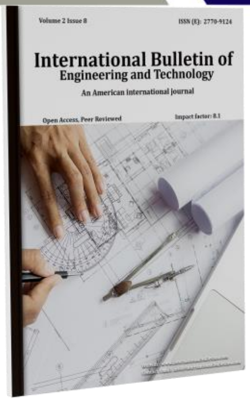


# ONE-DIMENSIONAL NEURON NETWORKS

**Bozorov Otabek Eshbo'ri o'g'li**
**Sayyod Dostonov Sultonovich**
**Yusupov Akmal Norxidir o'g'li**
Termiz State University, Applied Mathematics and Informatics (AT)
Master's degree student
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Abstract. One-dimensional neural networks, also known as 1D convolutional neural networks (CNNs), are a type of neural network commonly used for processing time series and sequential data. Unlike traditional feedforward neural networks that operate on vector inputs, 1D CNNs operate on 1D sequences, such as audio signals, text, and physiological signals.
Keywords: 1D CNN, convolutional layers, time series data, sequential data, audio signals, text, physiological signals, ReLU activation function, pooling layers, local patterns, global representations, speech recognition, music classification, natural language processing, long-term dependencies, recurrent neural networks, RNN.
Аннотация. Одномерные нейронные сети, также известные как одномерные сверточные нейронные сети (CNN), представляют собой тип нейронной сети, обычно используемый для обработки временных рядов и последовательных данных. В отличие от традиционных нейронных сетей с прямой связью, которые работают с векторными входными данными, одномерные CNN работают с одномерными последовательностями, такими как аудиосигналы, текст и физиологические сигналы.
Ключевые слова: 1D CNN, сверточные слои, данные временных рядов, последовательные данные, аудиосигналы, текст, физиологические сигналы, функция активации ReLU, слои объединения, локальные шаблоны, глобальные представления, распознавание речи, классификация музыки, обработка естественного языка, долгосрочные зависимости. , рекуррентные нейронные сети, СОК.

INTRODUCTION

1D CNNs use convolutional layers that scan a fixed-length window over the input sequence, performing a dot product between the filter weights and the values in the window. The output of each convolutional layer is typically passed through a non-linear activation function, such as ReLU, and then fed into pooling layers, which downsample the feature maps by computing the maximum or average value within each window.

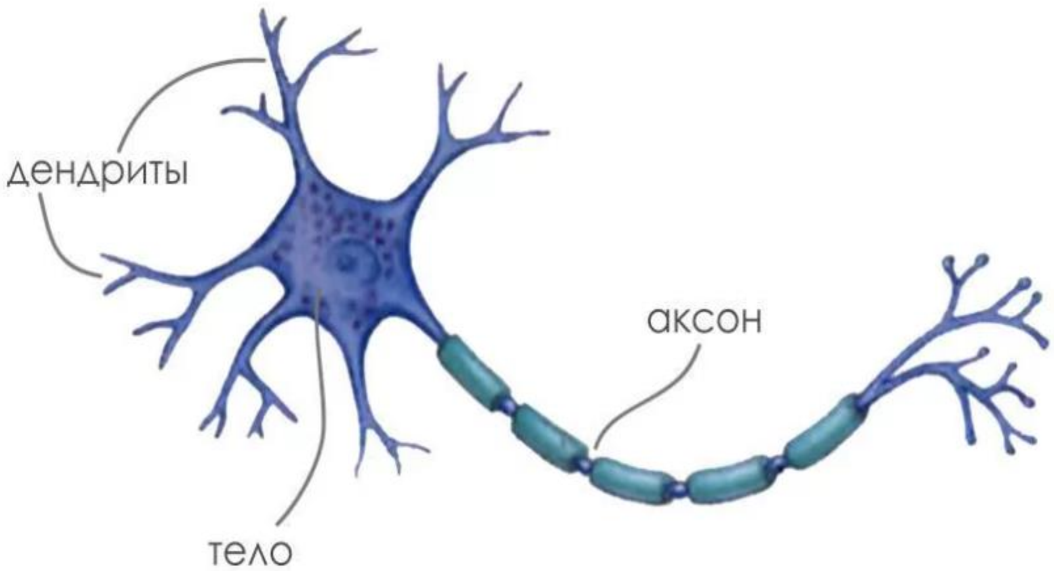
One of the main advantages of 1D CNNs is their ability to capture local patterns and dependencies in the input sequence, while also being able to learn global representations. This makes them particularly useful for tasks such as speech recognition, music classification, and natural language processing.

