Introduction to Graph Theory

Why Graphs?

Alexander Golovnev

Outline

What is a Graph?

Graph Examples

Graph Applications

Graphs

- A set of Objects

Graphs

- A set of Objects
- Relations between pairs of objects

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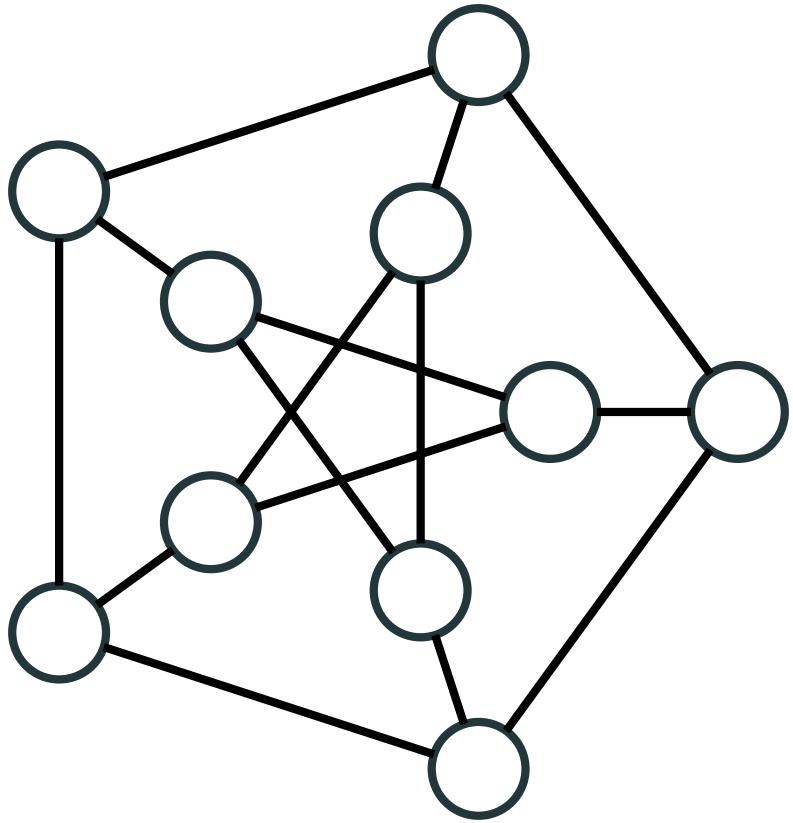
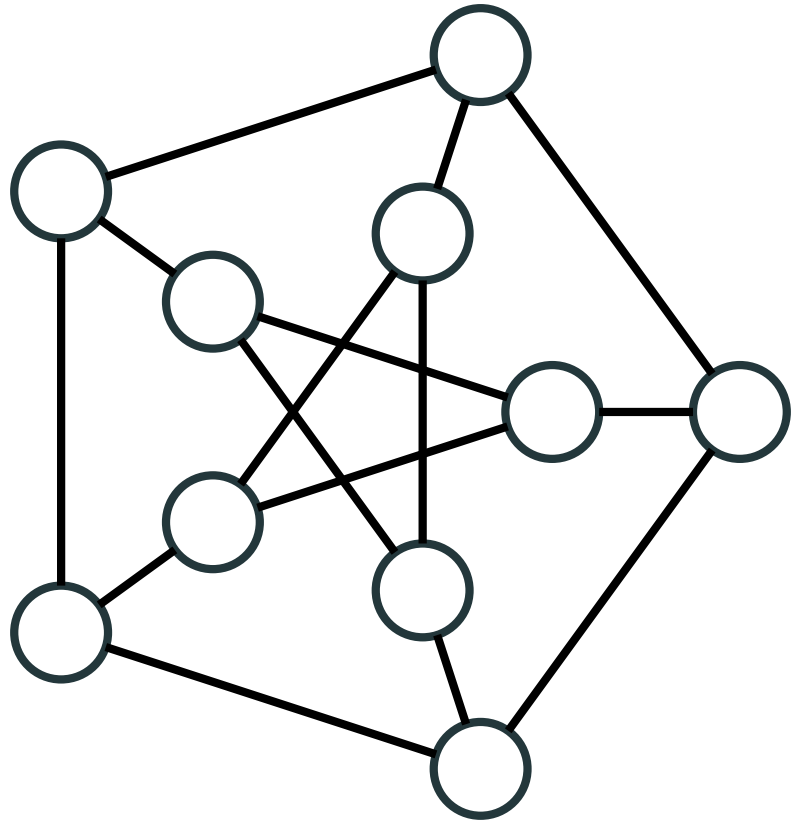
- Relations between pairs of objects



Definition

- A Graph $G = (V, E)$



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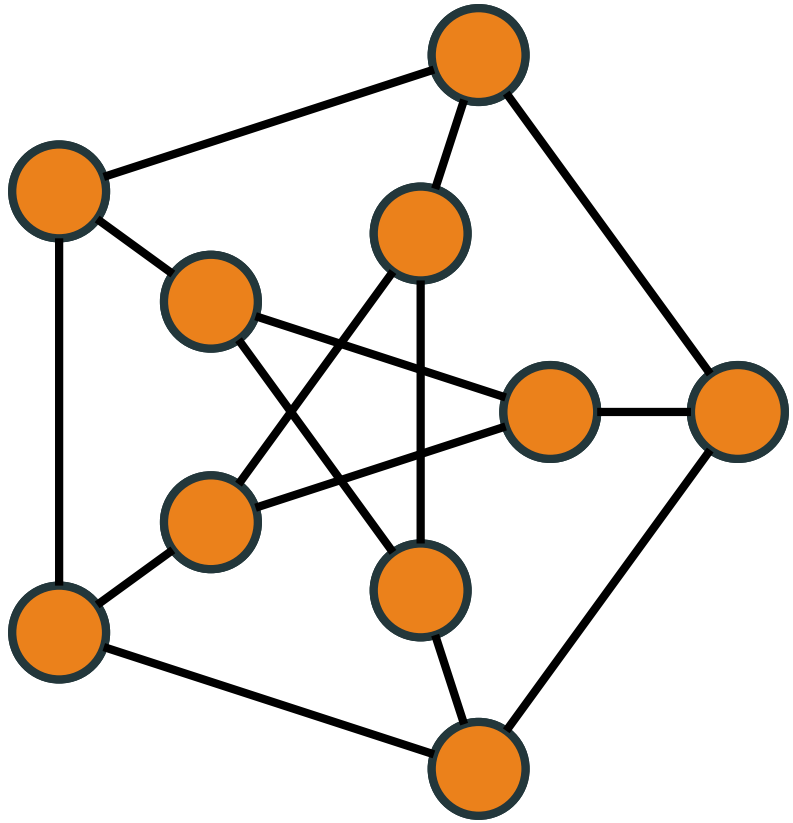
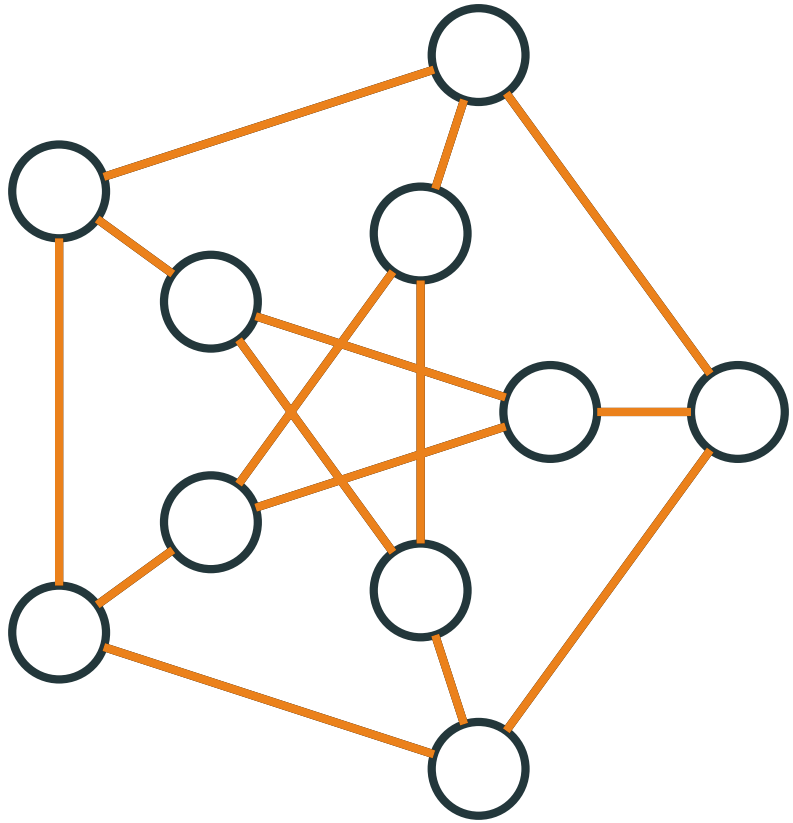


Definition

- A Graph $G = (V, E)$
- A set V of Vertices/Nodes
- A set E of Edges



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- *u* and *e* are Incident
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Drawing a Graph

Objects: {A,B,C,D}

Relations: {{A,C},{D,A},{B,D},{C,B}}

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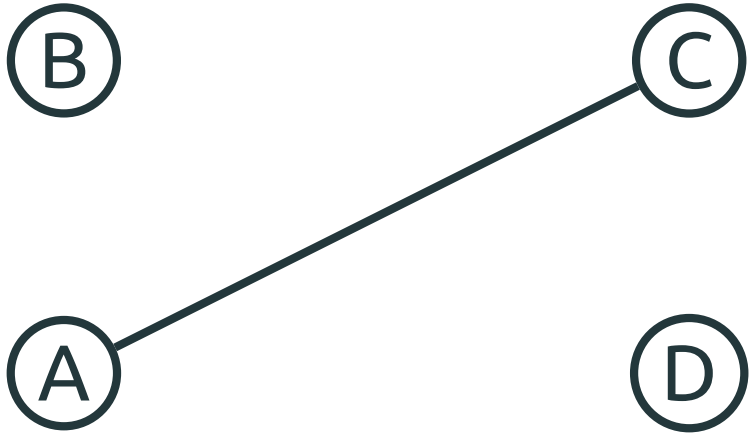

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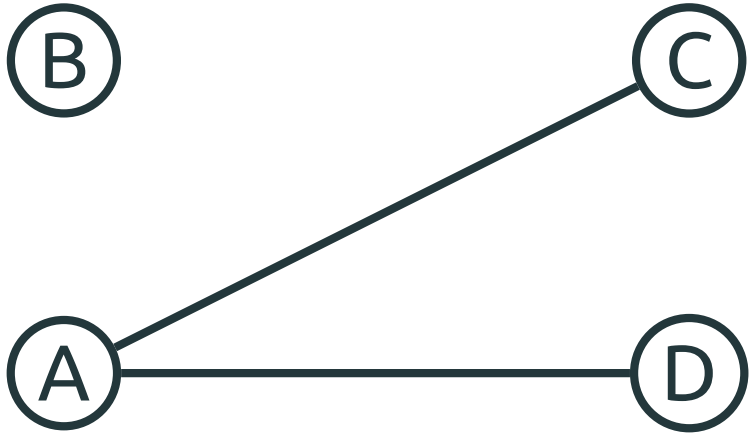

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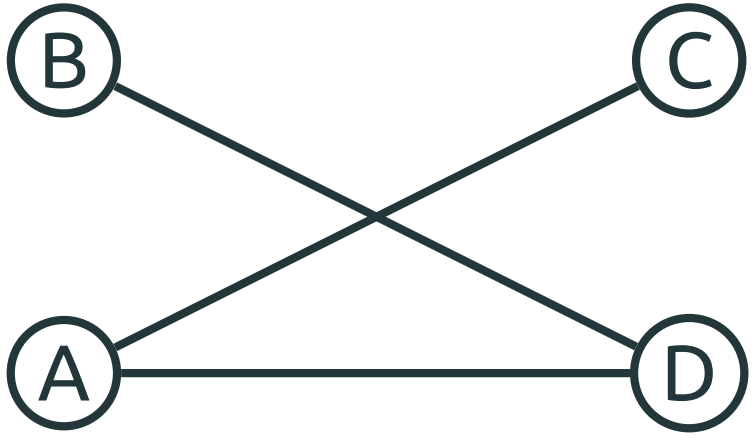

