

Rešavanje problema maksimalne nezavisne sekvence

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Februar 2022

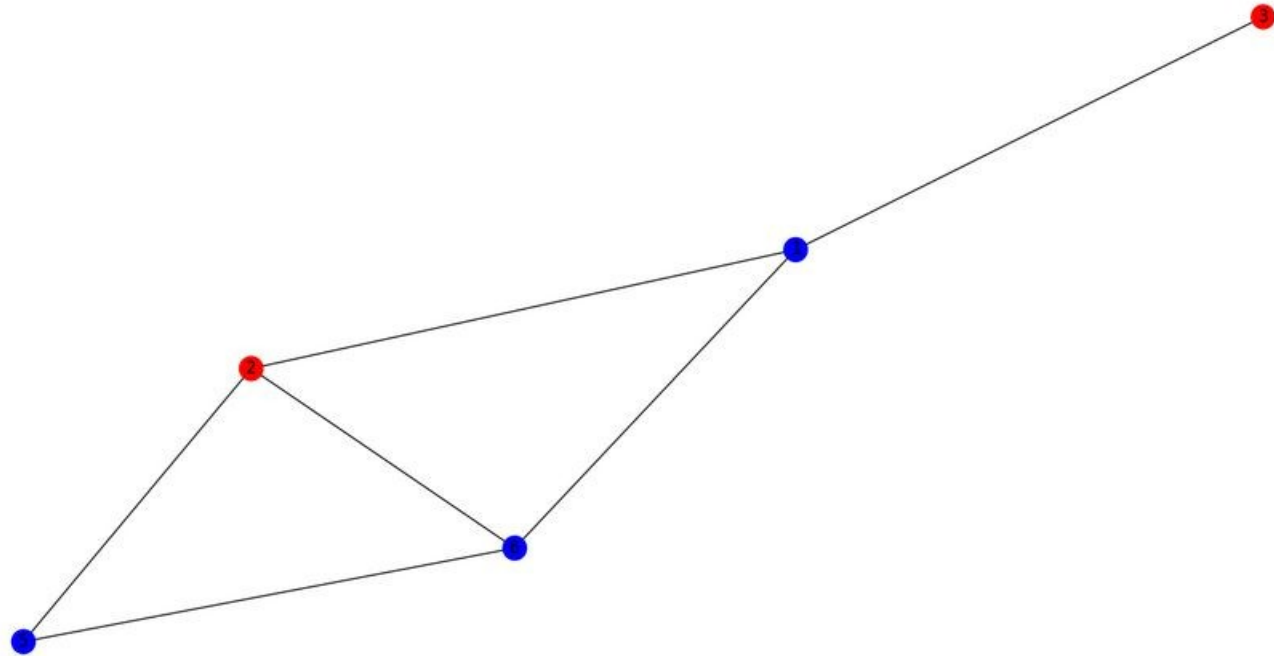


Nezavisna sekvenca

- Niz čvorova v_1, v_2, \dots, v_m takvih da za svaki v_{i+1} postoji neki susedan čvor u koji nije susedan ni sa jednim čvorom v_j , $j \leq i$.



Primer:



Primer grafa u kome je permutacija (3, 1, 2, 5, 6) dala rešenje [3, 2]



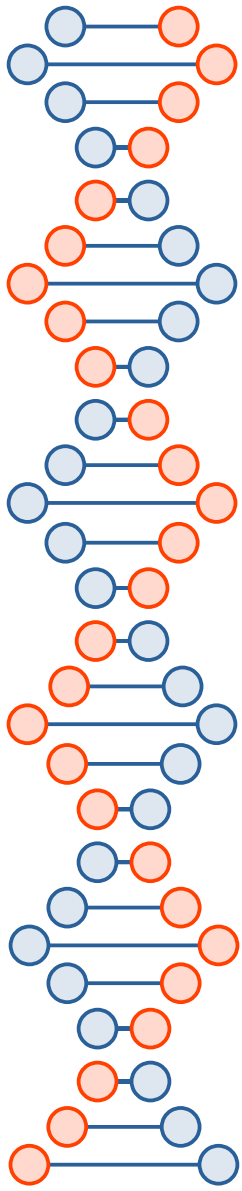
Predložena rešenja

- Gruba sila (pohlepni algoritam) – $O(V!)$
- Simulirano kaljenje
- Genetski algoritam



