Generisanje random grafova

Anđela Damnjanović

Univerzitet u Beogradu, Matematički fakultet

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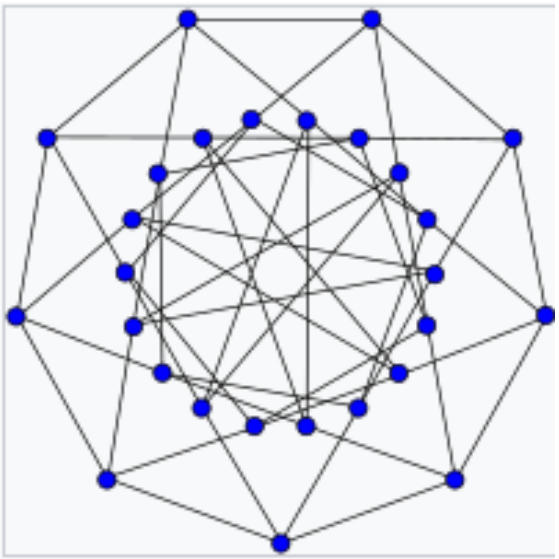
Sadržaj

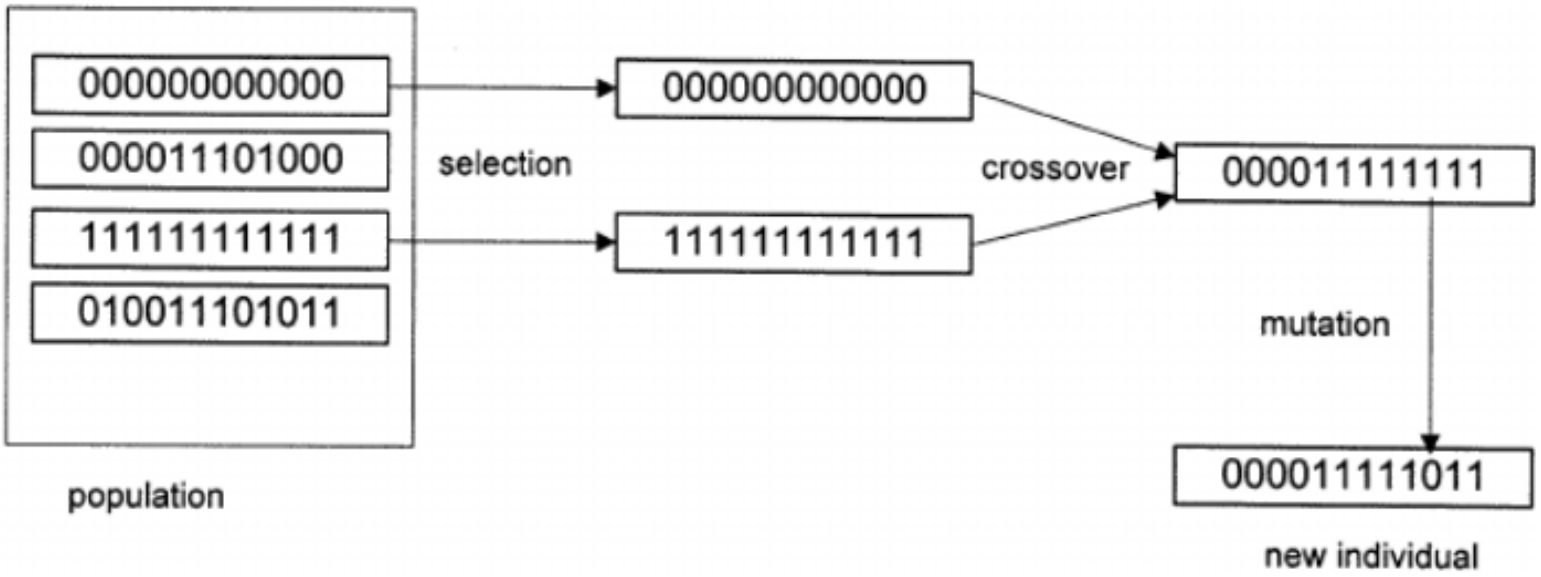
Uvod

- Značaj grafova — praktični i teorijski
- Grafovski algoritmi
- Mane algoritama



Opis problema

- Željena svojstva $\rightarrow$ graf
- Genetski algoritam



- Aviz projekat

Implementacija

1. Učitavanje test primera

```
{"num nodes": 6,
"average degree": 3.33,
"clustering coefficient": 0.7,
"num of connected components": 1,
"transitivity": 0.75}
```

