

BTC price head:

	open	high	low	close	volume	market_cap
date						
2010-07-18	0.0500	0.0500	0.0500	0.0500	0.0	0.0
2010-07-19	0.0858	0.0858	0.0858	0.0858	0.0	0.0
2010-07-20	0.0808	0.0808	0.0808	0.0808	0.0	0.0

ETH price head:

	open	high	low	close	volume	\
date						
2015-08-09	2.772120	2.798810	0.714725	0.714876	314143.614583	
2015-08-10	0.753325	0.879810	0.629191	0.729347	699826.371528	
2015-08-11	0.701897	0.729854	0.636546	0.707703	457747.909722	

market_cap

	date	market_cap
2015-08-09	1.039569e+08	
2015-08-10	4.156260e+07	
2015-08-11	4.182758e+07	

News daily head:

	coin	date	news_count	title_len_mean	sent_mean	sent_std
0	BTC	2013-04-08	1	33.0	0.0	NaN
1	BTC	2013-04-15	1	60.0	0.0	NaN
2	BTC	2013-05-01	1	92.0	0.0	NaN

Trends head:

	date	bitcoin	ethereum	cryptocurrency	blockchain	investing	\
date							
2009-01-01		0	0.0	NaN	NaN	78	
2009-01-02		0	0.0	NaN	NaN	87	
2009-01-03		0	0.0	NaN	NaN	71	
	date	bitcoin_d7	bitcoin_z	ethereum_d7	ethereum_z	cryptocurrency_d7	\
date							
2009-01-01		NaN	NaN	NaN	NaN	NaN	
2009-01-02		NaN	NaN	NaN	NaN	NaN	
2009-01-03		NaN	NaN	NaN	NaN	NaN	
	date	cryptocurrency_z	blockchain_d7	blockchain_z	investing_d7	\	
date							
2009-01-01		NaN	NaN	NaN	NaN	NaN	
2009-01-02		NaN	NaN	NaN	NaN	NaN	
2009-01-03		NaN	NaN	NaN	NaN	NaN	
	date	investing_z					
date							
2009-01-01		NaN					
2009-01-02		NaN					
2009-01-03		NaN					

Macros head:

	date	sp500_price	sp500_volume	vix_price	gold_usd_price	\
date						
2009-01-02		931.799988	4.048270e+09	39.189999	878.799988	
2009-01-05		927.450012	5.413910e+09	39.080002	857.200012	
2009-01-06		934.700012	5.392620e+09	38.560001	865.400024	
	date	sp500_price_ret_1d	sp500_price_z	vix_price_ret_1d	vix_price_z	\

2009-01-02	NaN	NaN	NaN	NaN
2009-01-05	-0.004679	NaN	-0.002811	NaN
2009-01-06	0.007787	NaN	-0.013395	NaN

date	gold_usd_price_ret_1d	gold_usd_price_z	sp500_volume_z
2009-01-02	NaN	NaN	NaN
2009-01-05	-0.024886	NaN	NaN
2009-01-06	0.009521	NaN	NaN

Combined dataset shape: (8342, 79)

Combined dataset tail:

date	open	high	low	close	volume	\
2024-06-26	3361.4335	3430.0008	3345.1593	3408.7740	2.211726e+10	
2024-06-27	61733.9900	62357.5800	60761.2400	60761.2400	1.017576e+11	
2024-06-27	3405.1884	3432.3600	3347.8603	3381.2506	1.439138e+10	
2024-06-28	60882.9000	62338.4300	60666.1900	61646.0500	1.215887e+11	
2024-06-28	3383.5292	3481.1707	3379.1649	3458.8487	1.580400e+10	

date	market_cap	log_ret_1d	log_ret_3d	log_ret_7d	hl_range	\
2024-06-26	4.075215e+11	0.013292	-0.032299	-0.023735	0.024889	
2024-06-27	1.210544e+12	-0.016789	-0.040782	-0.066667	0.026272	
2024-06-27	4.080268e+11	-0.008107	-0.018104	-0.054167	0.024991	
2024-06-28	1.208392e+12	0.014457	0.020705	-0.051147	0.027126	
2024-06-28	4.116605e+11	0.022690	0.027875	-0.019775	0.029491	

date	vol_7d	vol_30d	volume_log	volume_log_diff_1d	volume_log_z	\
2024-06-26	0.017210	0.016379	23.819624	0.124895	0.636344	
2024-06-27	0.021537	0.015693	25.345860	-0.031664	0.544587	
2024-06-27	0.012947	0.015978	23.389895	-0.429729	-1.174859	
2024-06-28	0.023281	0.015925	25.523910	0.178050	1.893444	
2024-06-28	0.017064	0.016672	23.483529	0.093634	-0.712123	

date	market_cap_z	ma_7	ma_7_ratio	ma_30	ma_30_ratio	\
2024-06-26	0.015260	3480.388314	0.979423	3641.636500	0.936056	
2024-06-27	-1.450558	62782.232857	0.967809	66801.683333	0.909576	
2024-06-27	0.036014	3453.502300	0.979079	3625.566643	0.932613	
2024-06-28	-1.450153	62320.085714	0.989184	66576.637000	0.925941	
2024-06-28	0.145128	3443.633857	1.004418	3613.474310	0.957209	

date	ma_90	ma_90_ratio	true_range	atr_14	y_local_max_7	\
2024-06-26	3385.035900	1.007013	84.8415	119.430407	0	
2024-06-27	66042.023444	0.920039	1596.3400	1717.008571	0	
2024-06-27	3382.971419	0.999491	84.4997	115.005279	0	
2024-06-28	65950.862667	0.934727	1672.2400	1696.632143	0	
2024-06-28	3382.286371	1.022636	102.0058	115.288436	0	

date	y_local_min_7	y_next_up	ema_7	ema_10	\
2024-06-26	0	0	3460.957101	3486.456420	
2024-06-27	0	1	62544.356083	63280.576068	
2024-06-27	0	1	3441.030476	3467.328089	
2024-06-28	0	0	62319.779562	62983.389510	
2024-06-28	0	0	3445.485032	3465.786382	

	ema_20	ema_50	ema_100	ema_200	\	
date						
2024-06-26	3535.421532	3502.472665	3370.415691	3070.406659		
2024-06-27	64843.998027	65782.109111	64096.773262	58030.608582		
2024-06-27	3520.738586	3497.718859	3370.630244	3073.499634		
2024-06-28	64539.431549	65619.910714	64048.244089	58066.583124		
2024-06-28	3514.844311	3496.194539	3372.377144	3077.333953		
	bb_upper	bb_lower	bb_width	rsi_14	stoch_k \	
date						
2024-06-26	3789.006116	3346.459274	0.124041	41.750085	36.465998	
2024-06-27	71361.965330	60156.353670	0.170404	18.427165	19.211737	
2024-06-27	3755.723674	3338.318406	0.117678	36.056491	29.603900	
2024-06-28	70991.427004	59753.916996	0.171899	27.275871	32.152538	
2024-06-28	3735.577461	3335.021249	0.113302	45.362220	48.950555	
	stoch_d	stoch_rsi	macd	macd_signal	obv \	
date						
2024-06-26	25.826017	1.000000	-40.095029	-9.840746	1.933115e+12	
2024-06-27	19.334815	0.152576	-1616.249968	-958.722029	1.925658e+12	
2024-06-27	29.866109	0.522780	-46.665506	-17.205698	1.918723e+12	
2024-06-28	25.712421	0.433097	-1660.078072	-1098.993237	2.047246e+12	
2024-06-28	38.340151	1.000000	-45.091354	-22.782829	1.934527e+12	
	wr_14	kdj_j	psar	news_count	title_len_mean	sent_mean \
date						
2024-06-26	-63.534002	57.745958	NaN	8.0	74.625000	-0.125
2024-06-27	-80.788263	18.965579	NaN	9.0	84.666667	0.000
2024-06-27	-70.396100	29.079482	NaN	5.0	92.000000	0.000
2024-06-28	-67.847462	45.032771	NaN	2.0	96.000000	0.500
2024-06-28	-51.049445	70.171364	NaN	5.0	83.600000	0.200
	sent_std	bitcoin	ethereum	cryptocurrency	blockchain \	
date						
2024-06-26	0.353553	28	18.0	40.0	72.0	
2024-06-27	0.000000	27	19.0	39.0	64.0	
2024-06-27	0.000000	27	19.0	39.0	64.0	
2024-06-28	0.707107	27	18.0	38.0	65.0	
2024-06-28	0.447214	27	18.0	38.0	65.0	
	investing	bitcoin_d7	bitcoin_z	ethereum_d7	ethereum_z \	
date						
2024-06-26	65	0.0	-0.810449	-3.0	-0.650489	
2024-06-27	63	-1.0	-0.883839	-4.0	-0.554411	
2024-06-27	63	-1.0	-0.883839	-4.0	-0.554411	
2024-06-28	67	0.0	-0.867153	0.0	-0.631099	
2024-06-28	67	0.0	-0.867153	0.0	-0.631099	
	cryptocurrency_d7	cryptocurrency_z	blockchain_d7	blockchain_z \		
date						
2024-06-26	-1.0	-0.843100	0.0	-0.014084		
2024-06-27	-3.0	-0.998354	-8.0	-1.008535		
2024-06-27	-3.0	-0.998354	-8.0	-1.008535		
2024-06-28	-2.0	-1.288032	-3.0	-0.873764		
2024-06-28	-2.0	-1.288032	-3.0	-0.873764		
	investing_d7	investing_z	sp500_price	sp500_volume	vix_price \	
date						
2024-06-26	7.0	0.042516	5477.899902	3.563920e+09	12.55	
2024-06-27	-3.0	-0.072403	5482.870117	3.589530e+09	12.24	

```
2024-06-27      -3.0    -0.072403  5482.870117  3.589530e+09    12.24
2024-06-28      5.0     0.131021  5460.479980  7.199220e+09    12.44
2024-06-28      5.0     0.131021  5460.479980  7.199220e+09    12.44
```

```
gold_usd_price  sp500_price_ret_1d  sp500_price_z  \
date
2024-06-26    2299.199951        0.001571    2.048113
2024-06-27    2324.500000        0.000907    2.023423
2024-06-27    2324.500000        0.000907    2.023423
2024-06-28    2327.699951       -0.004092   1.814464
2024-06-28    2327.699951       -0.004092   1.814464
```

```
vix_price_ret_1d  vix_price_z  gold_usd_price_ret_1d  \
date
2024-06-26    -0.022845   -0.909234   -0.007539
2024-06-27    -0.025011   -1.078991   0.010944
2024-06-27    -0.025011   -1.078991   0.010944
2024-06-28    0.016208    -0.935955   0.001376
2024-06-28    0.016208    -0.935955   0.001376
```

```
gold_usd_price_z  sp500_volume_z  coin  coin_BTC  coin_ETH
date
2024-06-26    0.284491   -0.604122  ETH    False    True
2024-06-27    0.492711   -0.559720  BTC    True    False
2024-06-27    0.492711   -0.559720  ETH    False    True
2024-06-28    0.505203    4.360775  BTC    True    False
2024-06-28    0.505203    4.360775  ETH    False    True
```

