



Structuri de date și algoritmi

P vs NP

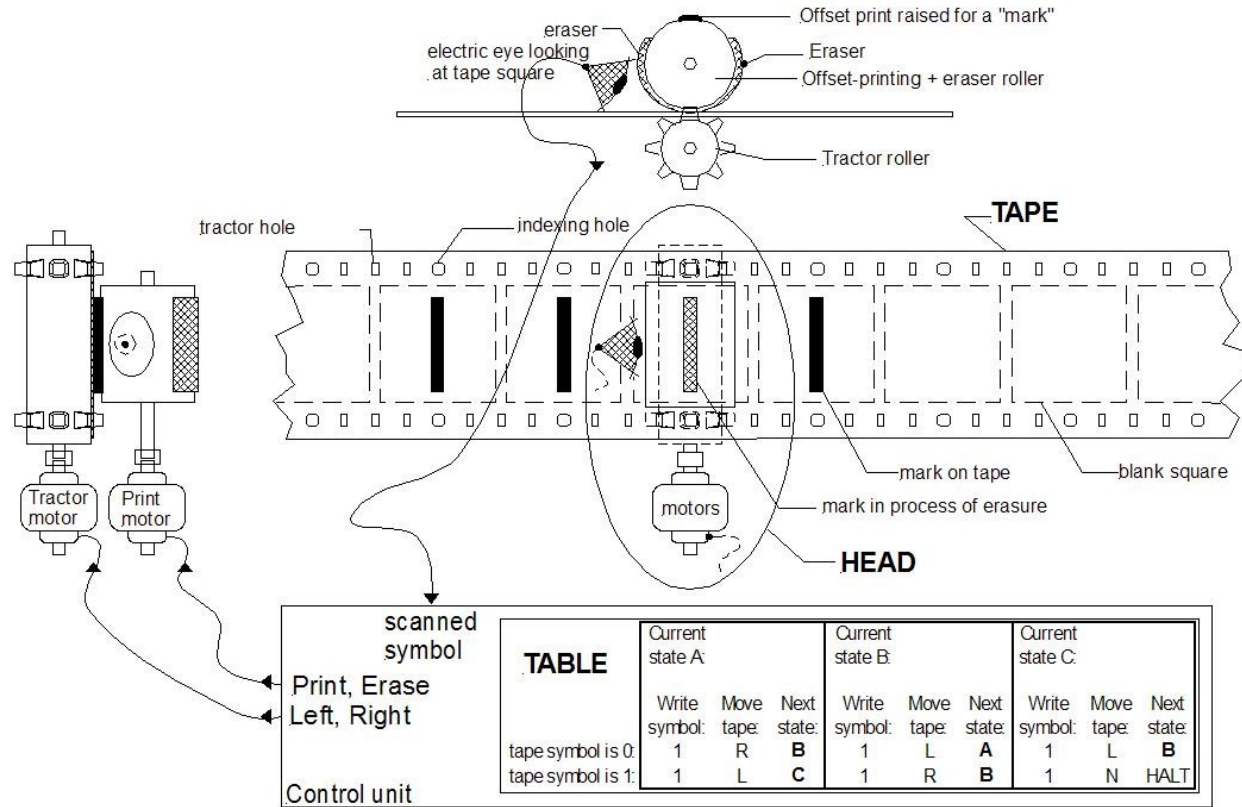
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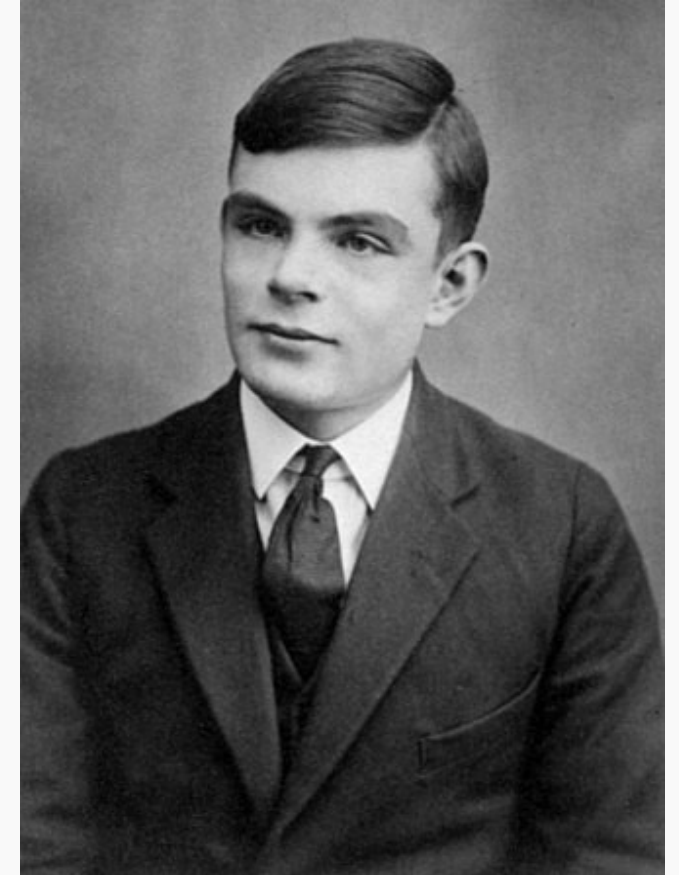




Turing computable – Turing machine – Turing complete



A fanciful mechanical Turing machine's TAPE and HEAD. The TABLE instructions might be on another "read only" tape, or perhaps on punch-cards. Usually a "finite state machine" is the model for the TABLE.

