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Lampiran 1 Sampel data harga Bitcoin

Timeframe 1 menit

<i>Datetime</i>	<i>Open</i>	<i>High</i>	<i>Low</i>	<i>Close</i>
01/01/2022 00:00	46216.93	46271.08	46208.37	46250.0
01/01/2022 00:01	46250.0	46344.23	46234.39	46312.76
01/01/2022 00:02	46312.76	46381.69	46292.75	46368.73
01/01/2022 00:03	46368.73	46391.49	46314.26	46331.08
01/01/2022 00:04	46331.07	46336.1	46300.0	46321.34
01/01/2022 00:05	46321.34	46443.56	46280.0	46436.03
01/01/2022 00:06	46436.03	46518.32	46432.5	46518.31
01/01/2022 00:07	46518.31	46527.26	46427.06	46427.95
01/01/2022 00:08	46427.94	46427.97	46383.78	46392.64
01/01/2022 00:09	46392.64	46406.48	46350.96	46371.11
01/01/2022 00:10	46369.79	46394.0	46341.55	46379.8
01/01/2022 00:11	46379.8	46379.81	46293.32	46312.37
01/01/2022 00:12	46312.38	46312.38	46276.22	46288.64
01/01/2022 00:13	46288.81	46363.84	46288.64	46329.0
01/01/2022 00:14	46329.0	46353.5	46320.3	46332.51
01/01/2022 00:15	46332.52	46332.52	46312.38	46329.13
01/01/2022 00:16	46329.12	46329.97	46307.84	46323.31
01/01/2022 00:17	46323.31	46323.31	46280.61	46283.37
01/01/2022 00:18	46283.36	46296.67	46266.32	46283.39
01/01/2022 00:19	46283.39	46303.79	46236.27	46293.9
01/01/2022 00:20	46295.42	46337.5	46286.25	46327.98
01/01/2022 00:21	46327.97	46384.35	46290.84	46384.34
01/01/2022 00:22	46384.35	46421.27	46371.97	46394.04
01/01/2022 00:23	46394.03	46401.9	46360.18	46368.56
01/01/2022 00:24	46368.56	46403.94	46368.55	46395.53
01/01/2022 00:25	46395.53	46400.38	46380.32	46385.31
01/01/2022 00:26	46385.32	46393.59	46385.31	46386.29
01/01/2022 00:27	46386.29	46386.29	46345.1	46354.88
01/01/2022 00:28	46354.88	46380.55	46352.51	46361.38
01/01/2022 00:29	46361.38	46379.99	46352.41	46375.42
01/01/2022 00:30	46375.42	46386.28	46360.19	46365.71
01/01/2022 00:31	46365.72	46377.84	46365.71	46375.01
01/01/2022 00:32	46375.0	46393.83	46375.0	46385.05

Timeframe 5 menit

<i>Datetime</i>	<i>Open</i>	<i>High</i>	<i>Low</i>	<i>Close</i>
01/01/2022 00:00	46216.93	46391.49	46208.37	46321.34
01/01/2022 00:05	46321.34	46527.26	46280.0	46371.11
01/01/2022 00:10	46369.79	46394.0	46276.22	46332.51
01/01/2022 00:15	46332.52	46332.52	46236.27	46293.9
01/01/2022 00:20	46295.42	46421.27	46286.25	46395.53
01/01/2022 00:25	46395.53	46400.38	46345.1	46375.42
01/01/2022 00:30	46375.42	46446.47	46360.19	46443.65
01/01/2022 00:35	46443.65	46590.0	46443.64	46530.7
01/01/2022 00:40	46530.71	46689.42	46503.51	46610.81
01/01/2022 00:45	46610.81	46731.39	46575.76	46693.74
01/01/2022 00:50	46693.75	46708.59	46628.6	46659.65
01/01/2022 00:55	46659.66	46690.16	46630.46	46656.13
01/01/2022 01:00	46656.14	46661.64	46574.06	46582.68
01/01/2022 01:05	46582.67	46678.13	46579.9	46675.0
01/01/2022 01:10	46675.0	46767.24	46674.99	46766.99
01/01/2022 01:15	46766.99	46900.0	46752.17	46876.81
01/01/2022 01:20	46876.82	46949.99	46799.0	46846.03
01/01/2022 01:25	46846.04	46869.16	46780.86	46815.33
01/01/2022 01:30	46815.34	46869.69	46800.29	46845.06
01/01/2022 01:35	46845.06	46884.63	46753.84	46799.9
01/01/2022 01:40	46798.2	46804.58	46748.05	46768.1
01/01/2022 01:45	46768.11	46779.7	46711.9	46771.72
01/01/2022 01:50	46769.61	46861.47	46765.75	46819.12
01/01/2022 01:55	46819.12	46823.96	46750.0	46778.14
01/01/2022 02:00	46778.14	46823.96	46769.95	46823.95
01/01/2022 02:05	46823.96	46861.86	46792.21	46816.15
01/01/2022 02:10	46816.14	46867.75	46789.02	46845.97
01/01/2022 02:15	46845.98	46928.94	46845.97	46914.5
01/01/2022 02:20	46914.5	46926.39	46836.07	46841.58
01/01/2022 02:25	46841.58	46868.04	46826.0	46826.01
01/01/2022 02:30	46826.0	46826.01	46785.0	46788.59
01/01/2022 02:35	46788.59	46797.59	46721.96	46764.0