Neuron nets history and his main components

Electronic - computing of the technique more lightning hit development during the 20th century in the middle field scientists and engineer - constructors between What is a typical, sample exposure ? principle based on touch and what it is like done increase possible said issues thoughts, views, research unity, unity, one thoughtfulness there is it's not was We are now all of us Informatics basics Science Neumann in the course machine principle architecture based on created , developed being released EHMs, computers we are learning . However, computer science according to in textbooks, that times Exposure, computer in creating another one activity principles, architectures based on ideas, practical recommendations about one not even a word was spoken. Such of ideas one scheme different principle and to architecture based on Exposures neuron netted computer or simple by doing neuron called nets. Neuron to the nets has been the first interest Mak Kollak and In Pitts's early work, published in 1943 basis put being, then a person of the brain work to the activity based on similarity based on drinker of the computer scheme offer done They were a person his brain organize doer element nerve cell model created and to him They named it neuron. Human brain white and series in color from substance organize found: white - of neurons body, body, series substances and this is it neurons each other with connective tool (tissue) or axons and are dendrites. Man brain approximately 1011 mutual divided from neurons organize found Each neuron information his own dendrides through receives, assimilates, information next to the place transmission only one axon through done is increased at the end thousands to synopses branched (Fig. 1). Simple up to 10,000 neurons to dendrites have to be can, dendrites another from the cells acceptance will be done. So by doing man brain about 1015 mutual from connections consists of If every how neurophysiological process suddenly one how much neurons collection plan activation account will receive if, then in our brains harvest to be, to come coming out information and of signals so one big the amount imagination reach can

LITERATURE ANALYSIS AND METHODOLOGY

a)




b)

1- (a and b) pictures . Neuron structure picture

Nerve cell is a neuron complicated to structure have body (soma) and processes - axon and one how many from dendrites consists of axon - this transmission process through it impulse cell from the body another to the neuron passes. Dendrites - reception doer are processes, they another from neurons impulses the ball played and them neuron to the body transmits We pay attention we give need was next thing is this of the signal from the axon next of a neuron to dendrites how transfer. Dendrites to axons directly not but synapses through is connected and of the signal axon to the end when reached, in the synapse neurotransmitter is released, of the signal how transmission determines Synapse two neuron between or neuron and signal acceptance doer effector cell between contact is the point.