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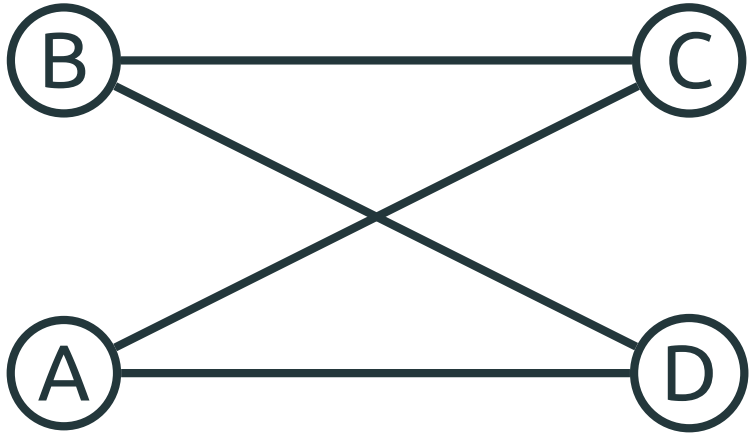

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Objects: {A,B,C,D}

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- They describe asymmetric relations
- There is a flight from A to B, but not the other way around
- Such a graph is called Directed

Drawing a Directed Graph

Objects: {A,B,C,D}

Relations: {(A,C),(D,A),(B,D),(C,B)}

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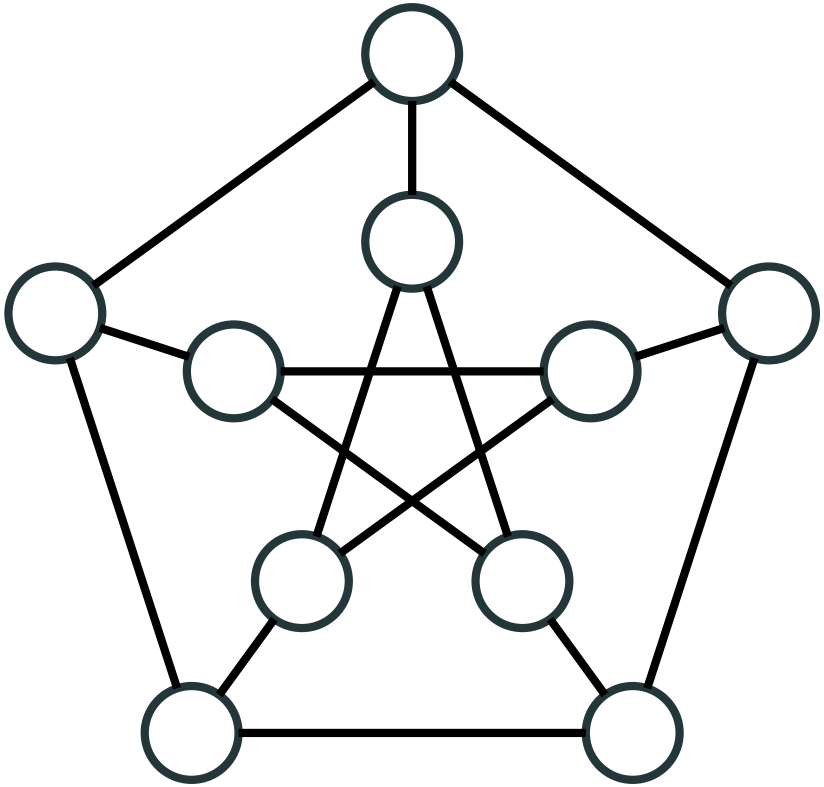
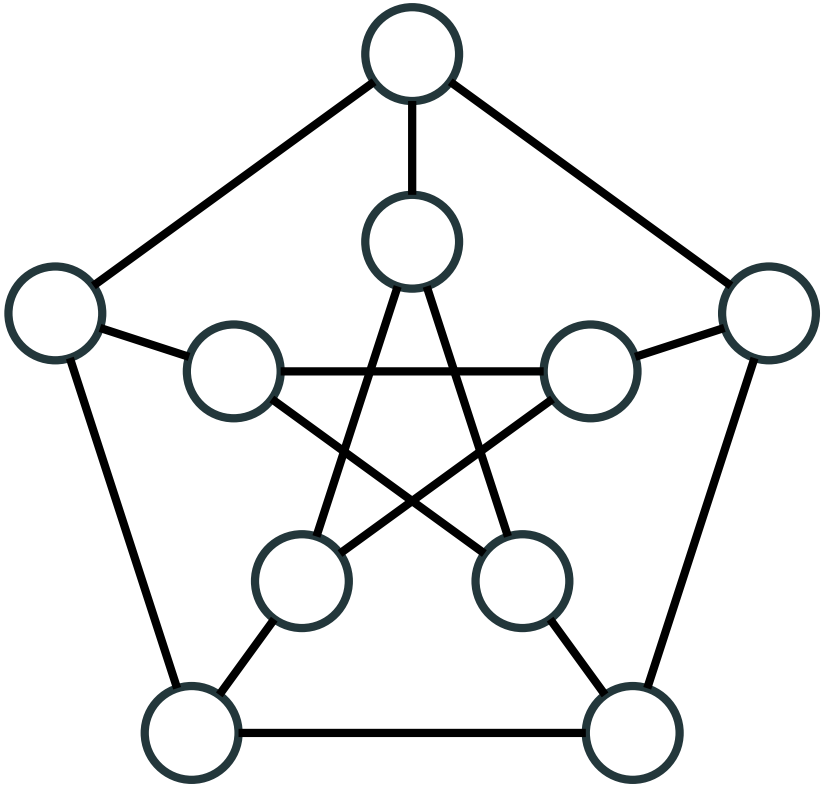
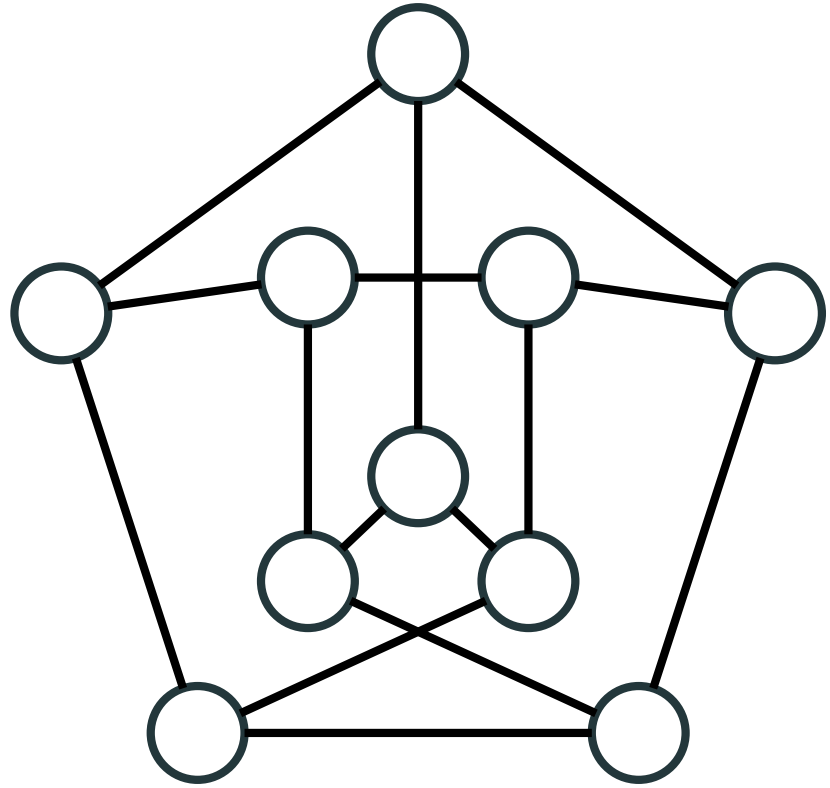
Many Ways to Draw a Graph



Many Ways to Draw a Graph

Are these graphs the same?





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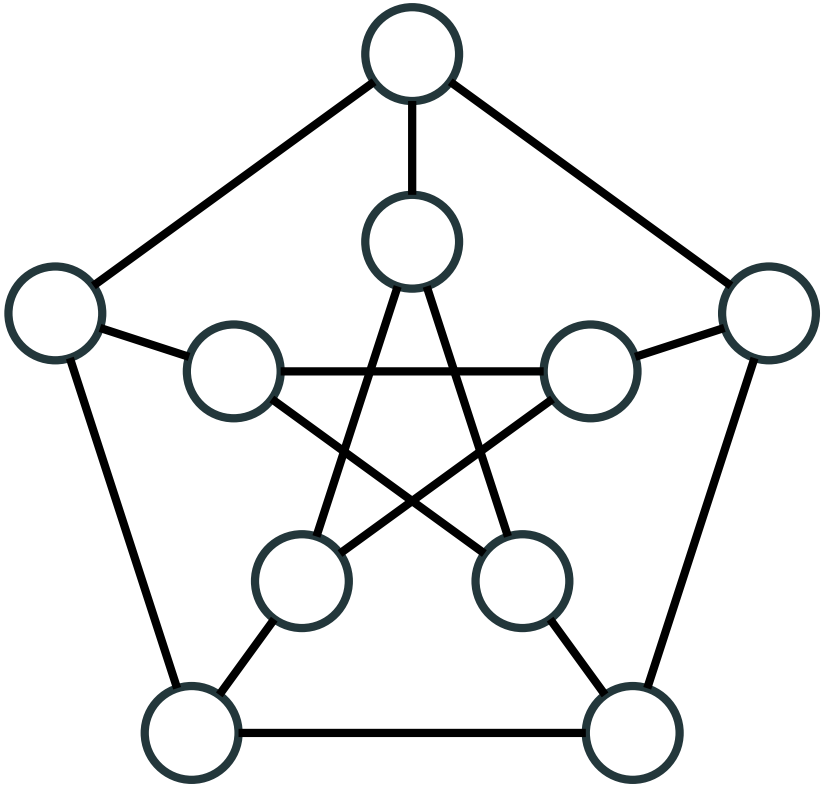

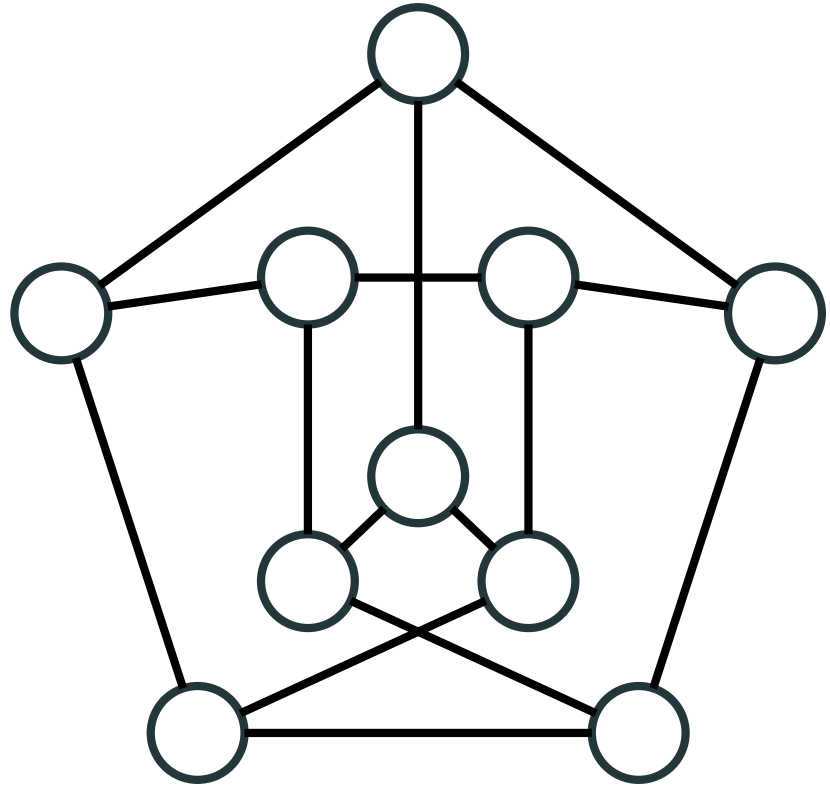

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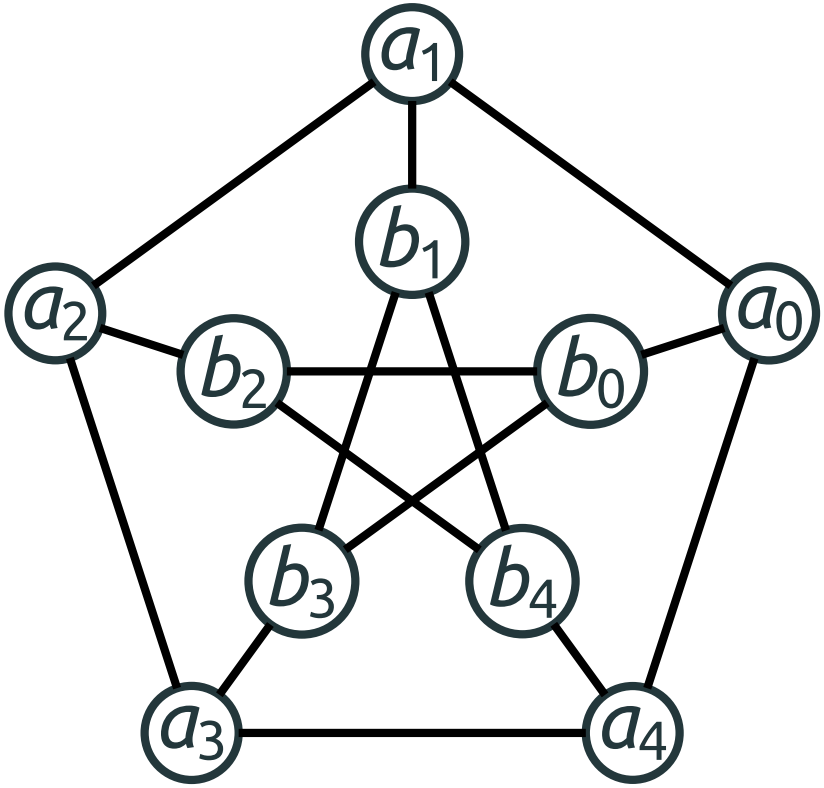

