

# *Neuronska mreža na CUDA-i trenirana algoritmom roja čestica*

Nenad Krpan

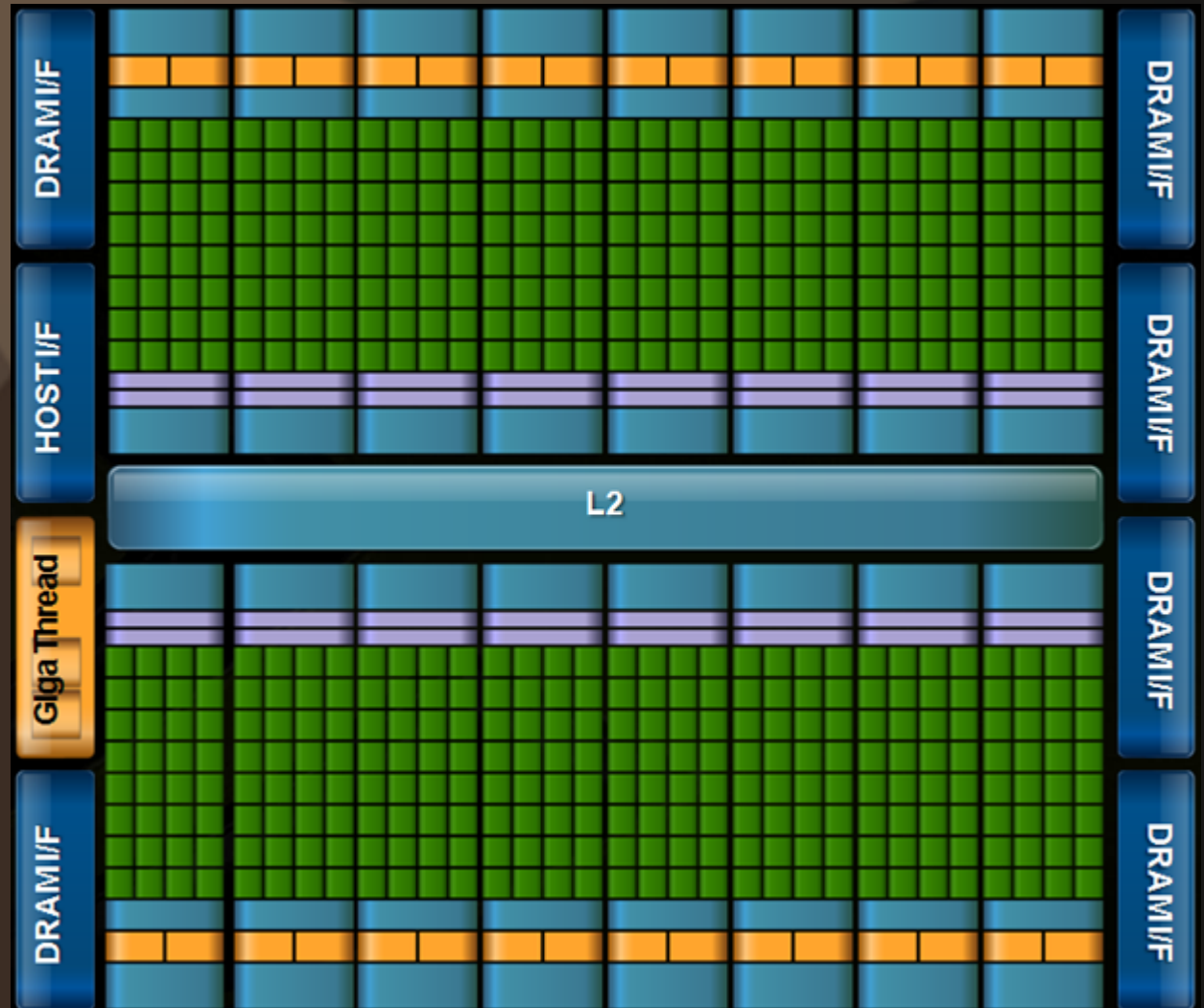
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# *Sadržaj*