Number of features selected: 62

Splits:

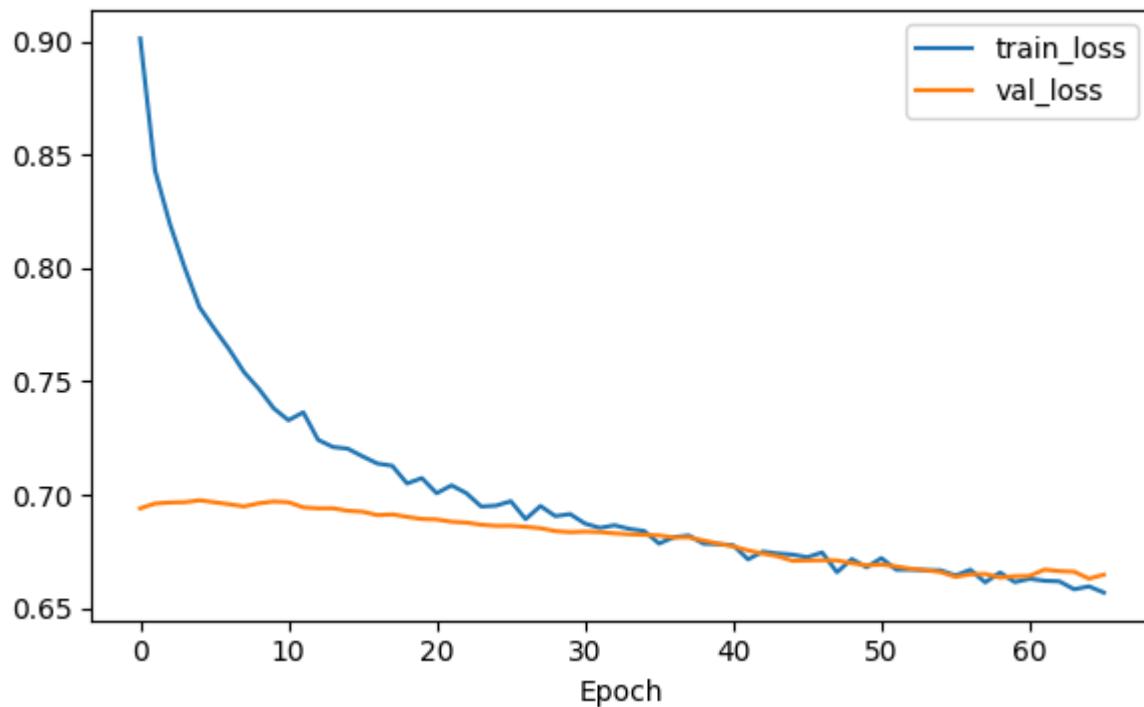
```
Train <= 2023-01-05, Val 2023-01-06..2023-07-04
Train <= 2023-07-04, Val 2023-07-05..2023-12-31
Train <= 2023-12-31, Val 2024-01-01..2024-06-28
```

```
==== Split 2023-01-06..2023-07-04 | Train 7262, Val 360 ===
```

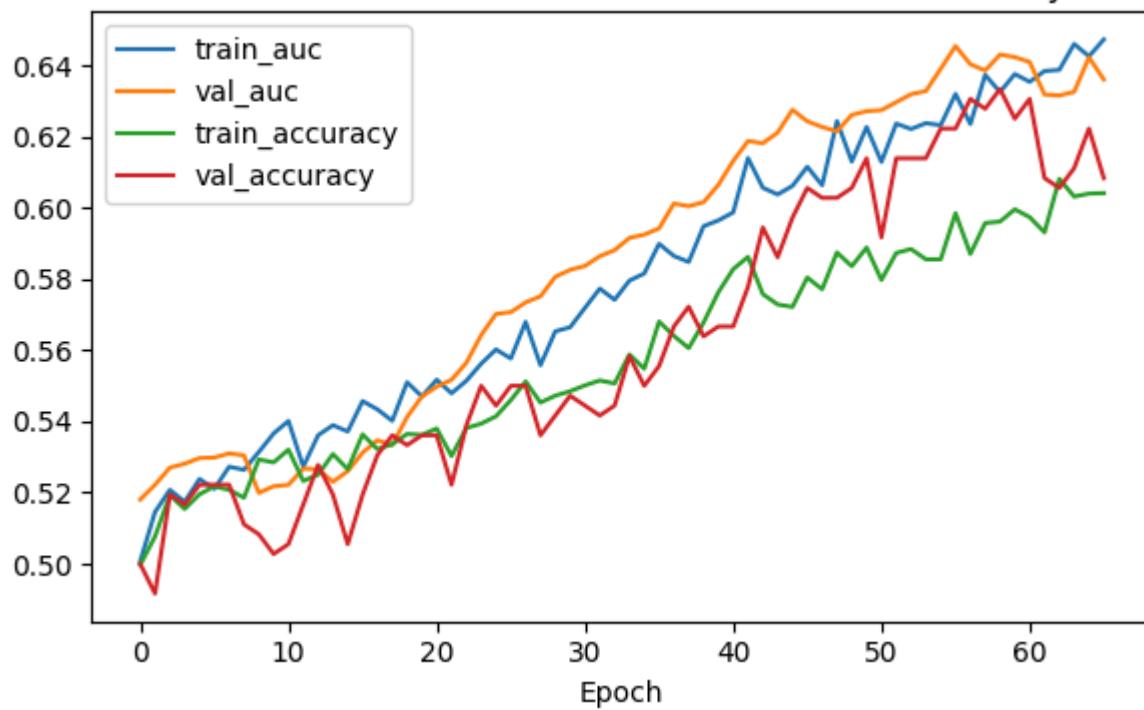
Training MLP for Task A (next-day direction)...

```
/tmp/ipython-input-3982147247.py:11: FutureWarning: DataFrame.fillna with 'method' is
data[feat_cols] = data[feat_cols].fillna(method="ffill").fillna(method="bfill")
```

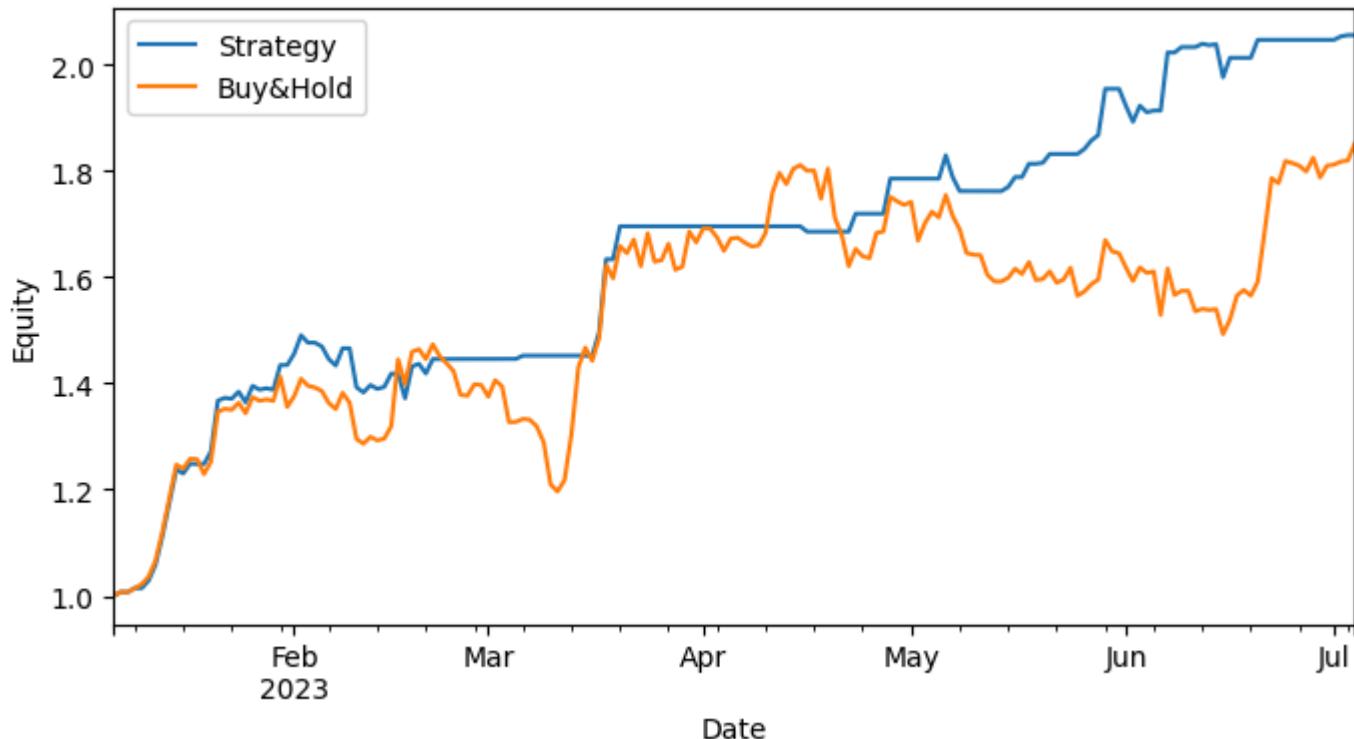
MLP Task A 2023-01-06..2023-07-04 - Loss



