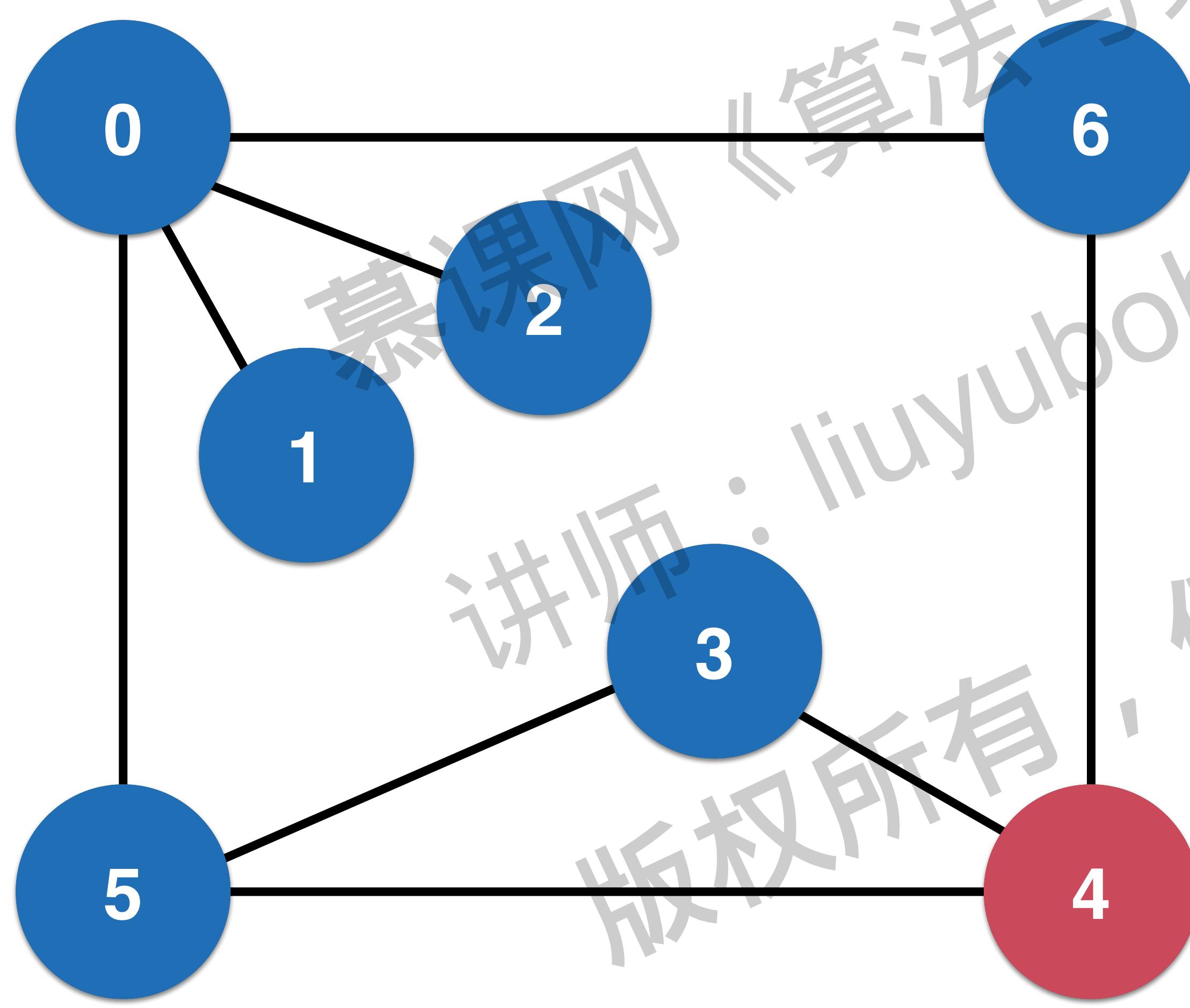
广度优先遍历



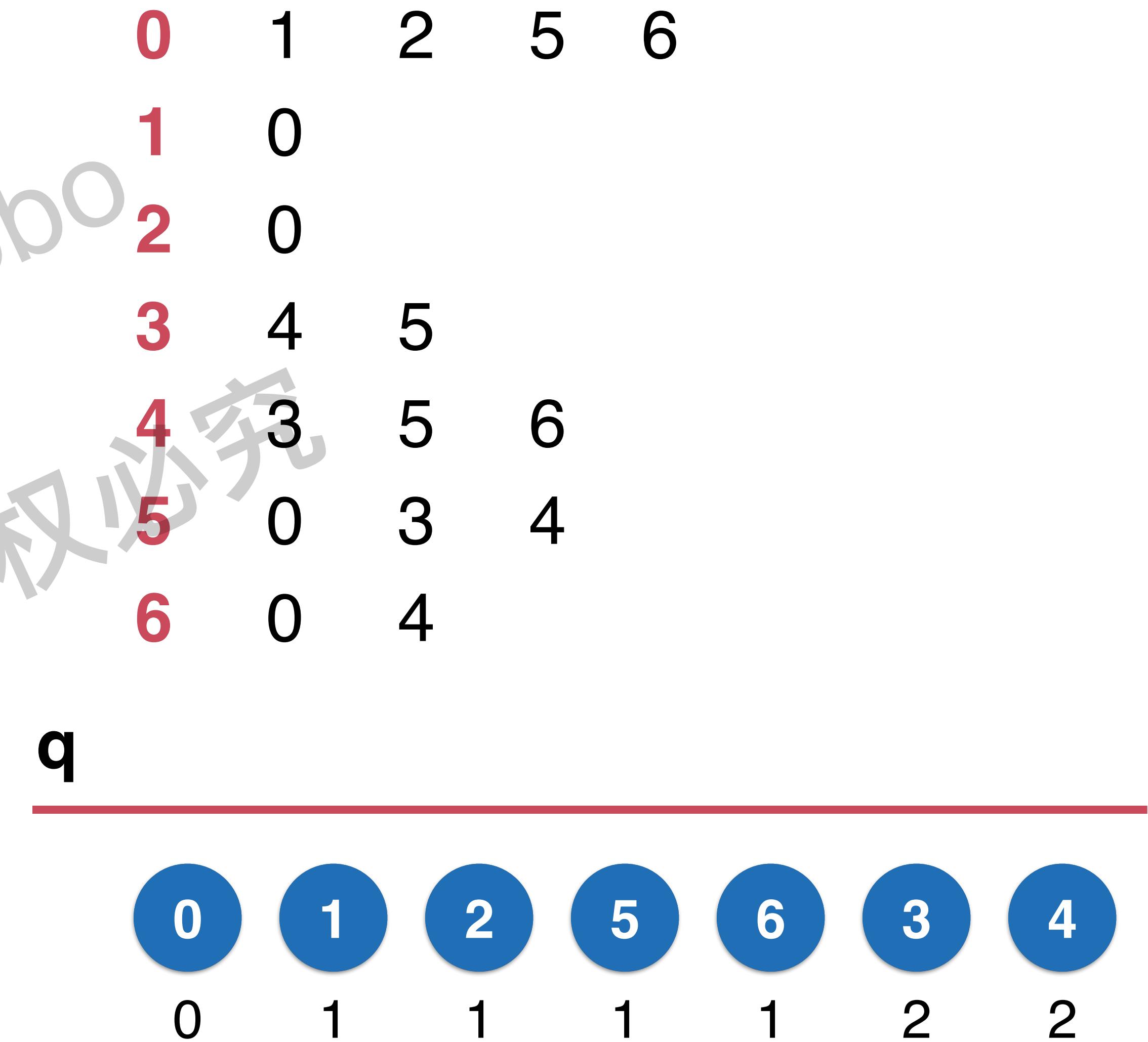
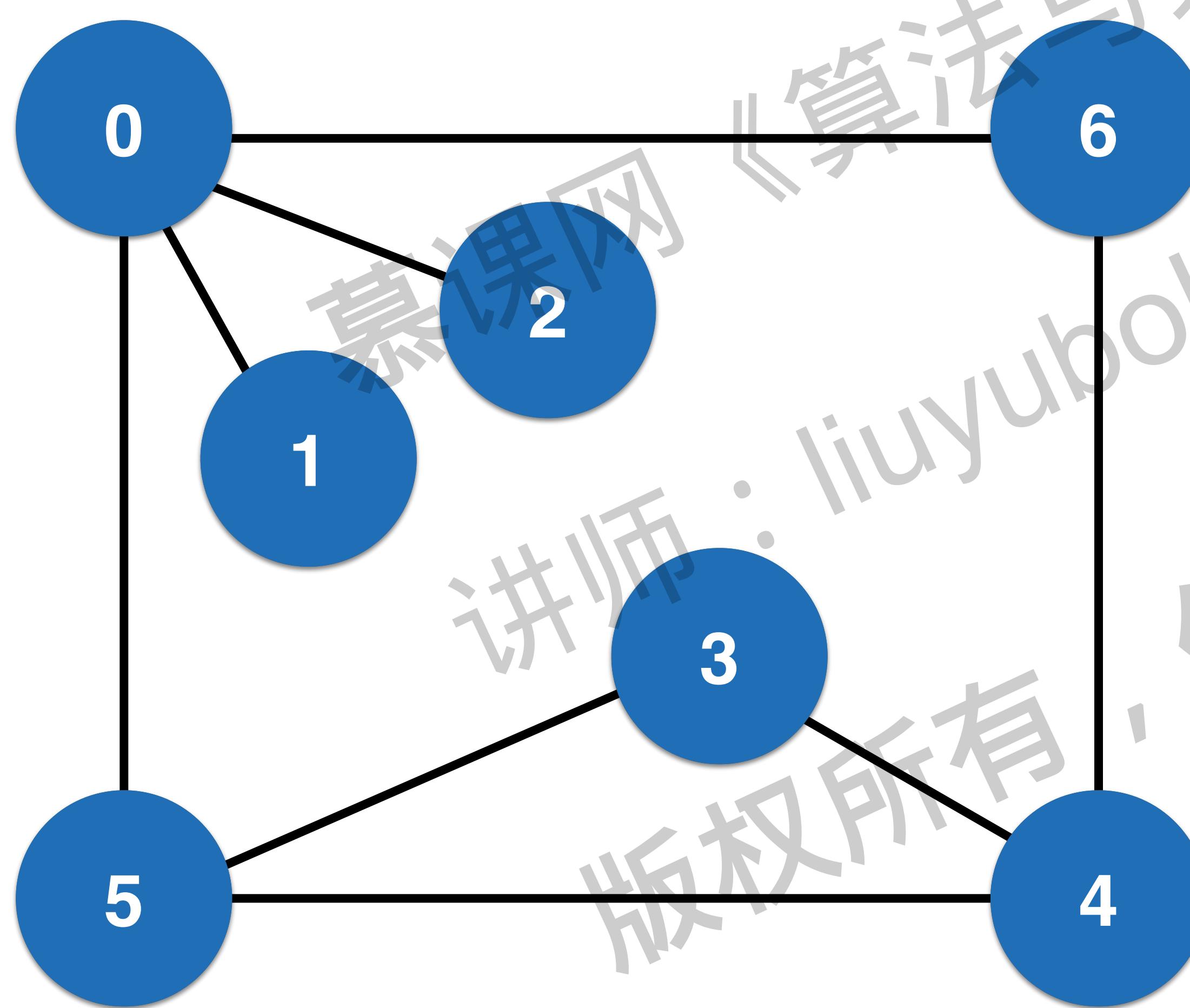
广度优先遍历