2. Organizacija ulaznih vrednosti
3. Poziv algoritma
4. Rezultati

Implementacija

- Klasa *Individual*

```
1000 self.graph = nx.erdos_renyi_graph(self.num_nodes, 0.5)
```

```
1000 return -((abs(num_of_graph_nodes - self.num_nodes))/max_nodes +
         abs(graph_avg_degree - self.avg_degree)/max_degree + abs(
         graph_clustering_coefficient - self.avg_clustering_coeff) +
         abs(graph_transitivity - self.transitivity)+ (abs(
         graph_connected_components-self.num_components)/
         max_components))
```

Implementacija

- Funkcije *mutation* i *selection*

```
1000 nx.to_numpy_array(parent1.graph)
```

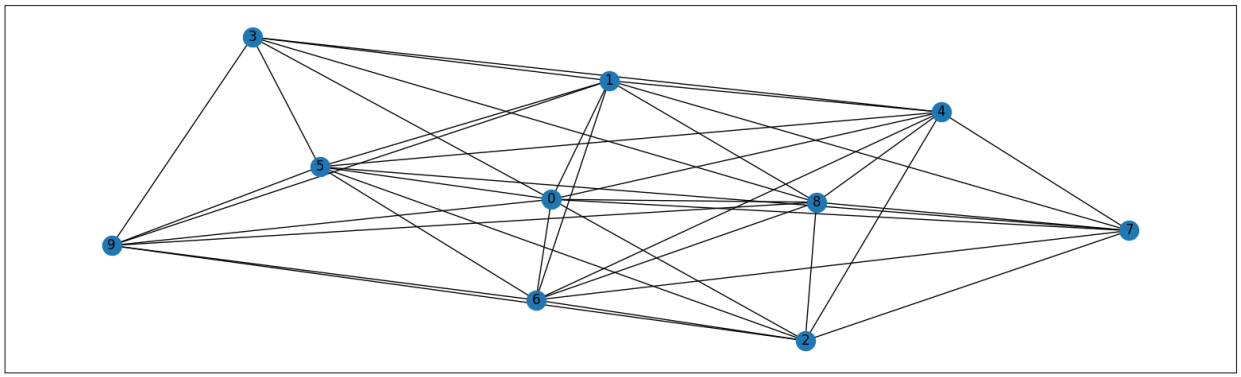
```
1000 nx.from_numpy_array(adj_mat_c1d1)
```