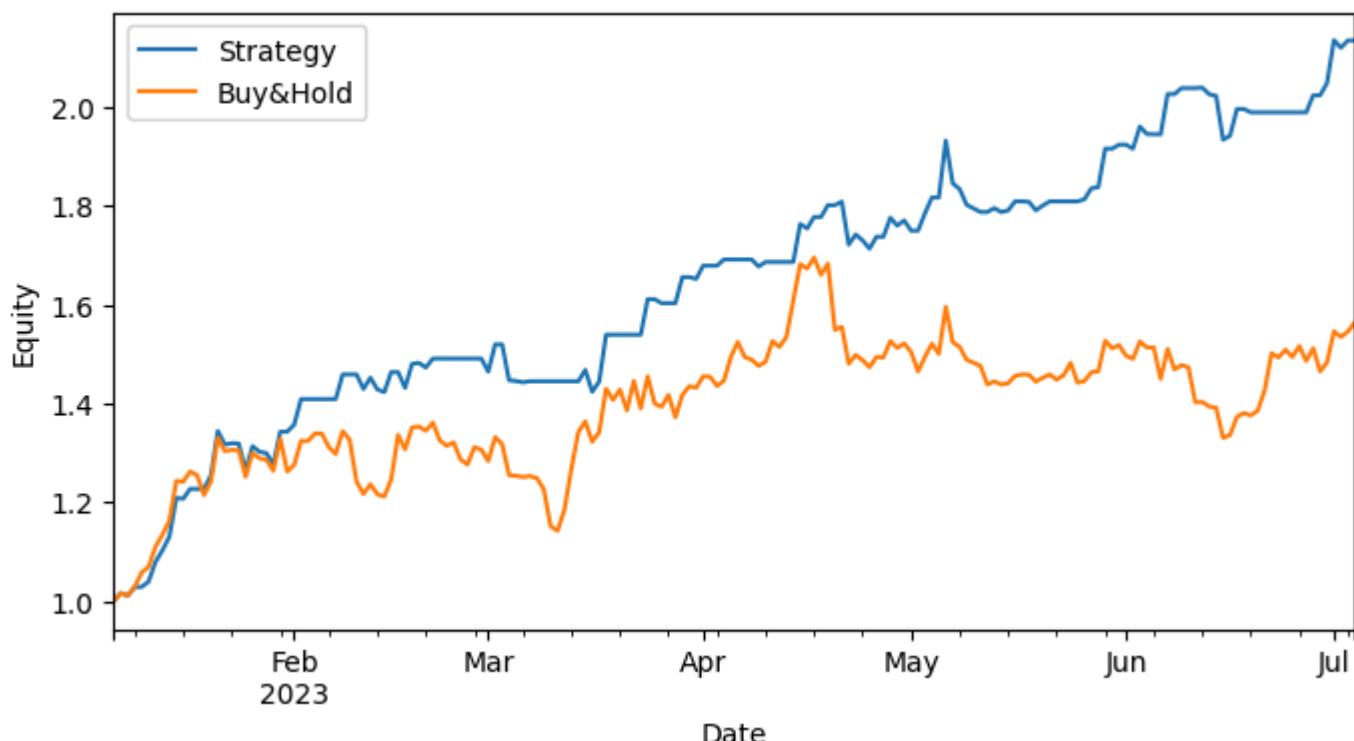
MLP Task A 2023-01-06..2023-07-04 - AUC / Accuracy



Task A MLP BTC 2023-01-06..2023-07-04

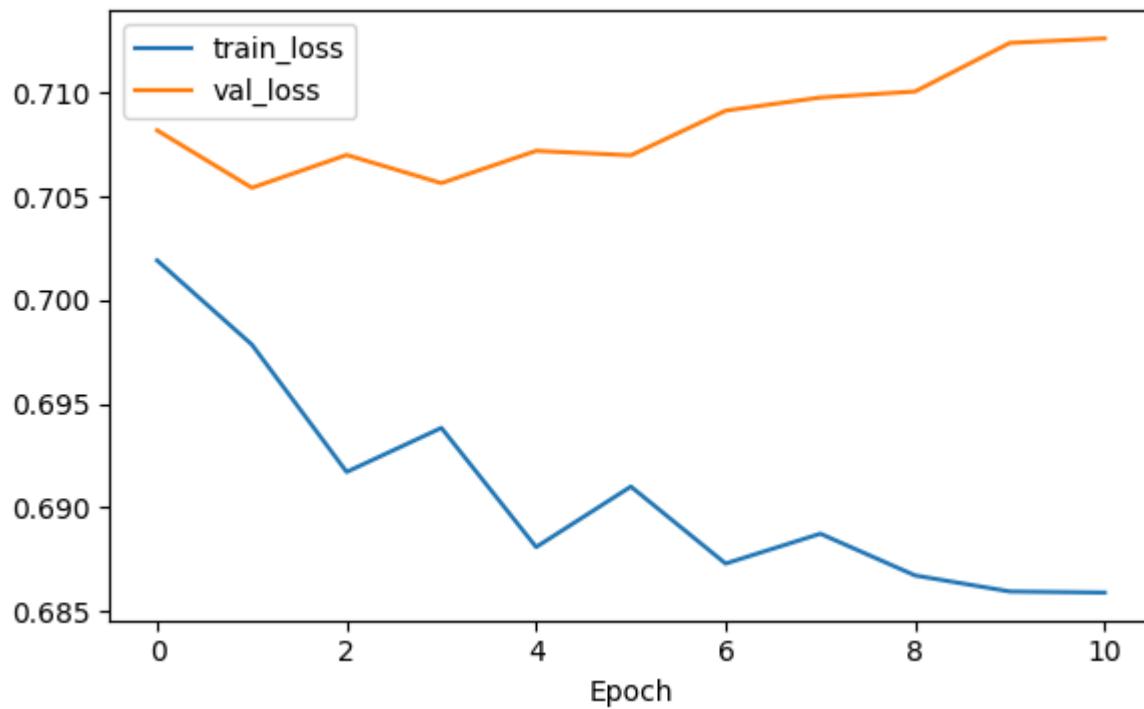


Task A MLP ETH 2023-01-06..2023-07-04

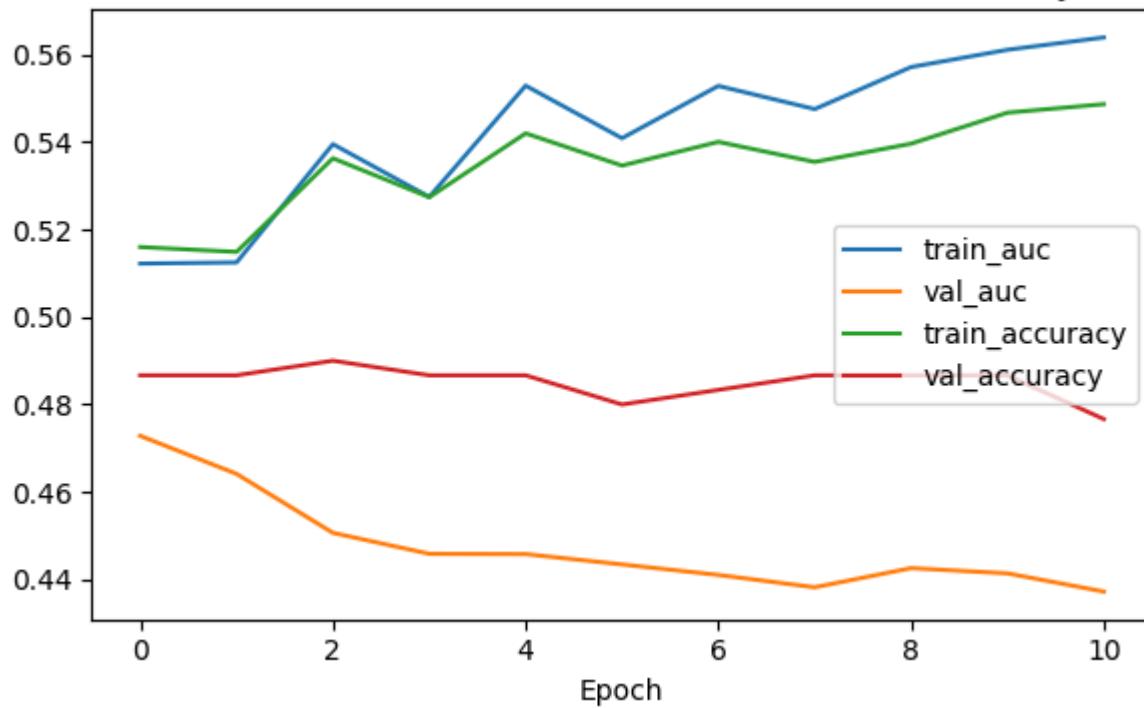


Training LSTM for Task A (next-day direction)...