- CUDA
- Neuronska mreža
- Rezultati
- Zaključak

# *CUDA*

- SM
- Global memory
- Shared memory



# *Neuronska mreža*

- Ista funkcija za GPU i CPU
- Shared/Global verzije za GPU
- Trenira se sa PSO
- Na GPU 1 thread / jedinka / uzorak

# *Ispitivanje*

- Veličina populacije: 64
- Broj neurona u mreži: 3-22-8-1
- Broj primjera za učenje: 1530
  - Black-Scholes jednadžba:

$$c = [S - PV(d)] \cdot N(x_1) - PV(k) \cdot N(x_2)$$

where

$$x_1 = \frac{1}{\sigma \sqrt{T}} \cdot \ln \left( \frac{S - PV(d)}{PV(k)} \right) + \frac{\sigma \sqrt{T}}{2}$$

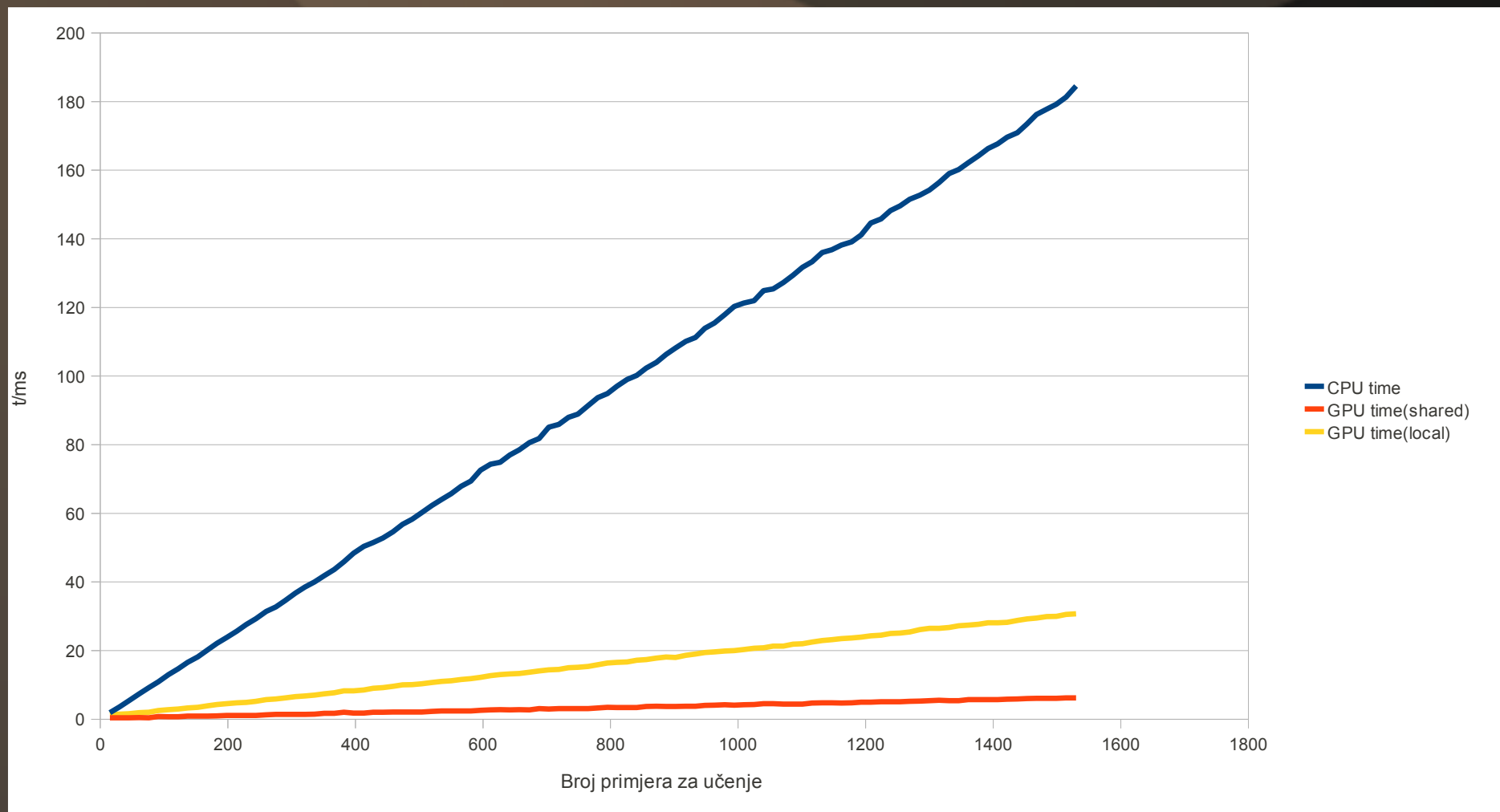
and

$$x_2 = \frac{1}{\sigma \sqrt{T}} \cdot \ln \left( \frac{S - PV(d)}{PV(k)} \right) - \frac{\sigma \sqrt{T}}{2}$$

## *Rezultati - NN*

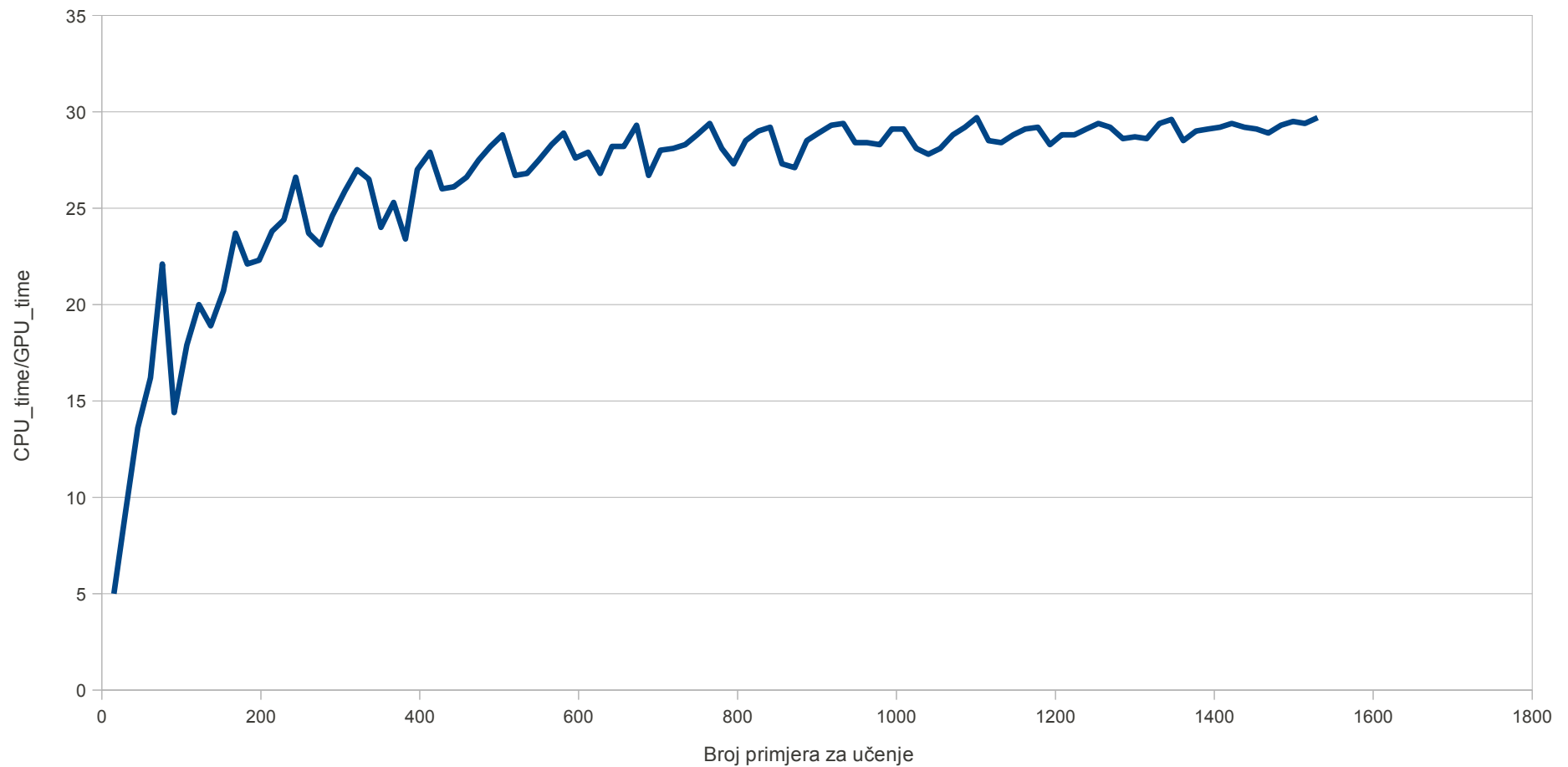
- CPU: 184.5 ms
- GPU (local): 30.7 ms
- GPU (shared): 6.2 ms
- Ubrzanje od 29.7x