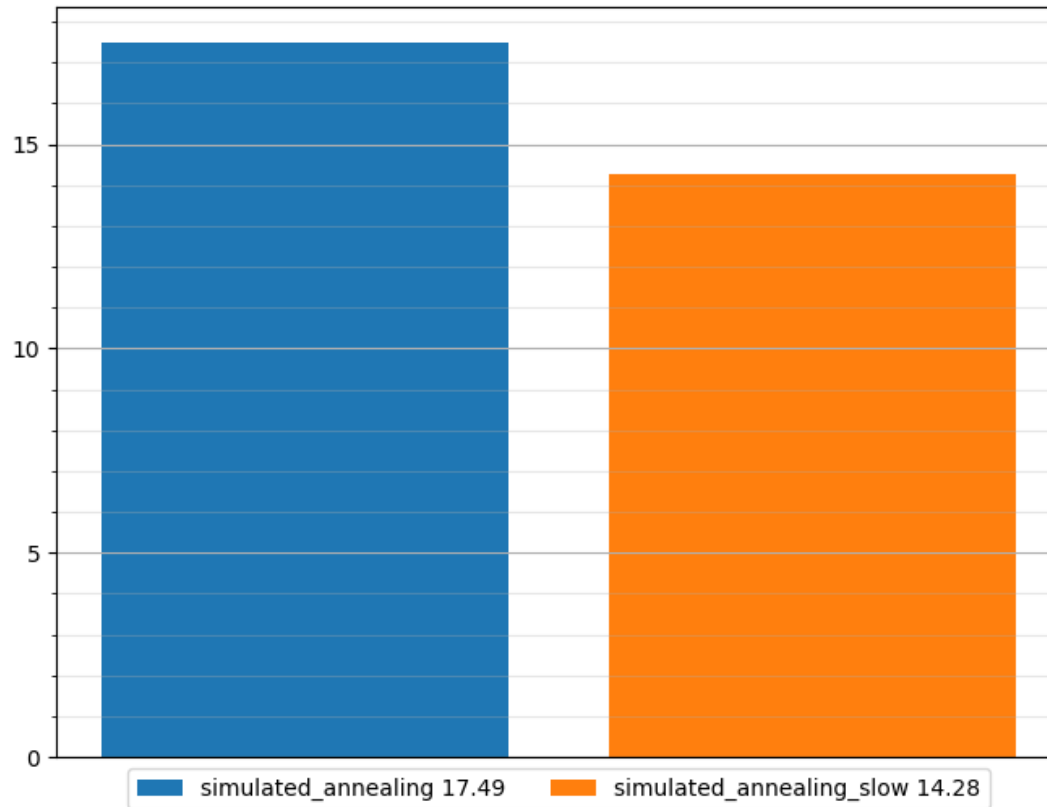
Simulirano kaljenje

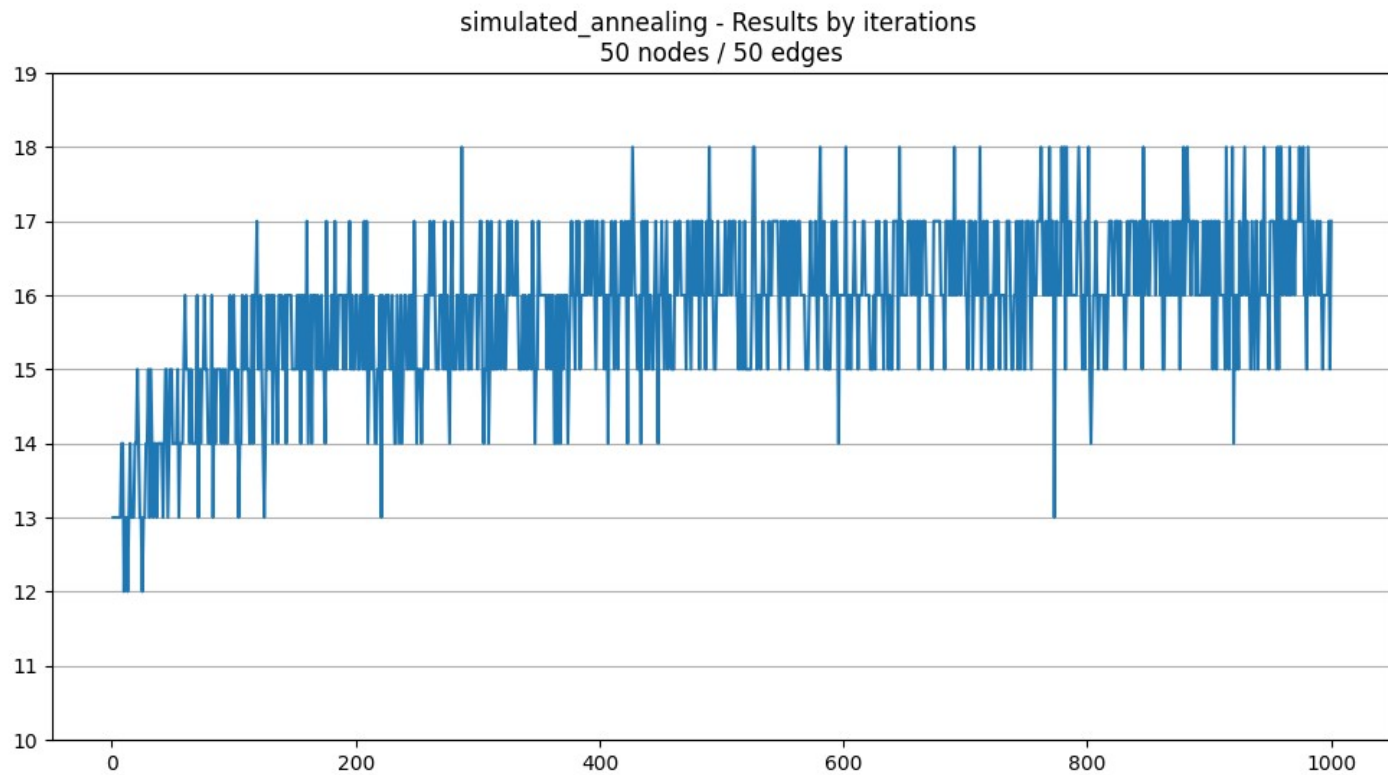
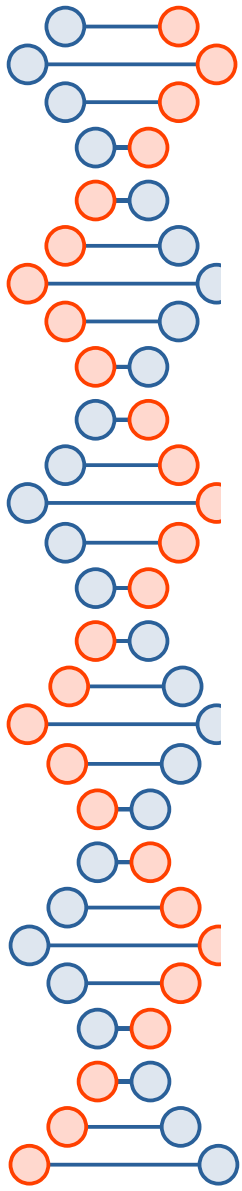
- Brzina konvergencije ($1/i$ ili $1/\sqrt{i}$)
- Broj iteracija
- Sortirano vs nesortirano