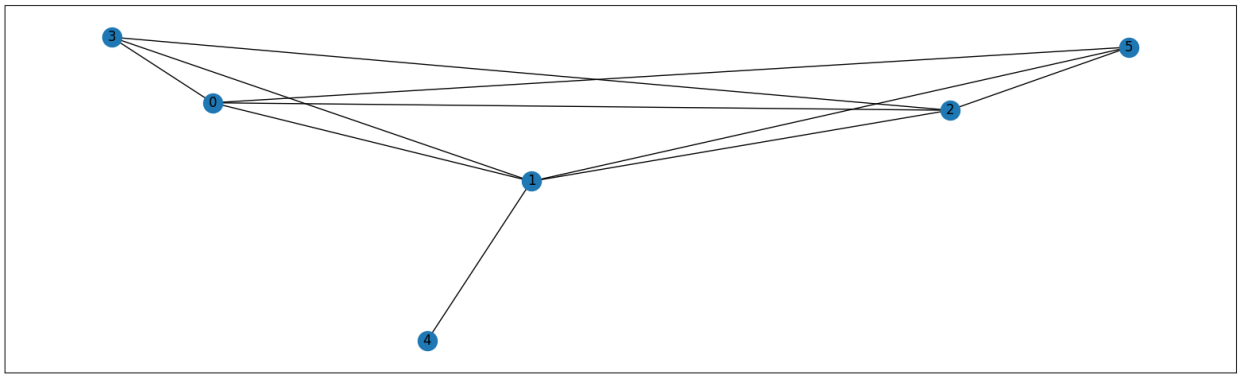
Rezultati

Tabela 1: Vrednosti fitness funkcije

Broj čvorova	Veličina populacije	Fitness
6	50	-0.005622222222222093
6	100	-0.005622222222222093
10	50	-0.02
10	100	-0.015999999999999997
10	50	-0.01085664682539699
10	100	-0.006736282964629461
25	50	-1.2832926628926629
25	100	-1.2528776855378152
50	50	-0.45898283539623946
50	100	-0.44200014007646093
75	50	-0.015890695284337637
75	100	-0.007531980904111335
100	50	-2.597159336271236
100	100	-2.6122425497135984