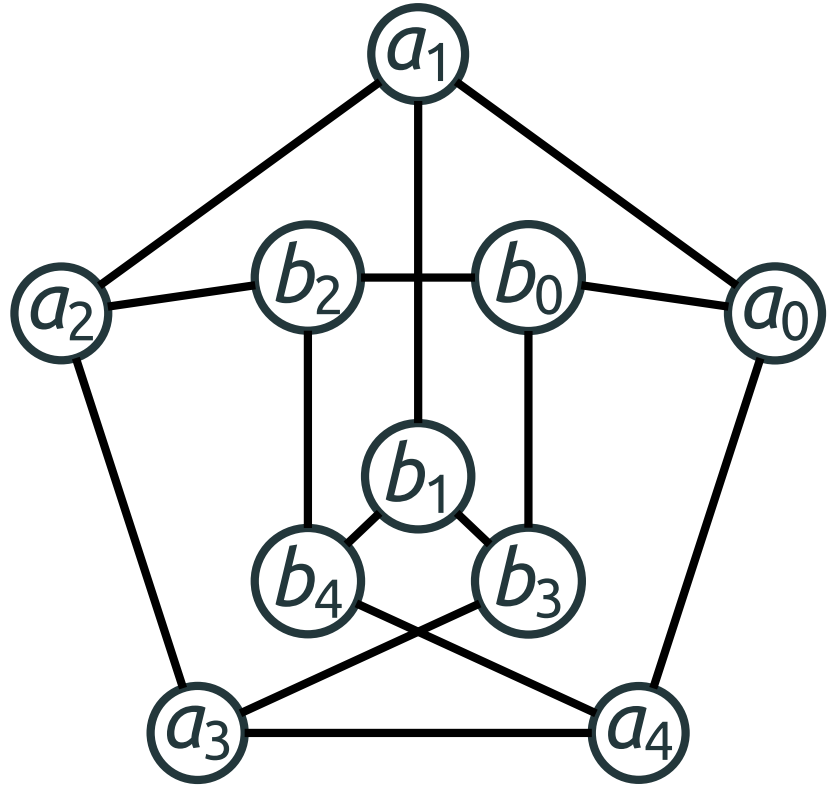

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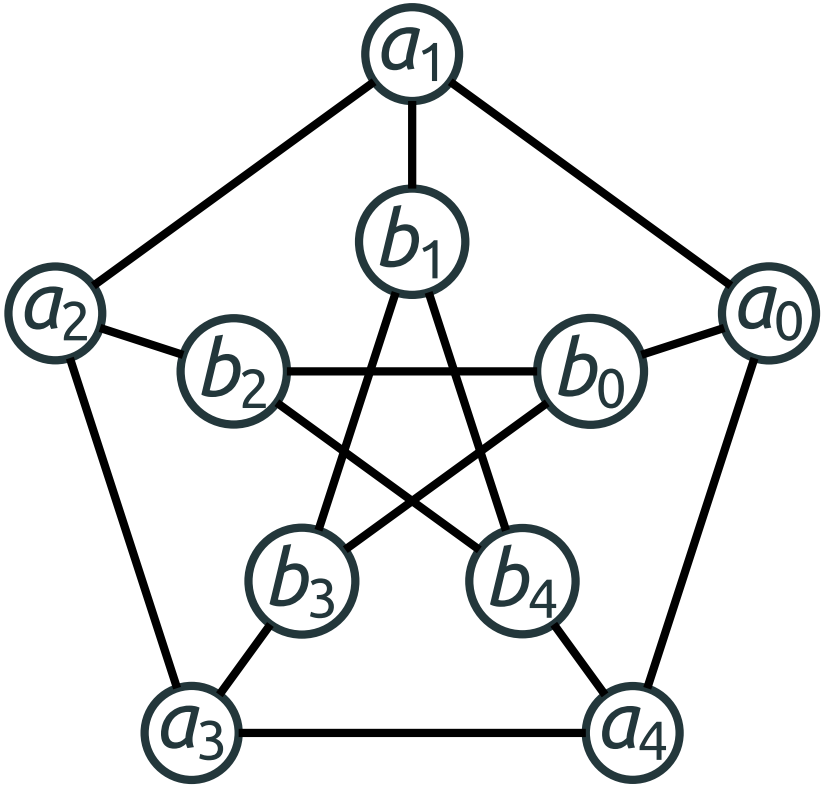

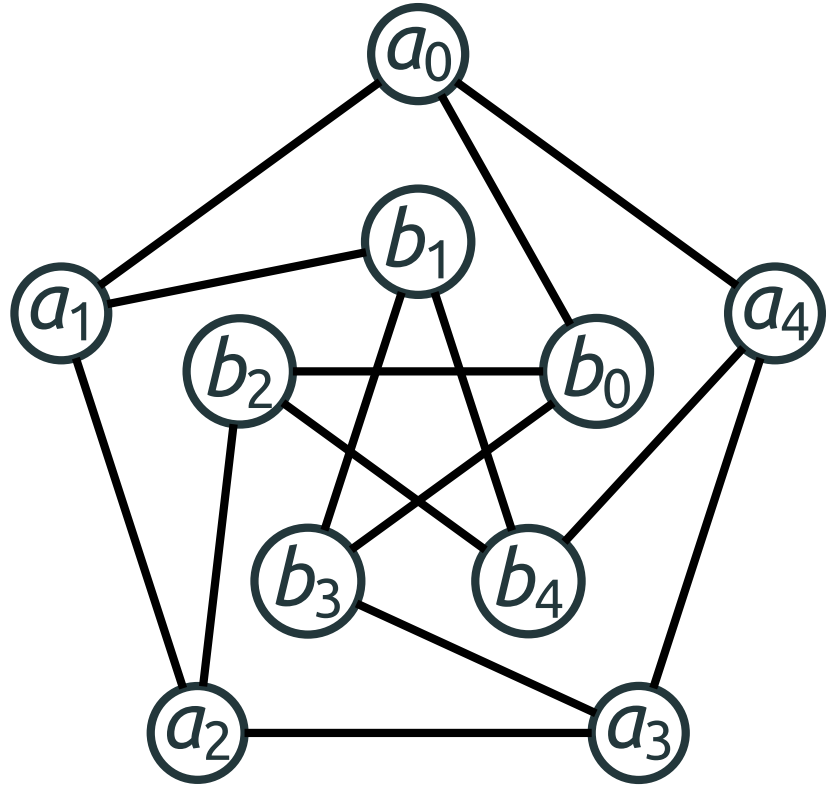

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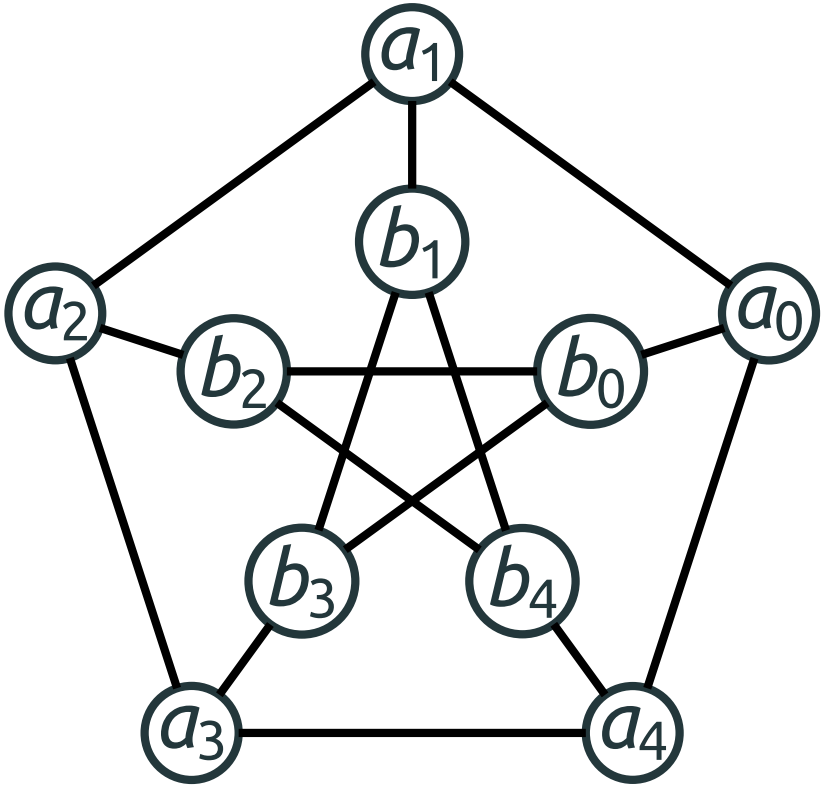

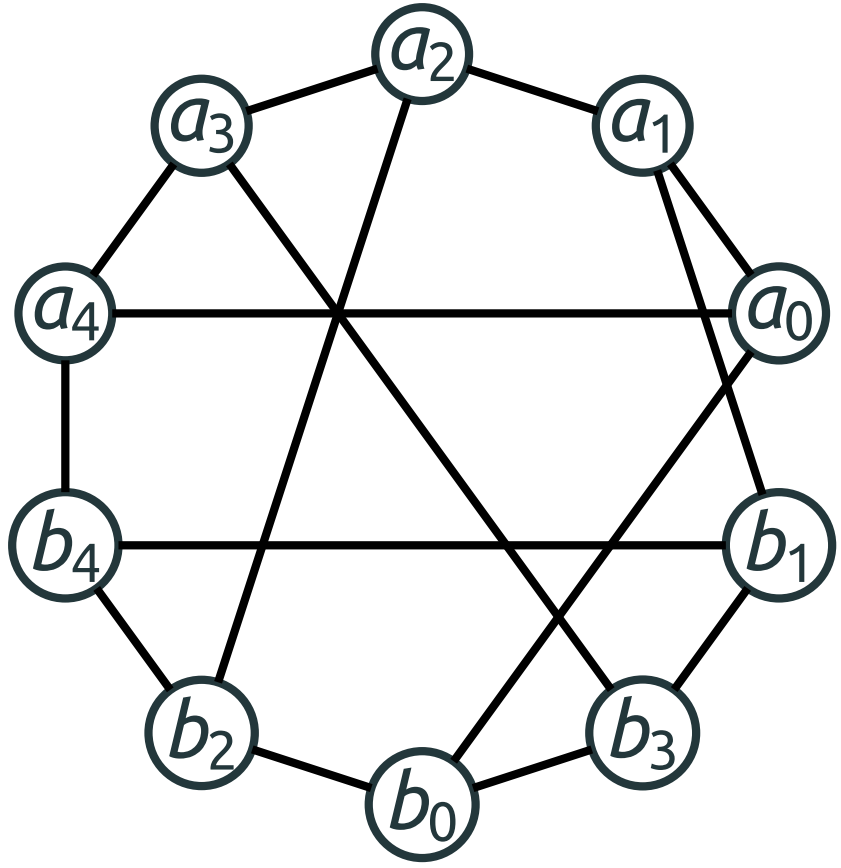

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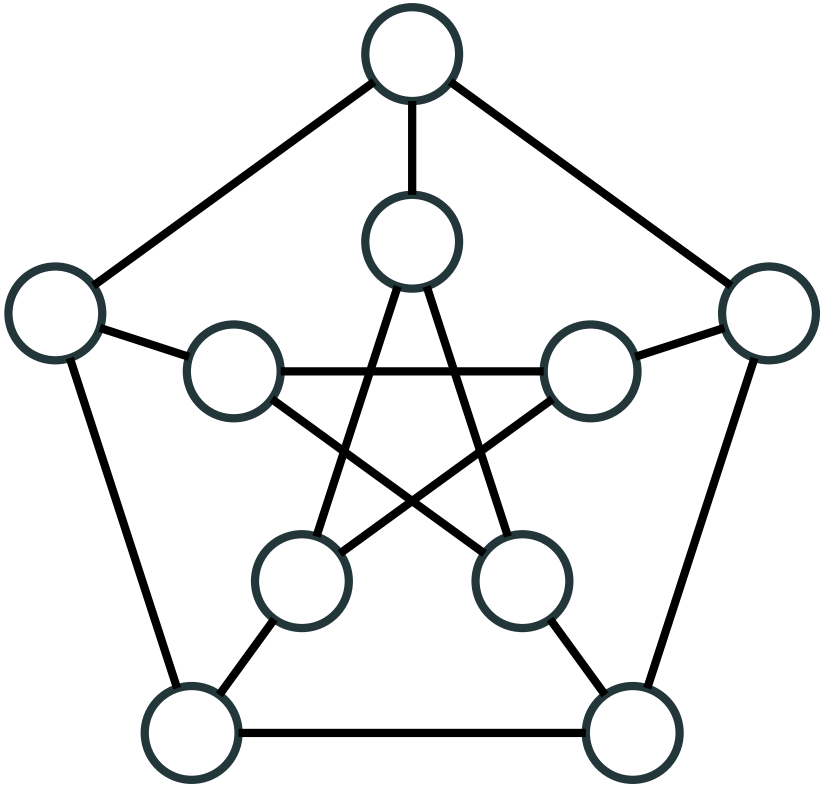