广度优先遍历



广度优先遍历



广度优先遍历求出了无权图的最短路径

慕课网《算法与数据结构》

讲师：liuyibobobo

版权所有，侵权必究

操作：广度优先遍历和无向图的最短路径

慕课网《算法与数据结构》

讲师：liuyanbobo

版权所有，侵权必究

图的广度优先遍历-复杂度

稀疏图 (邻接表) : $O(V + E)$

稠密图 (邻接矩阵) : $O(V^2)$

更多无权图算法

慕课网《算法与数据结构》

讲师：liuyubo

版权所有，侵权必究

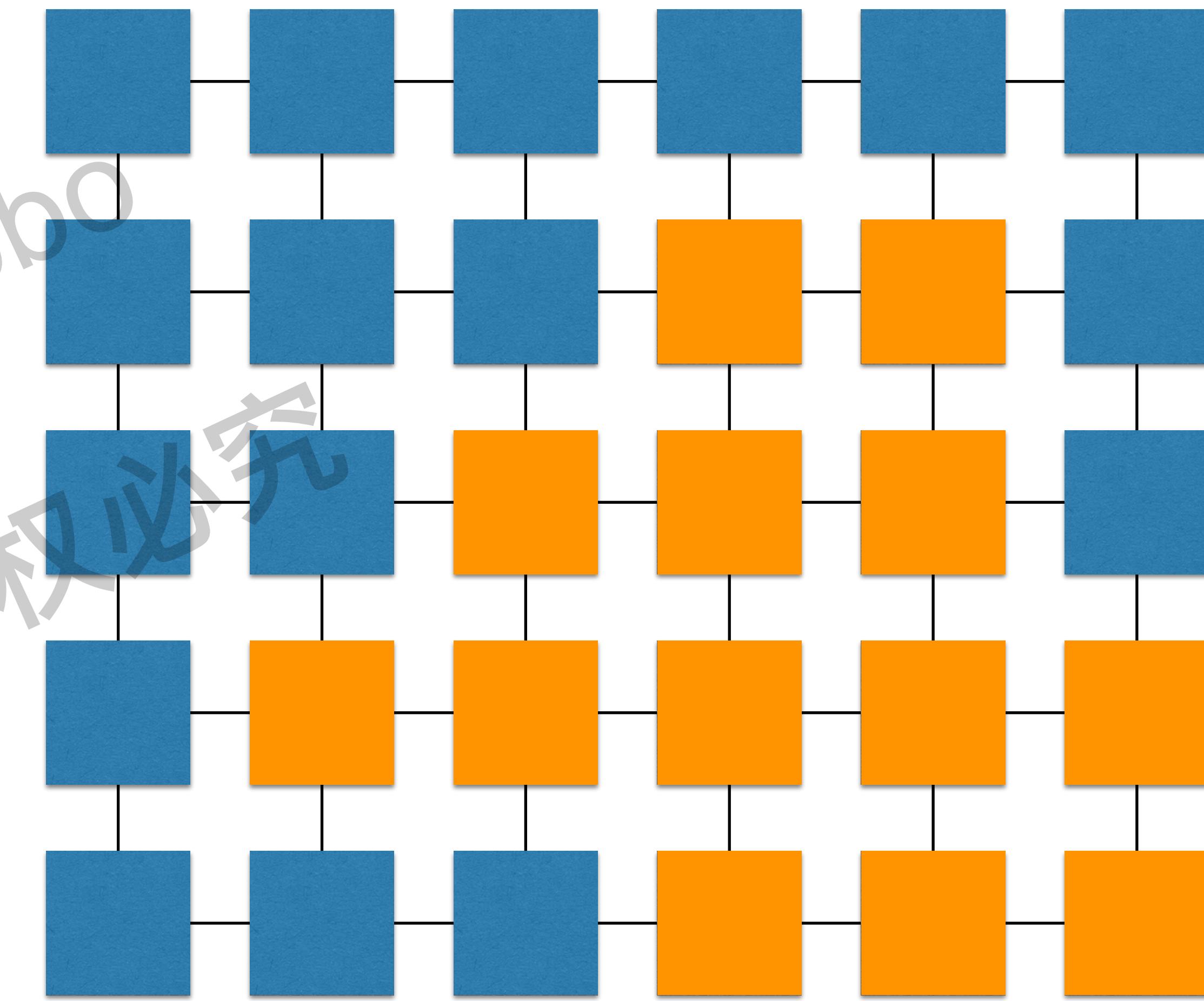
flood fill



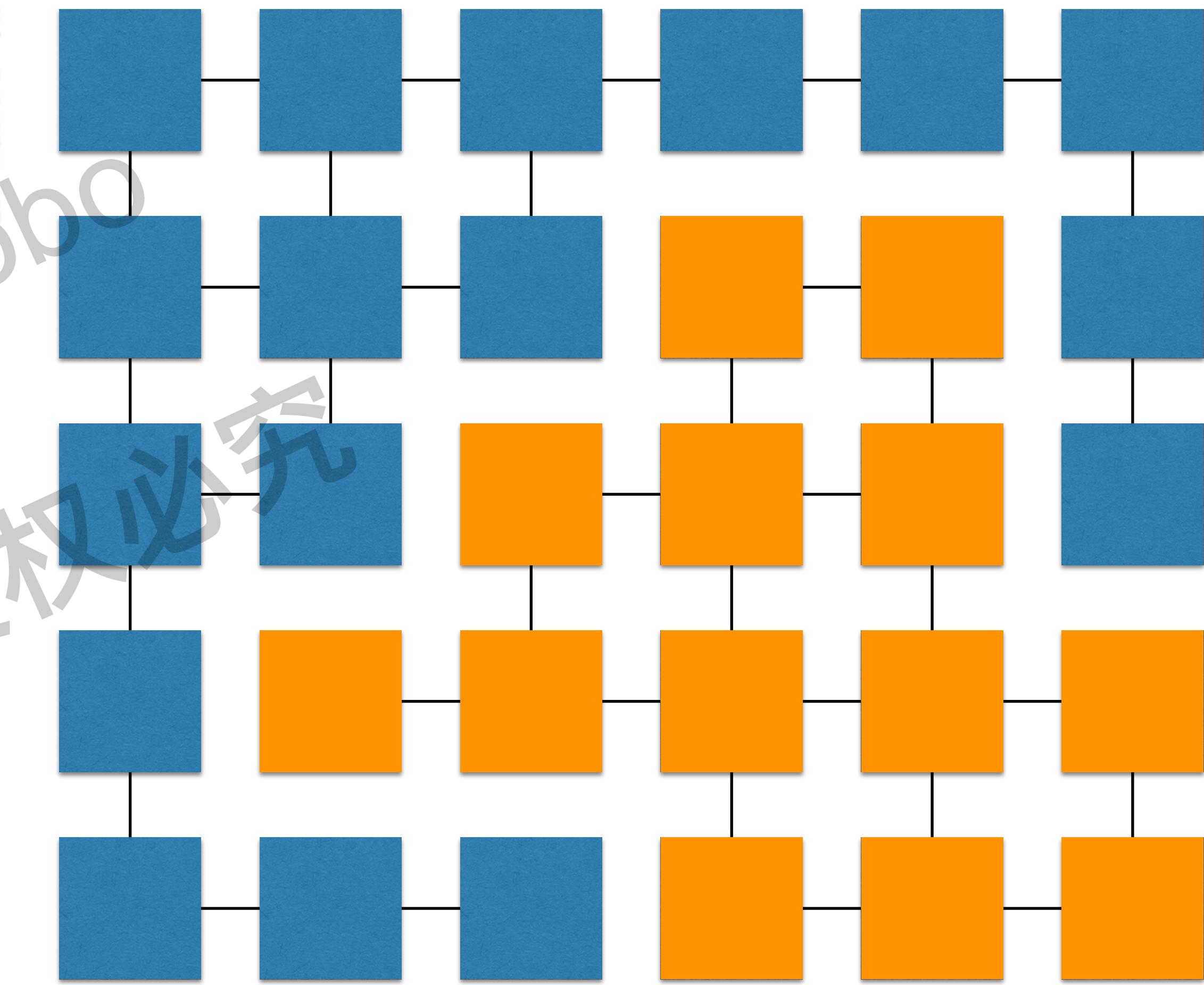
flood fill



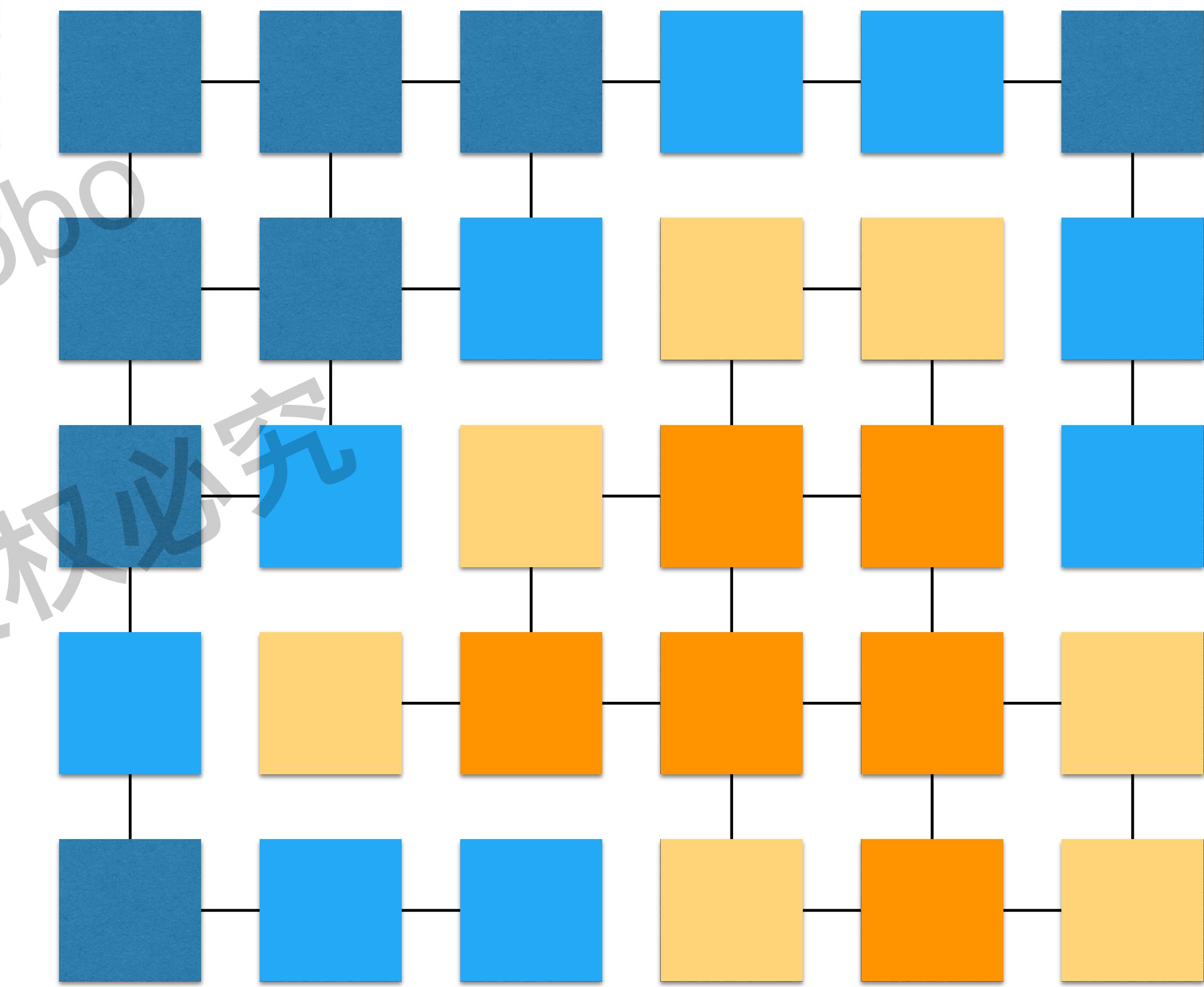
flood fill



flood fill

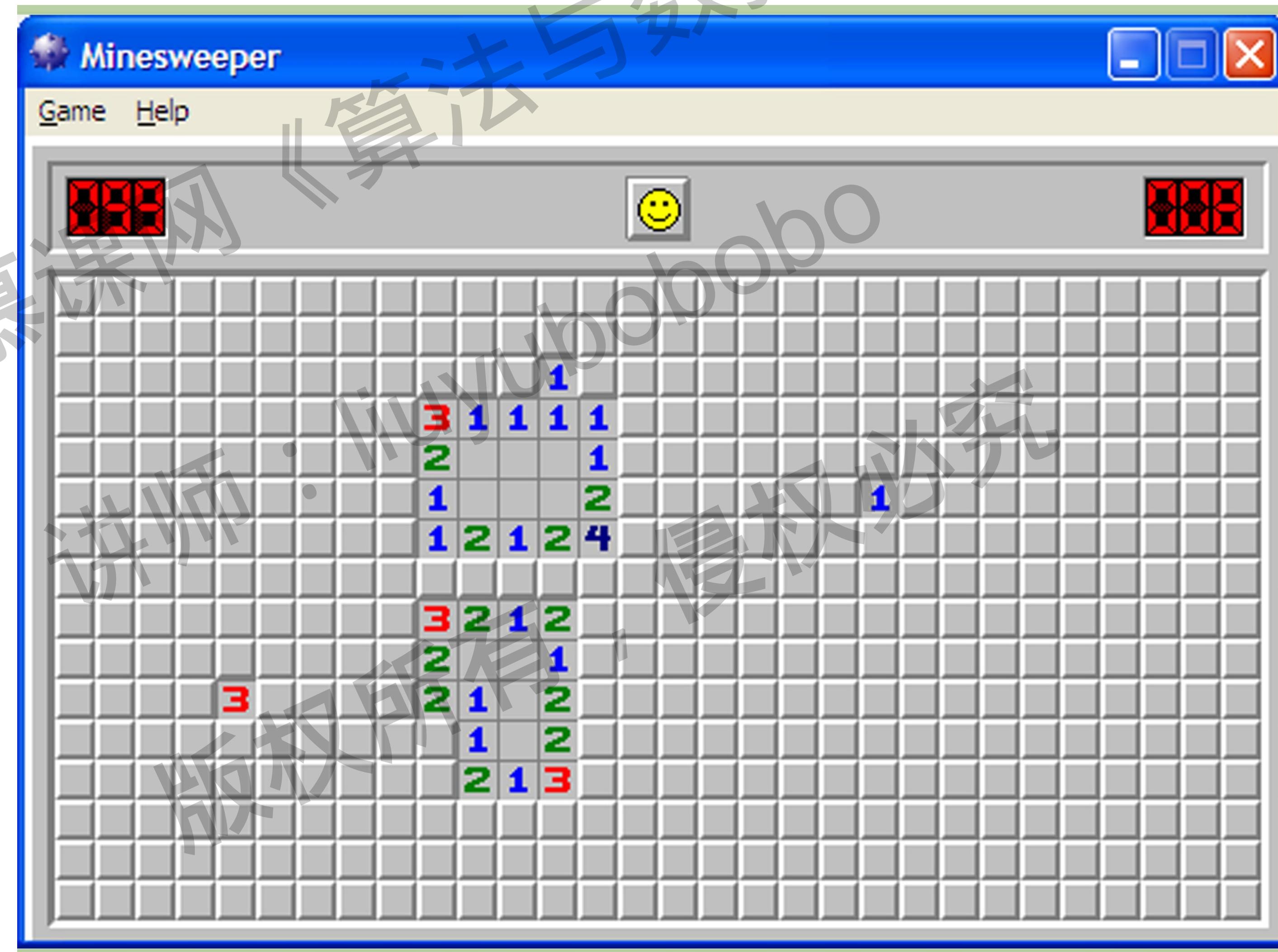


flood fill