Timeframe 15 menit

<i>Datetime</i>	<i>Open</i>	<i>High</i>	<i>Low</i>	<i>Close</i>
01/01/2022 00:00	46216.93	46527.26	46208.37	46332.51
01/01/2022 00:15	46332.52	46421.27	46236.27	46375.42
01/01/2022 00:30	46375.42	46689.42	46360.19	46610.81
01/01/2022 00:45	46610.81	46731.39	46575.76	46656.13
01/01/2022 01:00	46656.14	46767.24	46574.06	46766.99
01/01/2022 01:15	46766.99	46949.99	46752.17	46815.33
01/01/2022 01:30	46815.34	46884.63	46748.05	46768.1
01/01/2022 01:45	46768.11	46861.47	46711.9	46778.14
01/01/2022 02:00	46778.14	46867.75	46769.95	46845.97
01/01/2022 02:15	46845.98	46928.94	46826.0	46826.01
01/01/2022 02:30	46826.0	46826.01	46721.96	46775.91
01/01/2022 02:45	46775.9	46860.39	46773.93	46811.77
01/01/2022 03:00	46811.77	46851.56	46760.12	46826.1
01/01/2022 03:15	46826.11	46916.63	46777.0	46809.15
01/01/2022 03:30	46809.16	46900.0	46809.15	46867.98
01/01/2022 03:45	46867.98	46898.99	46813.2	46813.2
01/01/2022 04:00	46813.21	46887.33	46630.23	46648.04
01/01/2022 04:15	46648.04	46720.13	46591.23	46708.14
01/01/2022 04:30	46708.13	46783.76	46639.18	46734.52
01/01/2022 04:45	46734.52	46842.98	46708.0	46711.05
01/01/2022 05:00	46711.05	46780.0	46673.94	46780.0
01/01/2022 05:15	46780.0	47500.0	46762.63	47379.13
01/01/2022 05:30	47379.13	47555.55	47226.39	47300.0
01/01/2022 05:45	47300.01	47314.47	47135.3	47192.55
01/01/2022 06:00	47192.56	47324.42	47089.43	47307.04
01/01/2022 06:15	47307.03	47307.04	47119.37	47130.36
01/01/2022 06:30	47130.37	47197.32	47112.91	47158.02
01/01/2022 06:45	47158.02	47235.49	46940.0	46979.62
01/01/2022 07:00	46979.61	47044.26	46864.84	46990.23
01/01/2022 07:15	46990.23	47052.98	46948.41	46959.61
01/01/2022 07:30	46959.61	47122.91	46945.77	47096.7
01/01/2022 07:45	47096.69	47255.85	47073.12	47194.73