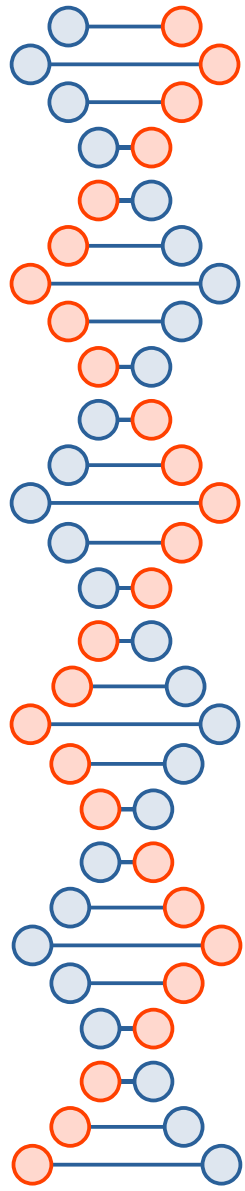


Primeri

Average for 50 nodes and 50 edges in 100 iterations

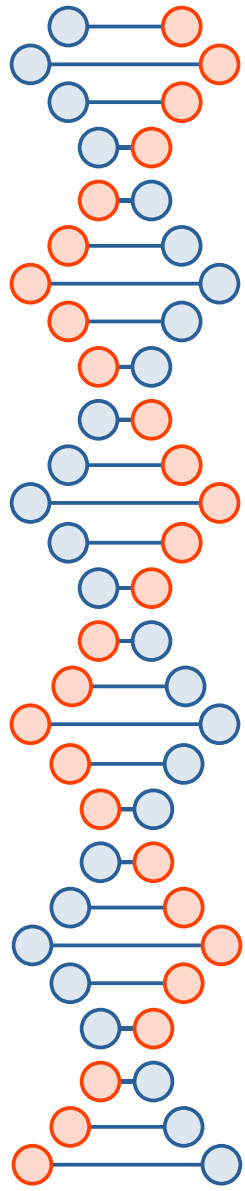




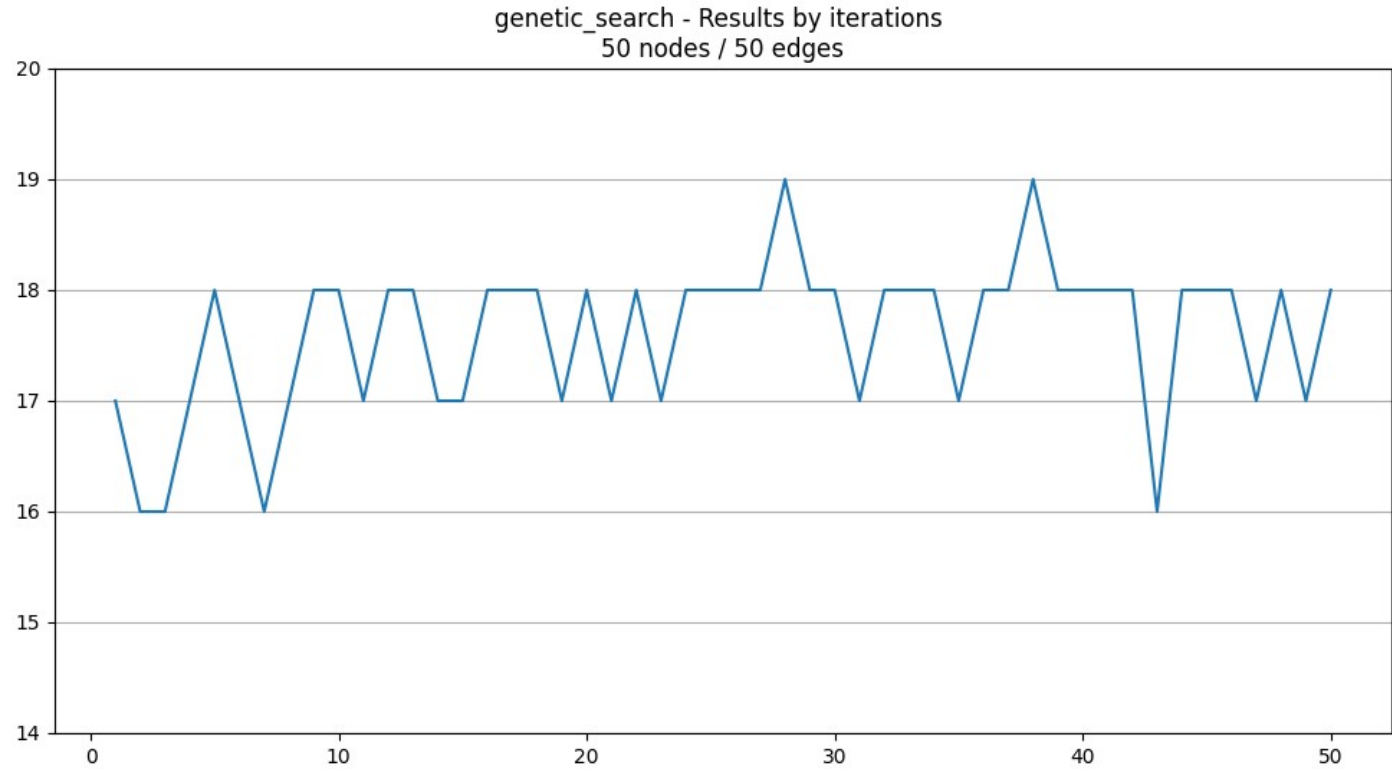


Genetski algoritam

- Bez elitizma
- Mutacija 1%
- Jednopoziciono ukrštanje (ukrštanje prvog reda)