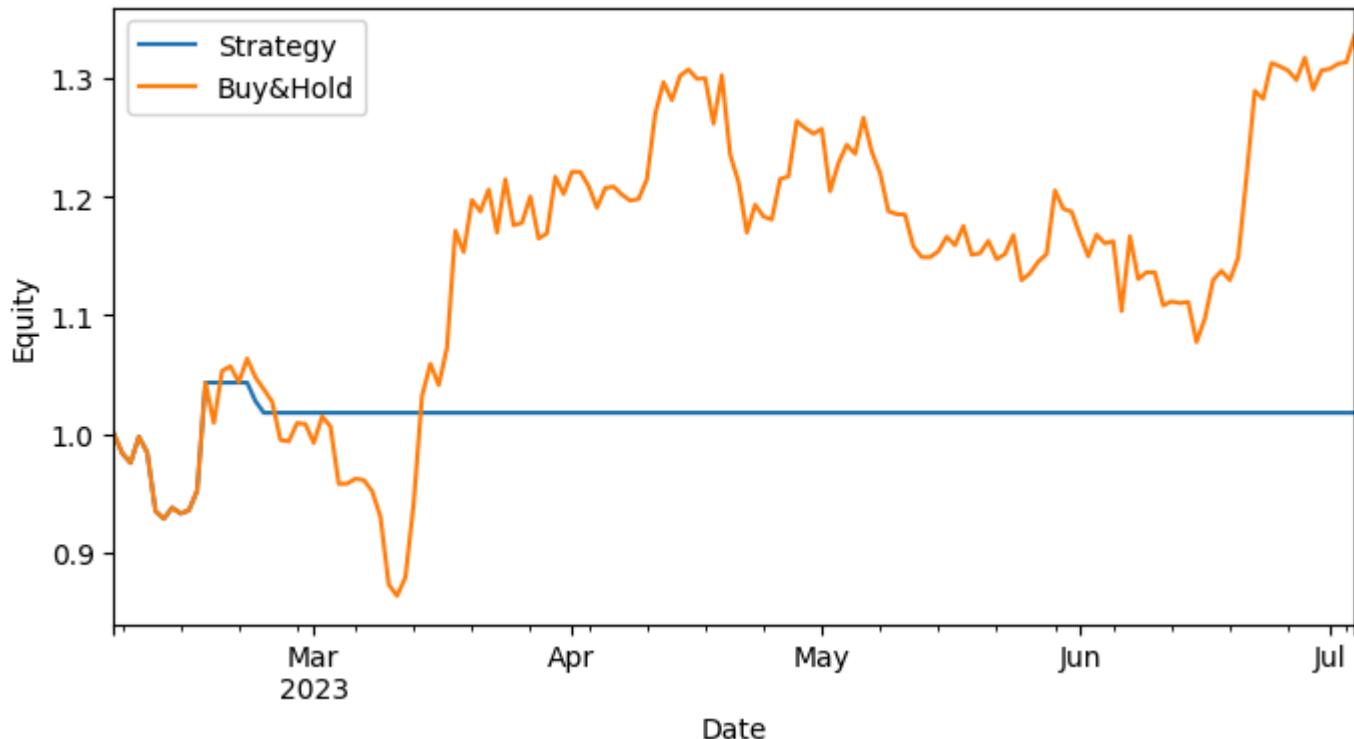
LSTM Task A 2023-01-06..2023-07-04 - Loss



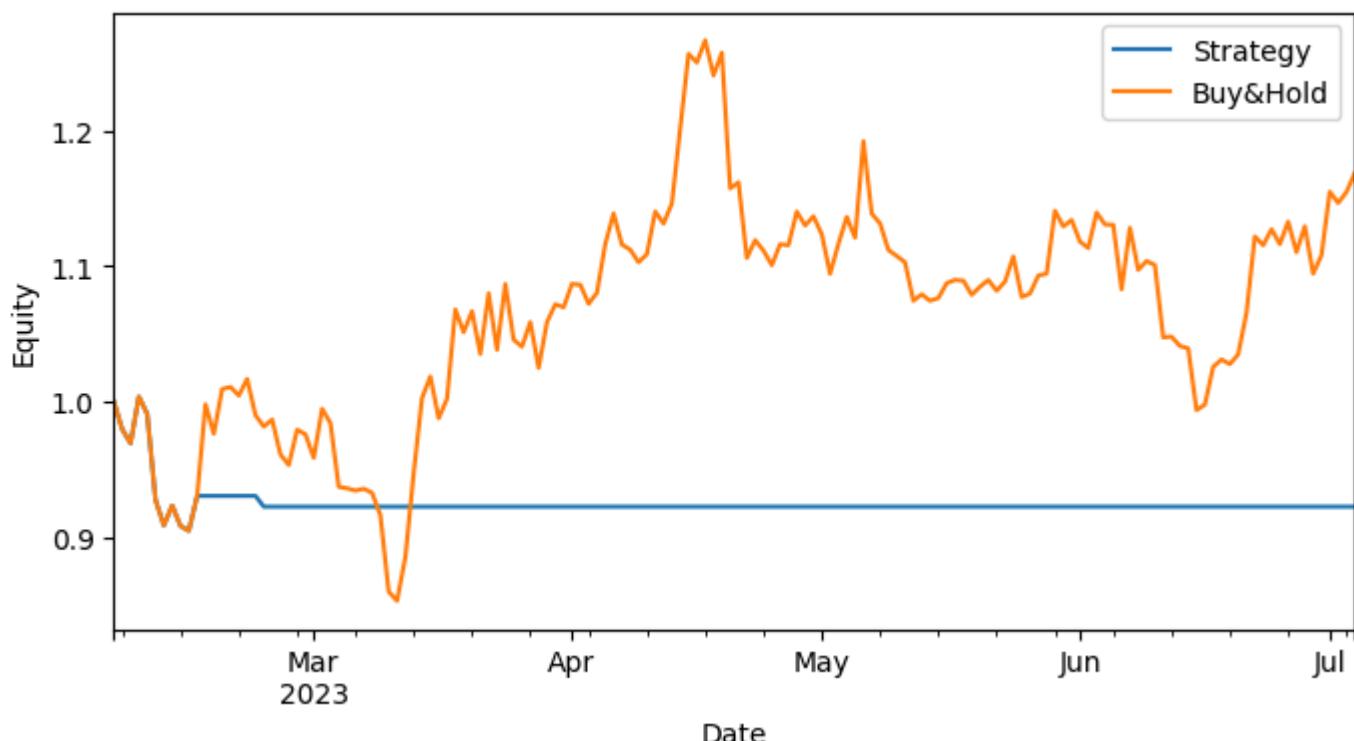
LSTM Task A 2023-01-06..2023-07-04 - AUC / Accuracy



Task A LSTM BTC 2023-01-06..2023-07-04

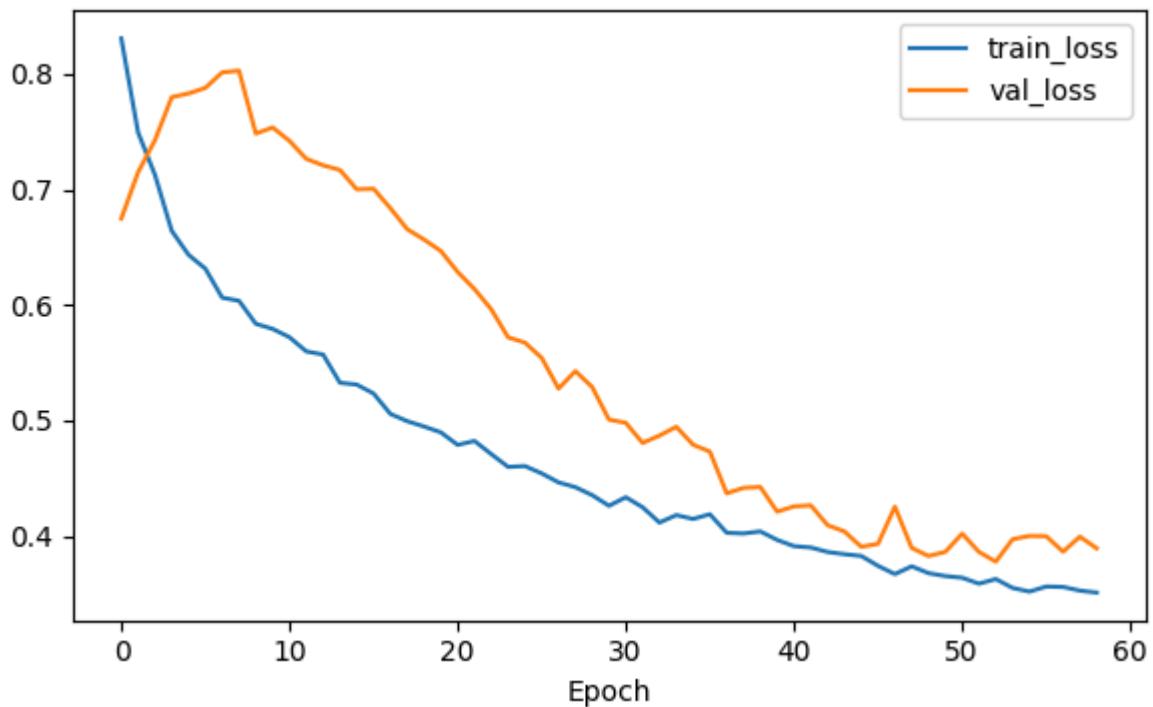


Task A LSTM ETH 2023-01-06..2023-07-04

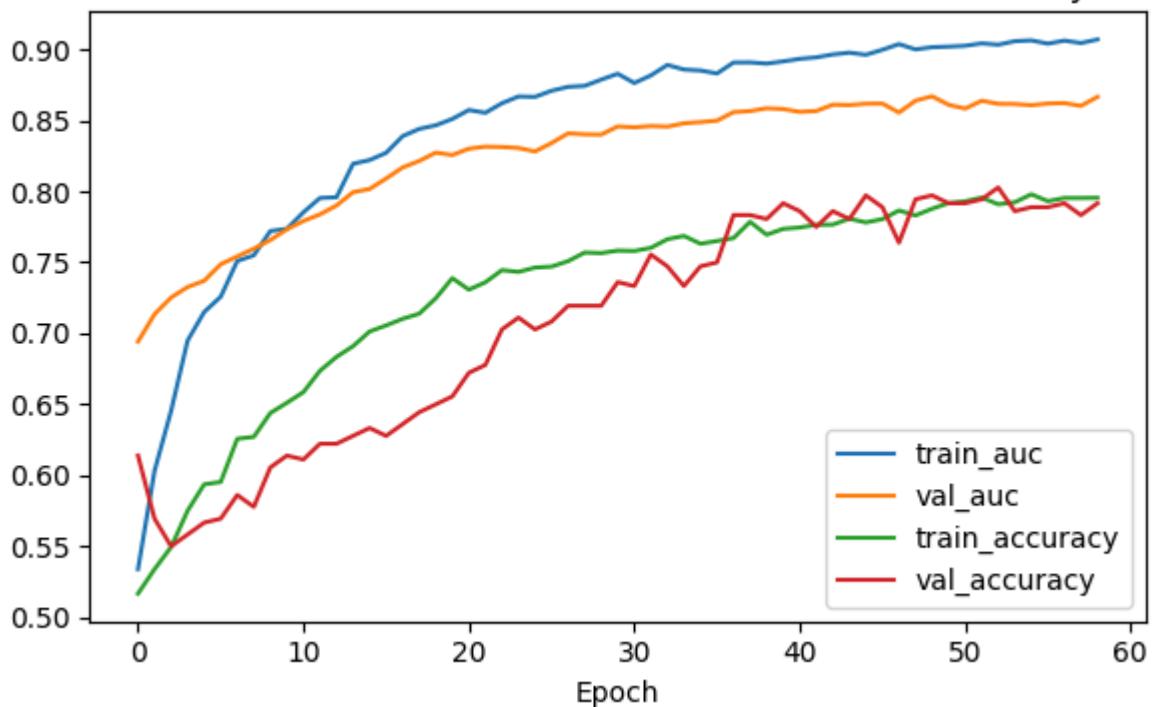


Training MLP for Task B_MIN (y_local_min_7)...

