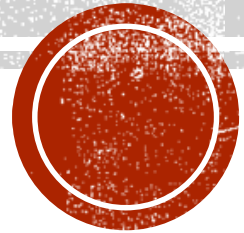
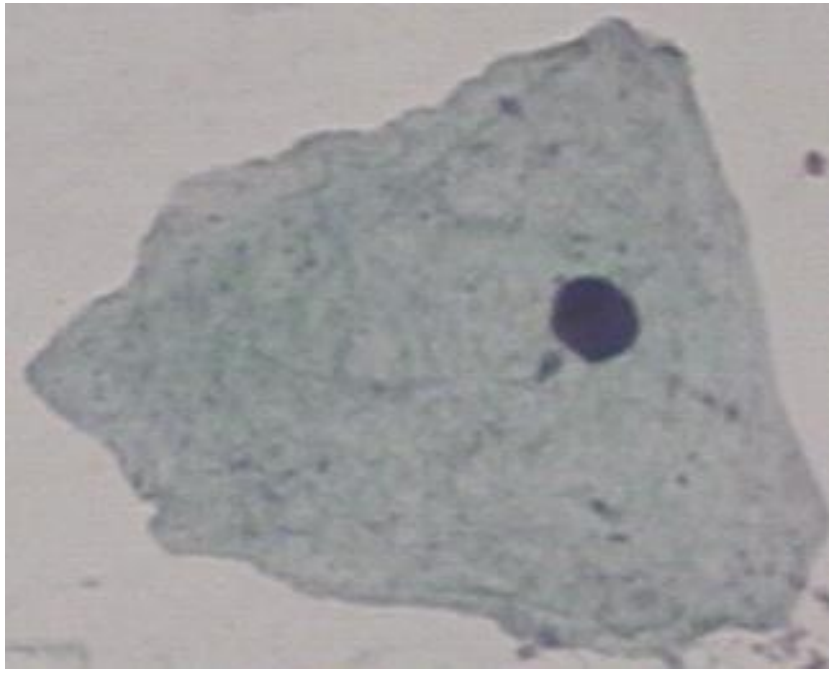
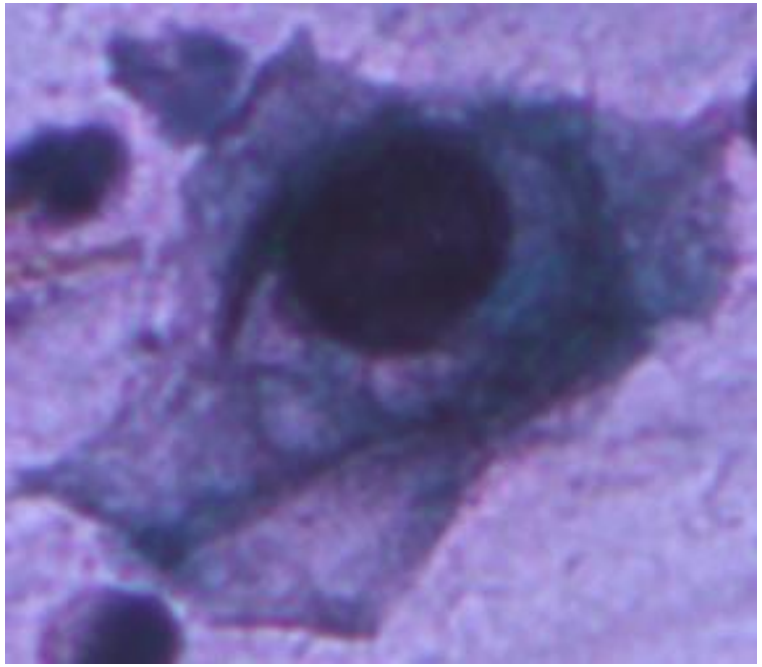
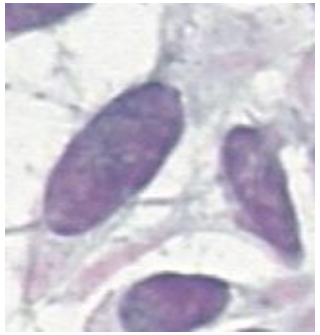
DETEKCIJA ABNORMALNIH STANICA IZ SLIKA DOBIVENIH PAPA-TESTOM