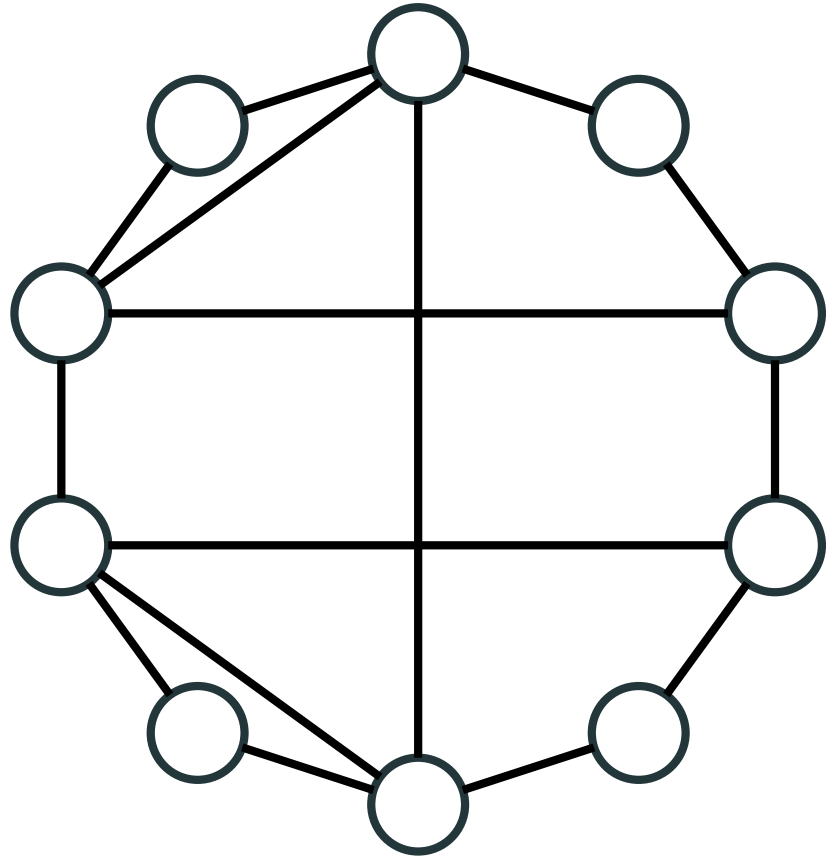

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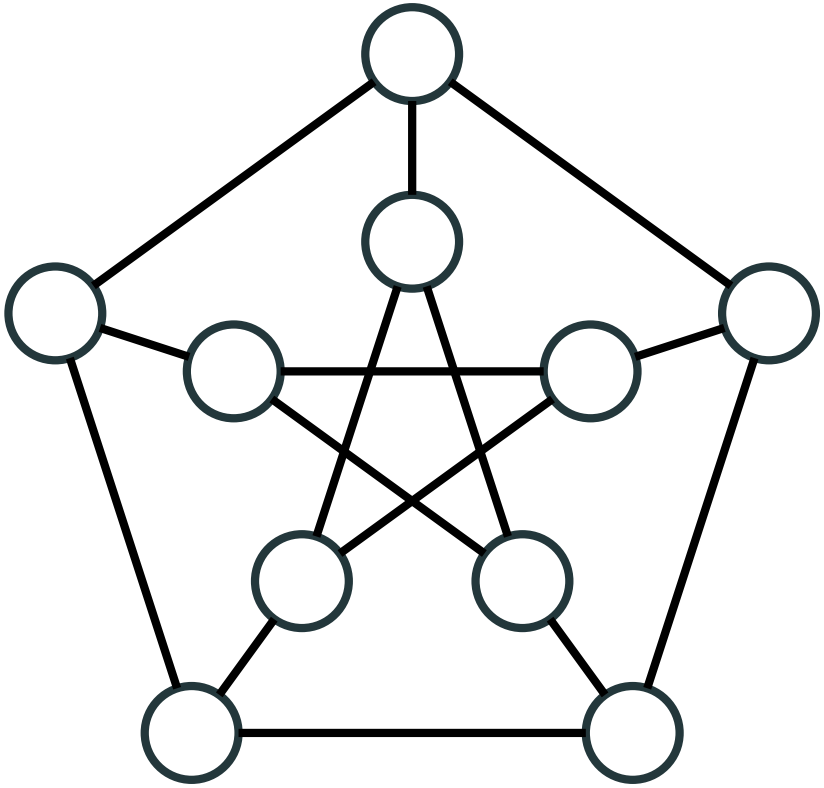

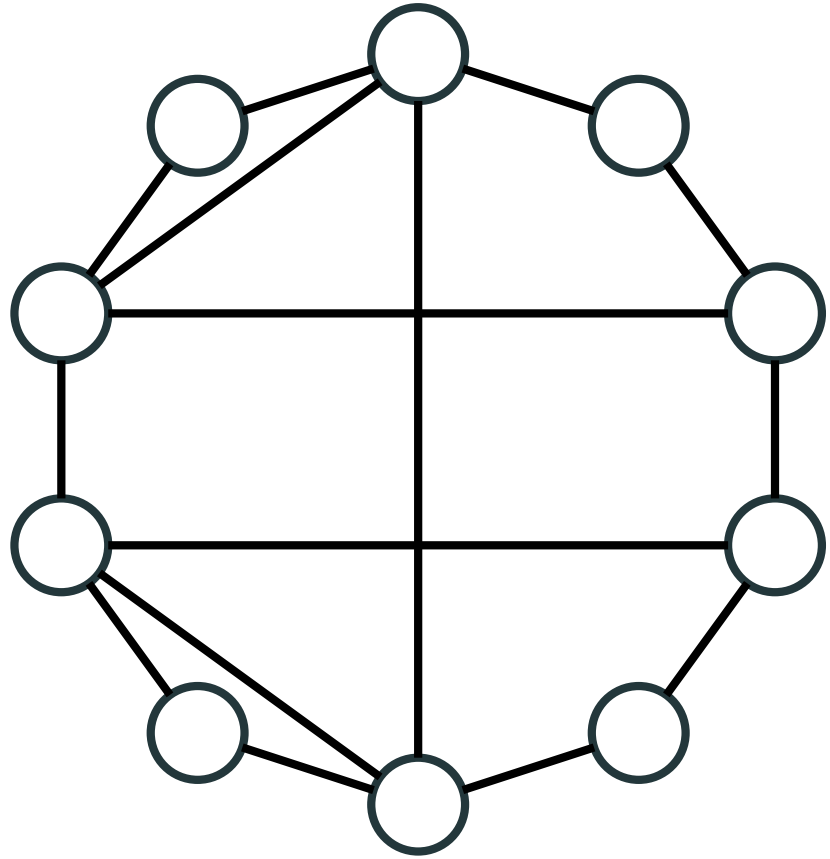

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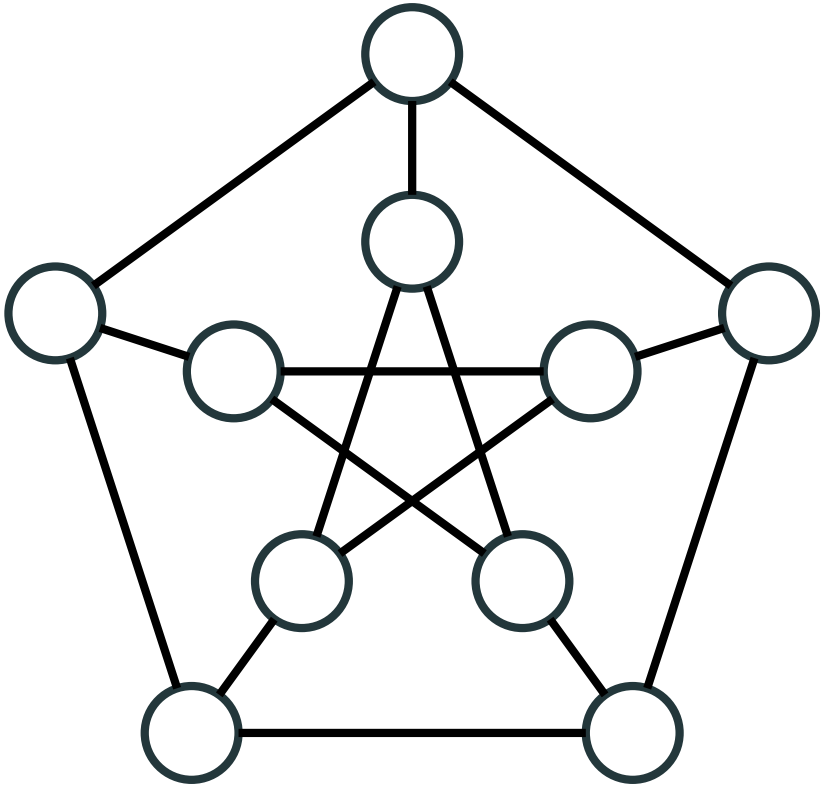