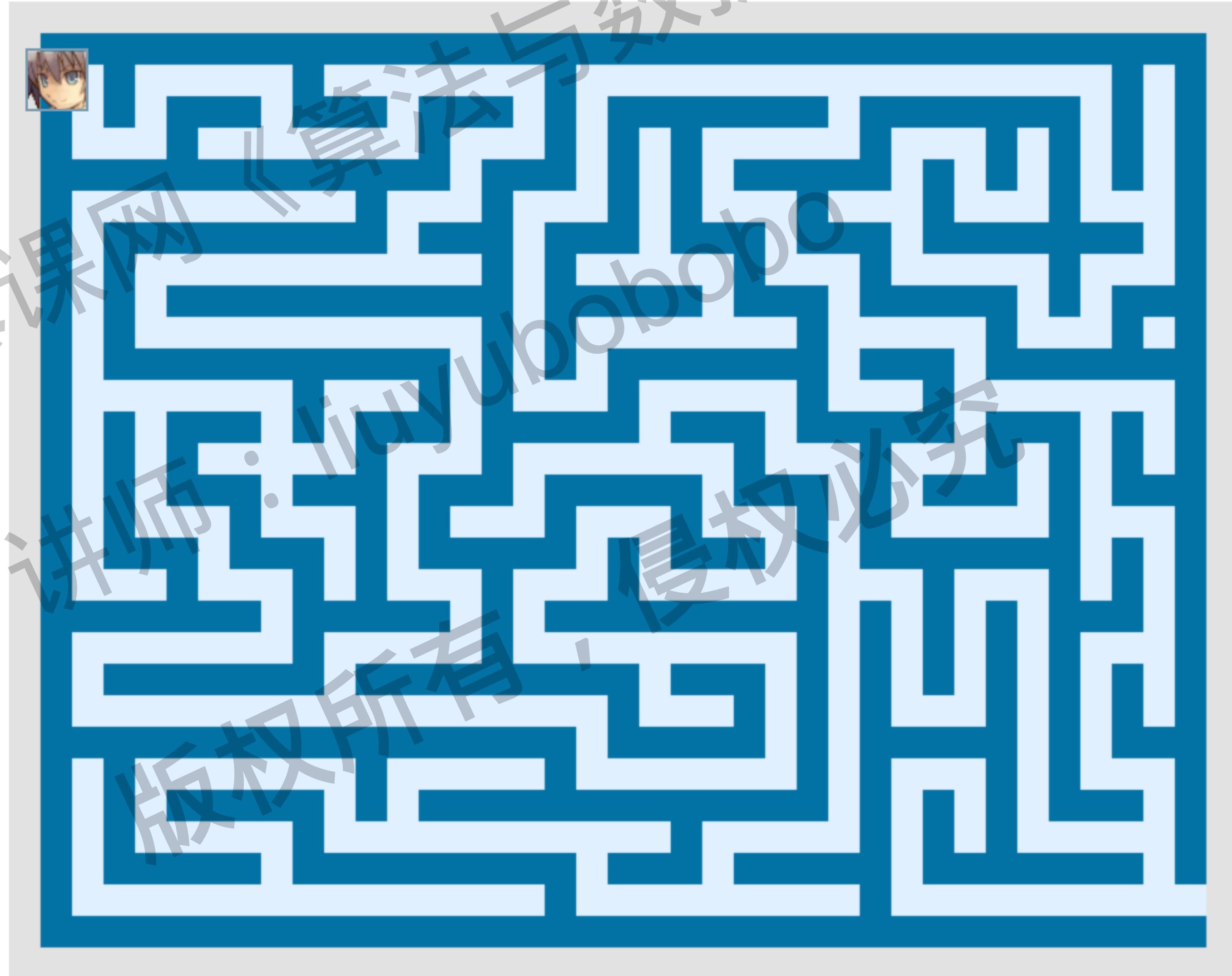
扫雷

扫雷 结构



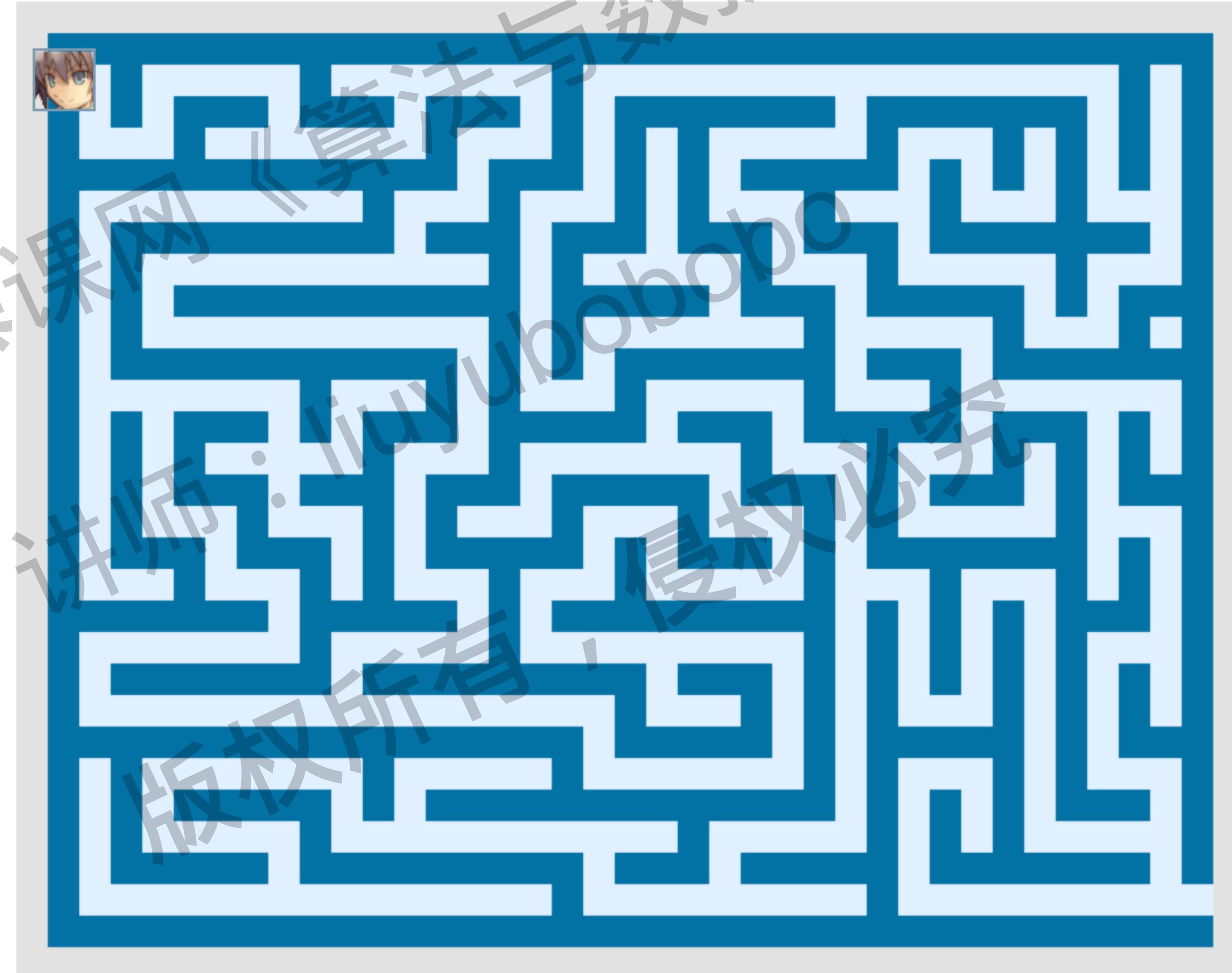
走迷宫

走迷宫结构

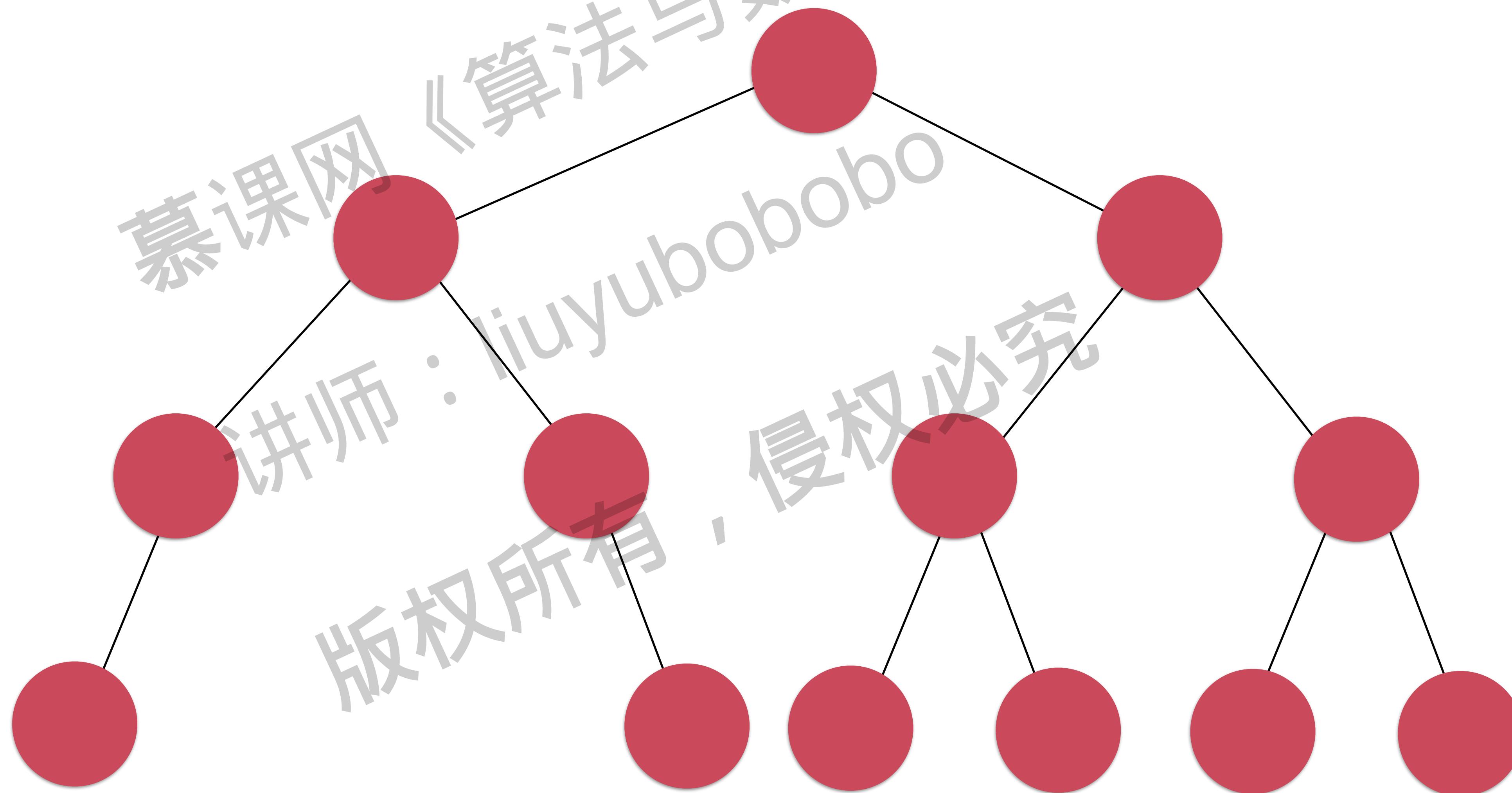


迷宫生成

《迷宫生成》



迷宫的本质是一棵树

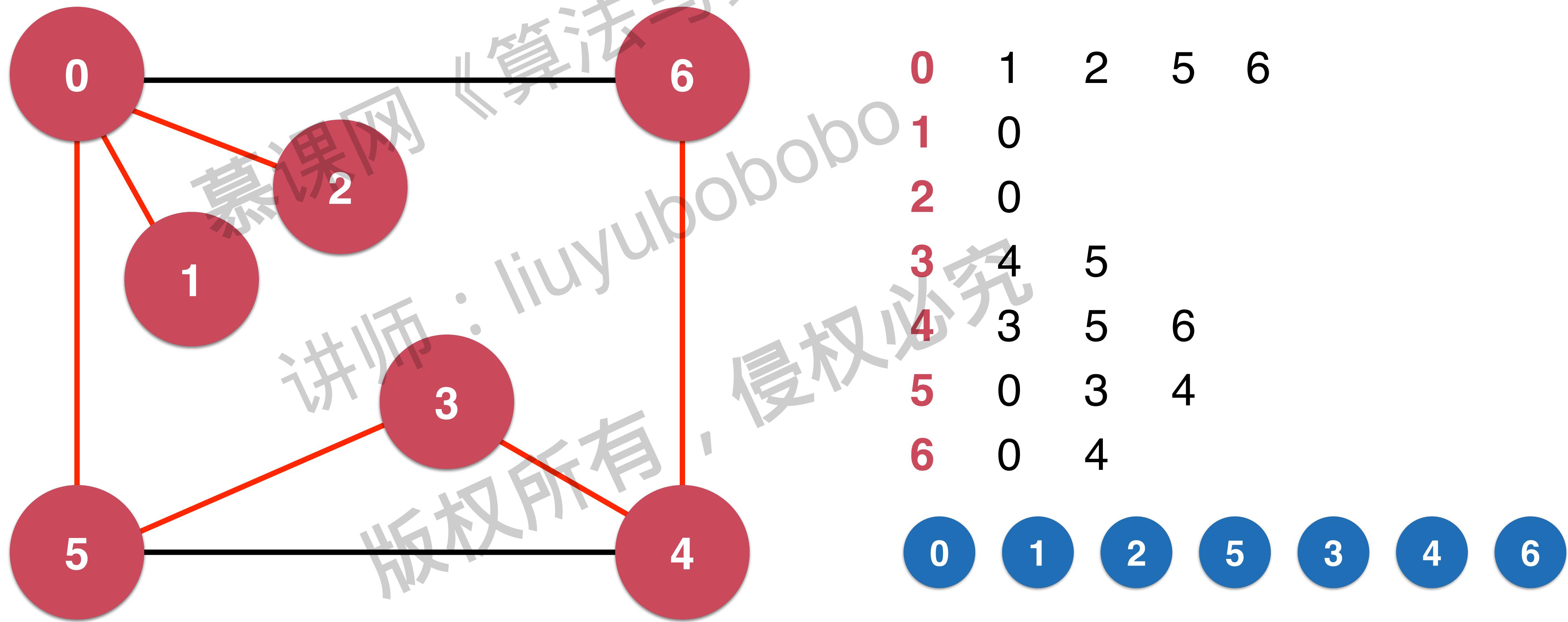


迷宫生成 是一个生成树的过程

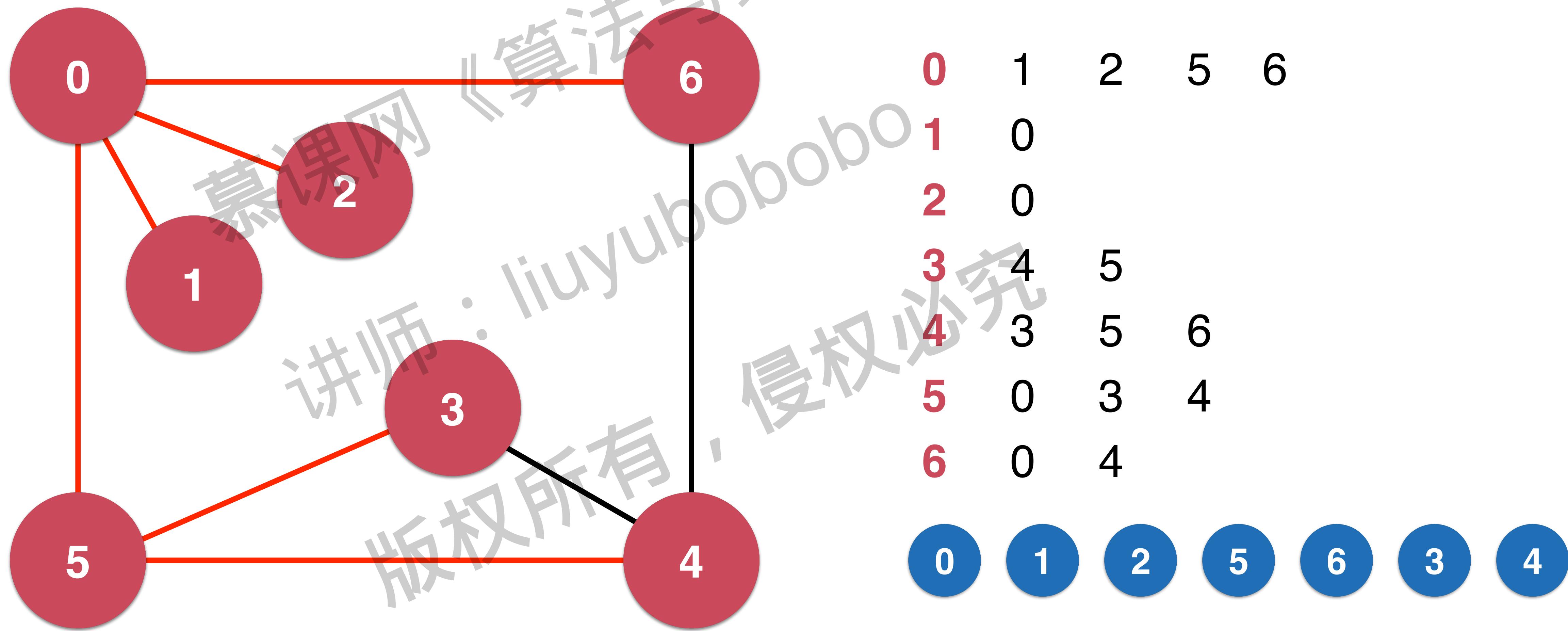