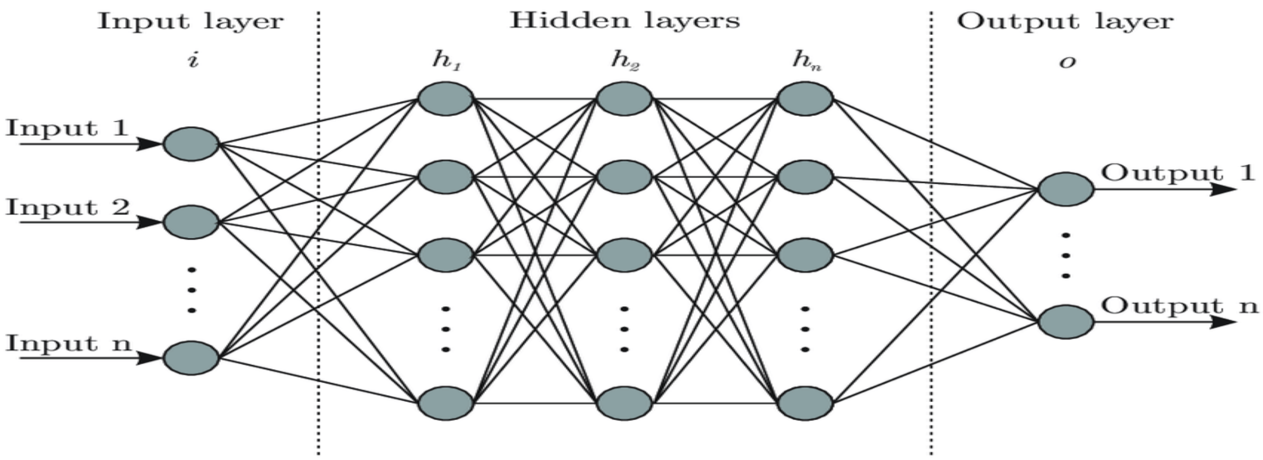
Neurons impulses series by means of mutually in action will be , this action is one how many millisecond during continue reach possible , every one impulse frequency signal is its frequency one how many from one to one hundred up to hers to be can This is the frequency modern of the computer work frequency with comparing won't be level , however a person brain to the computer than analog information very big at speed again performance possible, for example: the description knowledge, understanding, taste sense, sound distinguish, know, stranger the writing reading (knowing), adjective parameters on deeds perform Of these all of them mutually synapses with connected neuron types and in the means done is increased . Otherwise by doing in other words , the brain is a parallel activity showing, present consecutively based on calculations to the computer relatively very efficient working from processors organize found Therefore , the future computers many p processor, parallel computing to the materials based on to be necessary So is a neuron nets this direction next step to be wonder not Artificial neuron of nets future development a person work principles How studied, modeled level depends, however this on the ground reverse there is also a connection: artificial neuron types suddenly one tool being his using of a person nerve in the system passing, we imagine who does processes to learn more our improvement possible, appropriate of processes models to build the way with. Neuron types the future so much clear, present in the day this in the field knowledge , computer technologies in the field activity showing scientific experts , as well so next door smezhny in the fields working very a lot engineers and scientific employees this right very sure to imaginations they have Neuron nets mutually so one connected elements is complex, they between mutually connections to be provided necessary Such elements basically that neurons or called nodes and these are own in turn simple are processors. Their count possibilities usually activation ( activation ) rules and access signals something combined rules with is limited , resulting in 26, input signals complex according to exit signals count possibilities there is of the element exit signal dimensional ( coefficient ) connections through another to the elements transmission can Senders each one weight to the coefficients or to weight have Weight of coefficients to the value of dependent respectively the transmitted signal is amplified or is reduced .

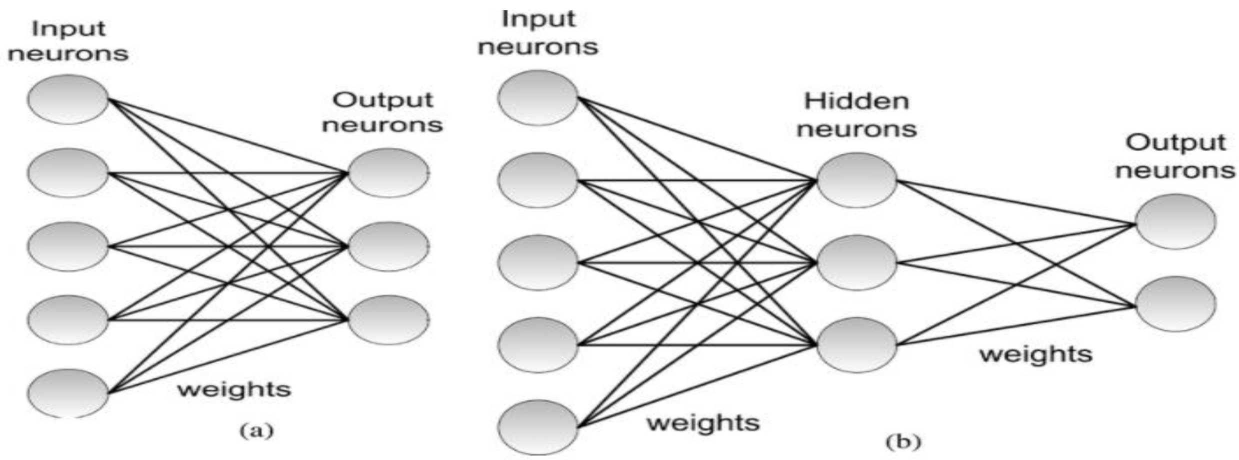
Methodology:

Single layer neuron net and him learning methods

Neuron of the network main feature his learning is the ability. Neuron network control under or uncontrolled classified as learning different different learning schemes through learns Control under learning in algorithms purposeful values to the network known . Optimal performance for necessary result (target) and real exit between error tries to reduce.

Out of control learning in algorithms purposeful values unknown and network clusters formation through at the entrance hidden laws determination through by itself learns An artificial neural network consists of 3 parts, namely input, hidden layer and output layer.

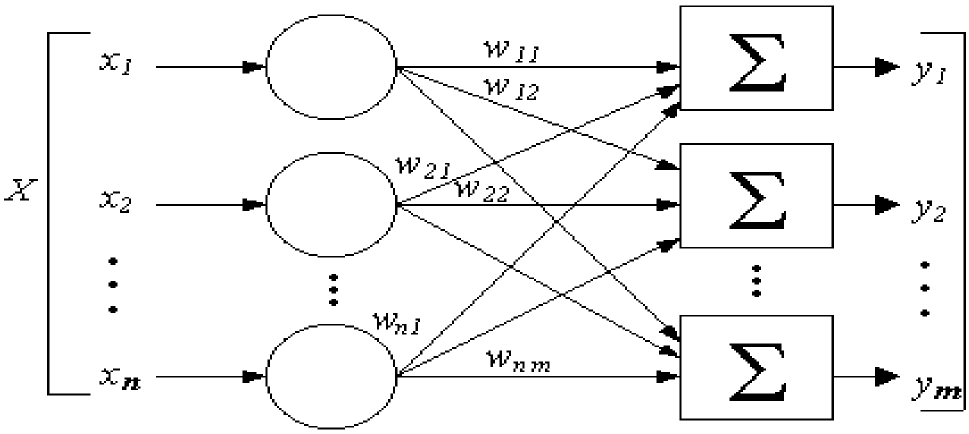


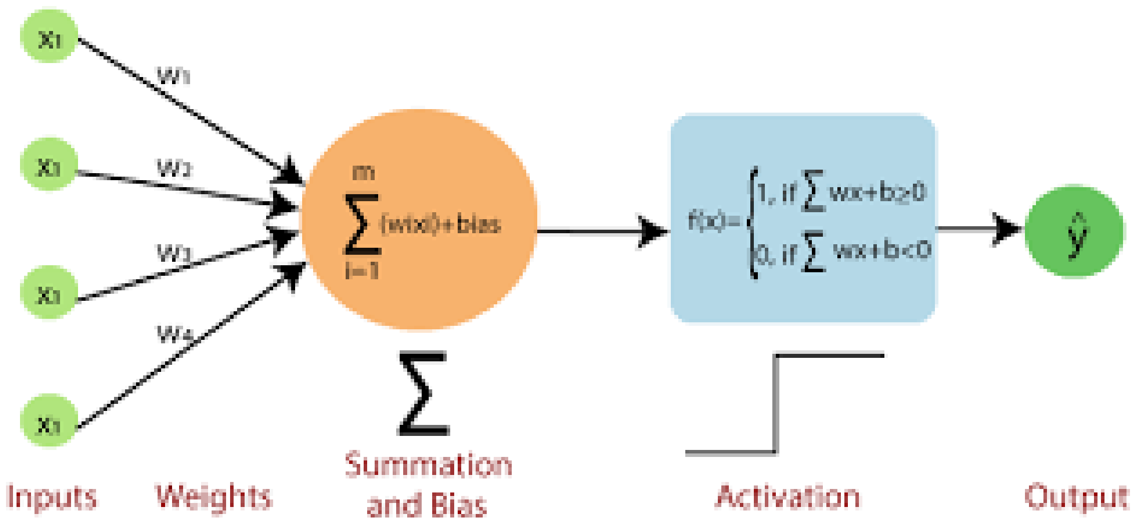



a) Single layer of the perceptron architecture.
b) A lot layered of the perceptron architecture.
Results:
One layer neuron net and him learning methods