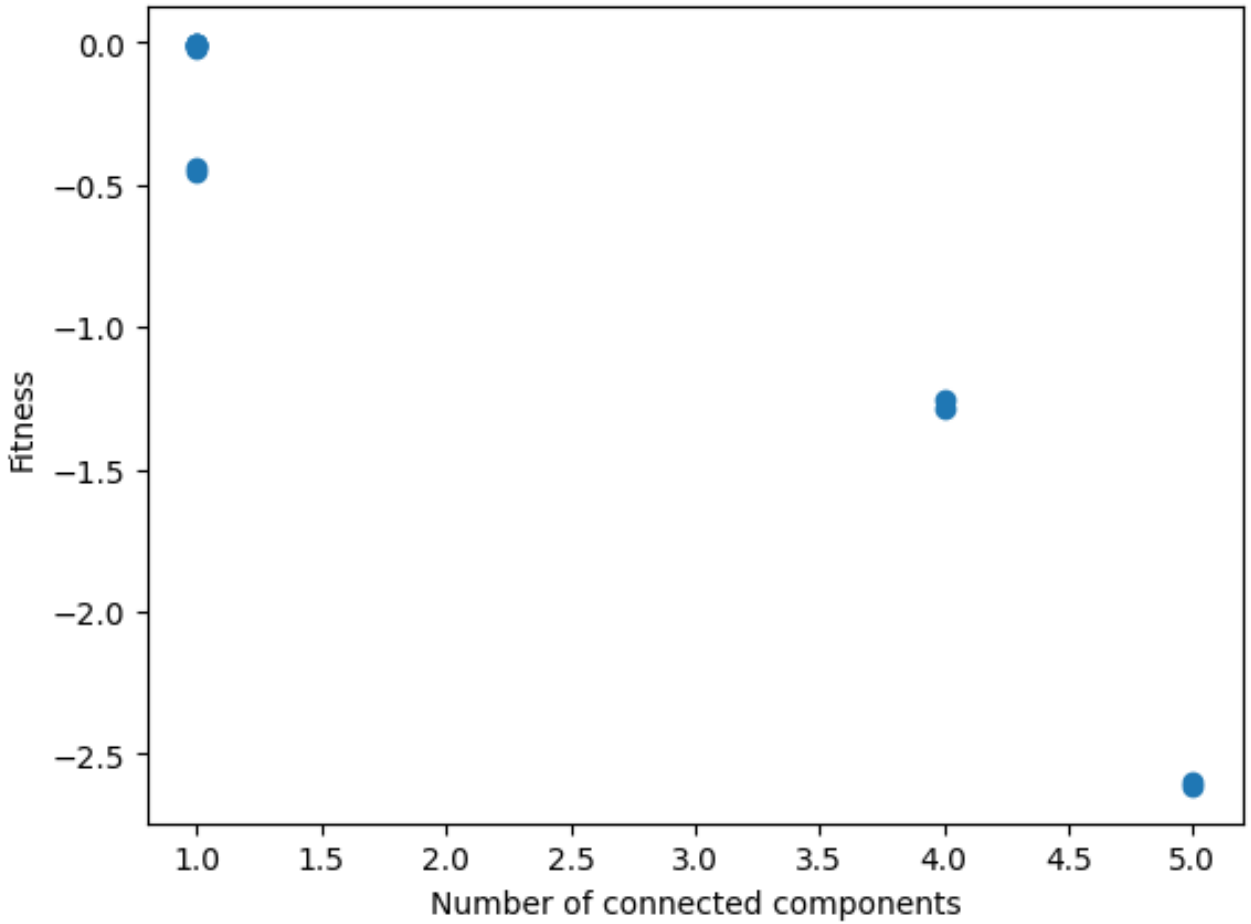
Rezultati





Rezultati

- Poboljšanja?
  - Postojanje linearnog modela?



Rezultati

- Poboljšanja?
  - Matrica korelacije?

```
Correlation matrix is :
                 fitness  num_of_nodes  avg_degree  num_components  \
fitness         1.000000     -0.658670    0.323508       -0.958681
num_of_nodes   -0.658670      1.000000    0.442679        0.521044
avg_degree      0.323508      0.442679    1.000000       -0.354475
num_components -0.958681      0.521044   -0.354475        1.000000
transitivity    0.615751     -0.329264    0.343455       -0.602434
clustering_coeff 0.608040    -0.311776    0.362305       -0.594298

                 transitivity  clustering_coeff
fitness              0.615751          0.608040
num_of_nodes        -0.329264         -0.311776
avg_degree           0.343455          0.362305
num_components      -0.602434         -0.594298
transitivity         1.000000          0.998739
clustering_coeff     0.998739          1.000000
```

Rezultati

- Poboljšanja?
  - Smanjenje verovatnoće za generisanje grana?

Tabela 2: Rezultati smanjenja verovatnoće za generisanje grana

Broj čvorova	Veličina populacije	Fitness
6	50	-0.005622222222222093
6	100	-0.005622222222222093
10	50	-0.1395151515151515
10	100	-0.012000000000000002
10	50	-0.008549953314659122
10	100	-0.005387076615423028
25	50	-0.6687809523809524
25	100	-0.48526616541353385
50	50	-0.420012338376997
50	100	-0.46940357205102456
75	50	-0.0125517293241569
75	100	-0.012004898528627055
100	50	-1.428400037947298
100	100	-2.6324747759596843

Rezultati

- Poboljšanja?
  - Povećanje verovatnoće za mutaciju?

Tabela 3: Rezultati povećanja verovatnoće za mutaciju

Broj čvorova	Veličina populacije	Fitness
6	50	-0.005622222222222093
6	100	-0.06117777777777778
10	50	-0.4827692307692308
10	100	-0.21071794871794872
10	50	-0.036000000000000136
10	100	-0.006736282964629461
25	50	-1.4037338762346439
25	100	-1.283509261380821
50	50	-0.4757752270329916
50	100	-0.44939682755602156
75	50	-0.0099214931224301
75	100	-0.013052419602693637
100	50	-2.595627933058239
100	100	-2.6392986448062357

Zaključak

1. Relativno dobri rezultati
2. Problem sa međusobno zavisnim svojstvima
3. Prostor za poboljšanje

Literatura

[1] Annu Lambora, Kunal Gupta, and Kriti Chopra. Genetic algorithm- a literature review. 2019 International Conference on Machine Lear- ning, Big Data, Cloud and Parallel Computing (Com-IT-Con), 2019.
[2] Vesna Marinkovic, Filip Maric, Strahinja Stanojevic, and Sana Stojanovic-Durdevic. Konstrukcija i analiza algoritama. Matematicki fakultet, Univerzitet u Beogradu, 2019.
[3] M.E.J. Newman. Random graphs with clustering. Physical review letters, 2009.
[4] Optimization algorithms. Complexica, 2023.
[5] Vili Podgorelec, Janez Brest, and Peter Kokol. Power of heterogeneous computing as a vehicle for implementing e3 medical decision support systems.