# *Rezultati - NN*



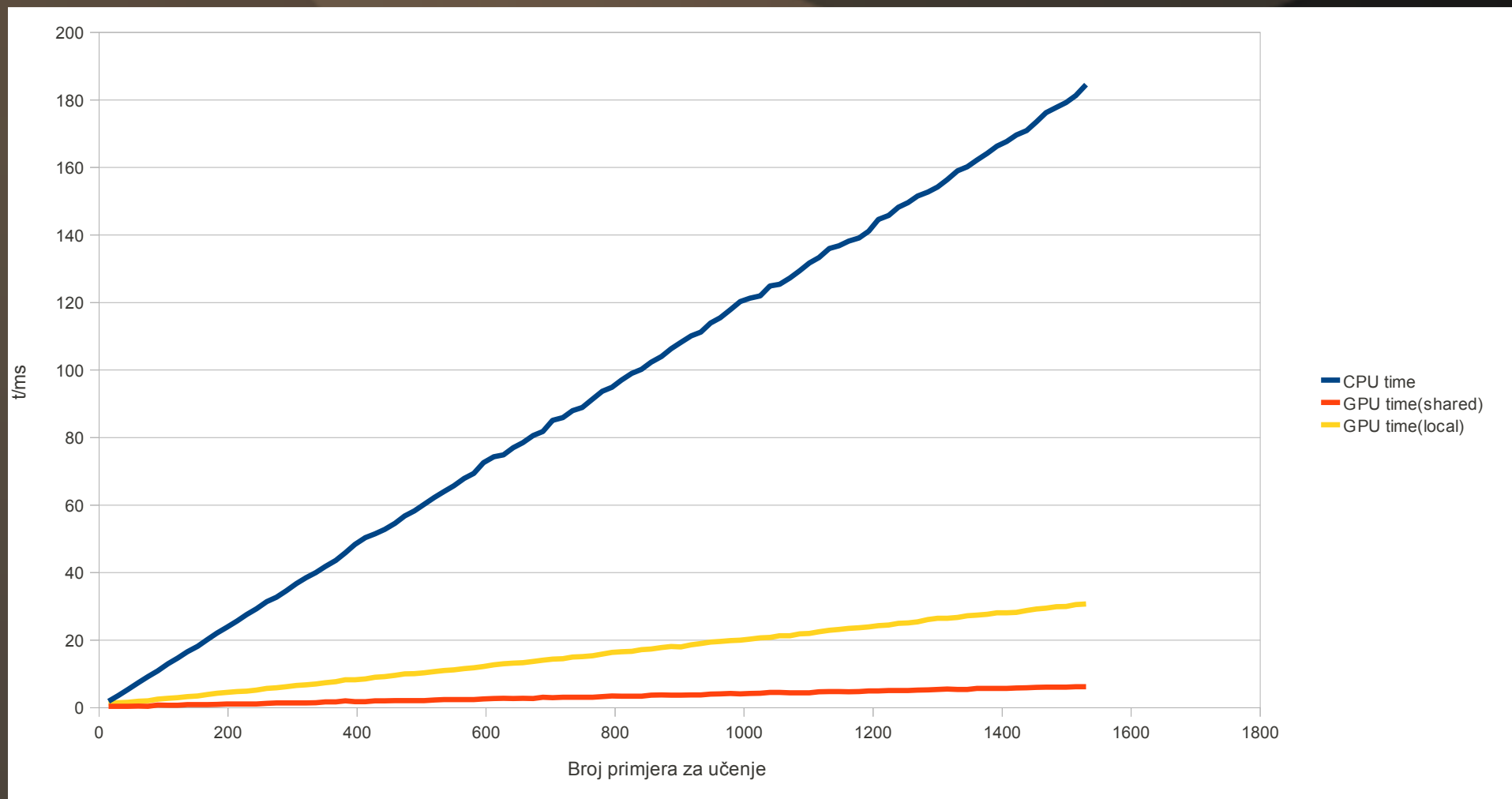
# *Rezultati - NN*

Ubrzanje