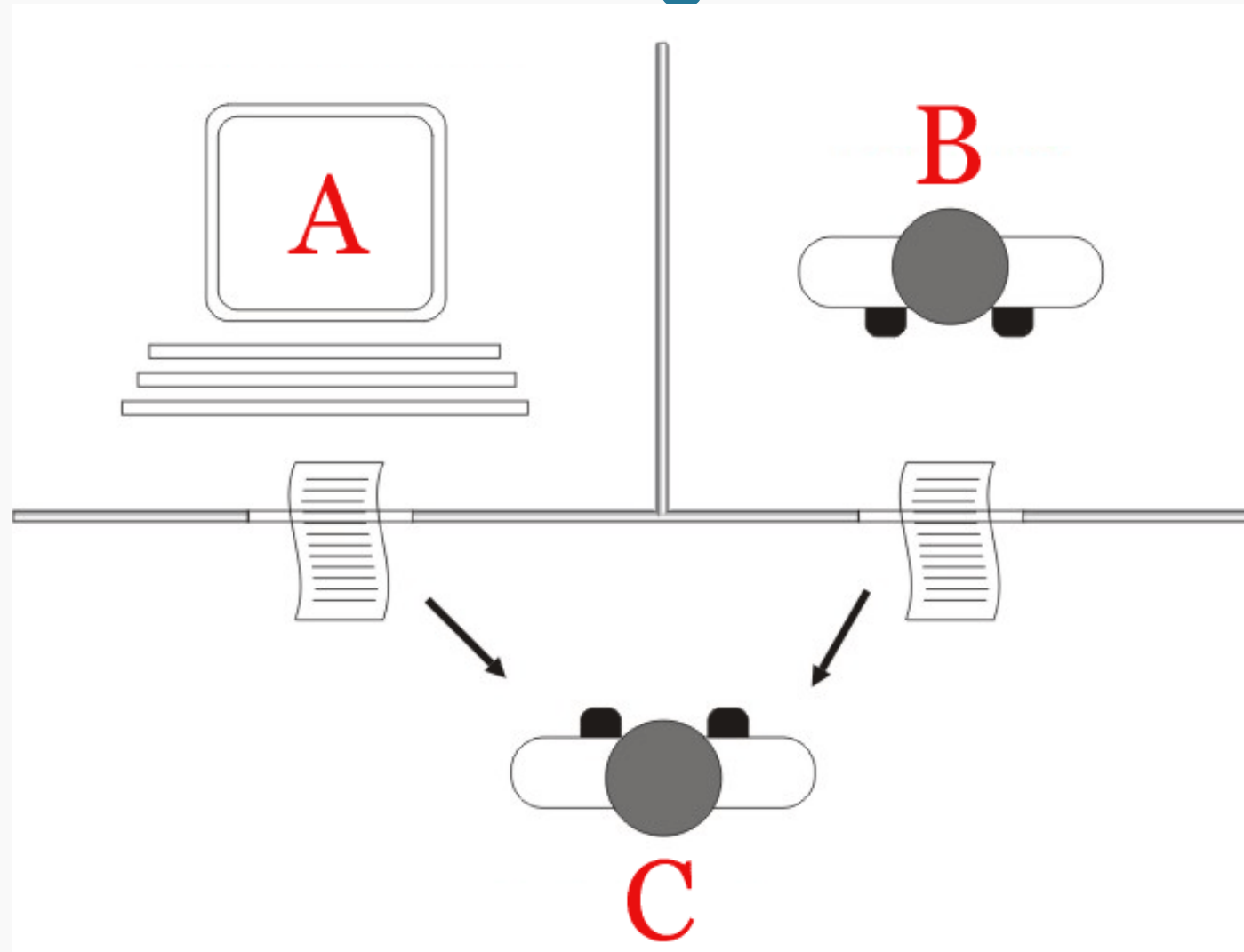


Alan Turing

https://en.wikipedia.org/wiki/Turing_machine_gallery



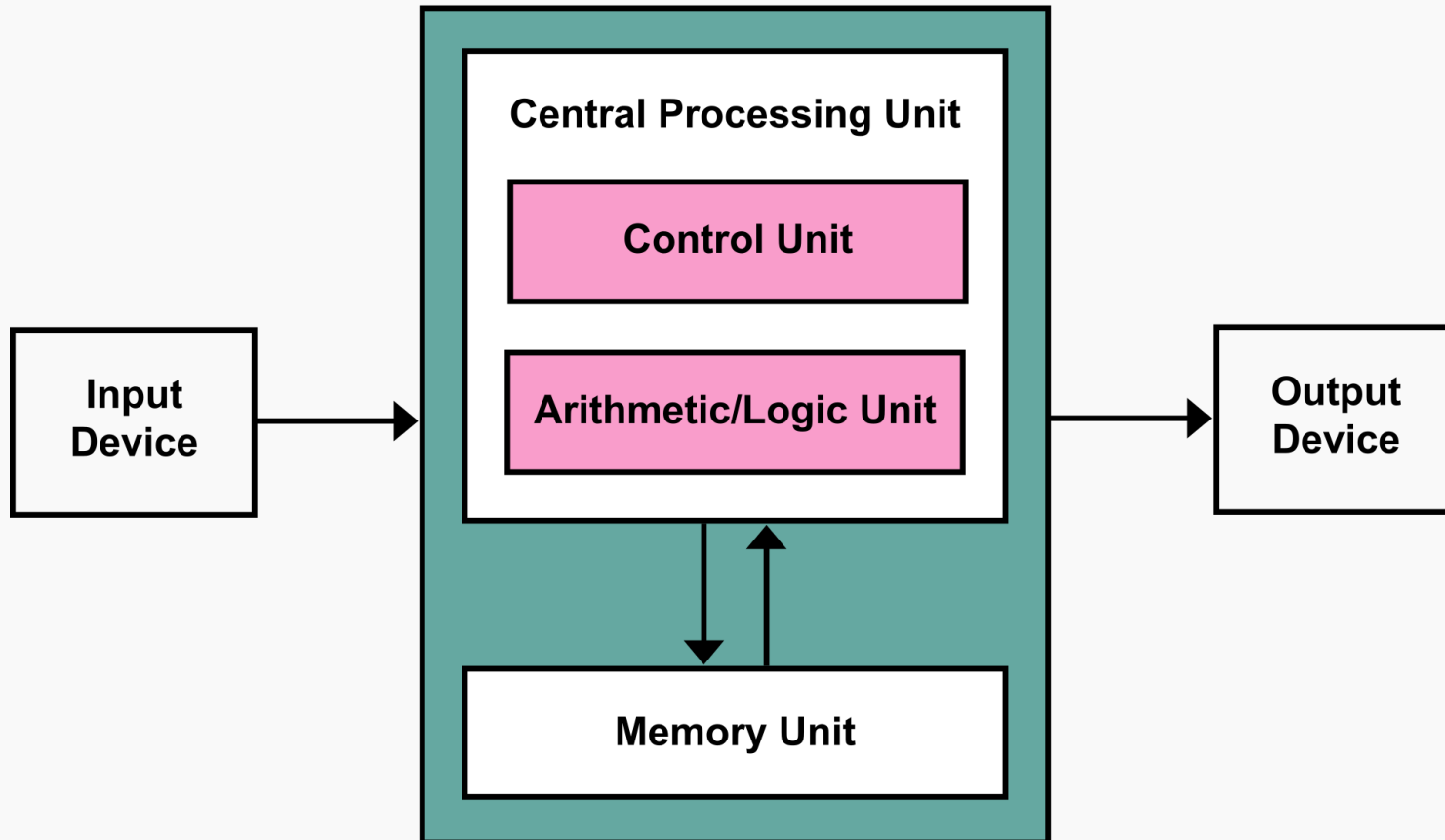
Turing test



https://en.wikipedia.org/wiki/Turing_test



von Neumann architecture