讲师: liuyubooboo
版权所有, 侵权必究

迷宫课网 《算法与数据结构》

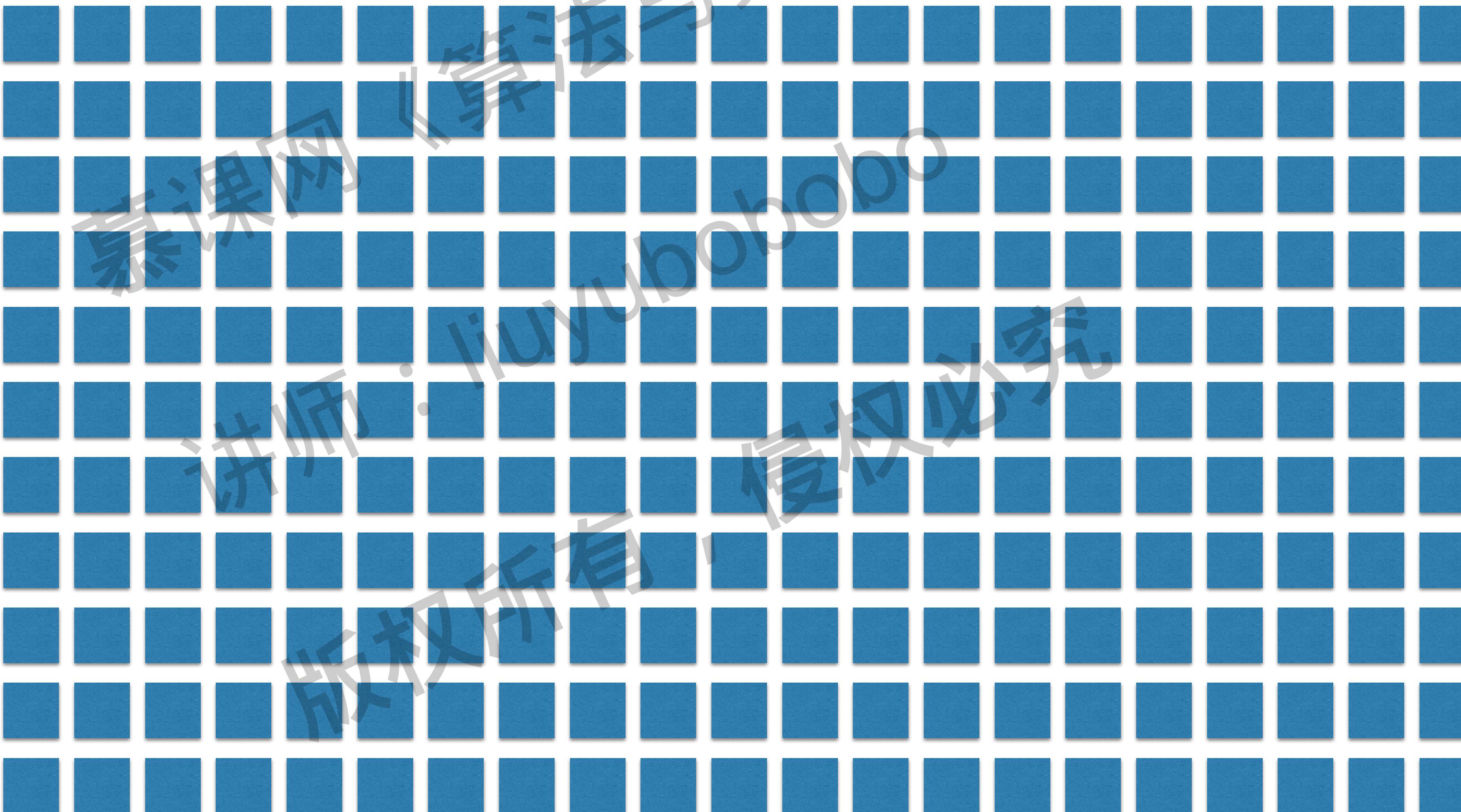
深度优先遍历



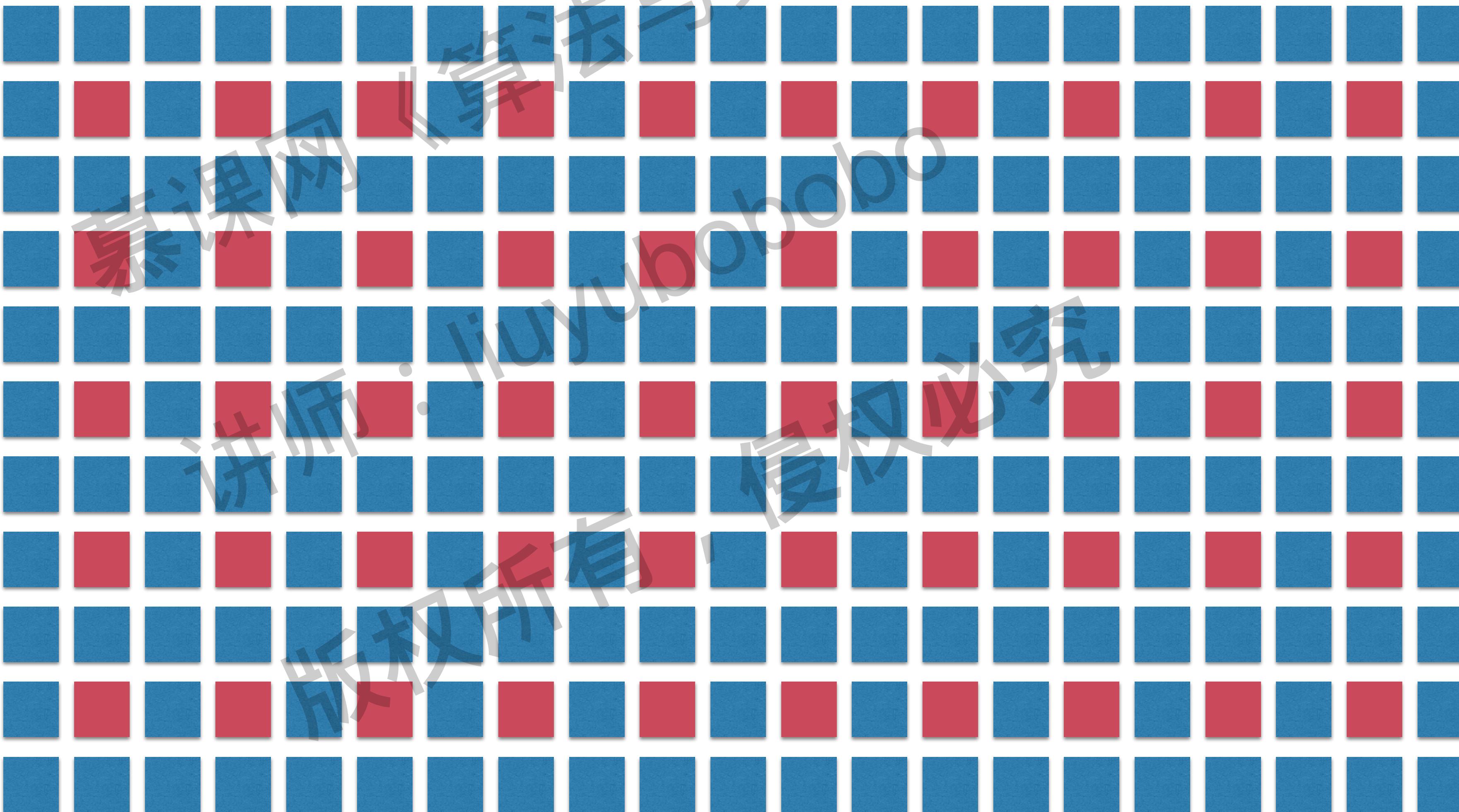
广度优先遍历



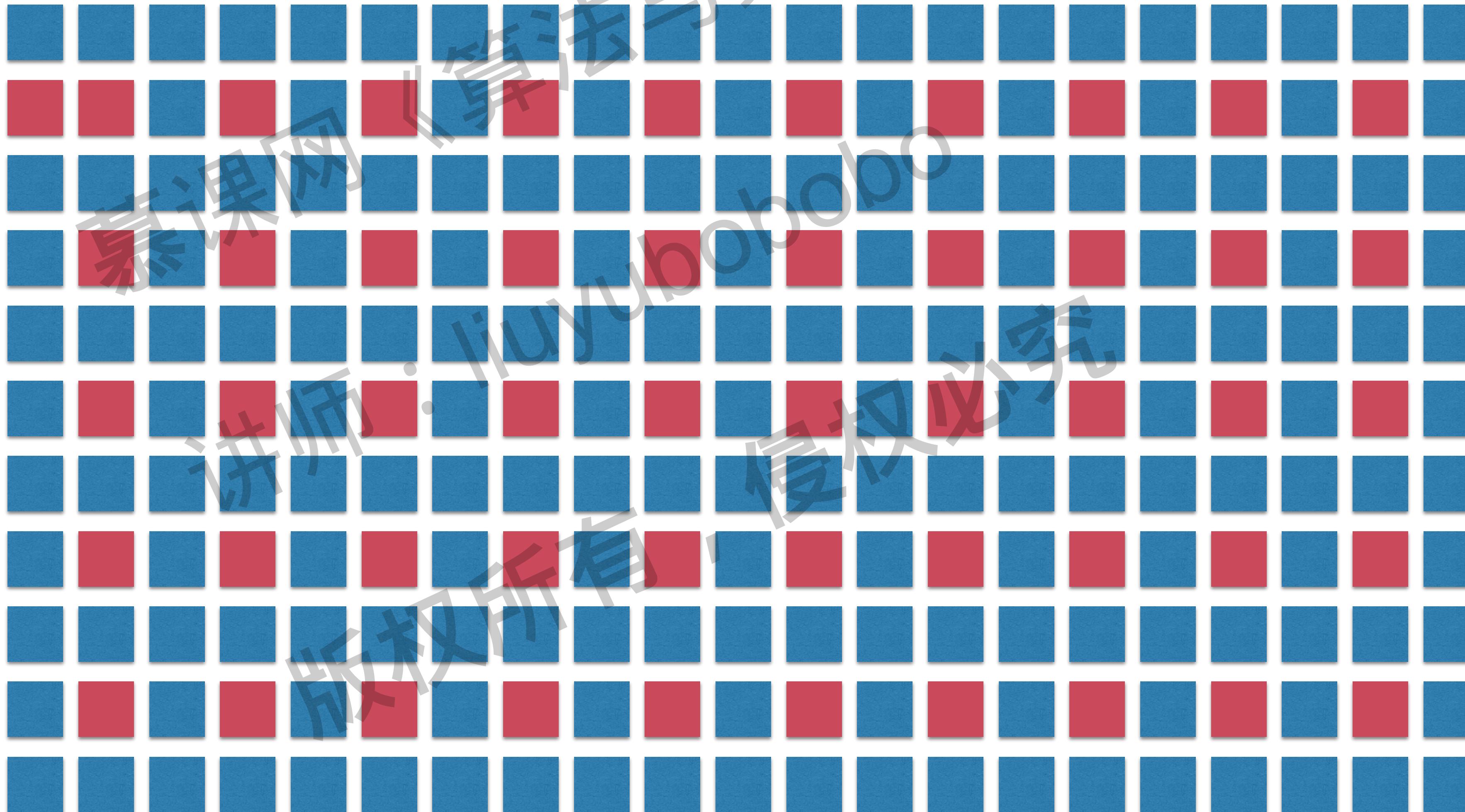
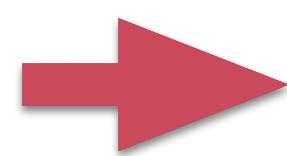
迷宫生成