Nikolina Đuranec, Ana Nedić, Borna Radoš, Fran Špigel

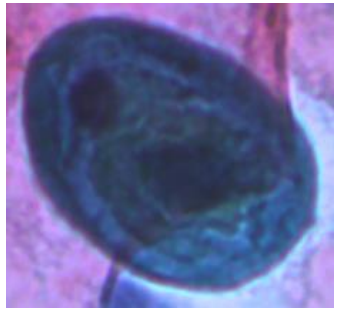


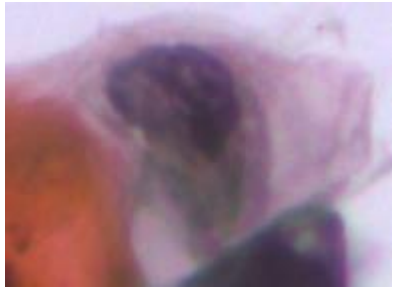






Normalne stanice



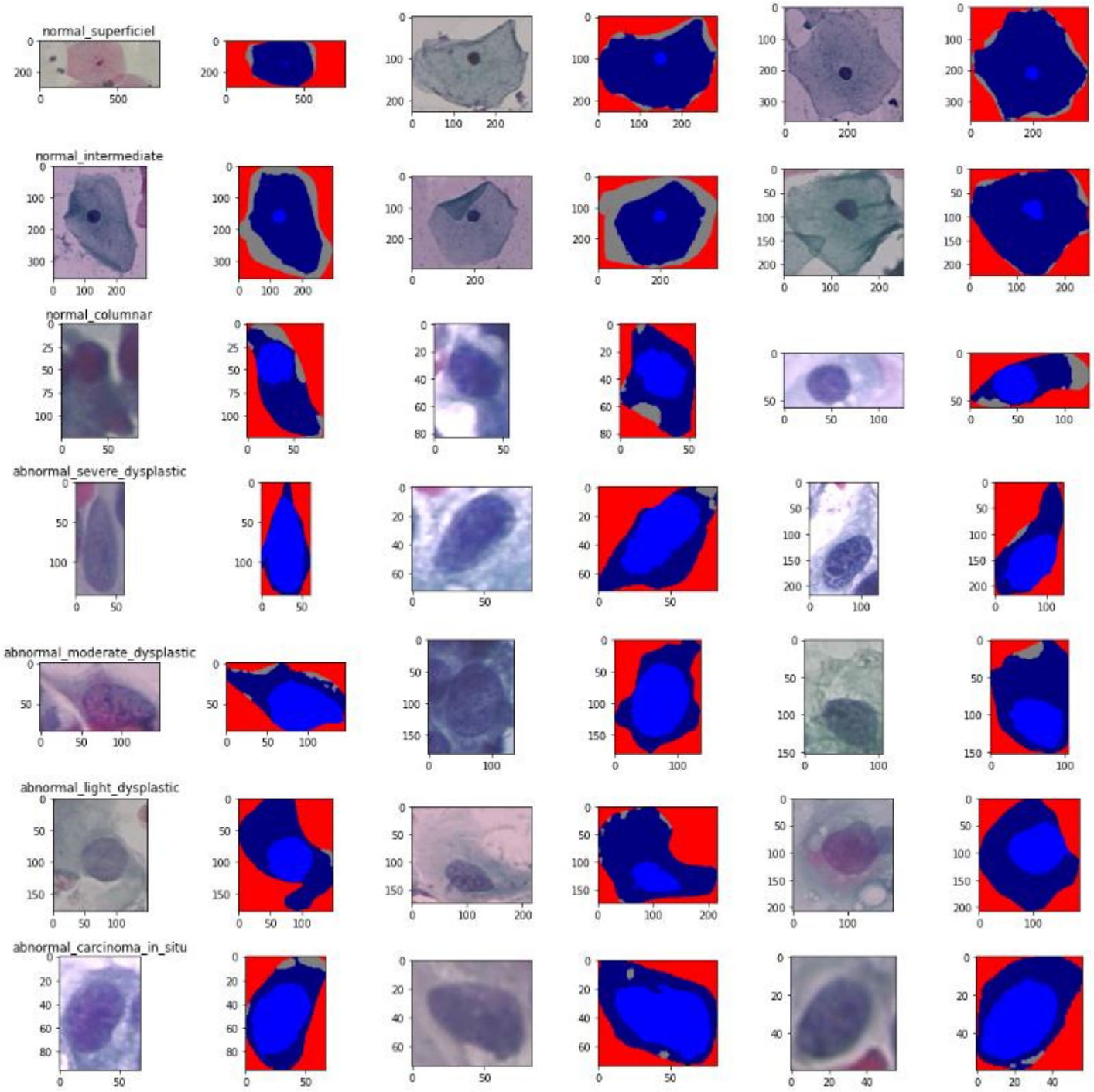


Abnormalne stanice

DVA SKUPA PODATAKA

Podatci preuzeti sa kaggle.com

- Herlev
  - veći kontrast između citoplazme i pozadine na slikama