https://en.wikipedia.org/wiki/Von_Neumann_architecture



John von Neumann



P

- Aproape toate problemele discutate
- Complexitate de forma $O(N^k)$

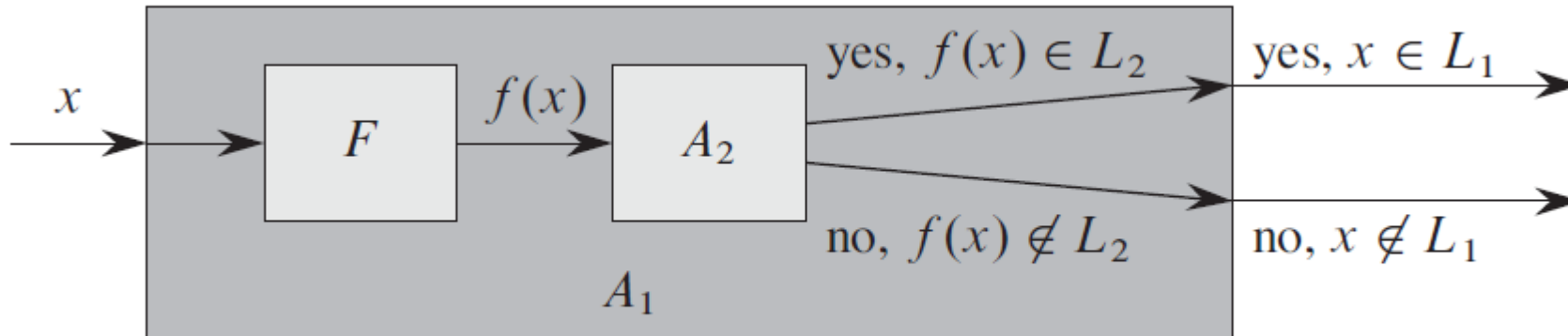
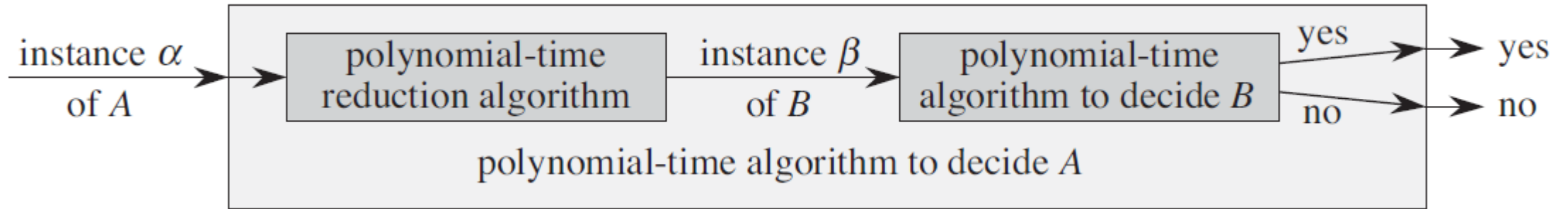