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| X | 1.03 | 1.08 | 1.13 | 1.18 | 1.23 | 1.28 | 1.33 | 1.38 | 1.43 | 1.48 |
| Y | 0.91 | 0.76 | 0.61 | 0.46 | 0.31 | 0.16 | 0.01 | -0.14 | -0.29 | -0.44 |

Scheme




*x* is input vector (input vector);
*R* is input elements number (number of input elements);
*w* – weights vector (weight vector);
*b* – push (bias);
*n* – enter to weights multiplied and pushed value (wpqb );
*f* – transfer function (transfer function);
*a* – output (output).
Of the program mathematician Appearance:

$y_{pred} = w \cdot x + b$

$E_{error} = (y_{pred} - y)^2$

$w = w - \alpha \frac{\partial E}{\partial w}$,

bu yerda $0 < \alpha \leq 1$ *shart bajariladi.*

$\frac{\partial E}{\partial w} = \frac{\partial E}{\partial y_{pred}} \cdot \frac{\partial y_{pred}}{\partial w} = 2 \cdot (y_{pred} - y) \cdot x$

$b = b - \alpha \frac{\partial E}{\partial b}$

$\frac{\partial E}{\partial b} = \frac{\partial E}{\partial y_{pred}} \cdot \frac{\partial y_{pred}}{\partial b} = 2 \cdot (y_{pred} - y) \cdot 1$

$MSE = \frac{1}{n} \cdot \sum E_{error} = \frac{1}{n} \cdot \sum (y_{pred} - y)^2$