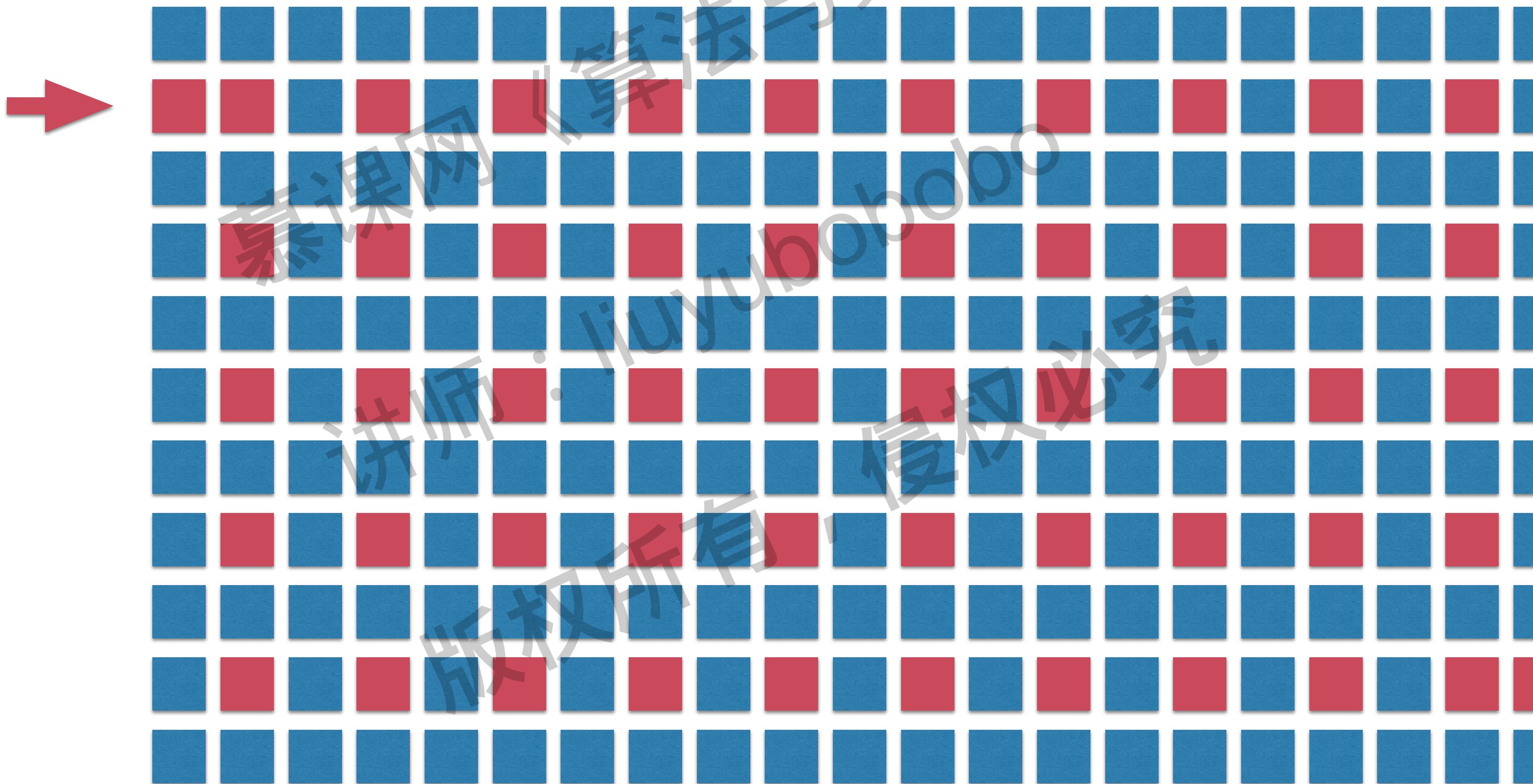
迷宫生成



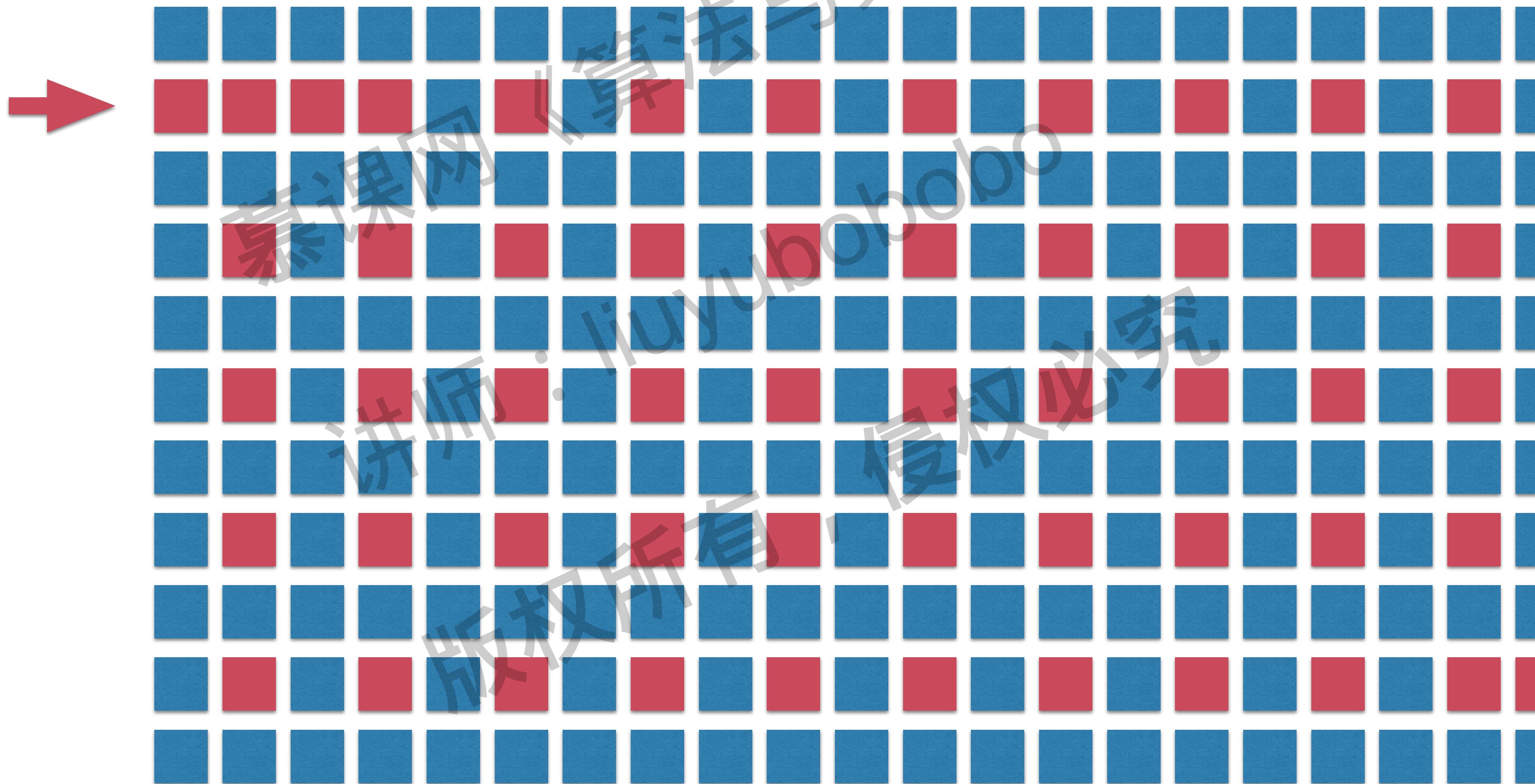
迷宫生成



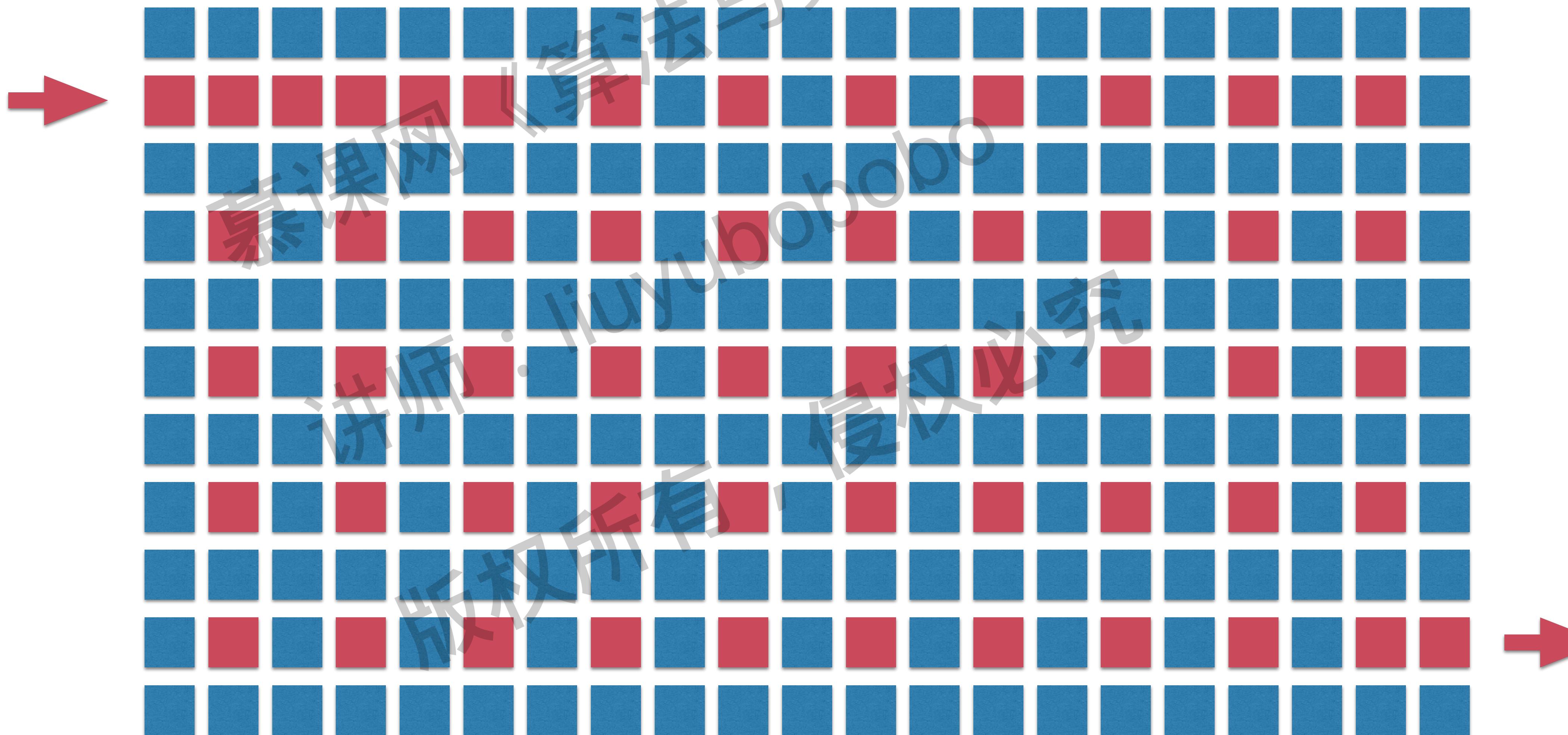
迷宫生成



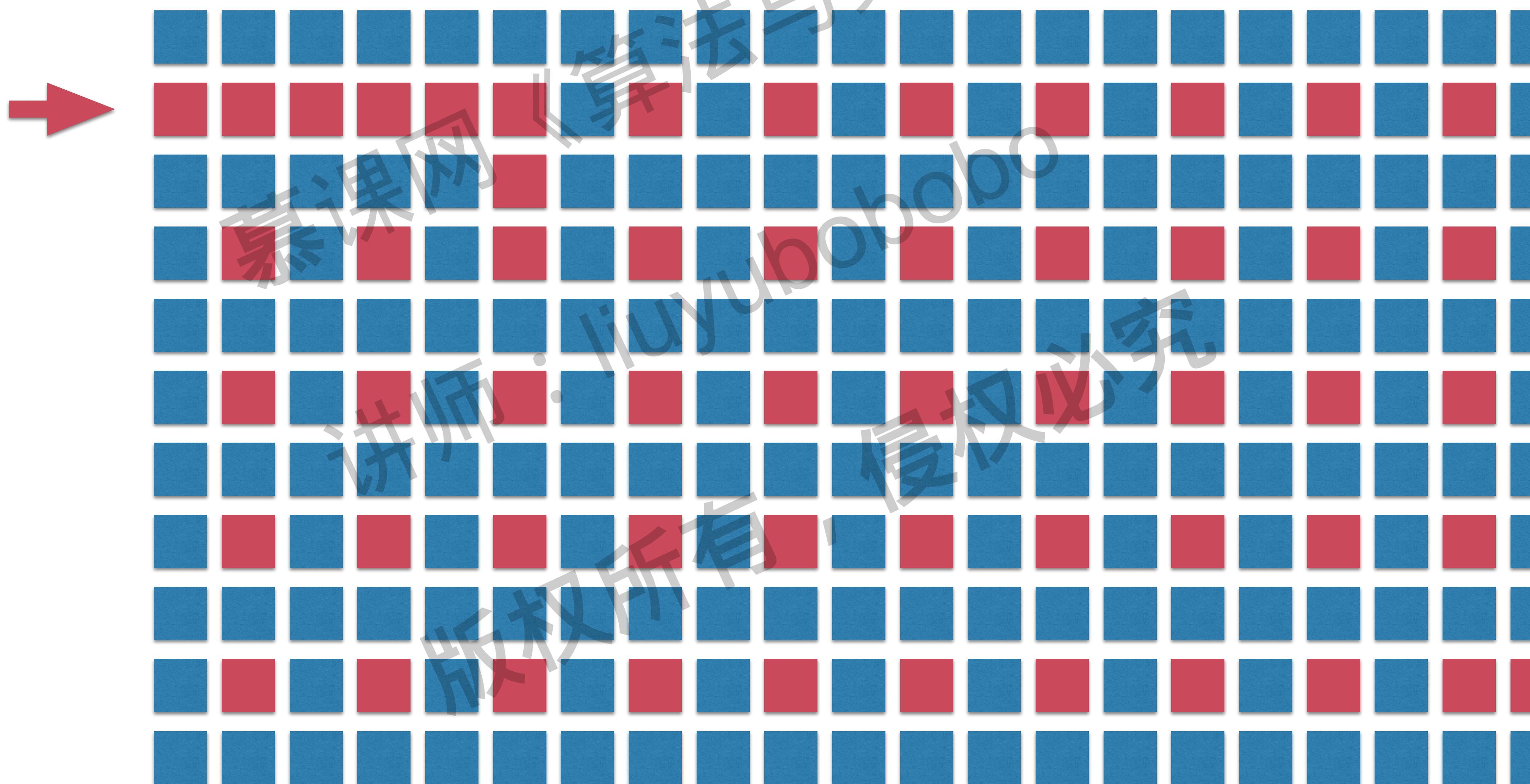
迷宫生成



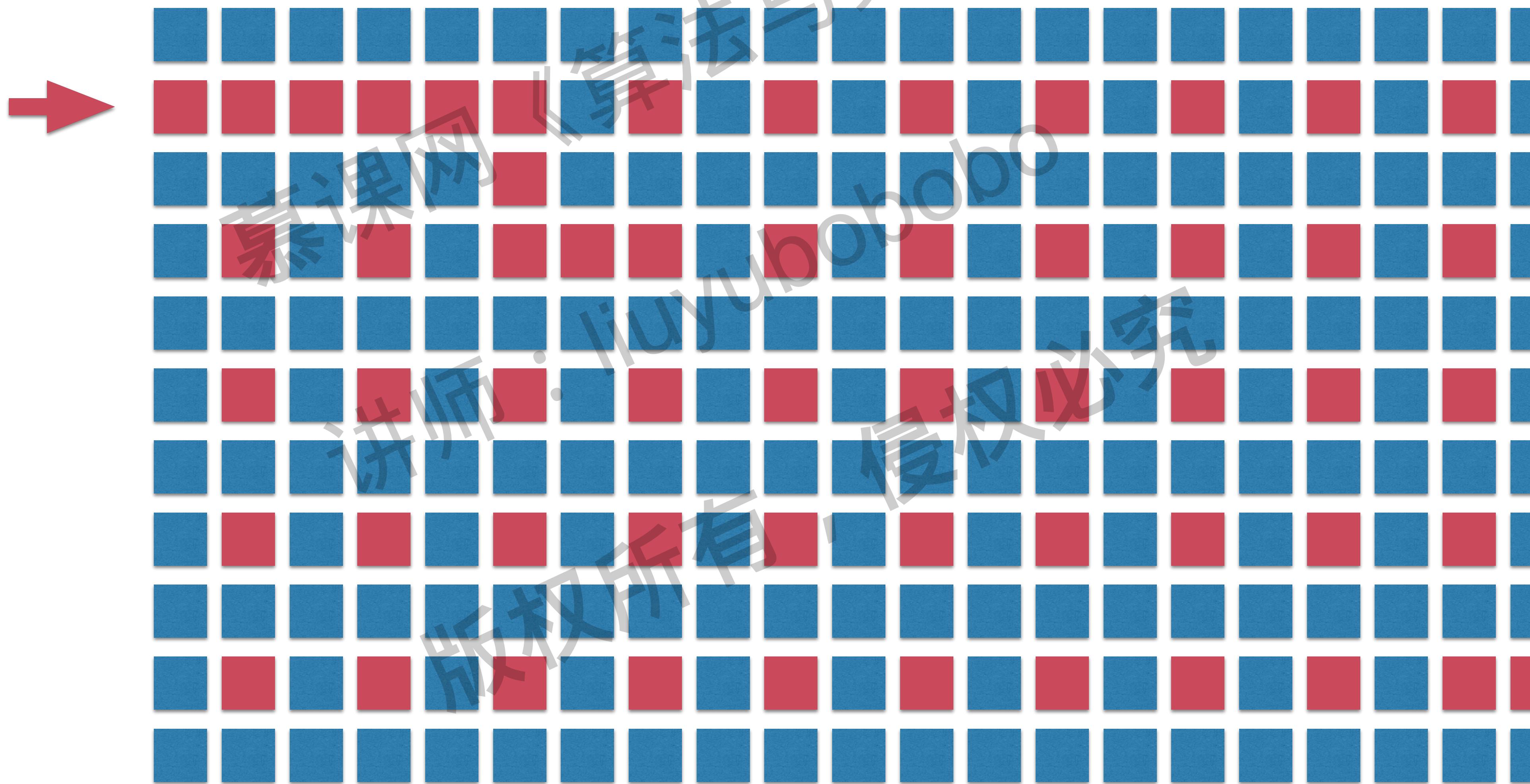
迷宫生成



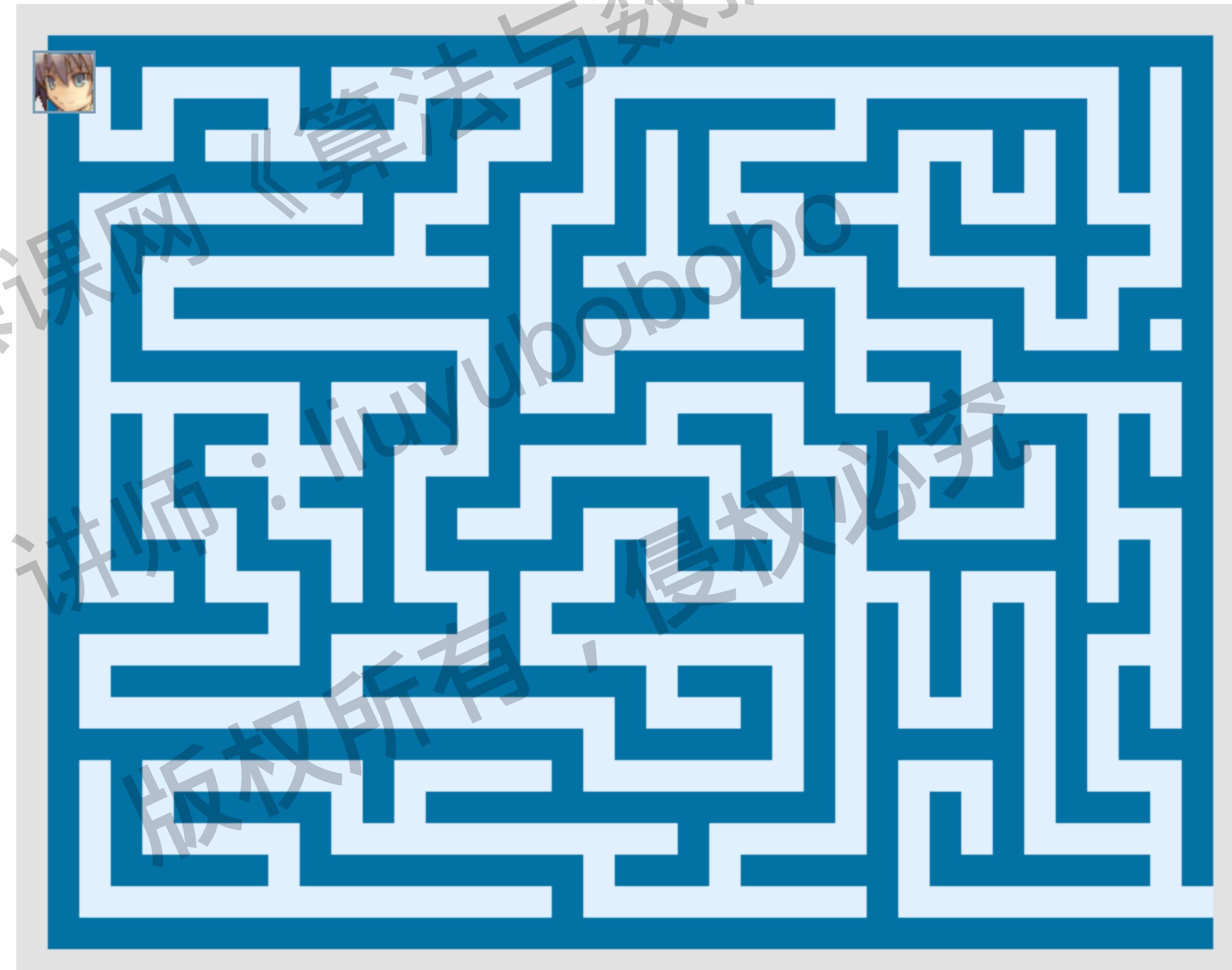