NP

- Verificabile în timp polinomial
- Multe au timp de execuție superpolinomial
 - ▣ În multe cazuri de forma exponențială $O(2^N)$



Reducerea



Cormen



NP-hard

- Oricare problemă din NP poate fi redusă la problema dată

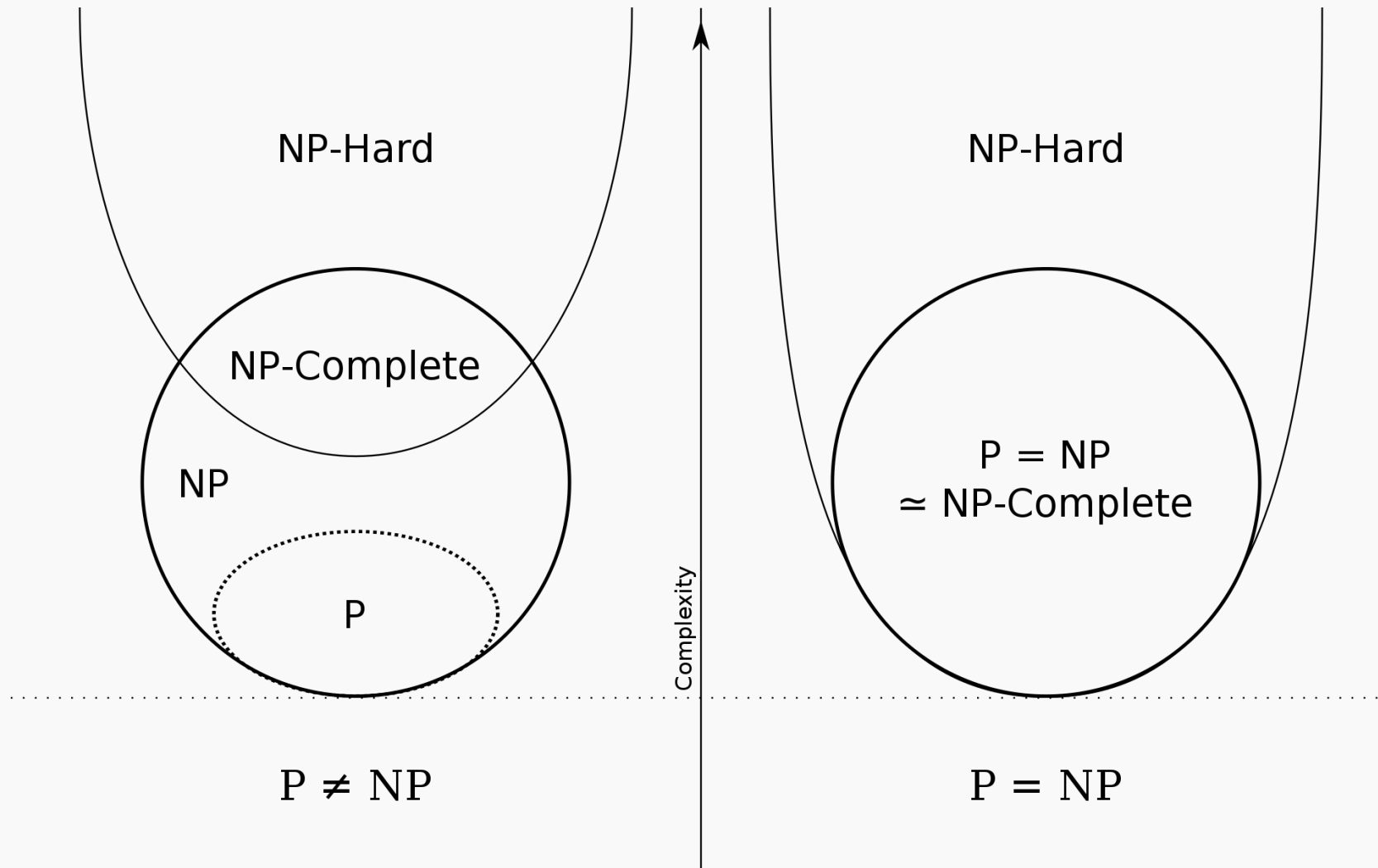


NP-complete

- Problema este în NP
