

# Rešavanje problema maksimalne nezavisne sekvence

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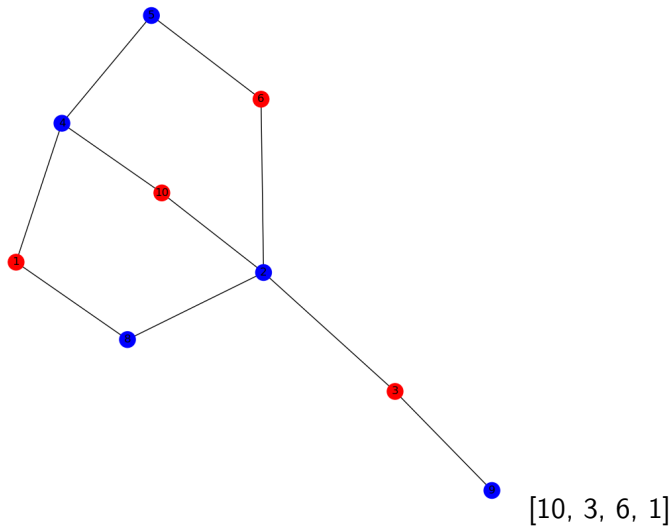
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# Nezavisna sekvenca

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



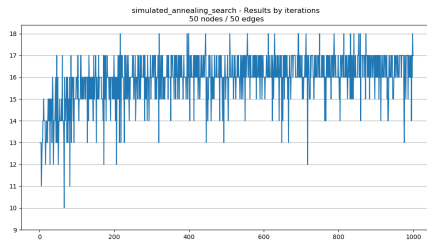
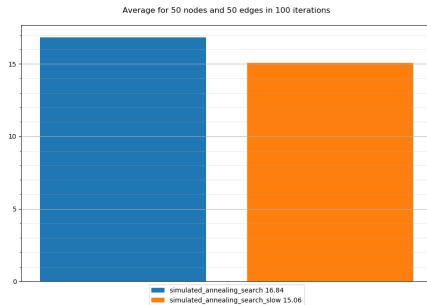
Rešenja:

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

# Simulirano kaljenje

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

# Primeri



# Varijacije kaljenja

Pokušaj pronalaženja više okolina:

- Svih  $n$

- $\frac{n}{2}$

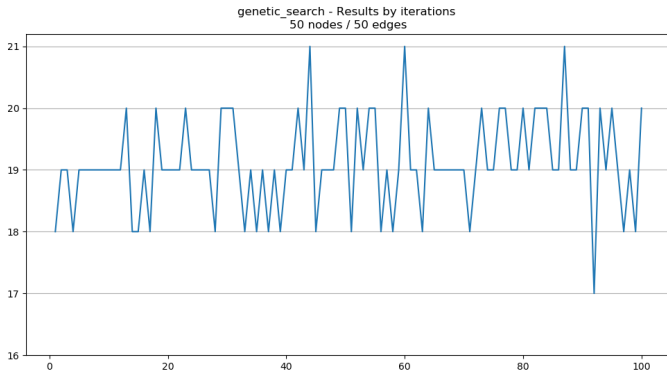
- 3

# Genetski algoritam

- Bez elitizma
- Mutacija 1%
- Ukrštanje prvog reda
- Turnirska selekcija



# Genetski po iteracijama



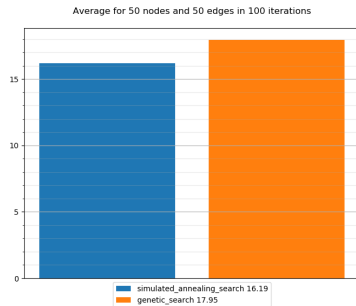
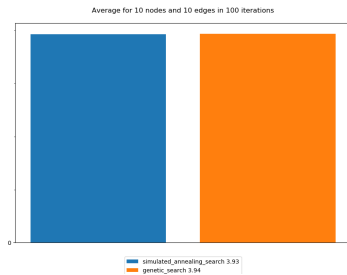
Genetski:

- Cela populacija jedinki (Rešenja)
- Ukrštanje i mutacija

Kaljenje:

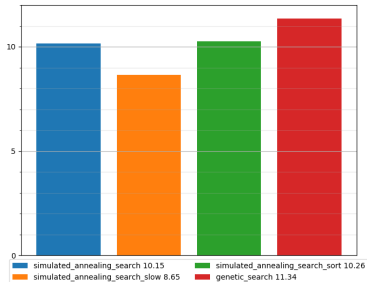
- Samo "mutacija" (okolina)
- Brži

# Poređenje

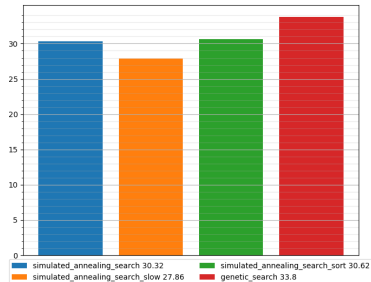


# Poređenja

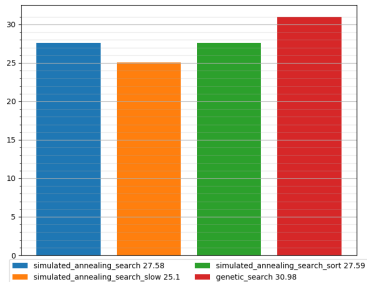
Average for 30 nodes and 50 edges in 100 iterations



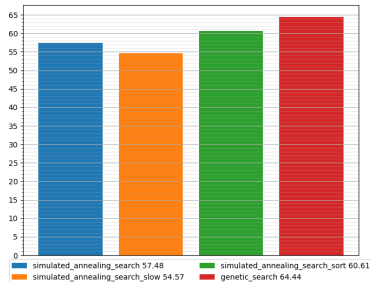
Average for 100 nodes and 100 edges in 100 iterations



Average for 100 nodes and 250 edges in 100 iterations

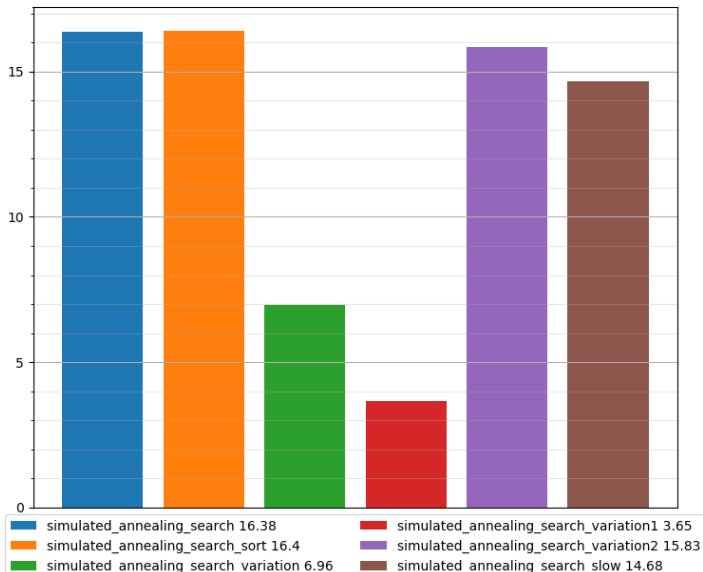


Average for 200 nodes and 300 edges in 100 iterations



# Poredjenja

Average for 50 nodes and 50 edges in 100 iterations



- Mali grafovi - simulirano kaljenje
- Veliki i gusti grafovi - genetski algoritam
- Eventualna poboljšanja simuliranog kaljenja

- P. Crescenzi and V. Kann, *A compendium of NP optimization problems, maximum independent sequence*, 1999.
- M. M. Halldórsson, *Approximations of weighted independent set and hereditary subset problems*, 2000.