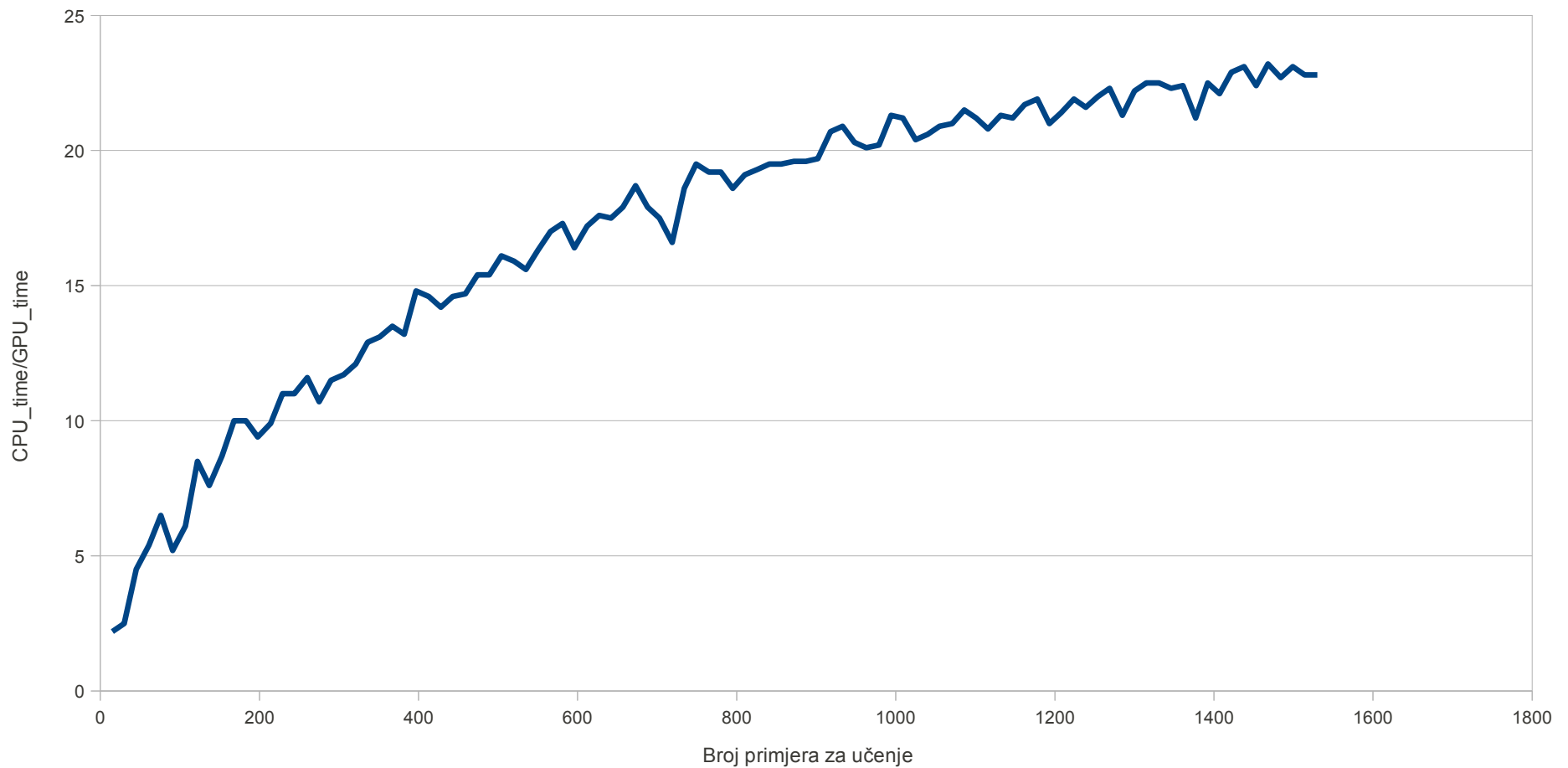


# *Rezultati – NN + PSO*



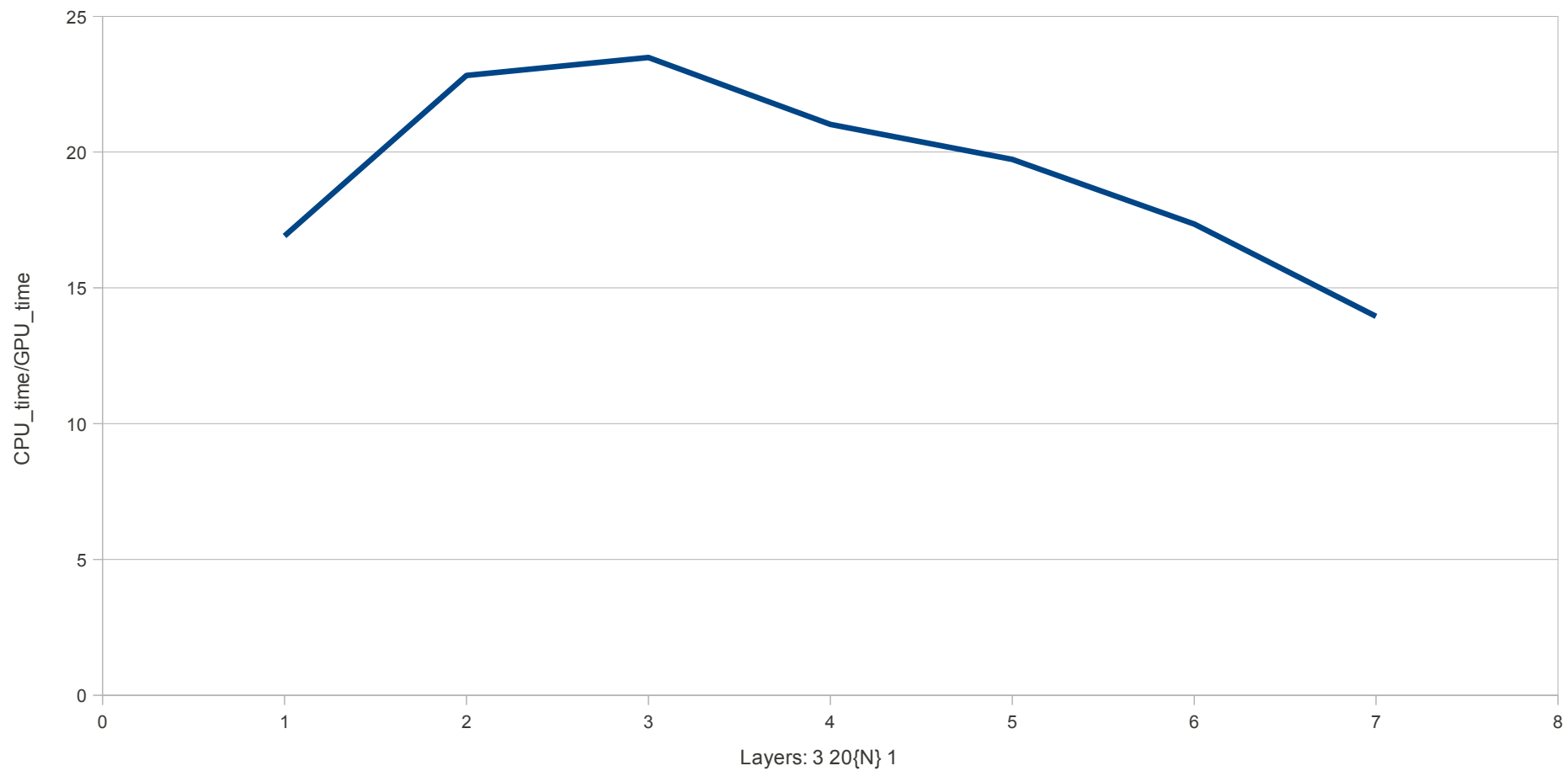