- Orice problemă din NP poate fi redusă la problema dată



P vs NP



https://en.wikipedia.org/wiki/P_versus_NP_problem

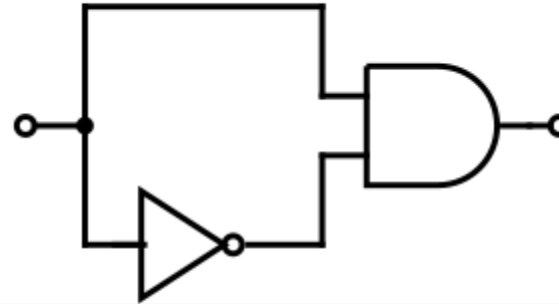




Probleme



Circuit SAT



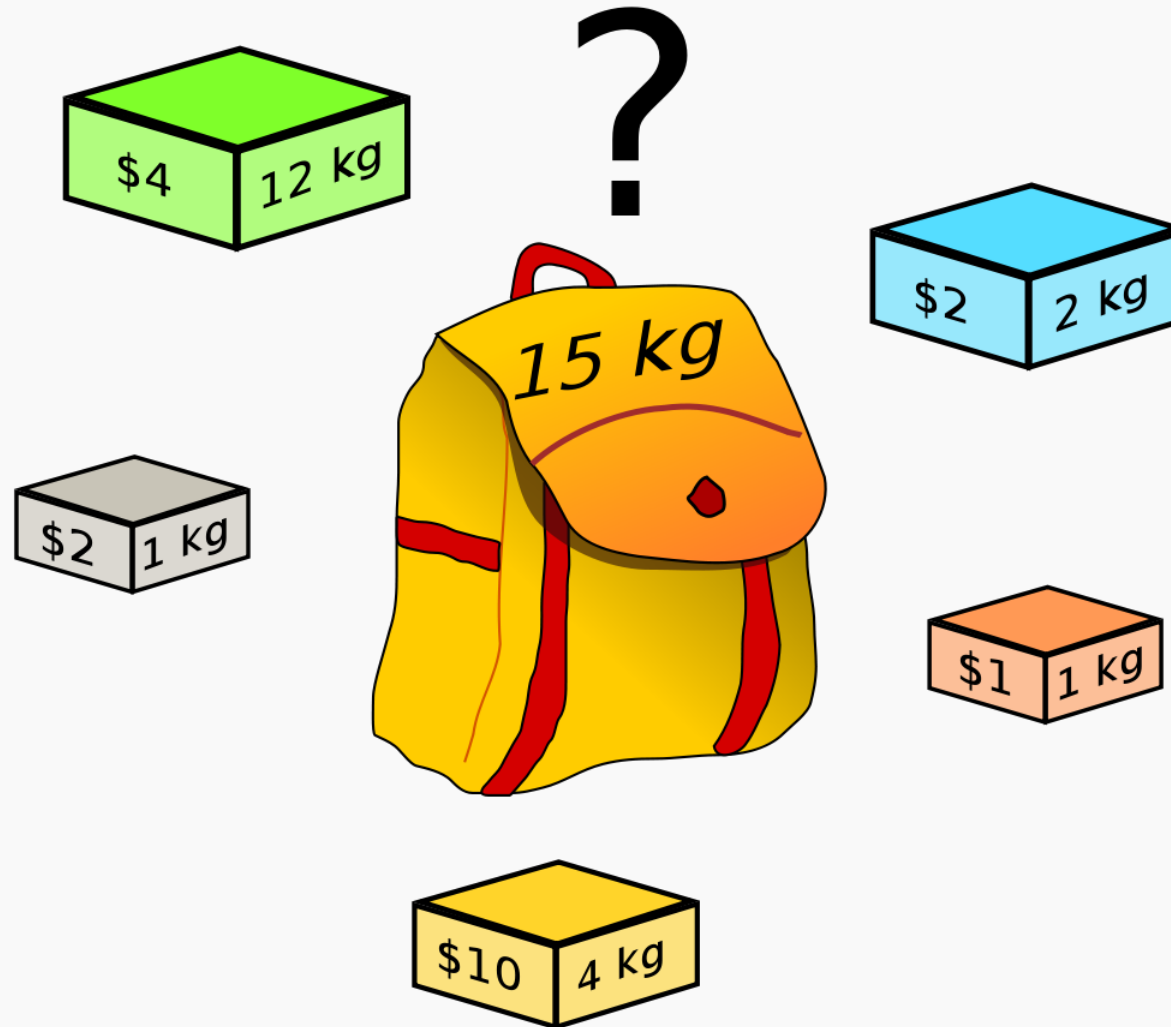
The circuit on the left is satisfiable but the circuit on the right is not.