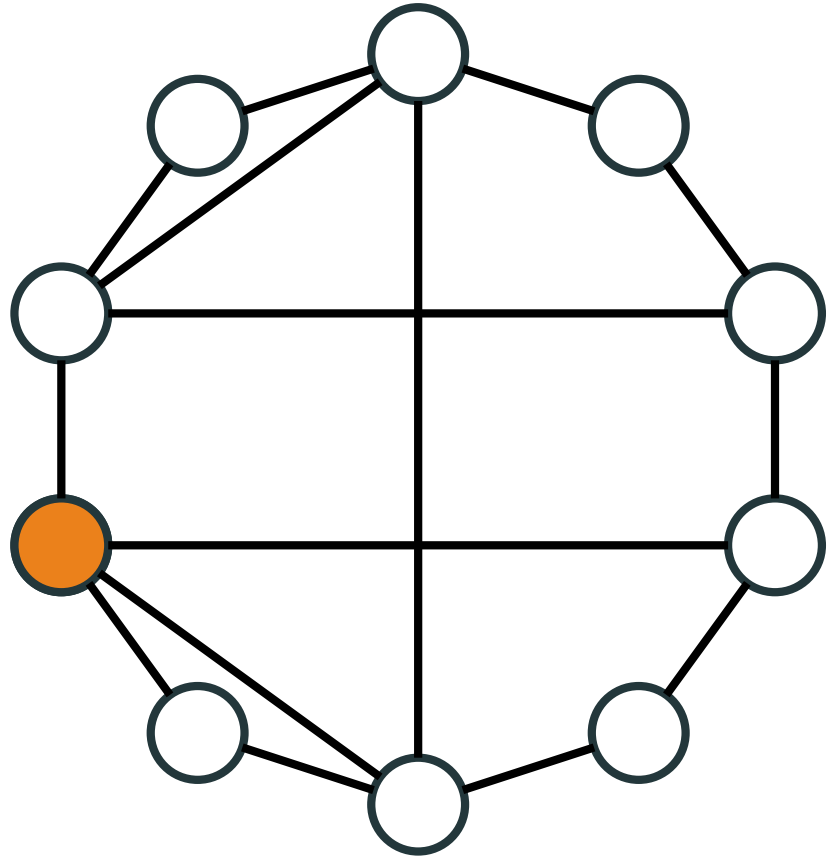

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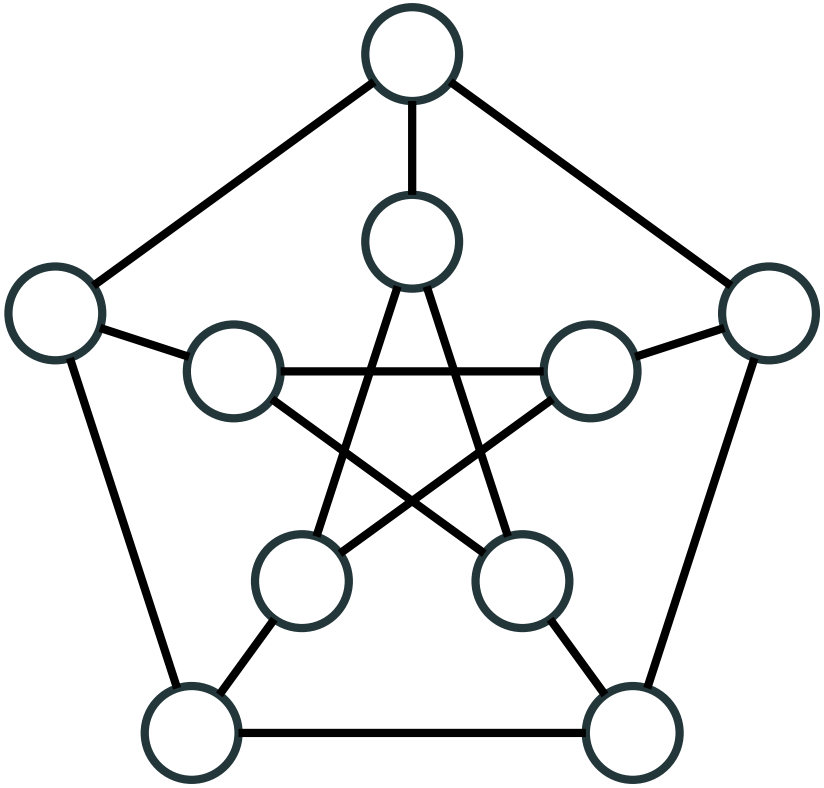

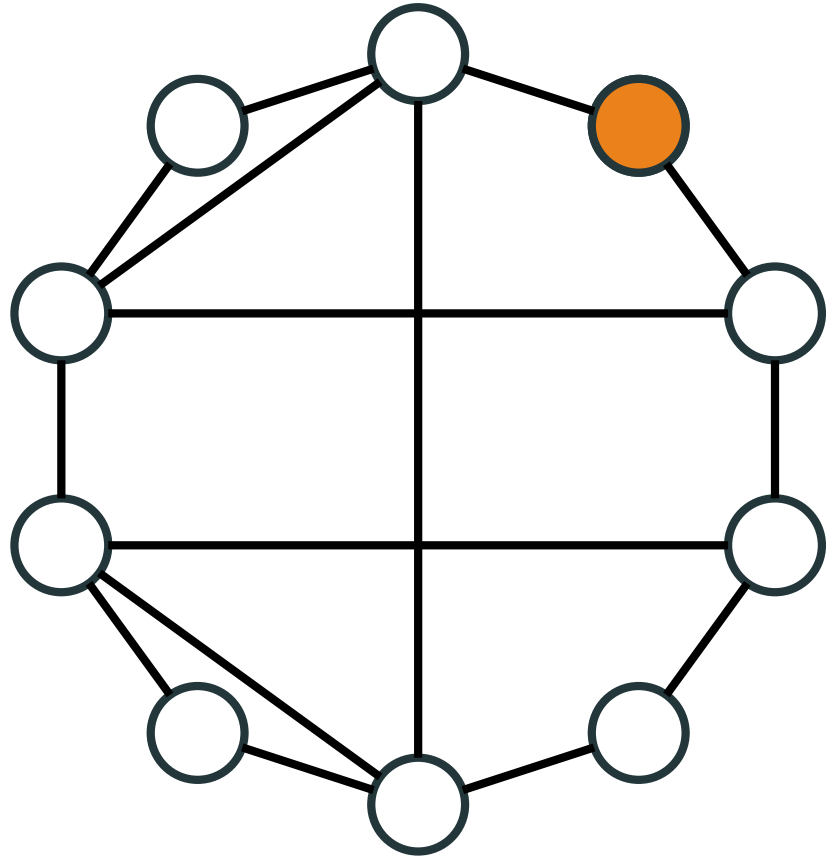

Graph Drawing is Beautiful!

Donald E. Knuth

Graph drawing is the best possible field I can think of: It merges aesthetics, mathematical beauty and wonderful algorithms.
It therefore provides a harmonic balance between the left and right brain parts.

Outline

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Graph Examples

Graph Applications

Airlines Graph

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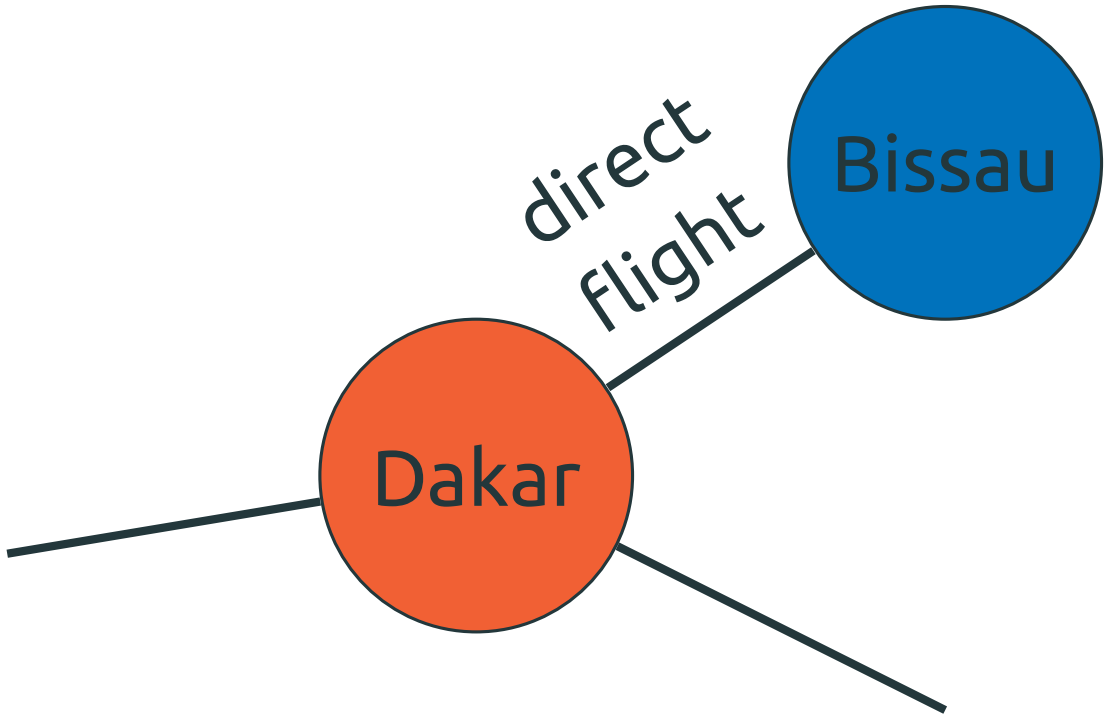

Facebook Graph

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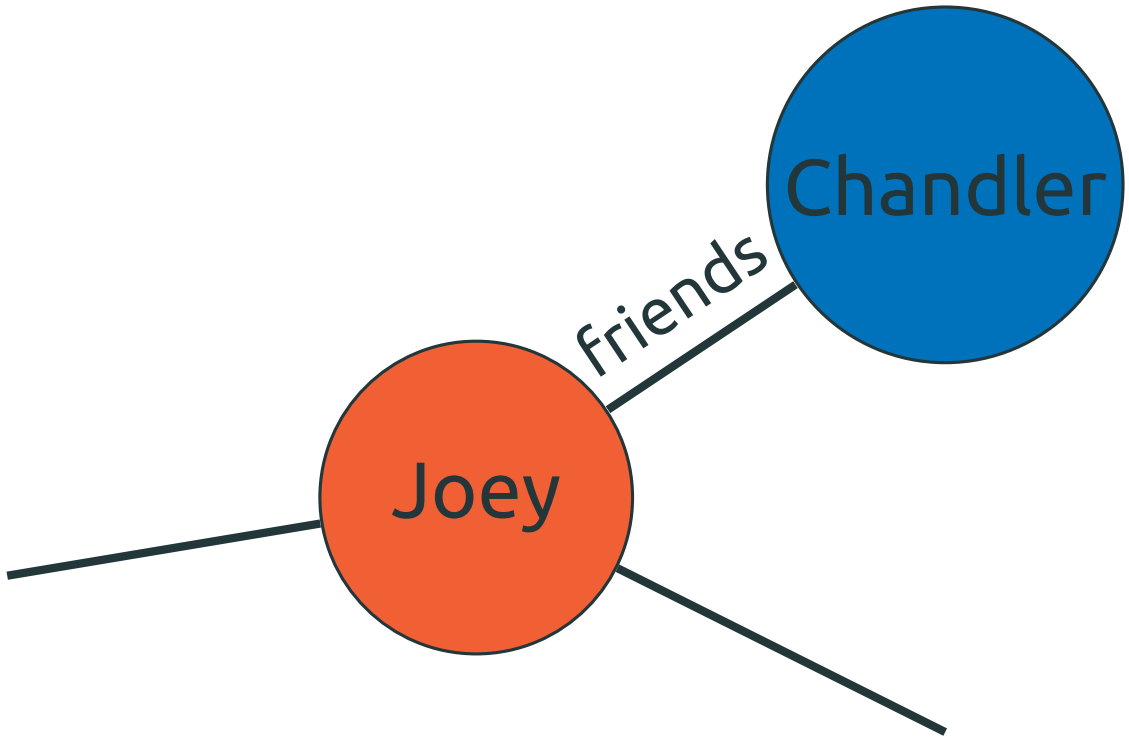
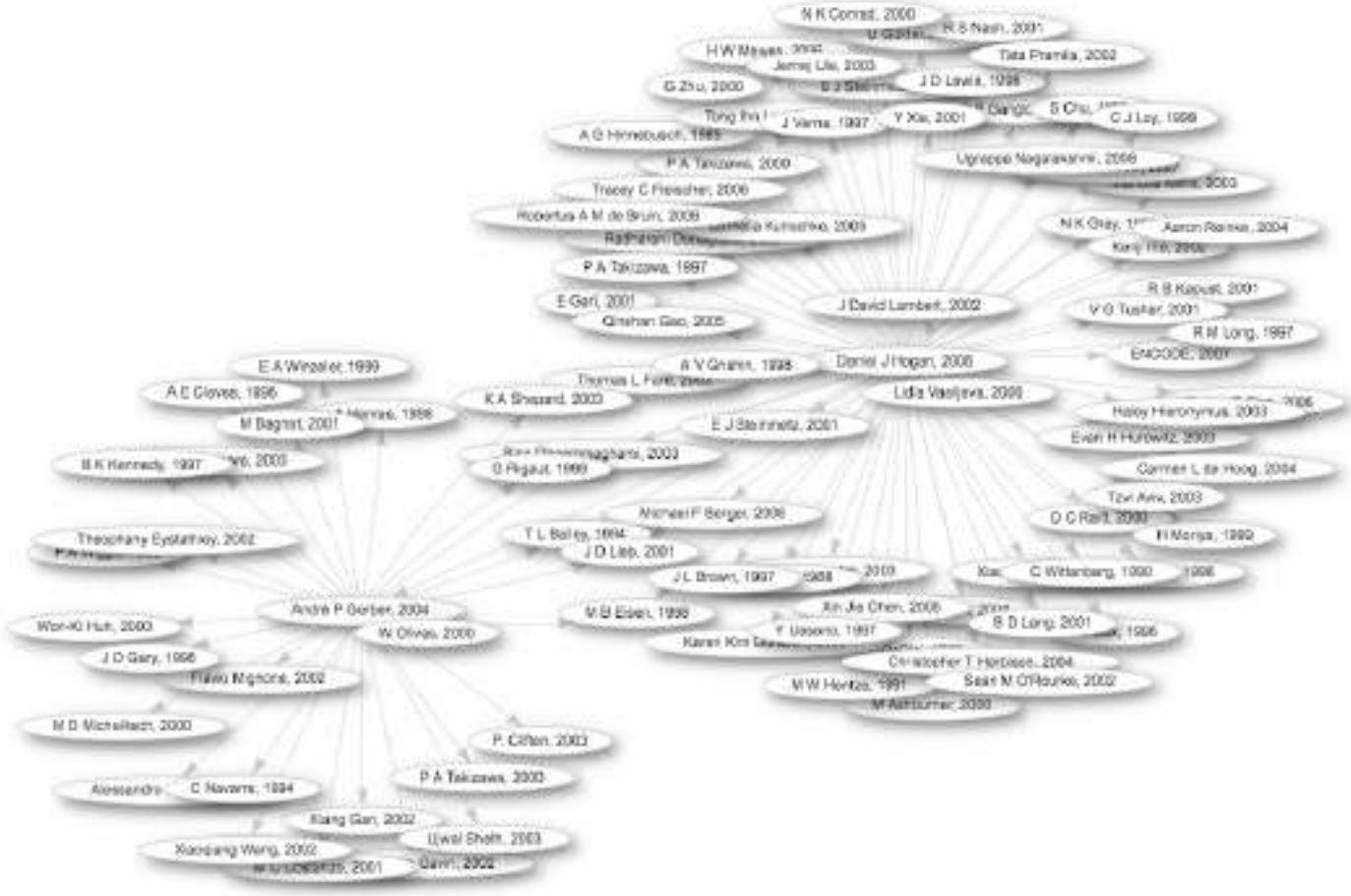