MLP for Task B 2023-01-06..2023-07-04 - Loss

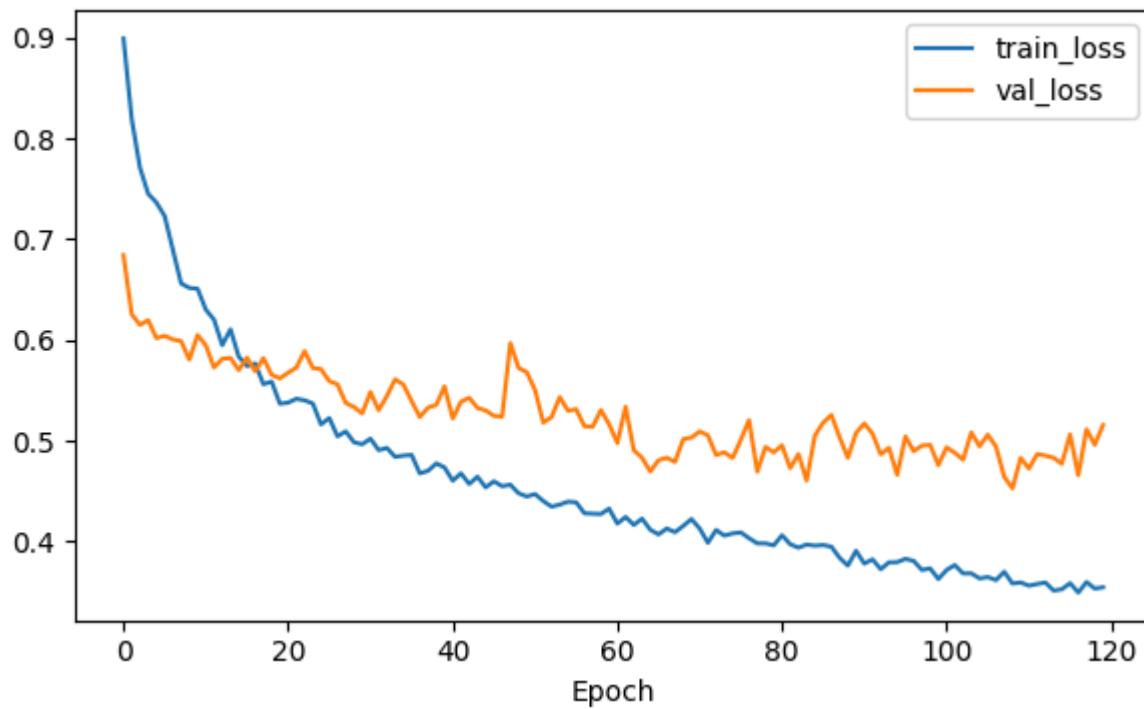


MLP for Task B 2023-01-06..2023-07-04 - AUC / Accuracy

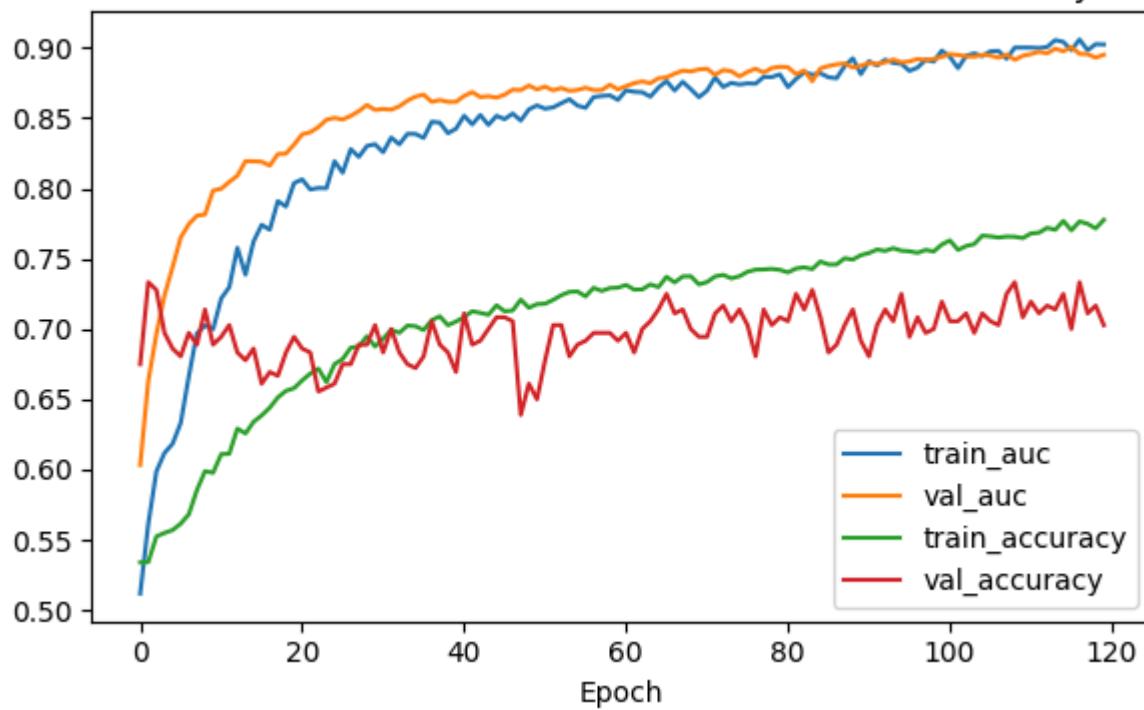


Training MLP for Task B_MAX (y_local_max_7)...

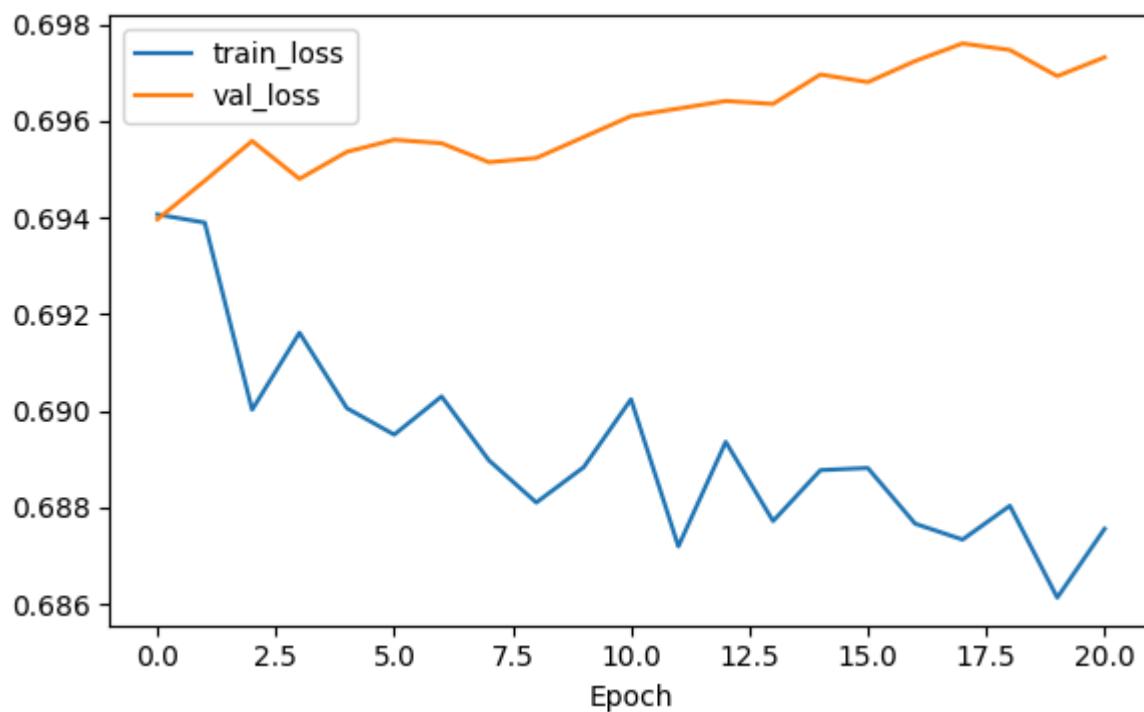
MLP for Task B 2023-01-06..2023-07-04 - Loss



