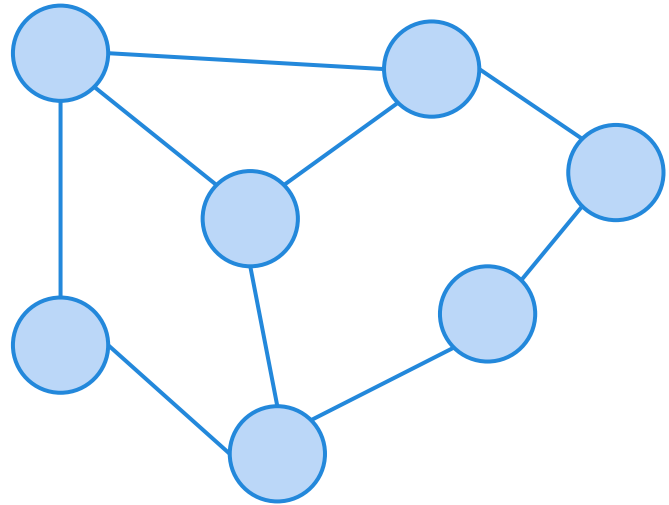


Distributed graph colouring

Open source study project

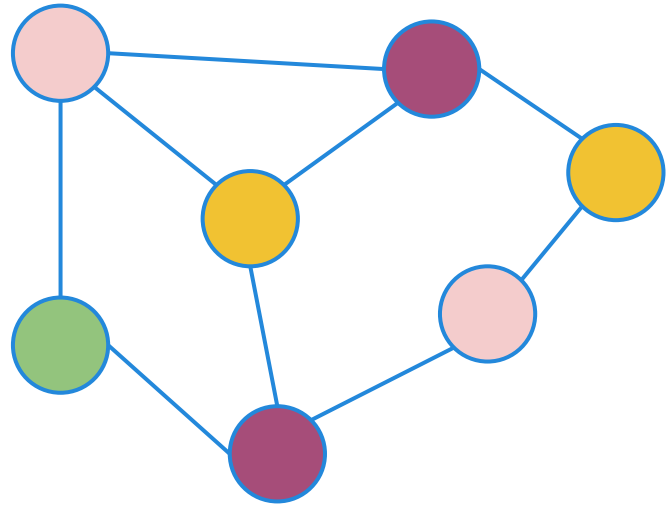
Vertex colouring

A proper vertex colouring is a labeling of a graph such that no two adjacent vertices share a label



Vertex colouring

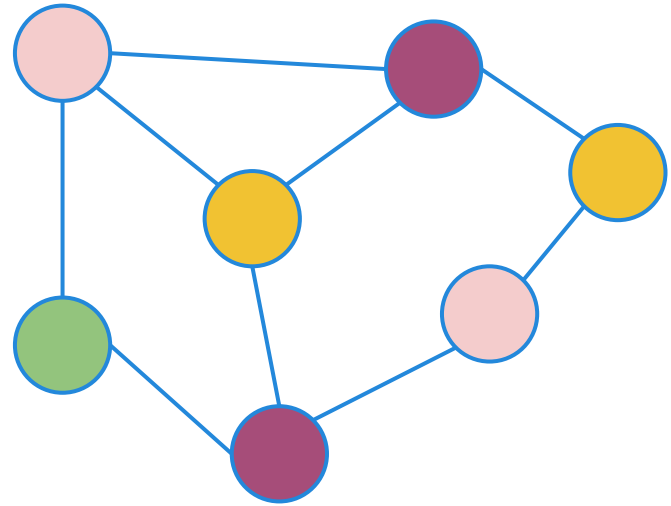
A proper vertex colouring is a labeling of a graph such that no two adjacent vertices share a label



Chromatic Number

The Chromatic Number, K , of a graph is the minimal number of labels required to colour a graph

Determining the Chromatic Number of a graph is NP-Hard



Here $K = 4$

Applications

Graph colouring has many applications:

- Resource Allocation
- GraphLab Chromatic Engine
- Clustering

Distributed Setting

- A naive synchronous algorithm can colour a graph of n vertices in $O(n)$ rounds using $\Delta+1$ colours.
- But for most graphs better colourings exists.
- Much more efficient algorithms are also known.

Project

- This project will explore the existing graph colouring algorithms using the graphlab platform.
- The goal is to implement and evaluate well known graph-colouring algorithms
- Study the trade-offs between the time complexity of algorithms and the quality of the colourings they produce.
- Certain graphs (EG. bipartite, triangle-free or trees) allow for faster colourings, would it make sense to try to discover the structure of the graph before colouring it?

Discussion

Any feedback or suggestions?

References:

[1] Michael Elkin, Distributed Graph Colouring and Related Problems, Ben-Gurion University, http://www.cs.bgu.ac.il/~elkinm/main_openu.pdf