Citation Graph For a Paper



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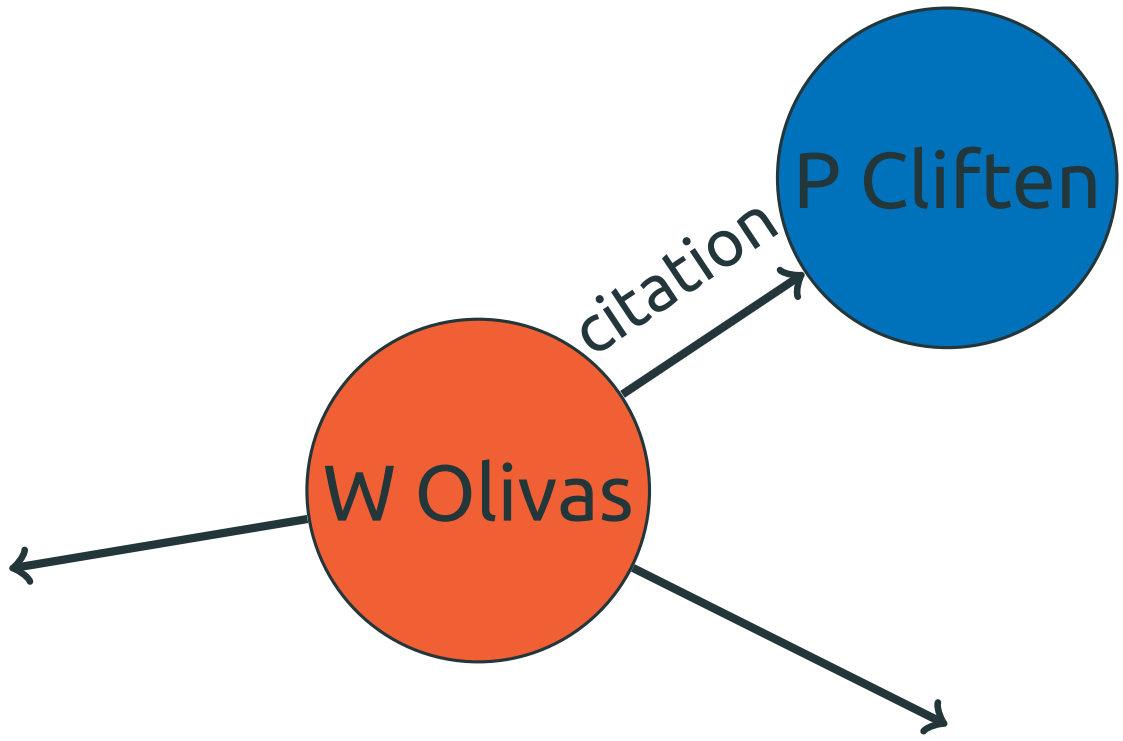
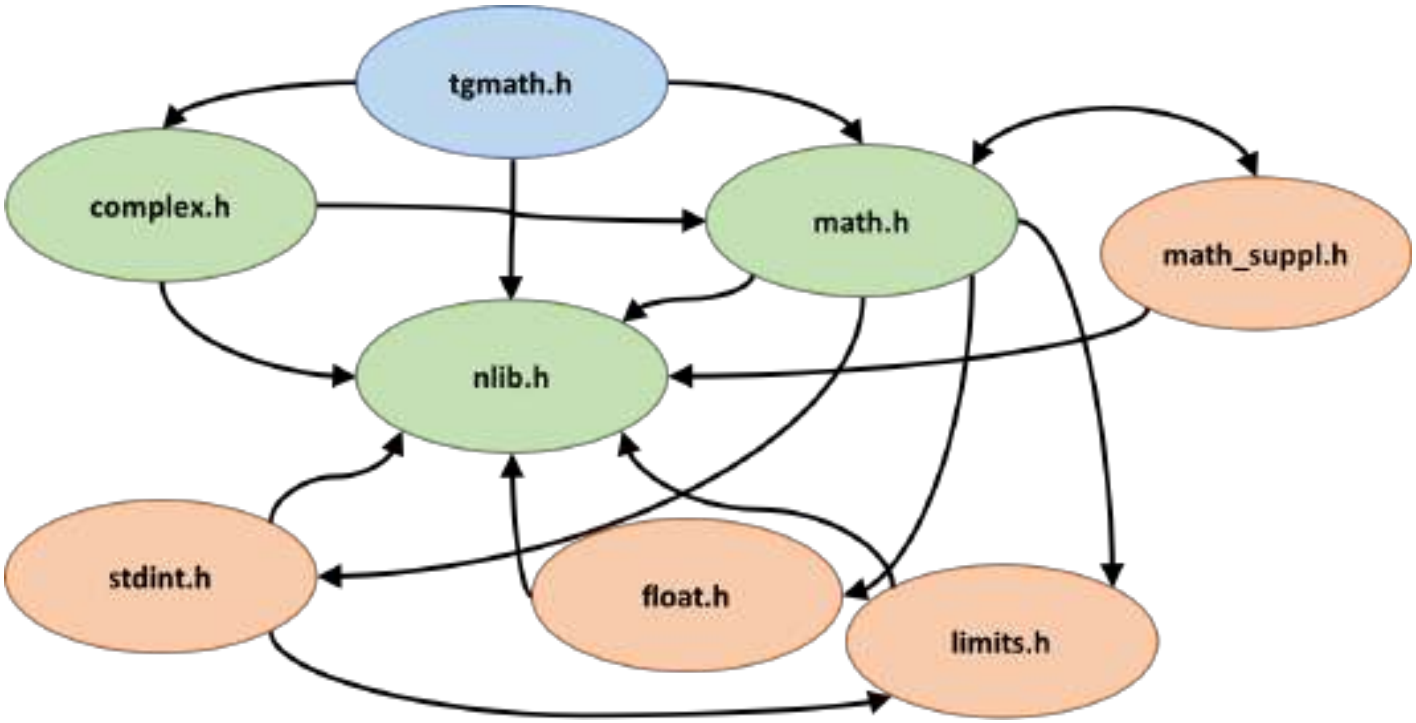


Dependency Graph



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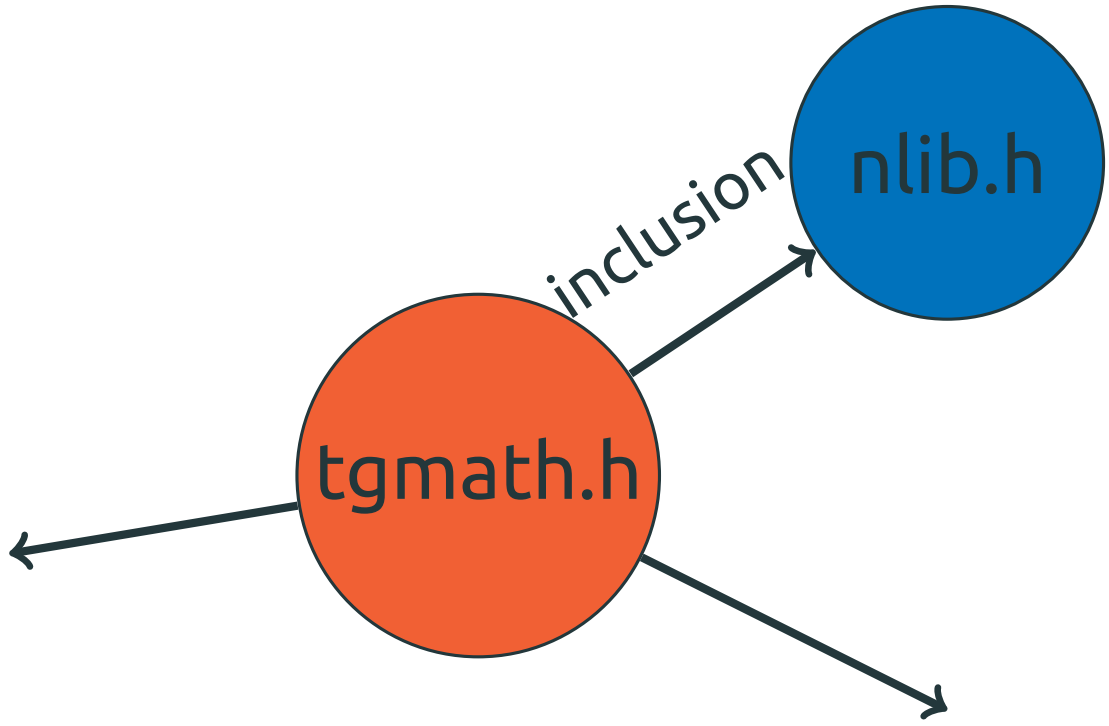
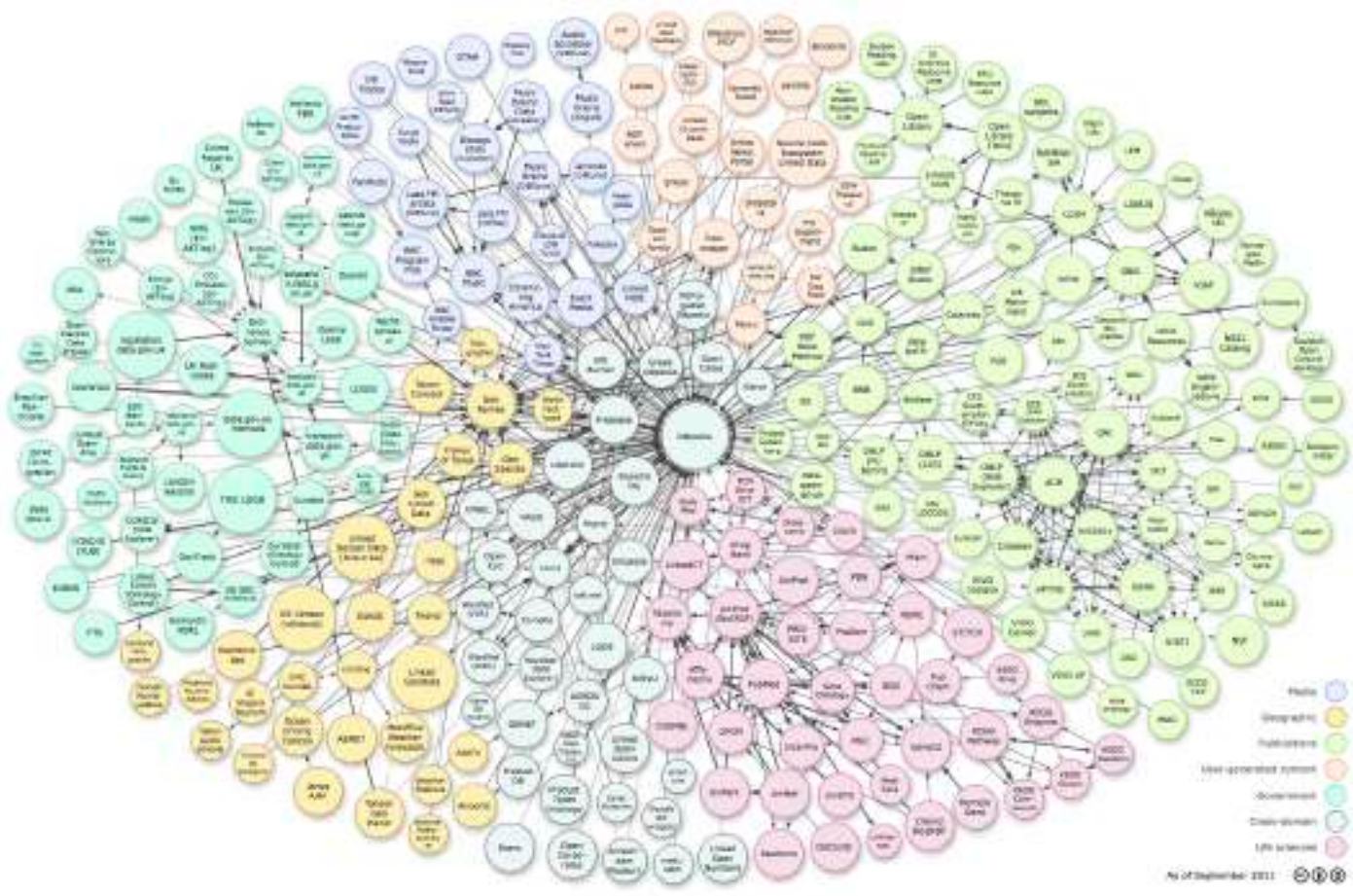