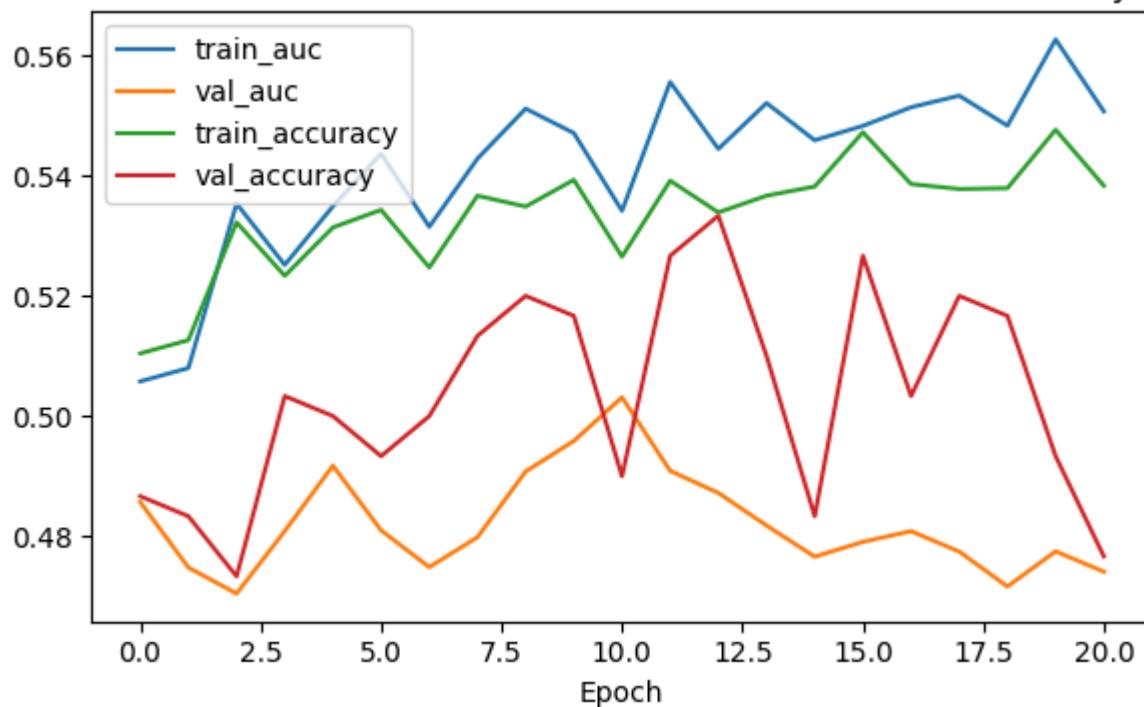
MLP for Task B 2023-01-06..2023-07-04 - AUC / Accuracy



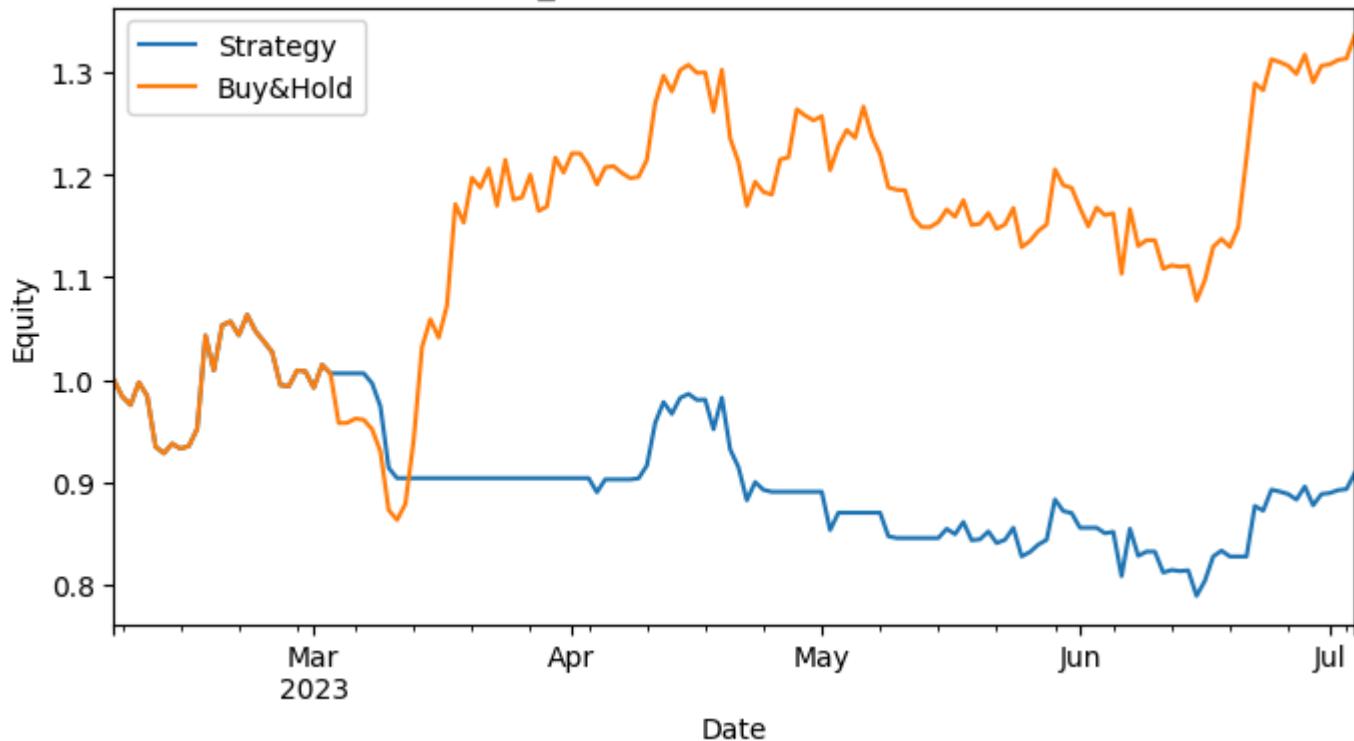
LSTM DEEP TASK A 2023-01-06..2023-07-04 - Loss



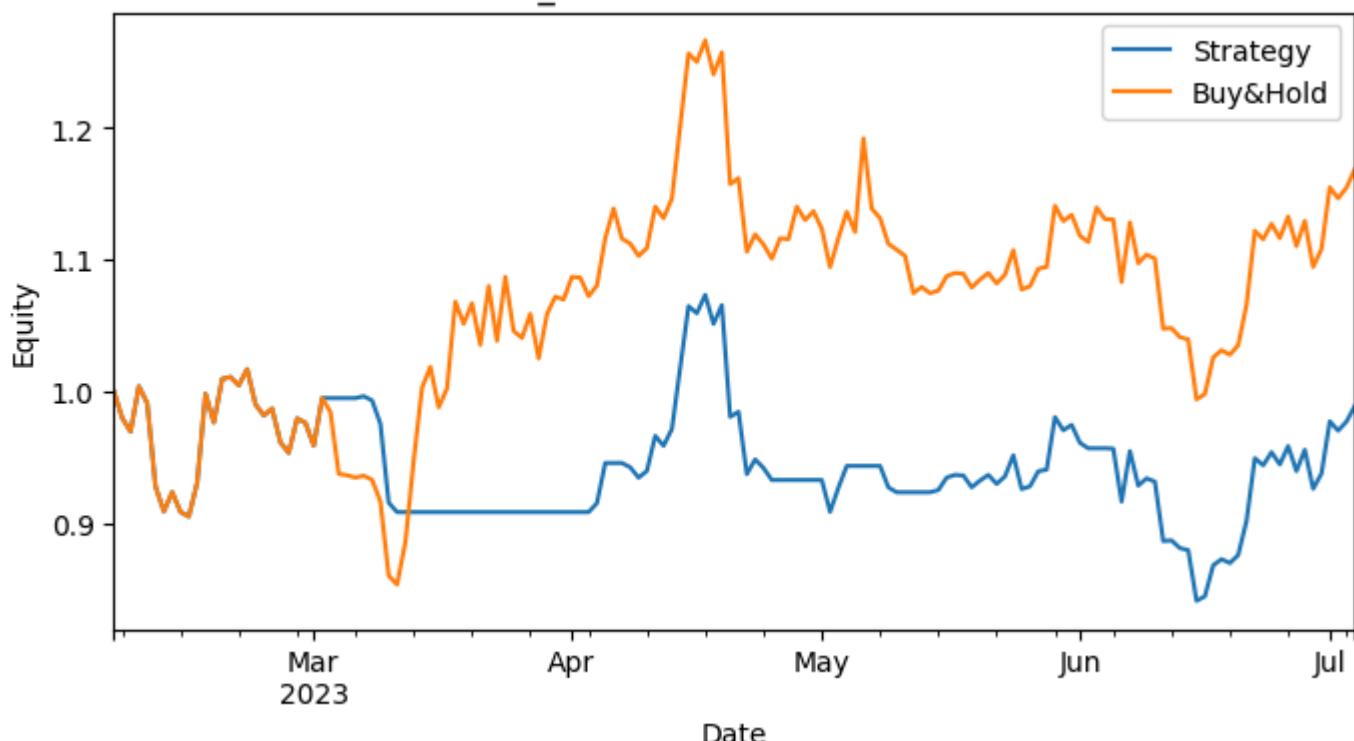
LSTM DEEP TASK A 2023-01-06..2023-07-04 - AUC / Accuracy