- SIPaKMeD



1. SEGMENTACIJA SLIKA

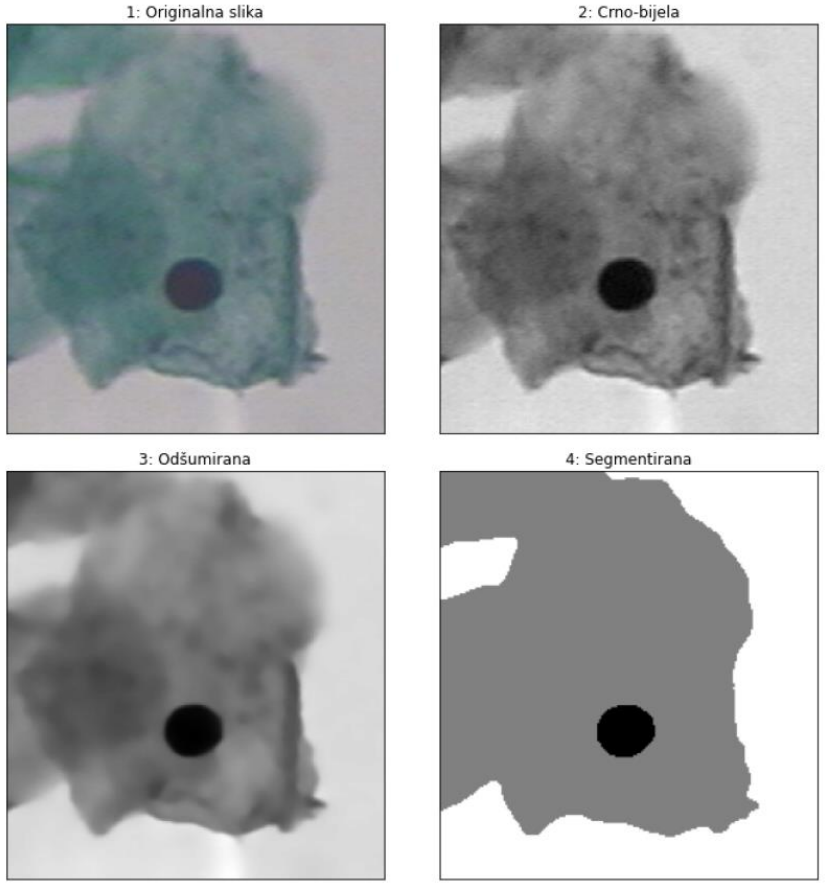
- PRED-PROCESIRANJE SLIKA
  - crno-bijela slika
    - CIELAB (L, a, b)
      - L: svjetlina od 0 (crna) do 100 (bijela)
  - odstranjivanje šuma sa slike
    - ne-lokalne sredine (non-local means)
      - funkcija sličnosti odgovarajućih piksela