迷宫生成



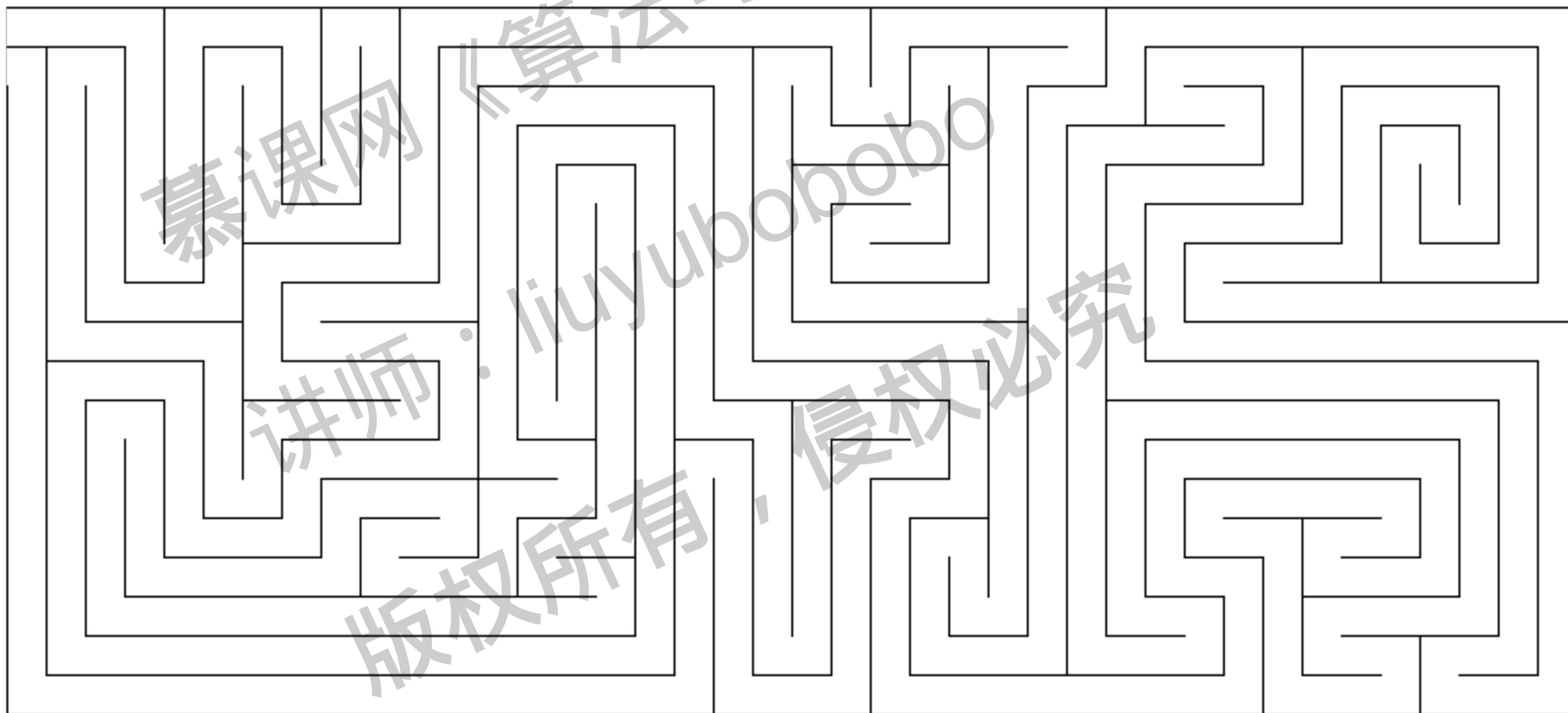
迷宫生成



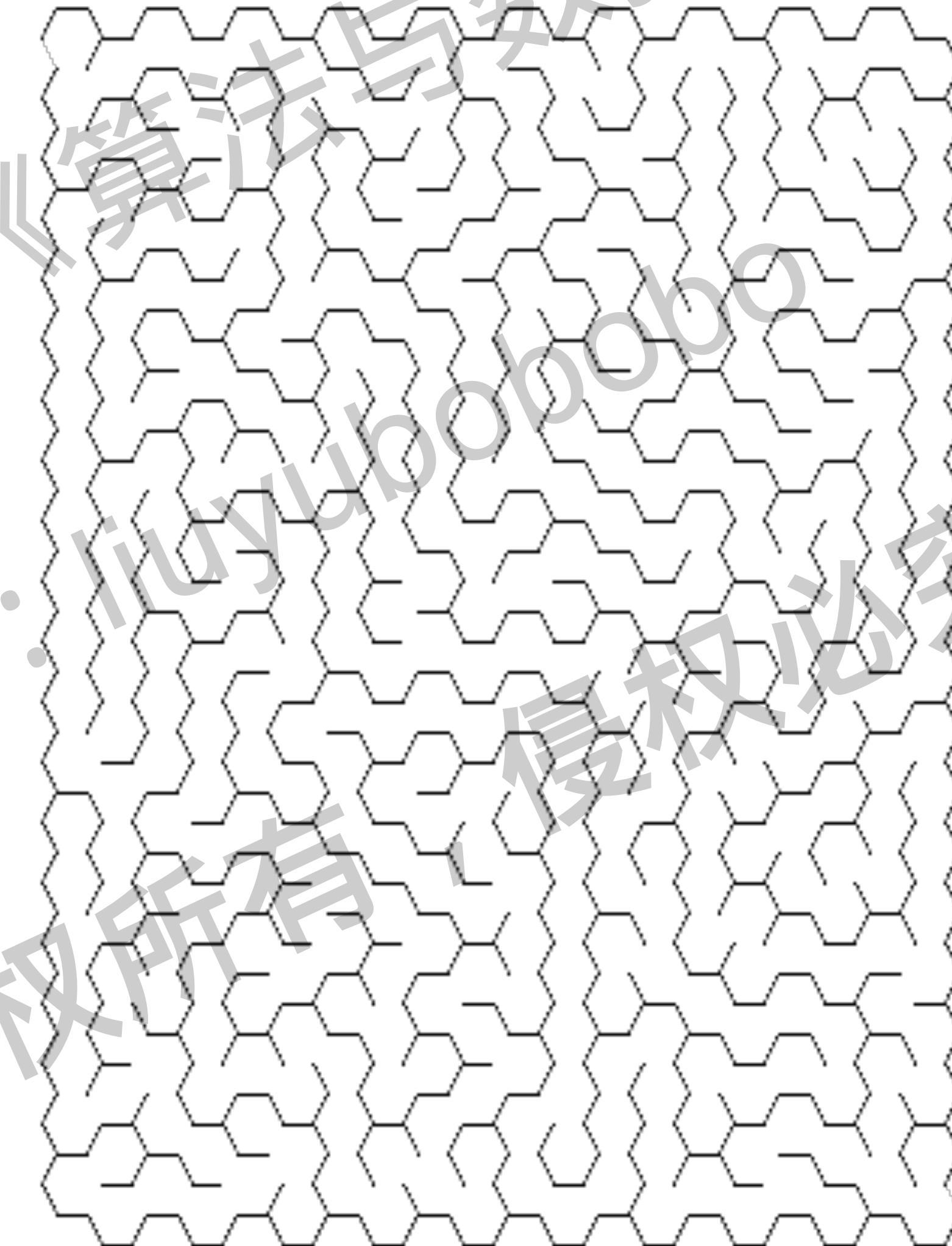
迷宫生成



迷宫生成



迷宫生成



慕课网

讲师

版权所有
· liuyubo@bjtu.edu.cn
· 信息工程学院

《算法设计与数据结构》

更多图算法

欧拉路径

哈密尔顿路径

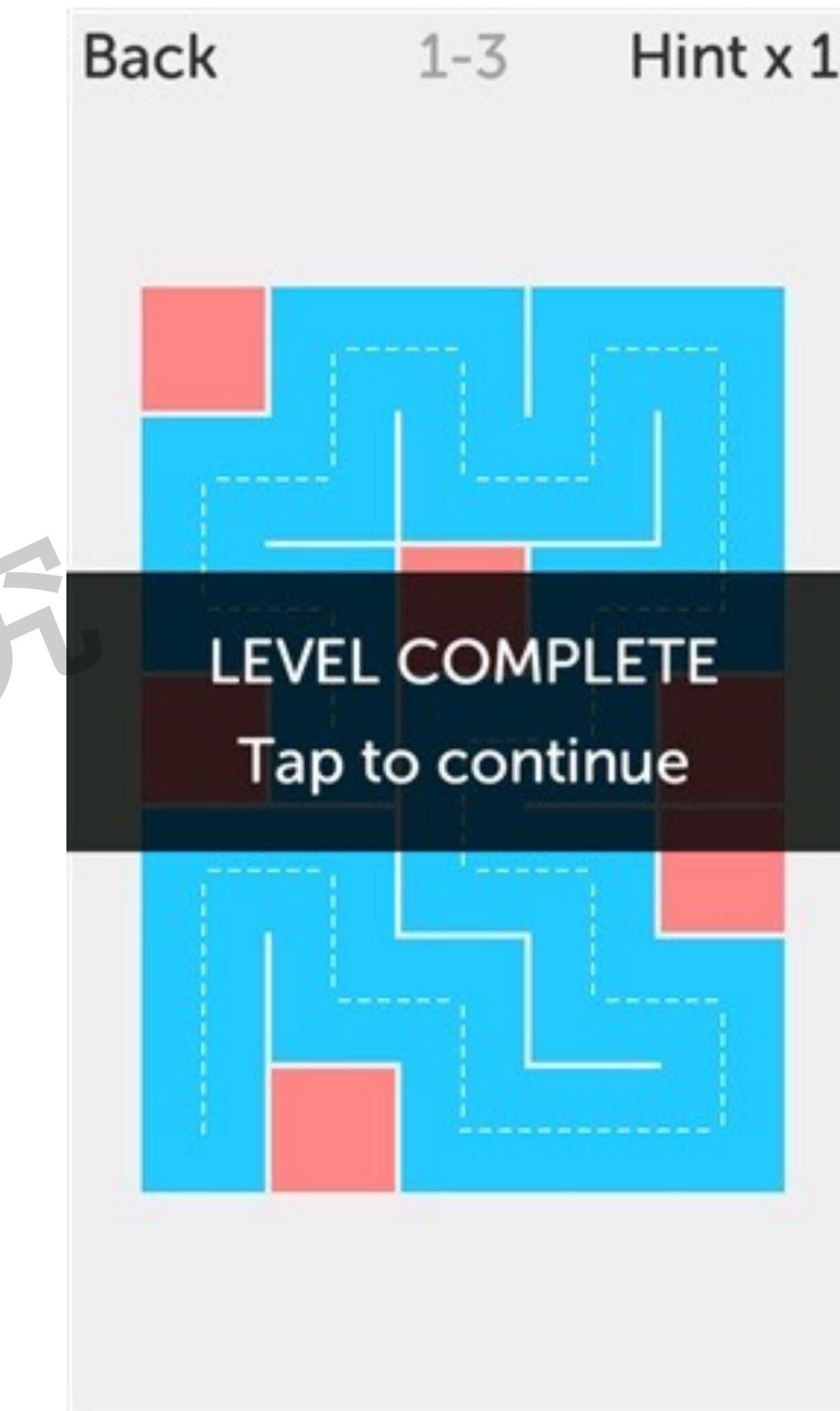