https://en.wikipedia.org/wiki/Circuit_satisfiability_problem

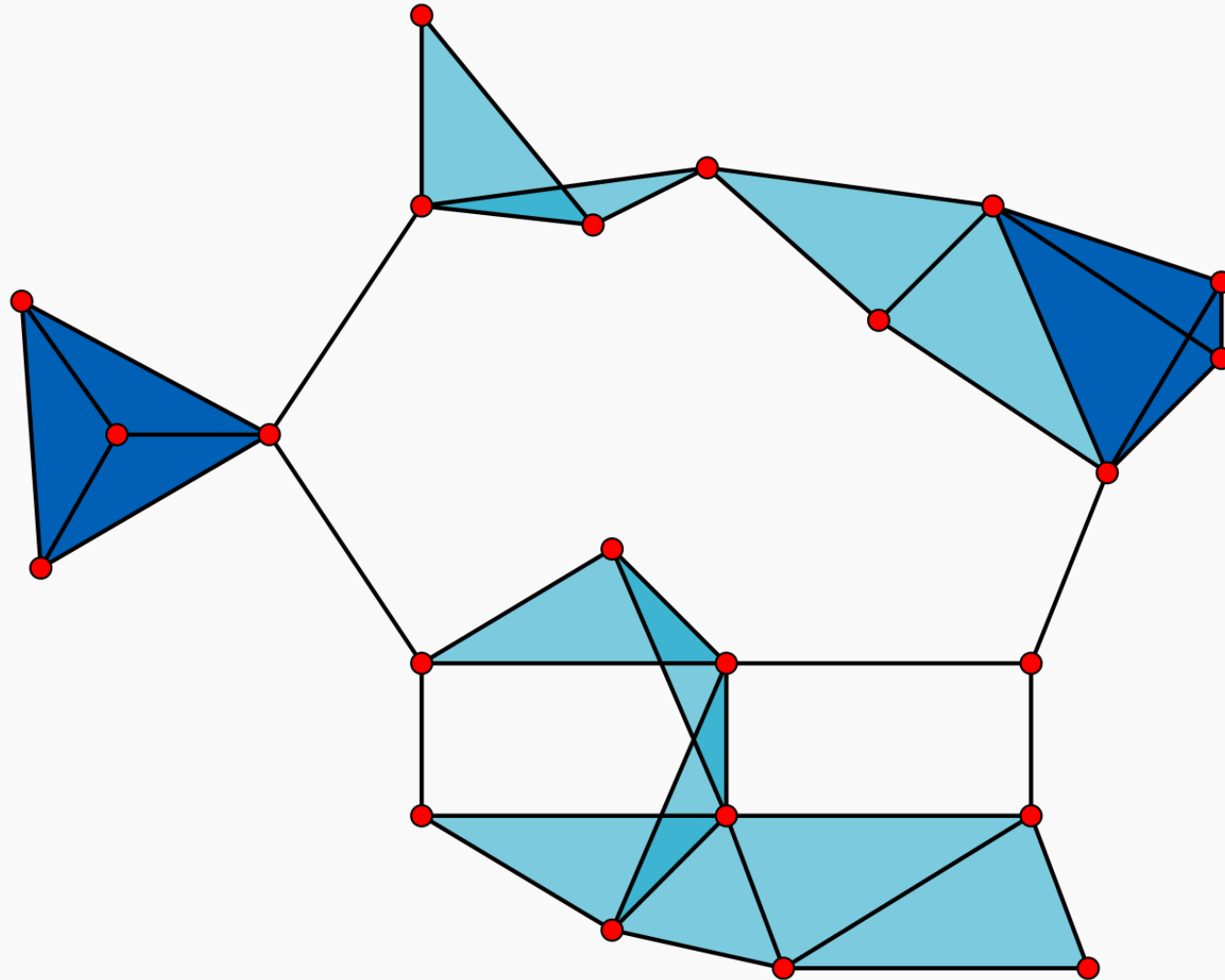


Knapsack





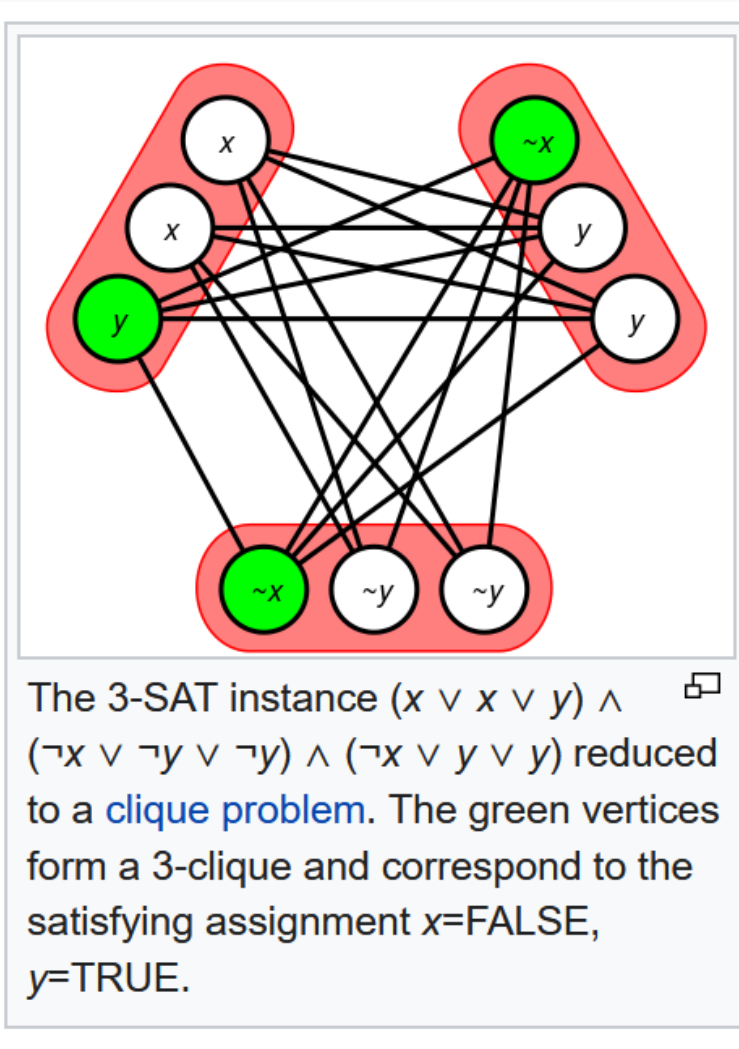
Clici



[https://en.wikipedia.org/wiki/Clique_\(graph_theory\)](https://en.wikipedia.org/wiki/Clique_(graph_theory))



Boolean satisfiability problem (SAT)



https://en.wikipedia.org/wiki/Boolean_satisfiability_problem



Subset sume

- Dându-se un set de numere întregi și o valoare (număr întreg) se cere să se determine dacă există un subset de numere care însumate au aceea valoare.