Lampiran 2 Hasil perhitungan indikator teknikal

SMA5	SMA10	SMA15	EMA5	EMA10	EMA15	WMA5	WMA10	WMA15	MACD			RSI	Stochastic Oscillator	
									MACD L	MACD H	MACD S		Stoch%K	Stoch%D
46375,24	46375,96	46368,56	46375,42	46371,23	46367,68	46376,47	46374,17	46374,16	8,136331	0,83163	7,304701	54,54726	73,71821	74,07964
46388,89	46380,77	46378,54	46398,16	46384,39	46377,17	46399,28	46386,48	46383,55	13,44765	4,914357	8,53329	64,7392	81,44935	76,76516
46409,53	46389,13	46387,94	46421,76	46399,77	46388,64	46425,96	46402,51	46394,85	19,47312	8,751865	10,72126	67,62011	83,30483	79,49079
46434,53	46400,5	46395,65	46447,83	46417,99	46402,56	46456,12	46422,67	46408,85	26,44894	12,58215	13,86679	70,77699	93,08631	85,94683
46459,24	46415,88	46403,29	46468,09	46434,46	46415,82	46480,81	46442,32	46422,97	32,29975	14,74637	17,55338	71,60374	92,72809	89,70641
46484,24	46429,74	46412,05	46478,73	46446,38	46426,34	46494,4	46457,62	46435,06	35,83039	14,6216	21,20879	69,49145	94,73579	93,51673
46501,65	46445,27	46421,06	46496,05	46461,71	46439,39	46509,88	46475,98	46449,89	40,63644	15,54212	25,09432	72,60127	88,30351	91,92246
46522,67	46466,1	46433,64	46522,05	46482,13	46456,22	46534,01	46499,39	46469,01	47,3953	17,84078	29,55451	76,27785	87,09206	90,04379
46549,49	46492,01	46450,17	46559,41	46509,77	46478,46	46571,17	46529,94	46494,07	56,94488	21,91229	35,03259	80,23879	87,32523	87,5736
46576,58	46517,91	46469,44	46587,61	46534,18	46499,15	46602,68	46557,58	46518,31	64,56755	23,62797	40,93958	80,80728	90,90708	88,44146
46608,15	46546,19	46489,21	46611,02	46556,66	46518,99	46629,76	46583,02	46541,86	70,90556	23,97279	46,93278	81,60237	89,88339	89,3719
46624,17	46562,91	46504,9	46610,95	46566,51	46530,47	46630,65	46594,77	46557,06	71,31152	19,503	51,80853	70,83963	84,21847	88,33631
46633,56	46578,11	46521,92	46614,3	46576,42	46541,78	46629,6	46605,33	46571,57	71,62979	15,85701	55,77278	71,71026	81,45438	85,18541
46634,28	46591,89	46539,43	46622,1	46587,56	46553,77	46630,98	46616,16	46586,04	72,39505	13,29782	59,09723	73,12636	79,16863	81,61382
46639,96	46608,27	46558,59	46638,89	46603	46568,61	46643,7	46630,81	46602,67	74,94247	12,67619	62,26628	75,83751	85,46524	82,02942
46651,98	46630,06	46581,45	46665,23	46623,89	46587,27	46669,69	46650,75	46622,59	79,71071	13,95554	65,75517	78,84361	91,20155	85,27847
46668,56	46646,37	46598,13	46674,73	46636,59	46600,58	46683,61	46662,33	46636,62	80,60924	11,88326	68,72598	73,59864	91,95524	89,54068
46682,6	46658,08	46612,94	46680,21	46646,51	46611,9	46691,15	46670,47	46648,25	80,18957	9,170872	71,0187	73,04246	88,59353	90,58344

Lampiran 3 Hasil normalisasi

SMA5	SMA10	SMA15	EMA5	EMA10	EMA15	WMA5	WMA10	WMA15	MACD			RSI	Stochastic Oscillator	
									MACD L	MACD H	MACD S		Stoch%K	Stoch%D
0,945712	0,946265	0,946213	0,945656	0,946109	0,94658	0,945552	0,945915	0,946151	0,454127	0,41734	0,459432	0,545153	0,737182	0,740807
0,94613	0,946413	0,946521	0,946354	0,946514	0,946873	0,946252	0,946292	0,946439	0,459423	0,428347	0,460806	0,653528	0,814493	0,767663
0,946764	0,94667	0,94681	0,947078	0,946987	0,947226	0,94707	0,946785	0,946787	0,46543	0,438693	0,463252	0,684162	0,833048	0,79492
0,947531	0,94702	0,947047	0,947878	0,947548	0,947655	0,947995	0,947404	0,947218	0,472386	0,449019	0,466769	0,71773	0,930863	0,859481
0,948289	0,947492	0,947282	0,9485	0,948054	0,948063	0,948753	0,948007	0,947652	0,478219	0,454854	0,47089	0,726521	0,927281	0,897077
0,949057	0,947918	0,947551	0,948826	0,948421	0,948387	0,94917	0,948477	0,948024	0,481739	0,454518	0,474977	0,70406	0,947358	0,935181
0,949591	0,948395	0,947828	0,949358	0,948892	0,948789	0,949645	0,949041	0,94848	0,486531	0,456999	0,479321	0,737128	0,883035	0,919238
0,950236	0,949036	0,948215	0,950156	0,94952	0,949308	0,950385	0,94976	0,949068	0,49327	0,463196	0,484308	0,776223	0,870921	0,900451
0,951059	0,949832	0,948723	0,951303	0,95037	0,949993	0,951524	0,950698	0,949838	0,502792	0,474173	0,490432	0,818341	0,873252	0,875749
0,95189	0,950628	0,949316	0,952168	0,951121	0,95063	0,952491	0,951547	0,950583	0,510392	0,478799	0,497036	0,824386	0,909071	0,884428
0,952859	0,951497	0,949924	0,952887	0,951812	0,951241	0,953322	0,952329	0,951308	0,516711	0,479728	0,503737	0,83284	0,898834	0,893732
0,953351	0,952011	0,950407	0,952885	0,952115	0,951595	0,953349	0,952689	0,951775	0,517116	0,467678	0,509188	0,718396	0,842185	0,883376
0,953639	0,952478	0,95093	0,952988	0,95242	0,951943	0,953317	0,953014	0,952221	0,517434	0,457848	0,51362	0,727654	0,814544	0,851867
0,953661	0,952902	0,951469	0,953227	0,952762	0,952313	0,953359	0,953346	0,952666	0,518197	0,450949	0,517337	0,742712	0,791686	0,81615
0,953836	0,953405	0,952058	0,953742	0,953237	0,95277	0,953749	0,953796	0,953178	0,520736	0,449273	0,52088	0,77154	0,854652	0,820306
0,954204	0,954075	0,952761	0,954551	0,95388	0,953345	0,954546	0,954409	0,95379	0,525491	0,452722	0,524781	0,803505	0,912016	0,852797
0,954713	0,954576	0,953274	0,954842	0,95427	0,953754	0,954973	0,954764	0,954222	0,526387	0,447135	0,528102	0,747734	0,919552	0,89542
0,955144	0,954936	0,95373	0,955011	0,954576	0,954103	0,955204	0,955014	0,954579	0,525968	0,439822	0,530665	0,74182	0,885935	0,905848