- Turnirska selekcija



Genetski po iteracijama





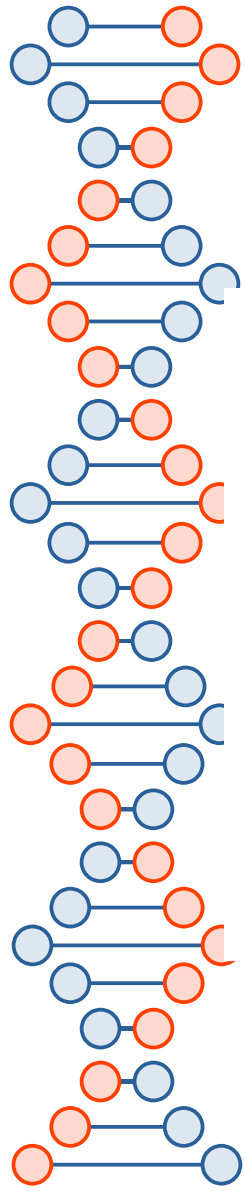
Poredjenja

Genetski:

- Cela populacija jedinki (svaka jedinka je jedno rešenje)
- Ukrštanje I mutacija
- Efikasniji pri velikom broju ivica I čvorova

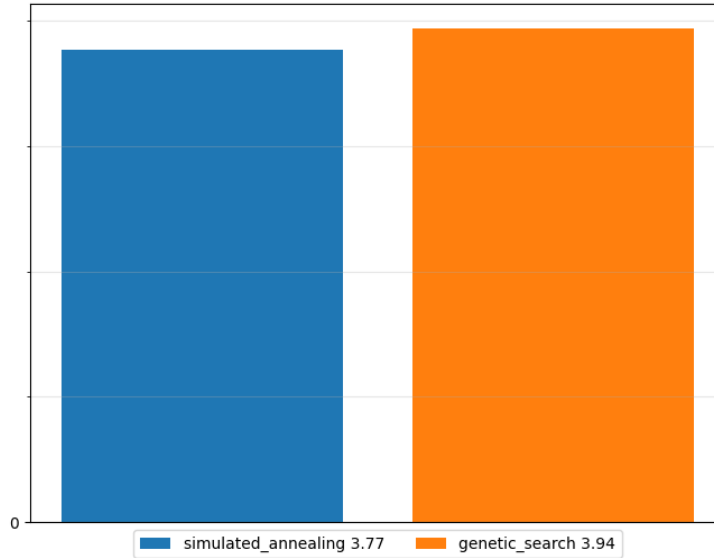
Kaljenje:

- Samo “mutacija”
- Brži
- Efikasniji na manje čvorova I ivica

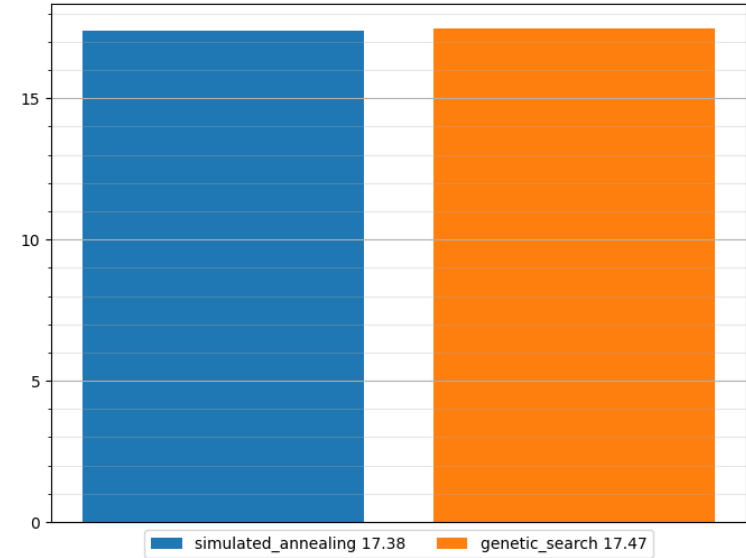


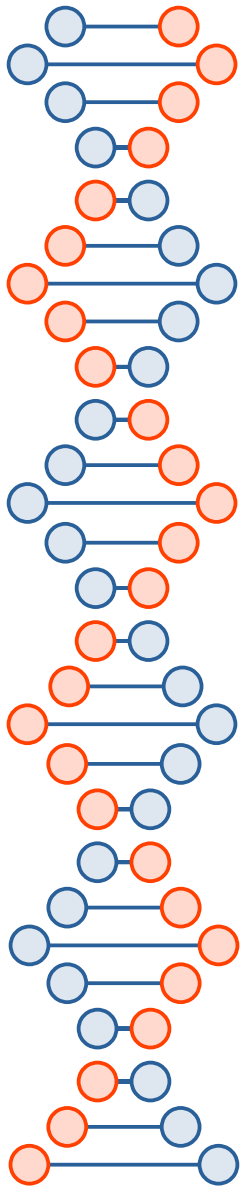
Poredjenja

Average for 10 nodes and 10 edges in 100 iterations



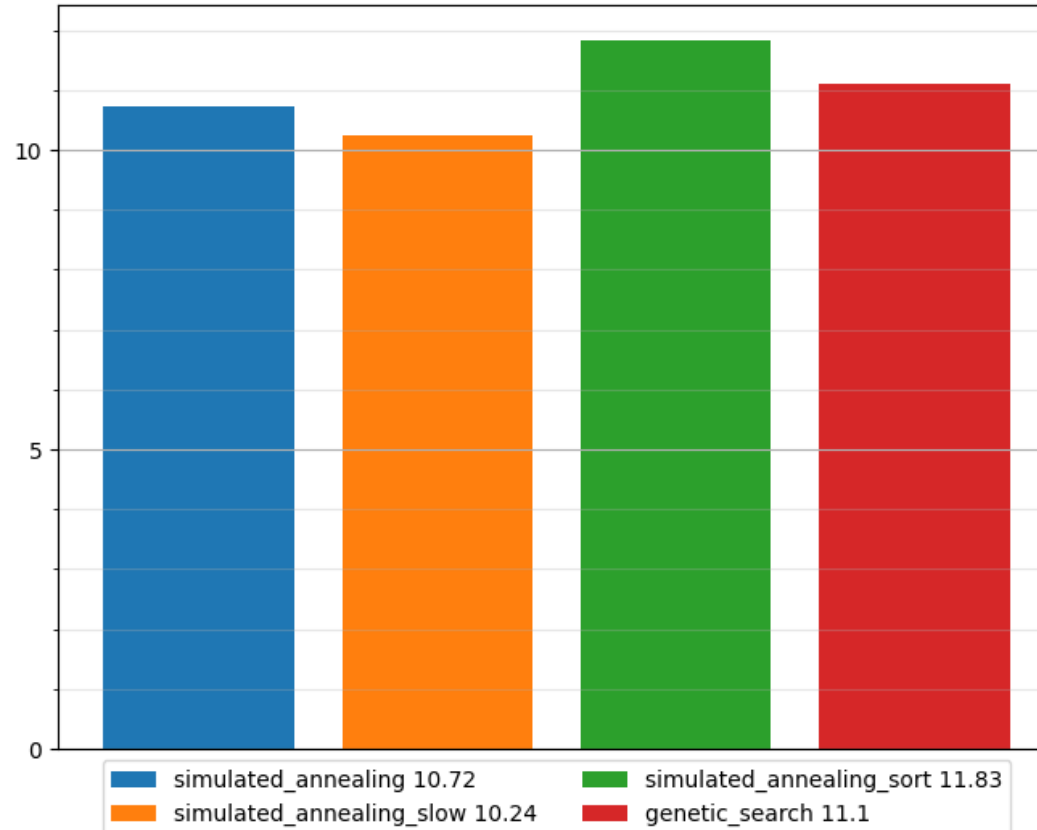
Average for 50 nodes and 50 edges in 100 iterations