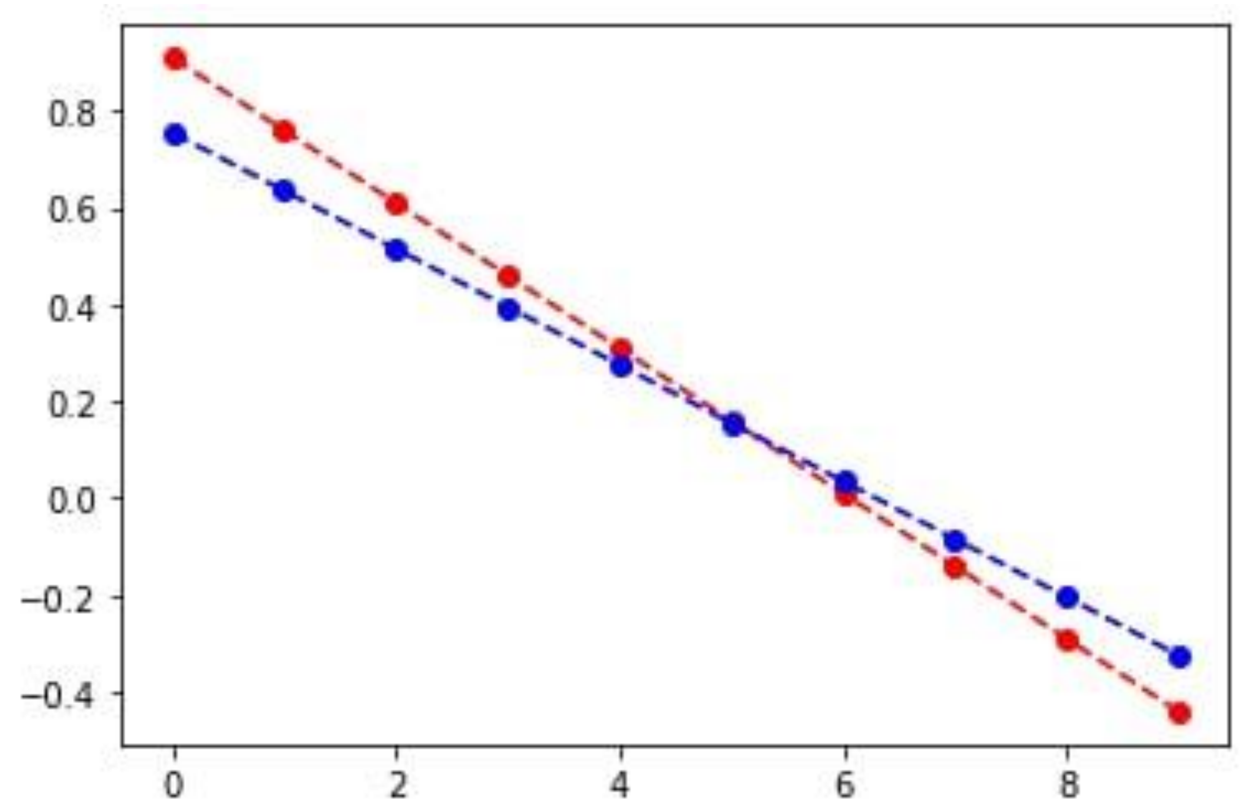
Computer software:

```
import matplotlib.pyplot as plt
x=[1.03,1.08,1.13,1.18,1.23,1.28,1.33,1.38,1.43,1.48]
y=[0.91,0.76,0.61,0.46,0.31,0.16,0.01,-0.14,-0.29,-0.44]
w=0
b=0
alfa=0.01
MSE_min=0.00001
for epoch in range(1000):
   s=0
   for x_in, y_in in zip (x,y):
      y_pred = x_in*w+b
      E_error=(y_pred-y_in)**2
      grad_w=2*(y_pred-y_in)*x_in
      w=w-alfa*grad_w
      grad_b=2*(y_pred-y_in)
      b=b-alfa*grad_b
      s=s+E_error
   MSE=s/len(x)
   if(MSE<=MSE_min):
      break
   print("epoch ",epoch)
   print("MSE= ",MSE)
print(w,b)
y_pArr=[]
for x_input in x:
   y_input=x_input*w+b
   y_pArr.append(y_input)
plt.plot(y,'o--r')
plt.plot(y_pArr,'o--b')
plt.show()
```

Computer result:

Figure:

```
epoch  988
MSE=  0.008336634516410946
epoch  989
MSE=  0.008309520745653309
epoch  990
MSE=  0.008282495158750213
epoch  991
MSE=  0.008255557468895466
epoch  992
MSE=  0.008228707390216
epoch  993
MSE=  0.008201944637768292
epoch  994
MSE=  0.008175268927535676
epoch  995
MSE=  0.008148679976425174
epoch  996
MSE=  0.008122177502264561
epoch  997
MSE=  0.008095761223799222
epoch  998
MSE=  0.008069430860689527
epoch  999
MSE=  0.008043186133507282
-2.398614203421819 3.2257450781773627
```




Conclusion

In conclusion, one-dimensional neural networks have proven to be a powerful tool in the field of deep learning. They are particularly useful for processing data that has a sequential nature, such as time series data or text data. By using convolutional layers and pooling layers, one-dimensional neural networks can effectively extract meaningful features from sequential data. One-dimensional neural networks have been successfully applied in various areas, such as natural language processing, speech recognition, and signal processing. They have been shown to achieve state-of-the-art performance in many tasks, including sentiment analysis, language translation, and speech recognition.

However, one-dimensional neural networks also have some limitations. For example, they may struggle to capture long-term dependencies in sequential data. Additionally, they may require large amounts of training data to achieve good performance.

Despite these limitations, one-dimensional neural networks remain a valuable tool in the deep learning toolkit. As the field of deep learning continues to evolve, it is likely that new architectures and techniques will emerge to overcome these limitations and further improve the performance of one-dimensional neural networks

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