Task A LSTM_DEEP BTC 2023-01-06..2023-07-04

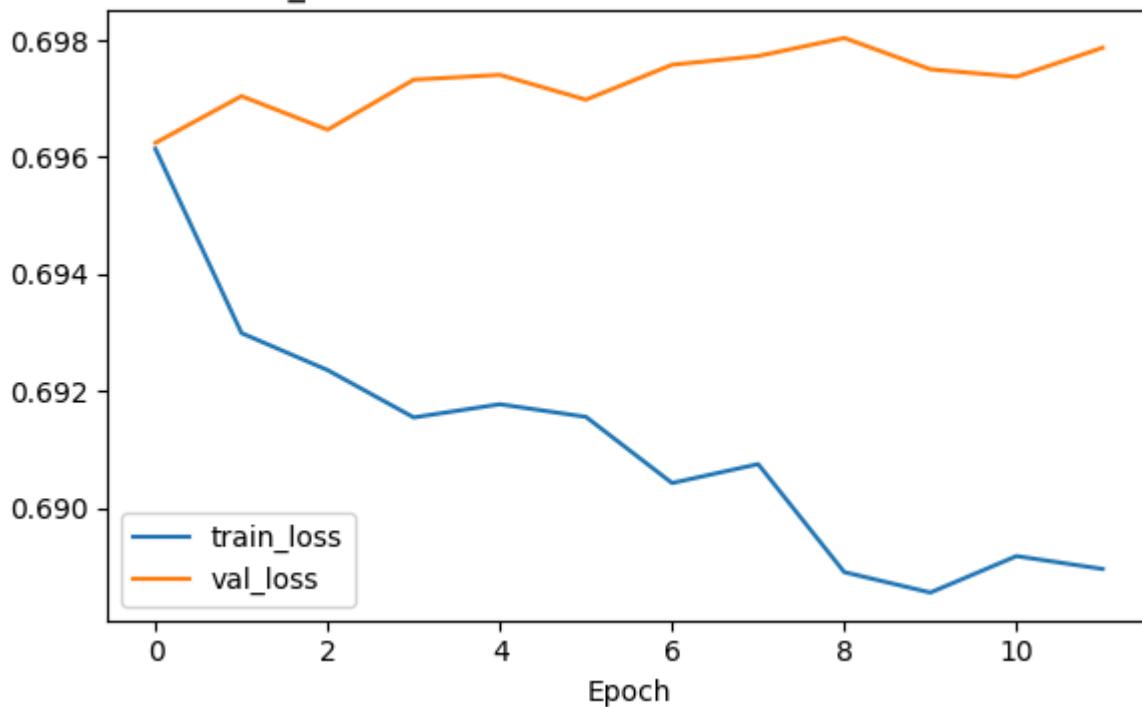


Task A LSTM_DEEP ETH 2023-01-06..2023-07-04

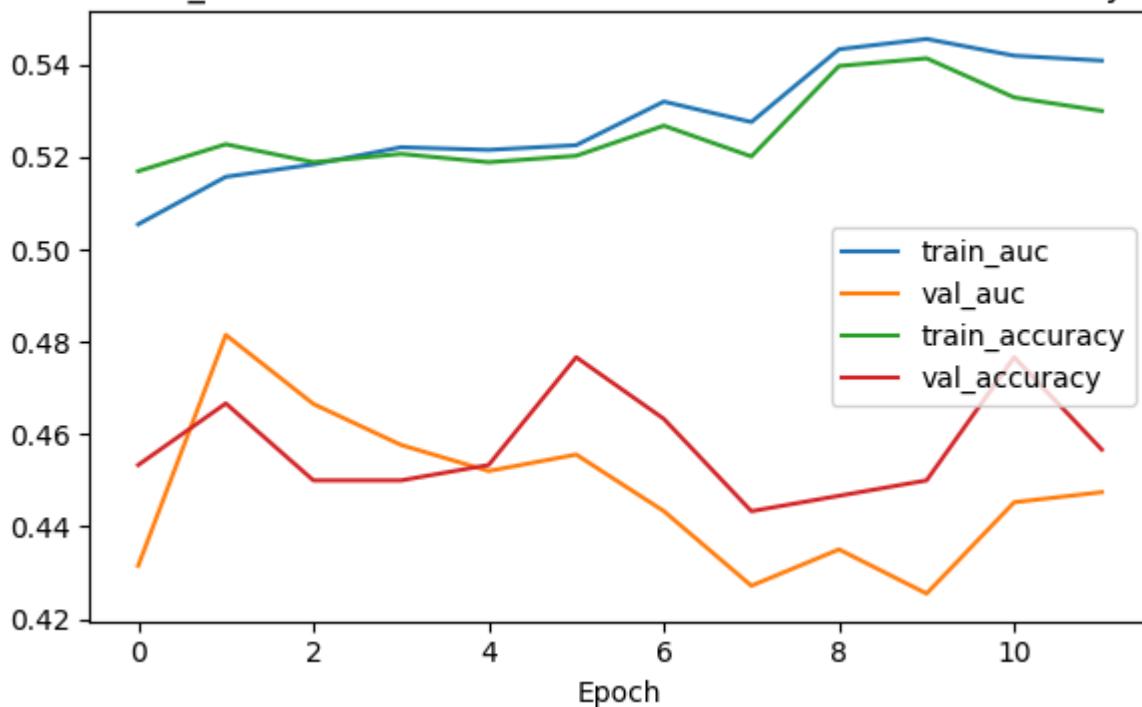


Training CNN-LSTM for Task A (next-day direction)...

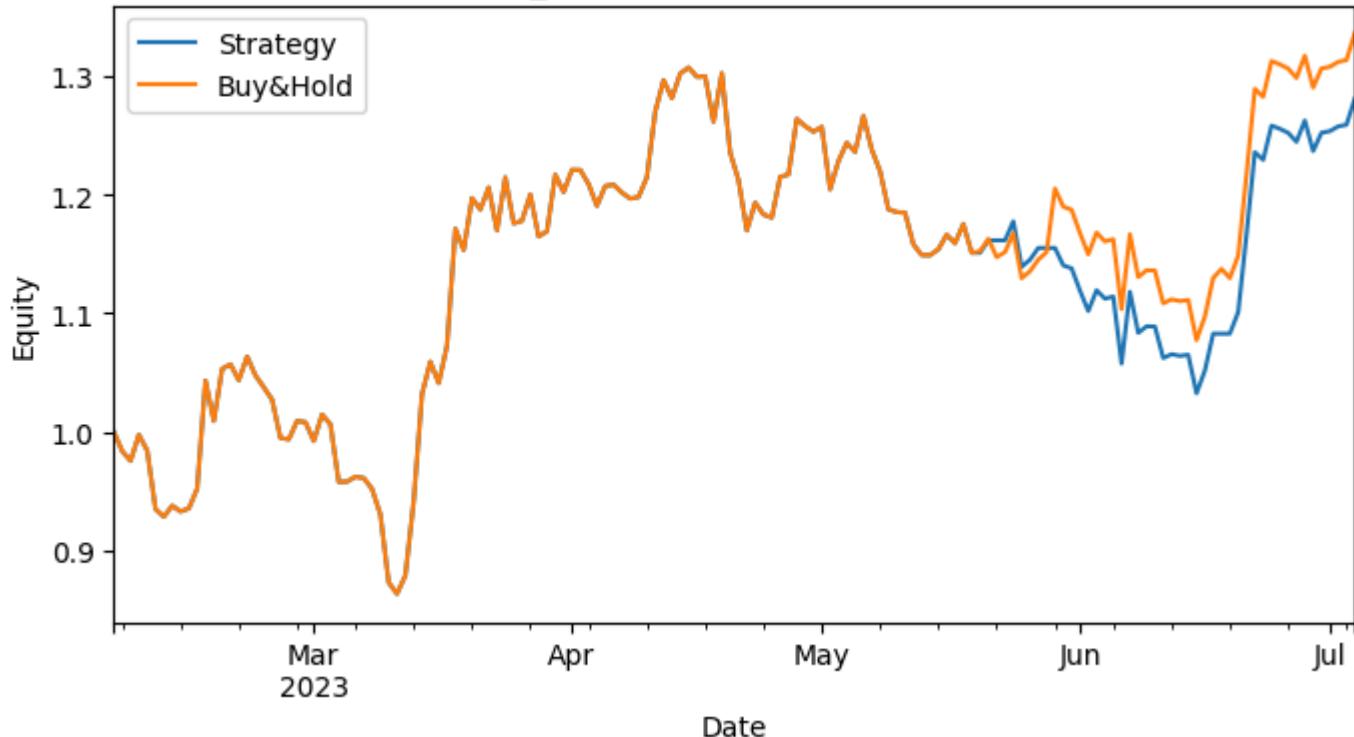
CNN_LSTM TASK A 2023-01-06..2023-07-04 - Loss



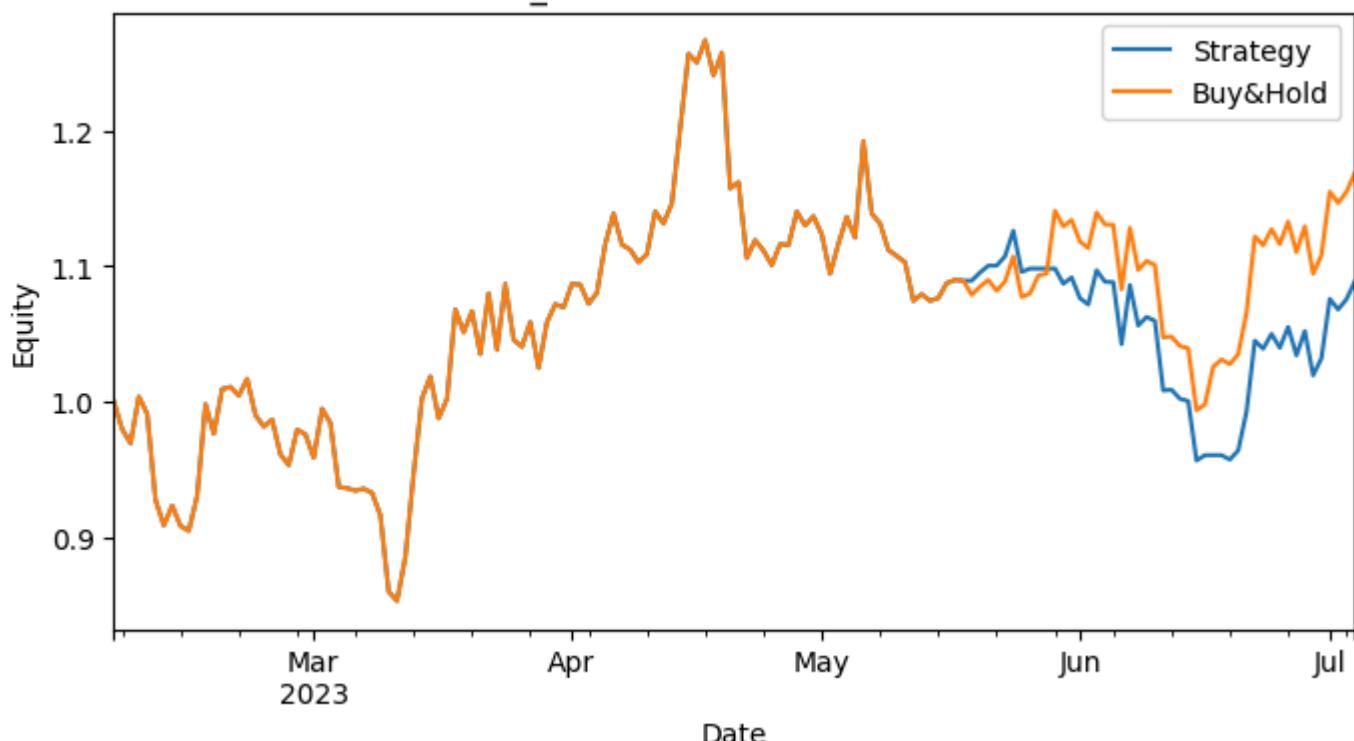
CNN_LSTM TASK A 2023-01-06..2023-07-04 - AUC / Accuracy