Linked Open Data Diagram



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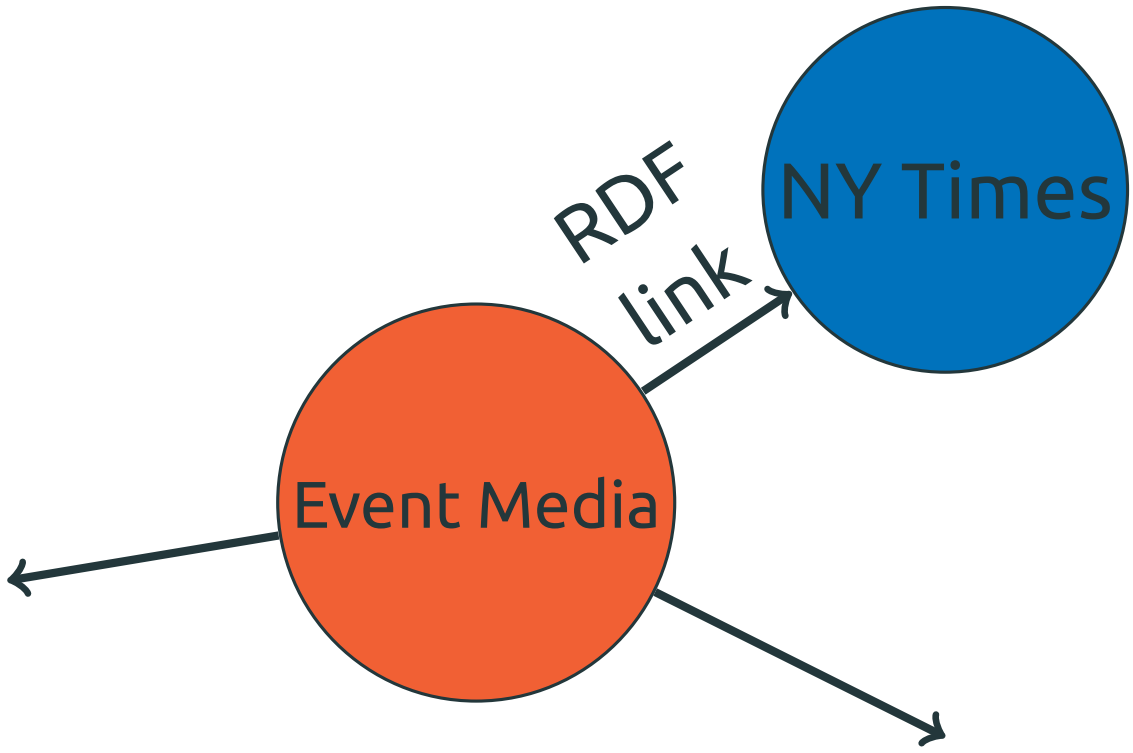
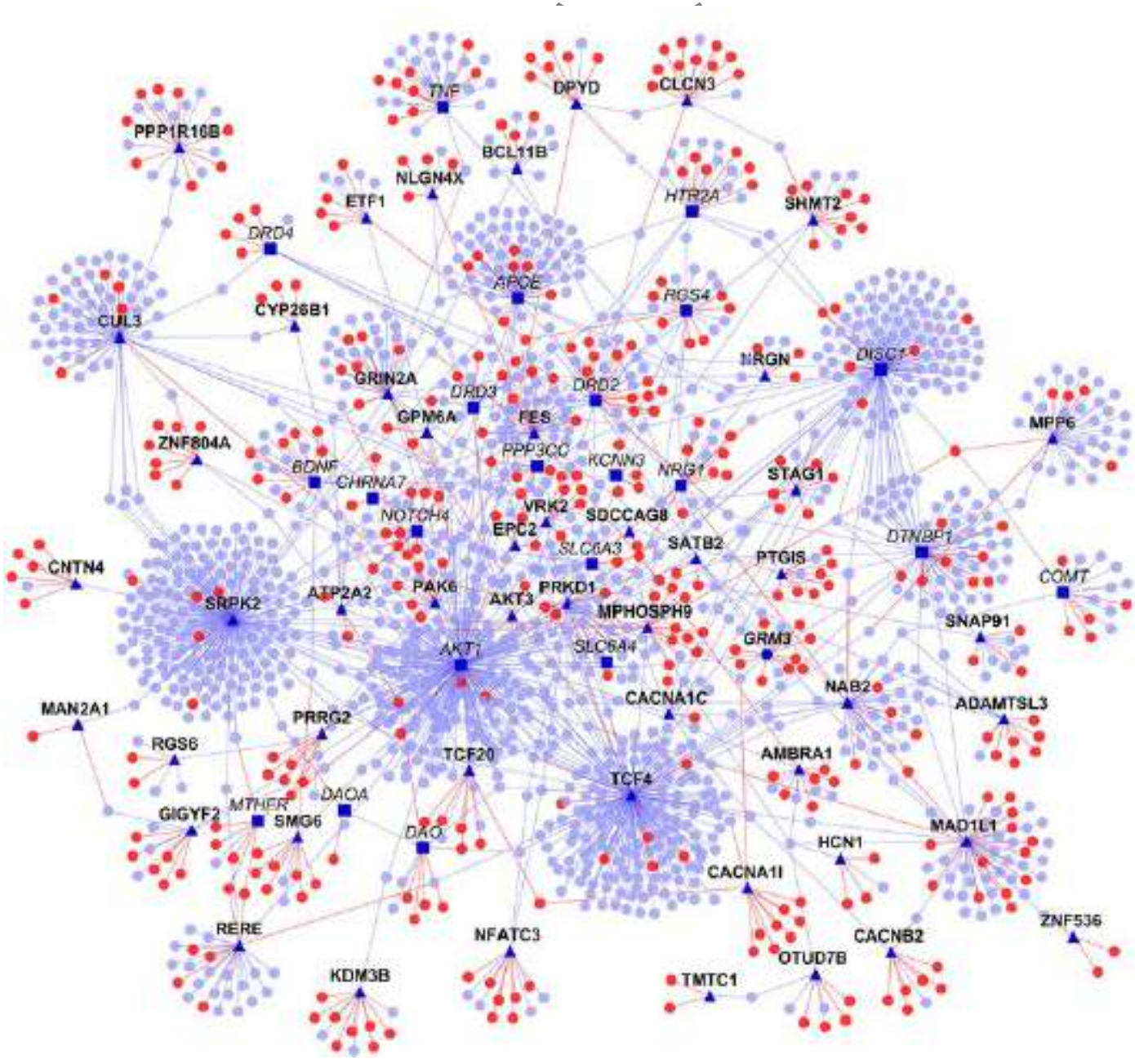
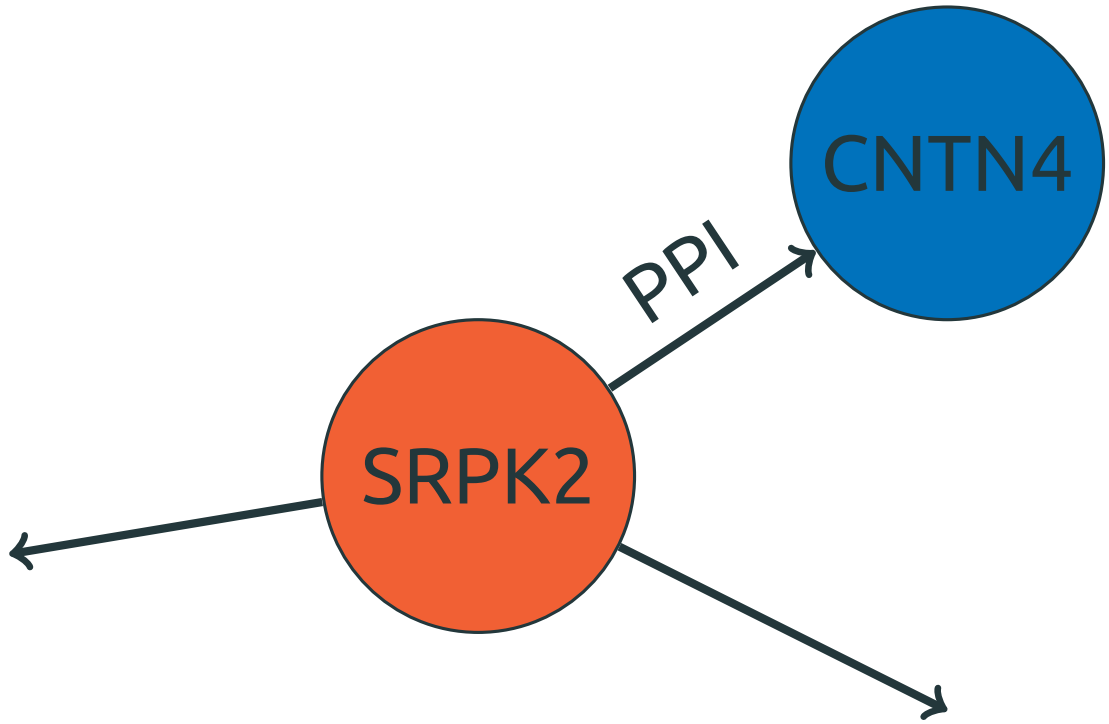


Schizophrenia Protein–Protein Interaction



Schizophrenia Protein–Protein Interaction (PPI)



Outline

What is a Graph?

Graph Examples

Graph Applications

Navigation

Navigation


A
Central Park W
B
Penn Plz, 4
Central Park
E 79th
E 66th St
E 59th St
E 57th St
1st Ave
FDR Dr
Grand Central Terminal
Pennsylvania Station-New York
Broadway

PageRank

PageRank


graph
All
Images
News
Books
Videos
More
Settings
Tools
About 333,000,000 results (1.94 seconds)
graph[1]
/graf/
noun
1. a diagram showing the relation between variable quantities, typically of two variables, each measured along one of a pair of axes at right angles.
synonyms: chart, diagram; More
verb
1. plot or trace on a graph.
synonyms: plot, trace, draw up, delineate
"we graphed the new prices"
Translations, word origin, and more definitions
Feedback
Graph - Wikipedia
https://en.wikipedia.org/wiki/Graph
Graph (topology), a topological space resembling a graph in the sense of discrete mathematics. Graph of a function. Chart, a means of representing data (also called a graph).
Graph of a function - Wikipedia
https://en.wikipedia.org/wiki/Graph_of_a_function

PageRank


Graph TV
graphtv.kevinformatics.com/
Graph Ratings of Your Favorite TV Shows. Visualize IMDb ratings and trends of TV shows by episode.
Have you seen Mad Men, Breaking Bad, or Battlestar ...
Gooooooooooogle
Previous 1 2 3 4 5 6 7 8 9 10 Next