Lampiran 4 *Source code Extreme Learning Machine*

```

import numpy as np

class ELM:
    def __init__(self, input_size, hidden_size, output_size):
        self.input_size = input_size
        self.hidden_size = hidden_size
        self.output_size = output_size

        # inisialisasi bobot antara input layer dan hidden
        layer secara acak (Weight)
        self.input_weights = np.random.uniform(-1, 1,
        size=(self.input_size, self.hidden_size))

        # inisialisasi bias pada hidden layer secara acak
        self.bias_hidden = np.random.normal(0, 0.01,
        size=(1, self.hidden_size))

    def sigmoid_activation(self, x):
        return 1 / (1 + np.exp(-x))

    def linear_activation(self, x):
        return x

    def relu_activation(self, x):
        return np.maximum(0, x)

    def tanh_activation(self, x):
        return np.tanh(x)

    def train(self, X, y, activation):
        if activation == 'sigmoid':
            self.activation = self.sigmoid_activation
        elif activation == 'linear':
            self.activation = self.linear_activation
        elif activation == 'relu':
            self.activation = self.relu_activation
        elif activation == 'tanh':
            self.activation = self.tanh_activation
        else:
            raise ValueError("Invalid activation
            function.")

        # hitung output pada hidden layer
        H_init = np.dot(X, self.input_weights) +
        self.bias_hidden
        hidden_layer = self.activation(H_init)

```



```
# hitung bobot pada output layer dengan moore  
penrose pseudoinverse  
self.output_weights =  
np.dot(np.linalg.pinv(hidden_layer), y)  
  
def predict(self, X):  
    # hitung output pada hidden layer  
    H_init = np.dot(X, self.input_weights) +  
    self.bias_hidden  
    hidden_layer = self.activation(H_init)  
  
    # hitung output pada output layer  
    output_layer = np.dot(hidden_layer,  
    self.output_weights)  
  
    return output_layer
```

Lampiran 5 *Source code dashboard* sistem

Untuk *source code dashboard* sistem dapat diakses melalui link github di bawah.

<https://github.com/arsyh09/streamlit-app>

Lampiran 6 Lembar Perbaikan Skripsi

LEMBAR PERBAIKAN SKRIPSI



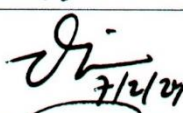
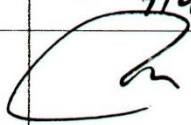
**“PREDIKSI NILAI TUKAR BITCOIN TERHADAP DOLAR AS
DENGAN PENDEKATAN INDIKATOR TEKNIKAL
MENGUNAKAN METODE
EXTREME LEARNING MACHINE”**

OLEH:


**AHMAD REZA SYAHBANA
D121171006**

Skripsi ini telah dipertahankan pada Ujian Akhir Sarjana pada tanggal 29 Januari 2024.
Telah dilakukan perbaikan penulisan dan isi skripsi berdasarkan usulan dari penguji dan pembimbing skripsi.

Persetujuan perbaikan oleh tim penguji:

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Persetujuan perbaikan oleh pembimbing:

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