Partiționare

- Se dă un set de numere. Să se separe acest set în două subseturi astfel încât însumarea valorilor celor două subseturi au aceeași valoare.

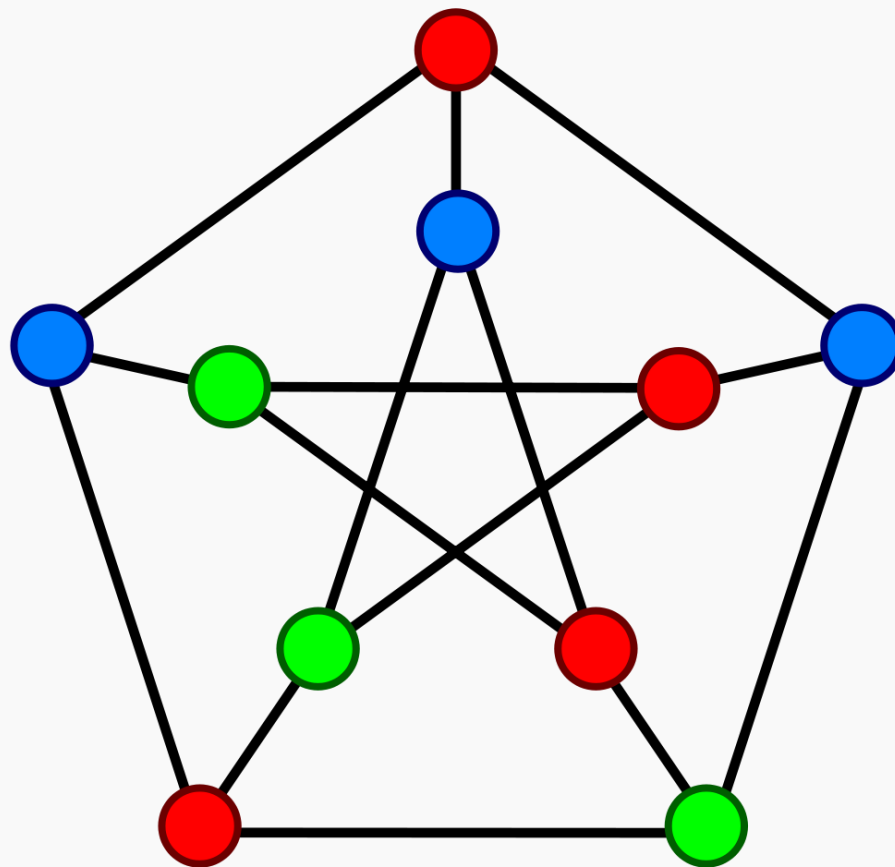


Drum maxim

- Care este cel mai lung drum între două noduri?