$$v(x) = \frac{1}{C(x)} \int_{\Omega} u(x) f(x,y) dy$$

      - mjera sličnosti piksela

$$f(x,y) = e^{-\frac{|B(q)-B(p)|^2}{h^2}}$$

  - povećanje kontrasta na slici



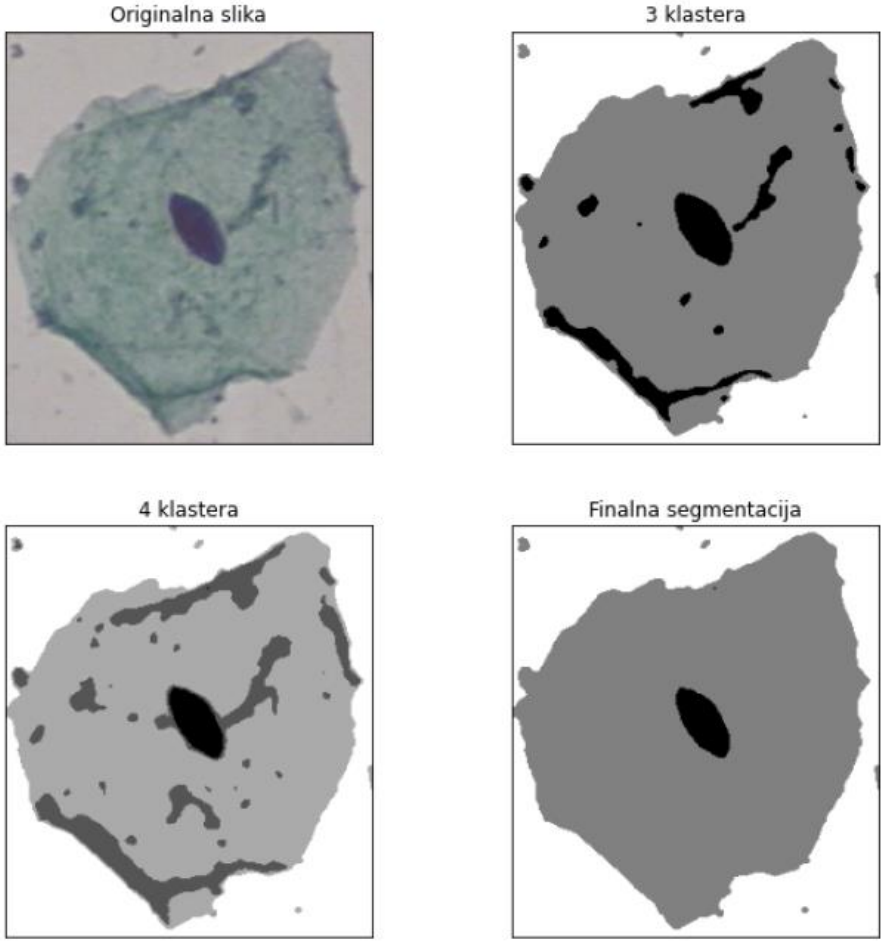
Pred-procesiranje i segmentacija slika

1. SEGMENTACIJA SLIKA

- K-MEANS
  - piksel = (x, y)
    - karakteristični vektor

$$\vec{v}(x,y) = [f(x,y), f_{mean}(x,y), f_{median}(x,y)]$$

  - jezgra, citoplazma, pozadina
    - 3 klastera
    - 4 klastera
    - spojeni klasteri