Poredjenja

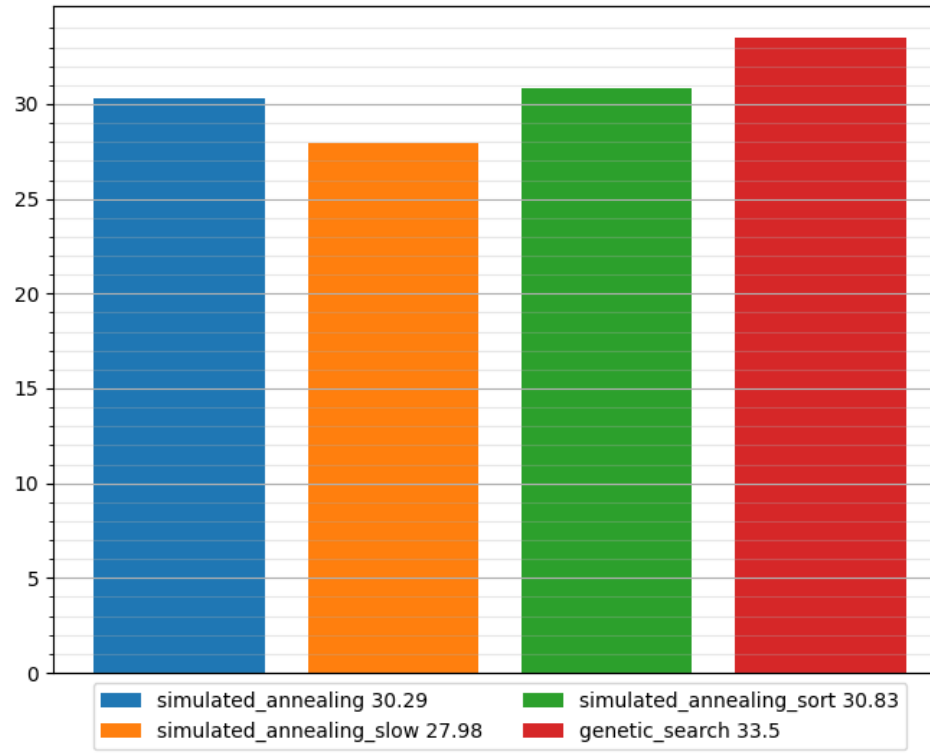
Average for 30 nodes and 50 edges in 100 iterations