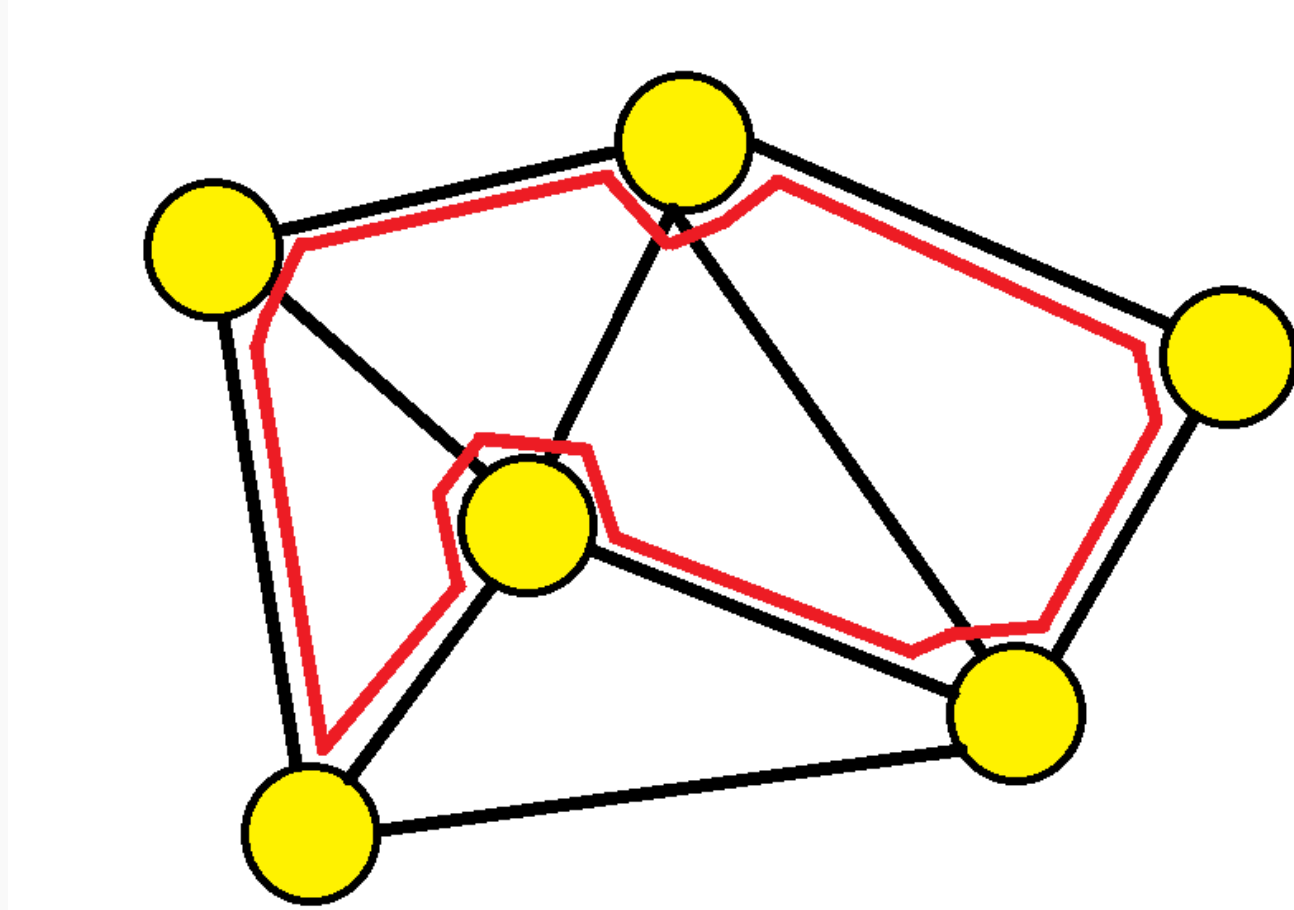
Colorare graf



https://en.wikipedia.org/wiki/Graph_coloring



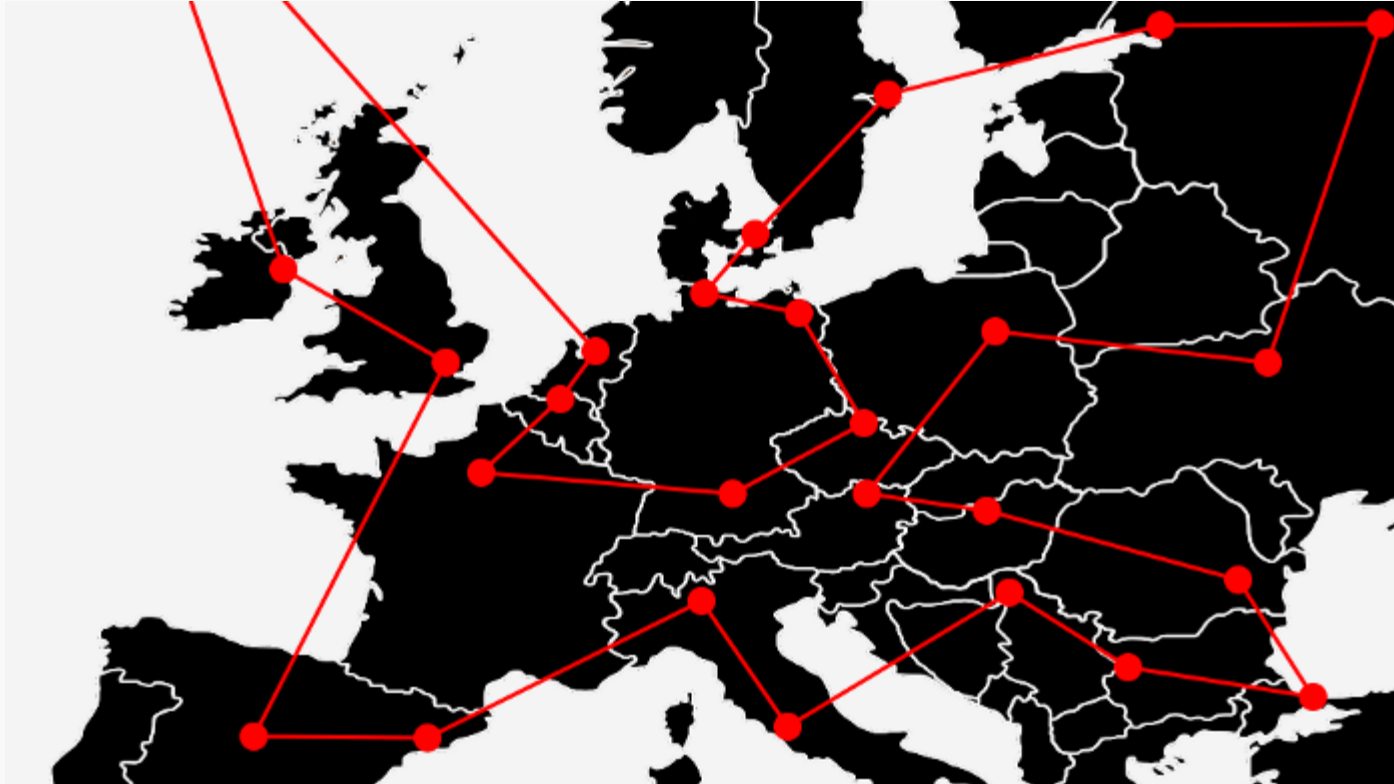
Ciclu Hamiltonian



https://en.wikipedia.org/wiki/Hamiltonian_path



Traveling salesman



<https://towardsdatascience.com/animating-the-traveling-salesman-problem-56da20b95b2f>