Segmentacija na 3 i 4 klastera

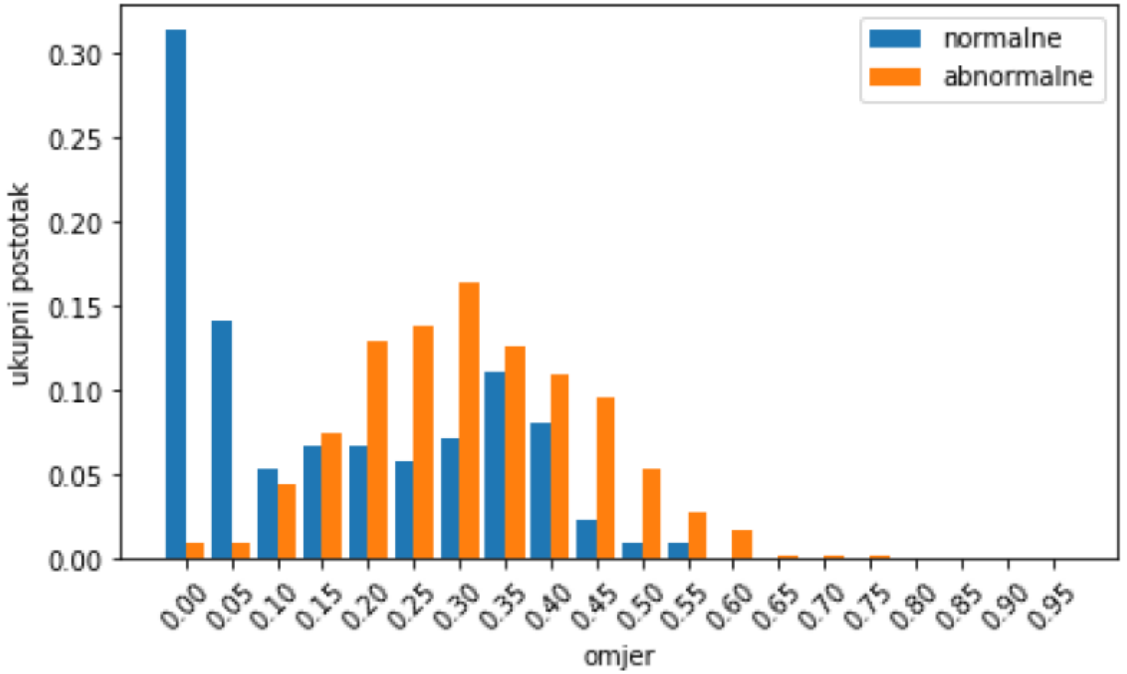
1. SEGMENTACIJA SLIKA

- KLASIFIKACIJA NAKON SEGMENTACIJE

$$r = \frac{površina\ jezgre}{površina\ stanice}$$

- $r < x \Rightarrow$ normalna
- $r > x \Rightarrow$ abnormalna

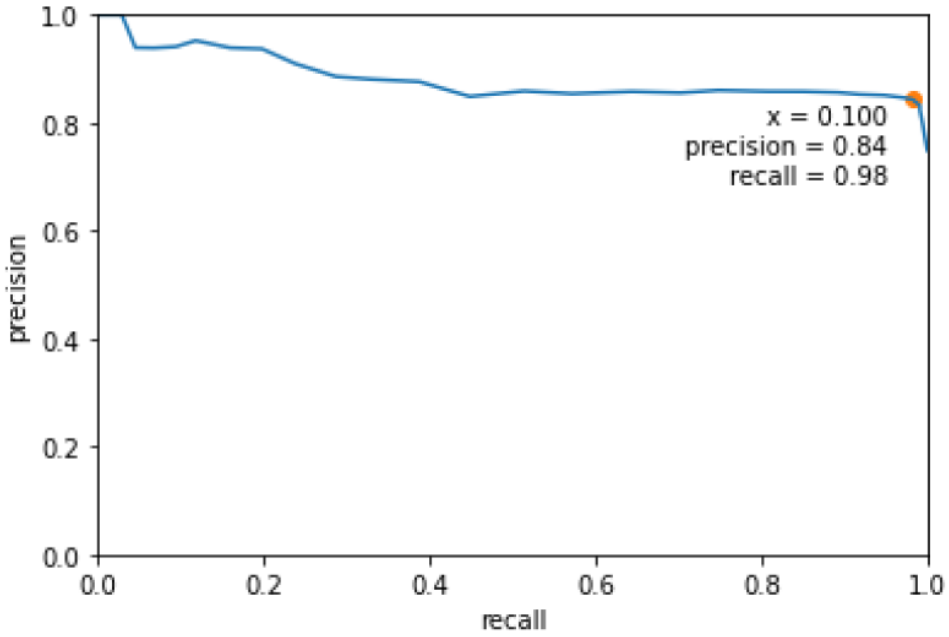
$x = 0.1$



Histogrami omjera površina jezgre i stanice za normalne i abnormalne stanice

1. SEGMENTACIJA SLIKA

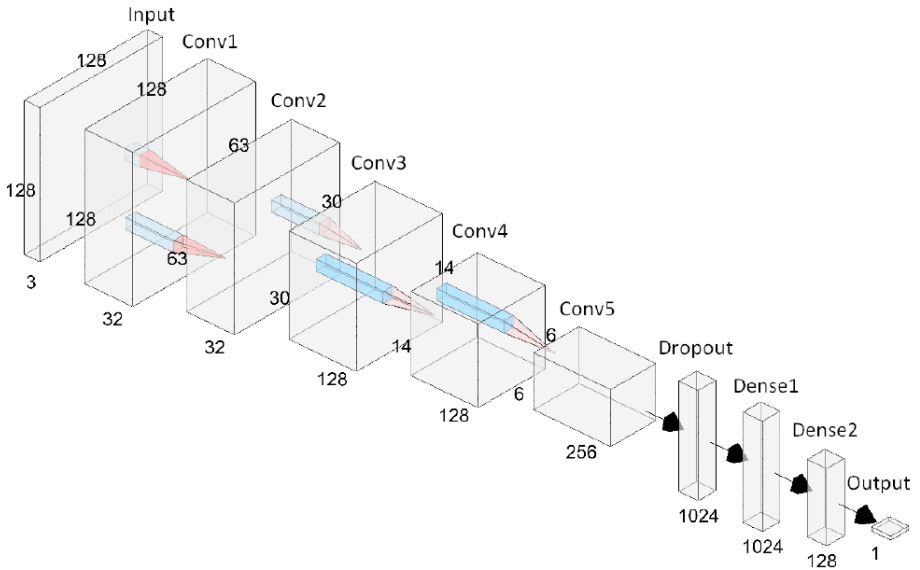
- REZULTATI
  - *accuracy:* 85%
  - *precision:* 84%
  - *recall:* 98%
  - *F1 score:* 91%