# *Rezultati – NN + PSO*

PSO ubrzanje



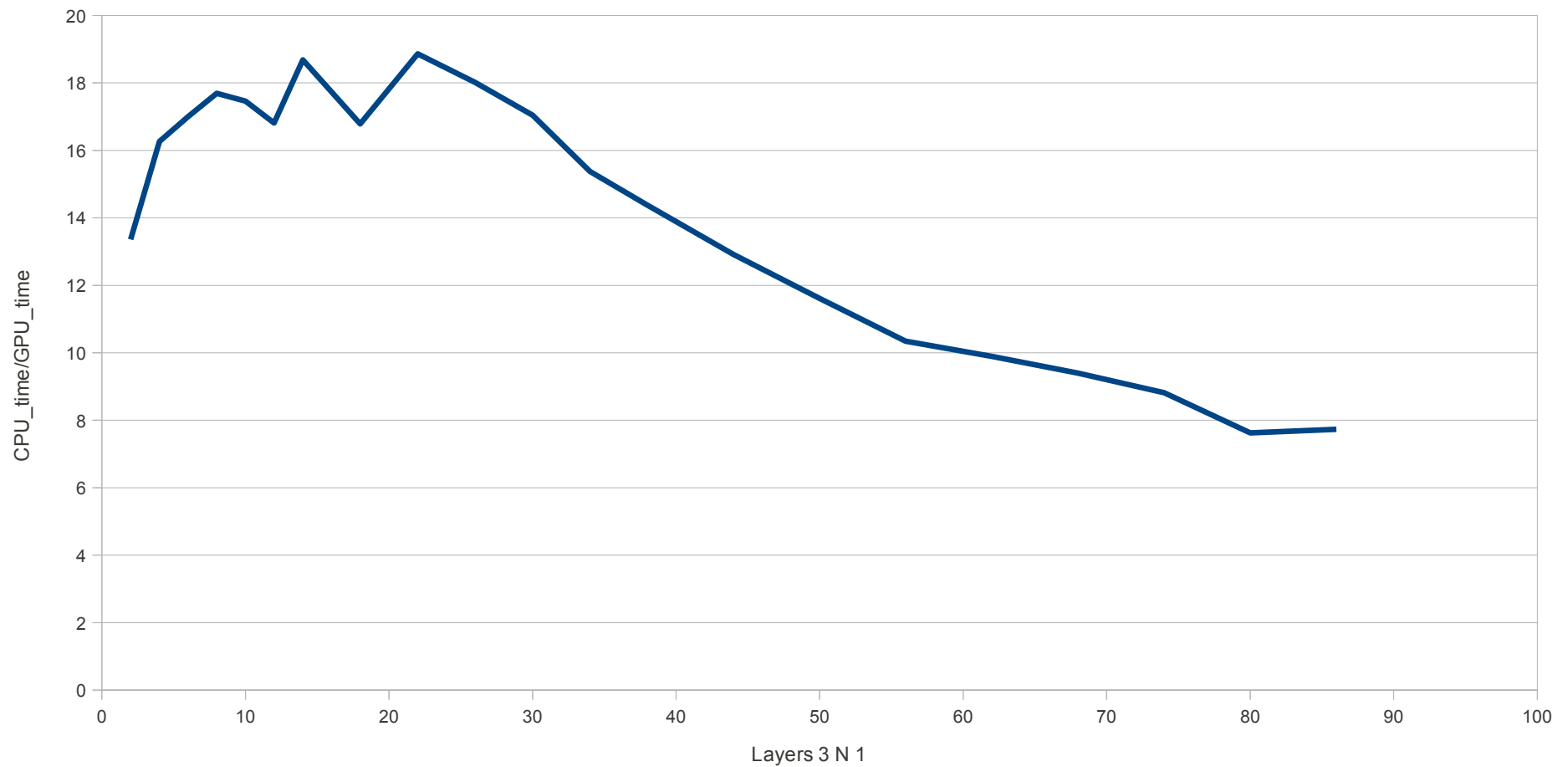
# *Rezultati – slojevi*

Ubrzanje



# *Rezultati – slojevi*

Ubrzanje



# *Zaključak*

- Grafičke kartice su brze