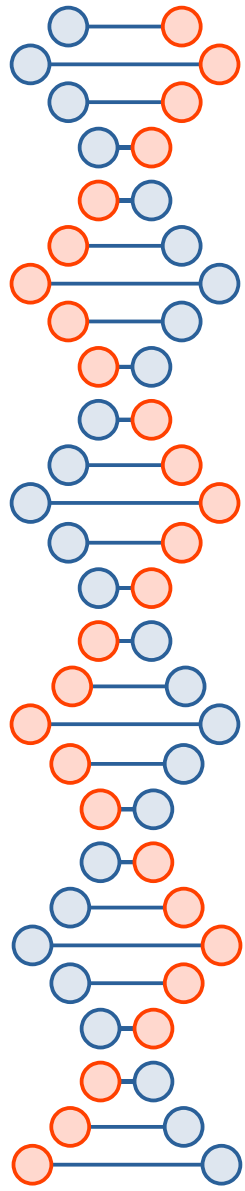




Poredjenja

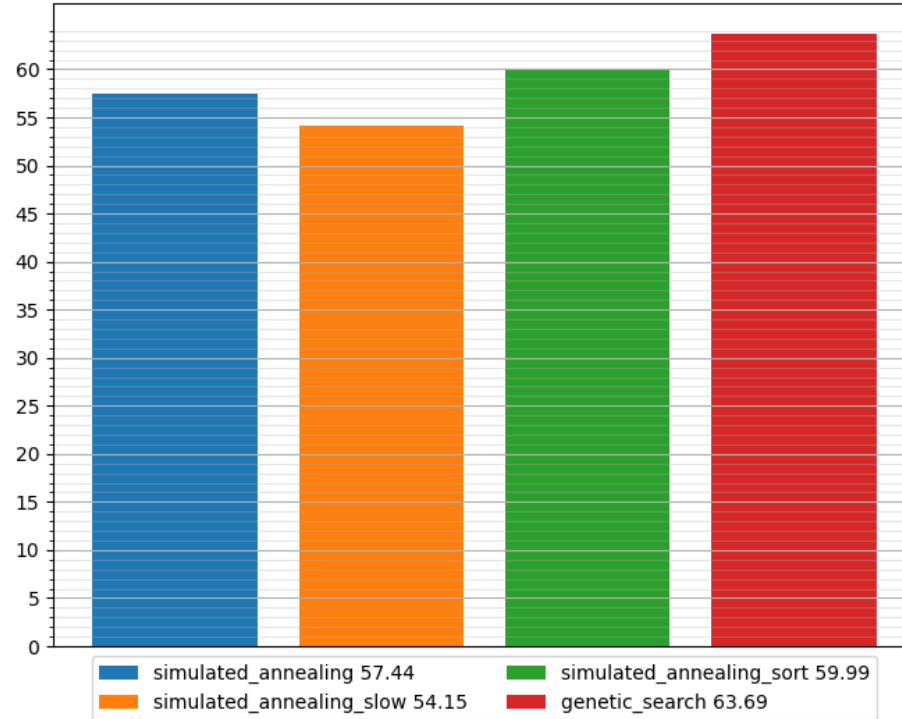
Average for 100 nodes and 100 edges in 100 iterations

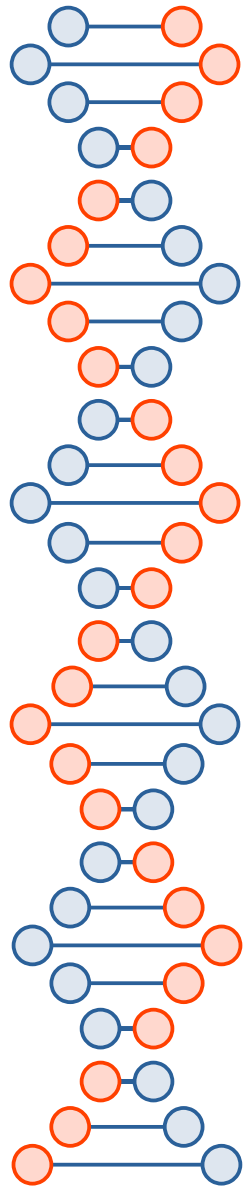




Poredjenja

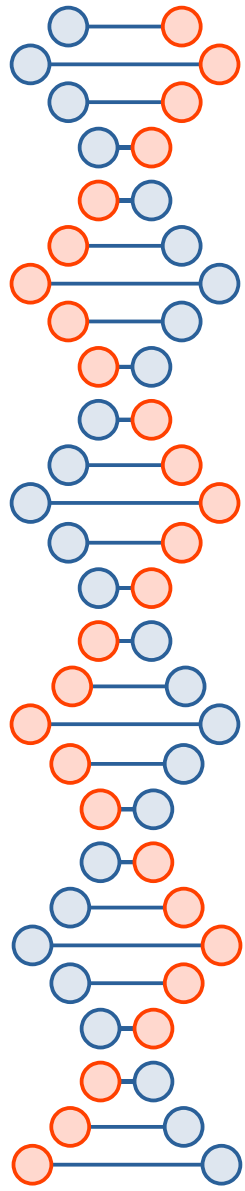
Average for 200 nodes and 300 edges in 100 iterations





Zaključak:

- Mali grafovi – simulirano kaljenje
- Veliki, gusti grafovi – genetski algoritam
- Eventualno poboljšanje simuliranog kaljenja



Literatura

- P. Crescenzi and V. Kann, A compendium of NP optimization problems, maximum independent sequence, 1999.