Ovisnost metrika recall i precision

2. KONVOLUCIJSKA NEURONSKA MREŽA

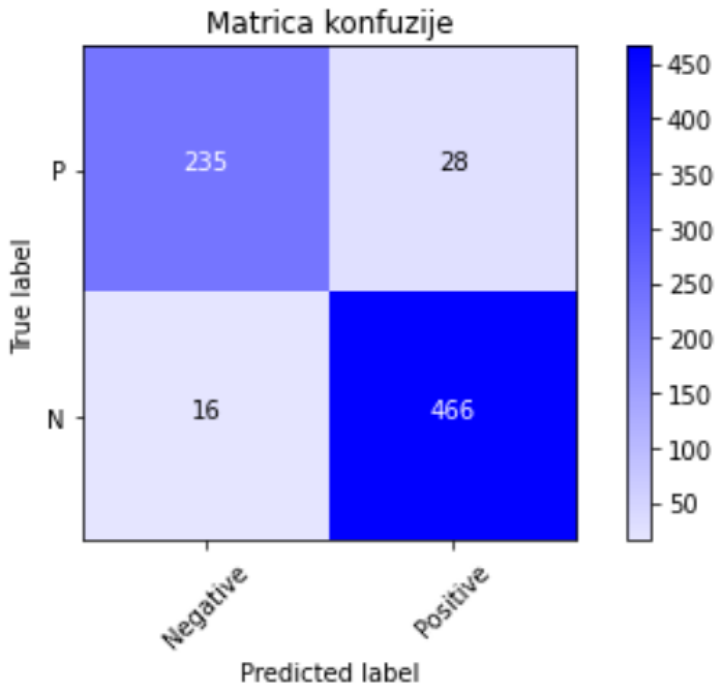
- 5 konvolucijskih slojeva
- dropout sloj (suzbijanje pre-treniranja)
- 3 potpuno povezana sloja
- output:
  - vjerojatnost da je input abnormalna stanica

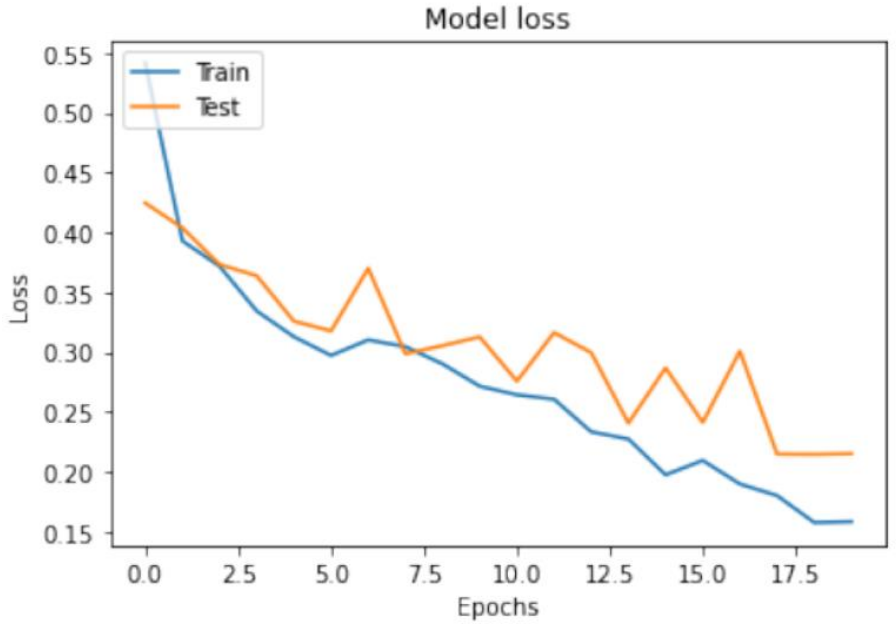


Arhitektura konvolucijske neuronske mreže

2. KONVOLUCIJSKA NEURONSKA MREŽA

- OPTIMALNI REZULTATI
  - 20 epoha
  - *accuracy:* 94%
  - *precision:* 94%
  - *recall:* 97%
  - *F1 score:* 94%





Proces treniranja

ZAKLJUČAK

1. KNN
   - bolji rezultatI
   - testiran na oba skupa
     (Herlev i SIPaKMeD)
   - bolji alat za klasifikaciju

2. SEGMENTACIJA
   - recall malo bolji
   - testirana samo na Herlev skupu
   - Herlev je „lakši” skup