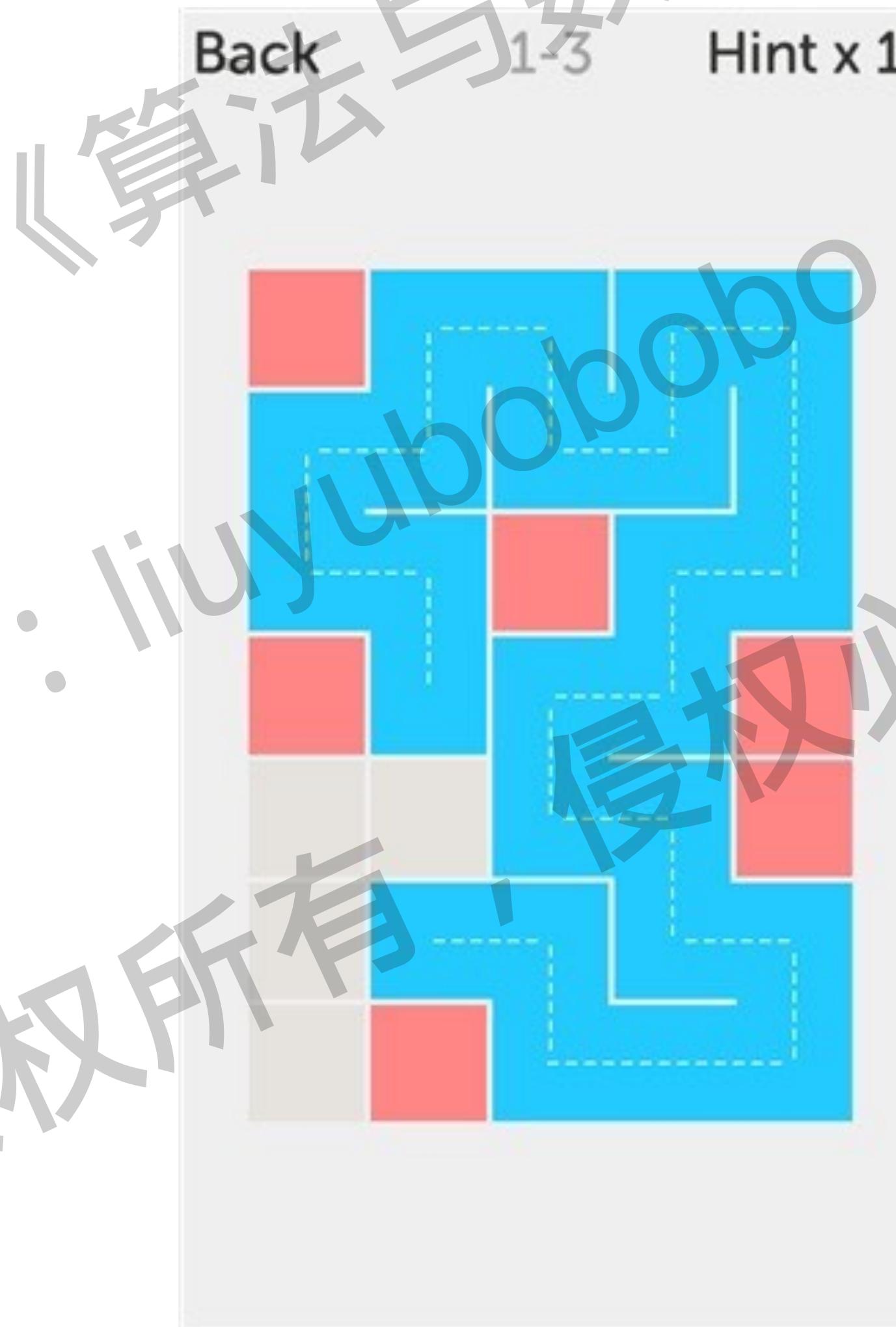
慕课网《算法与数据结构》

讲师

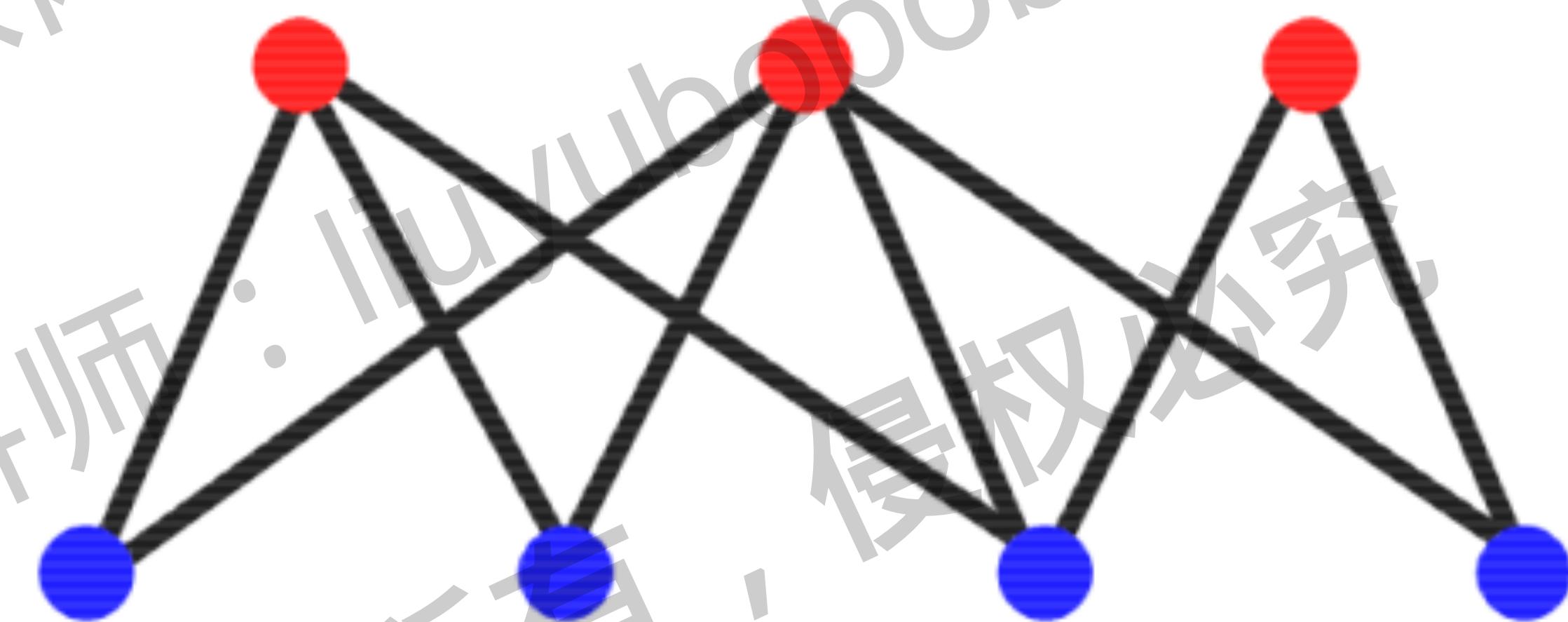
· liuyanbobo

版权所有，侵权必究

更多图算法

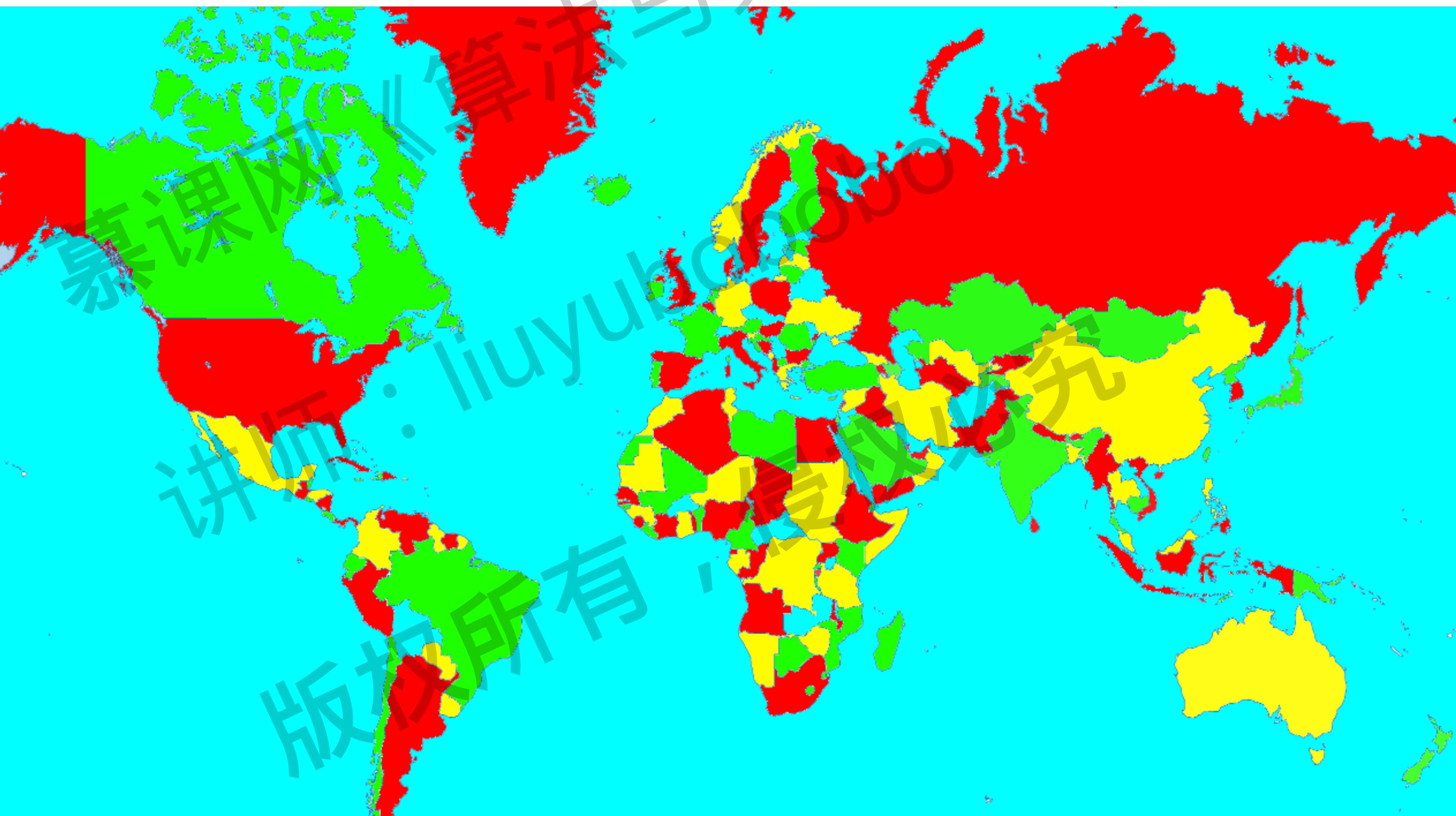


二分图



慕课网 《算法与数据结构》
讲师：liuyubobobo
版权所有，侵权必究

地图填色问题



其他

欢迎大家关注我的个人公众号：是不是很酷



慕课网

讲师

版木

《算法与数据结构》



算法与数据结构