PageRank


graph
All
Images
News
Books
Videos
More
Settings
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About 333,000,000 results (1.94 seconds)
graph[1]
/graf/
noun
1. a diagram showing the relation between variable quantities, typically of two variables, each measured along one of a pair of axes at right angles.
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https://en.wikipedia.org/wiki/Graph
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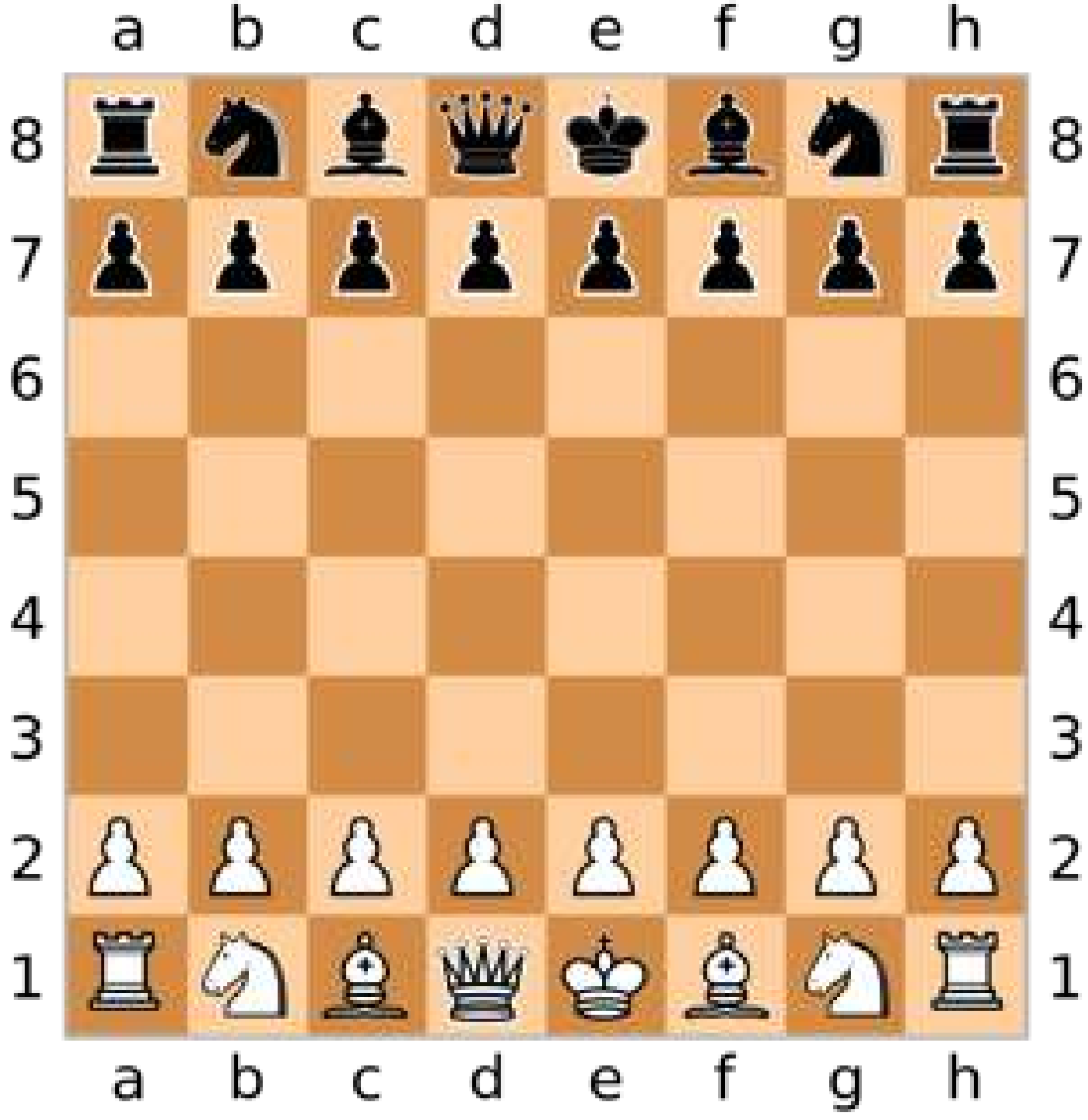
Graph of a function - Wikipedia
https://en.wikipedia.org/wiki/Graph_of_a_function

Game Strategies



Game Strategies

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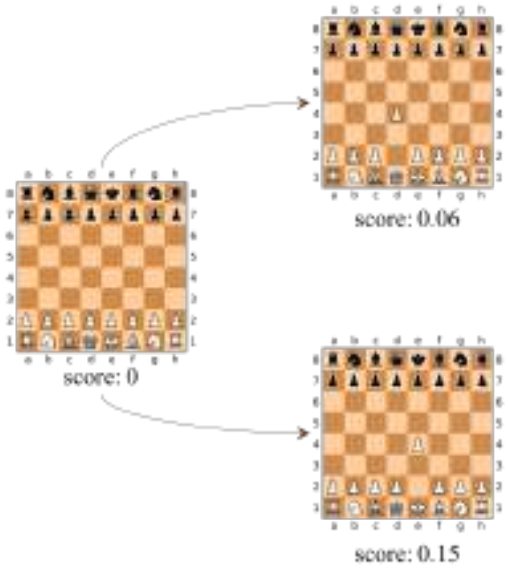
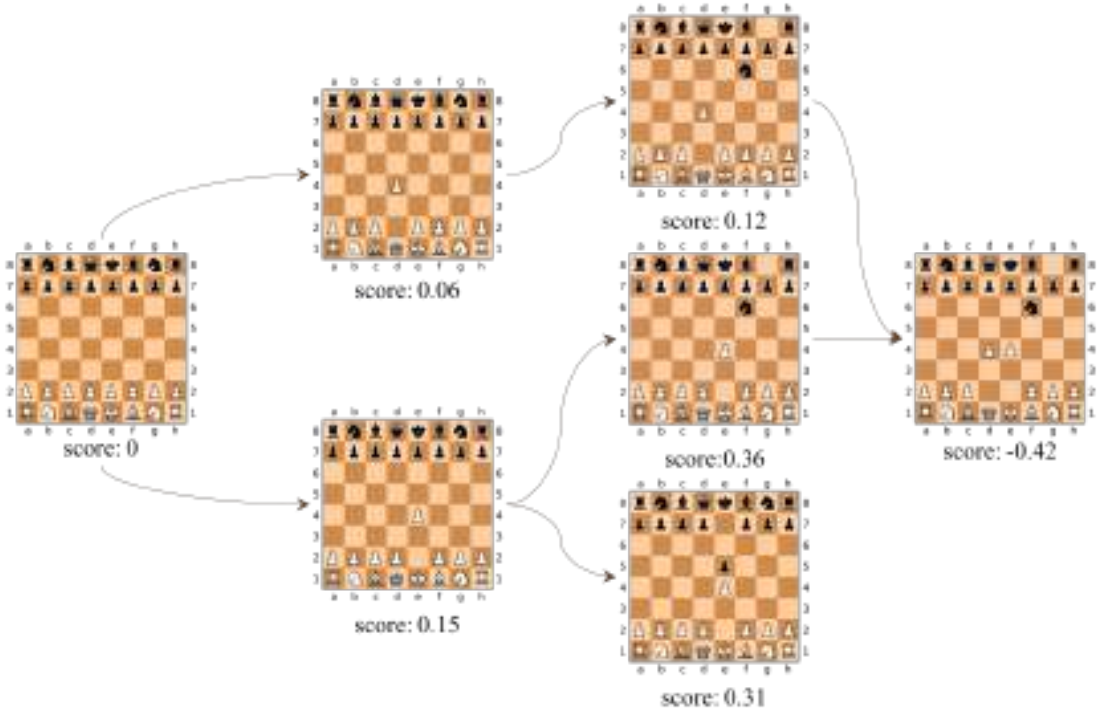
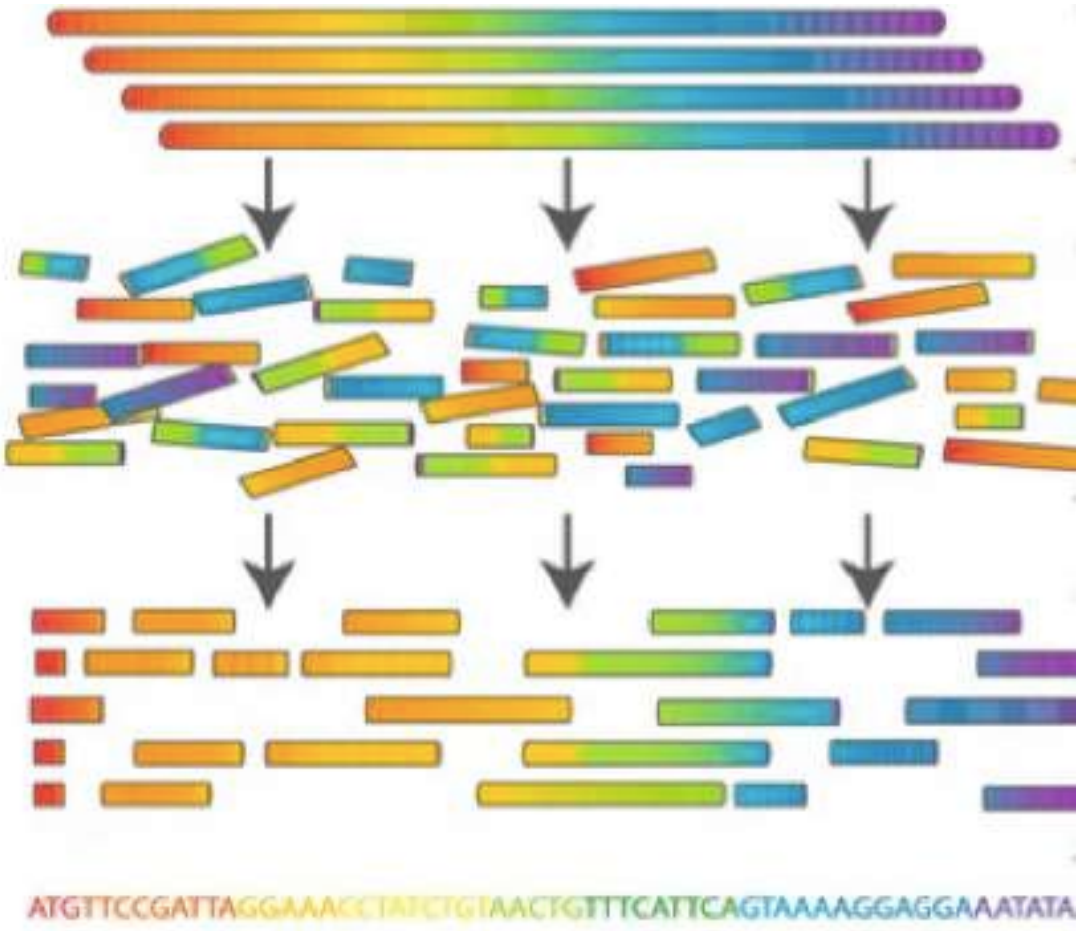


Game Strategies



Genome Assembly



GSM

GSM

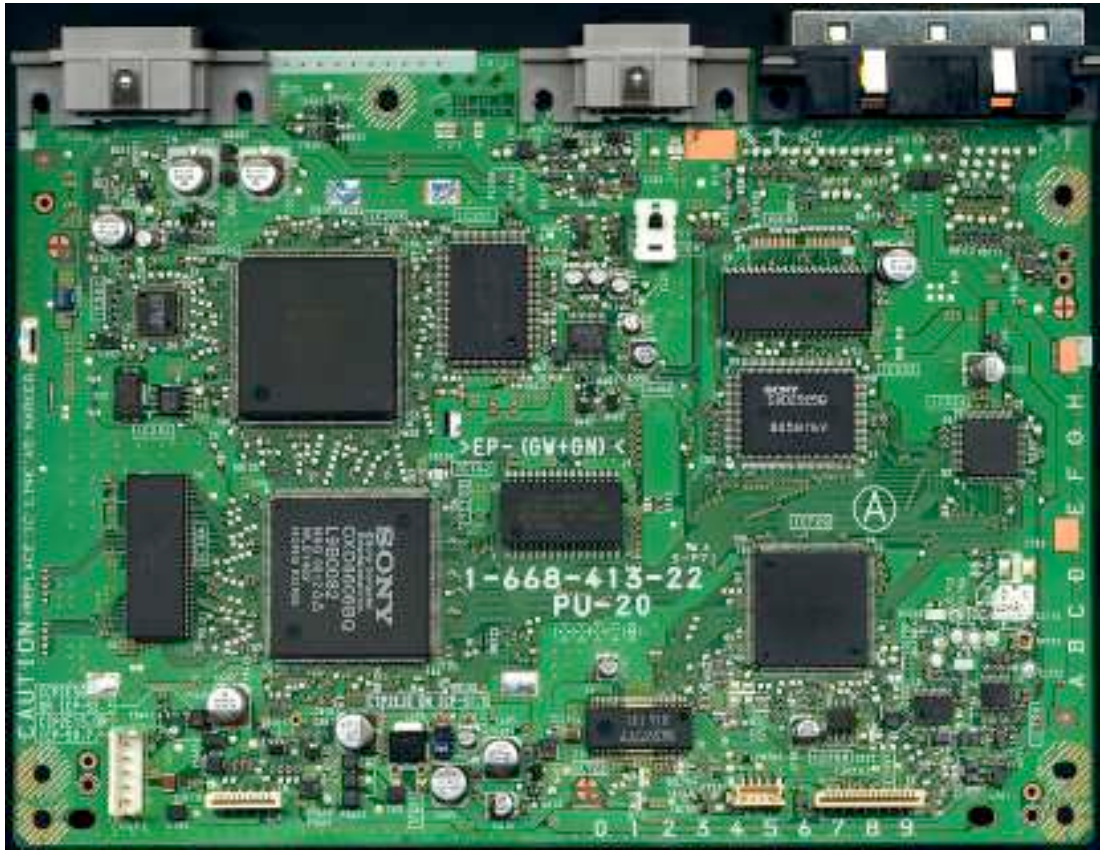
GSM

4 Frequency Ranges

GSM

4 Frequency Ranges

Computer Chips



Computer Chips