Task A CNN_LSTM BTC 2023-01-06..2023-07-04

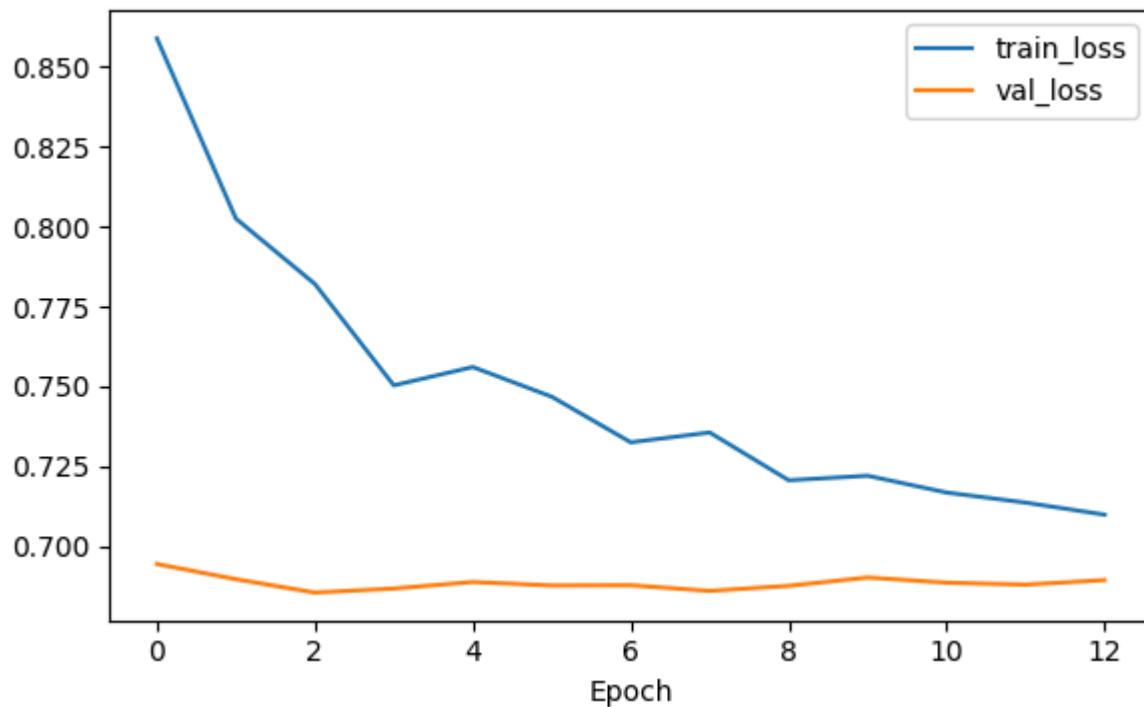


Task A CNN_LSTM ETH 2023-01-06..2023-07-04

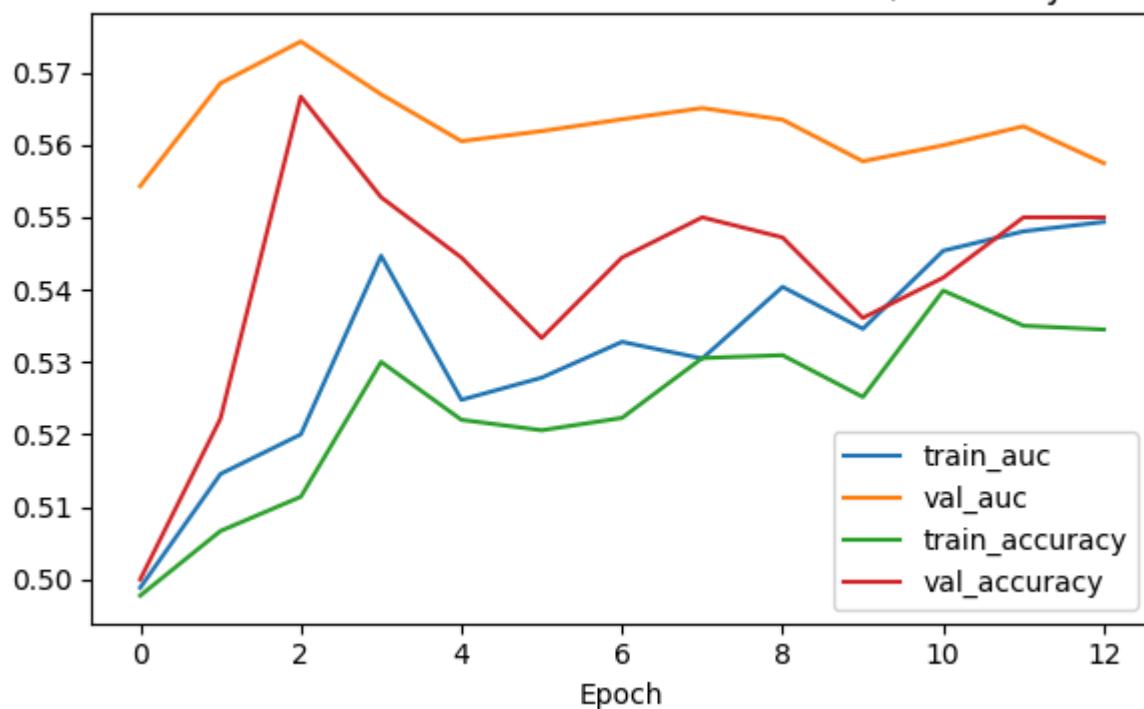


== Split 2023-07-05..2023-12-31 | Train 7622, Val 360 ==
Training MLP for Task A (next-day direction)...

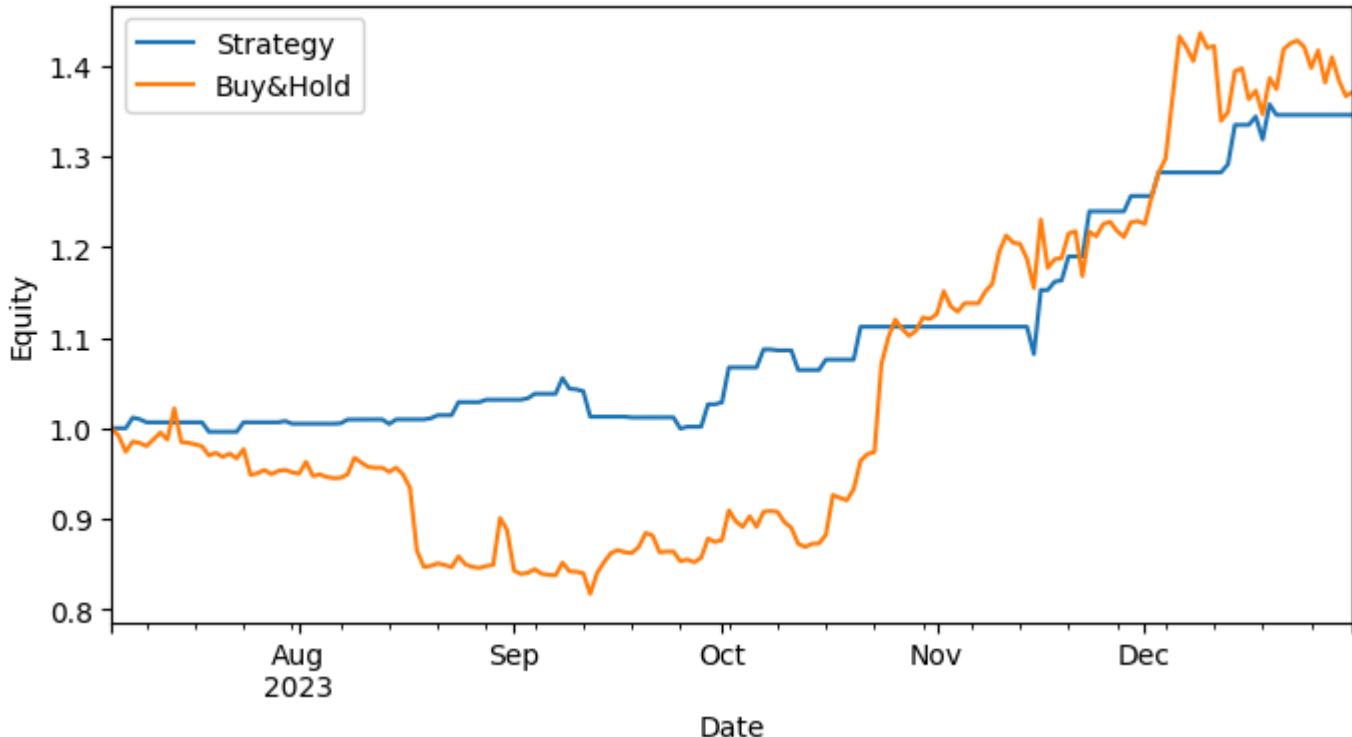
MLP Task A 2023-07-05..2023-12-31 - Loss



MLP Task A 2023-07-05..2023-12-31 - AUC / Accuracy



Task A MLP BTC 2023-07-05..2023-12-31

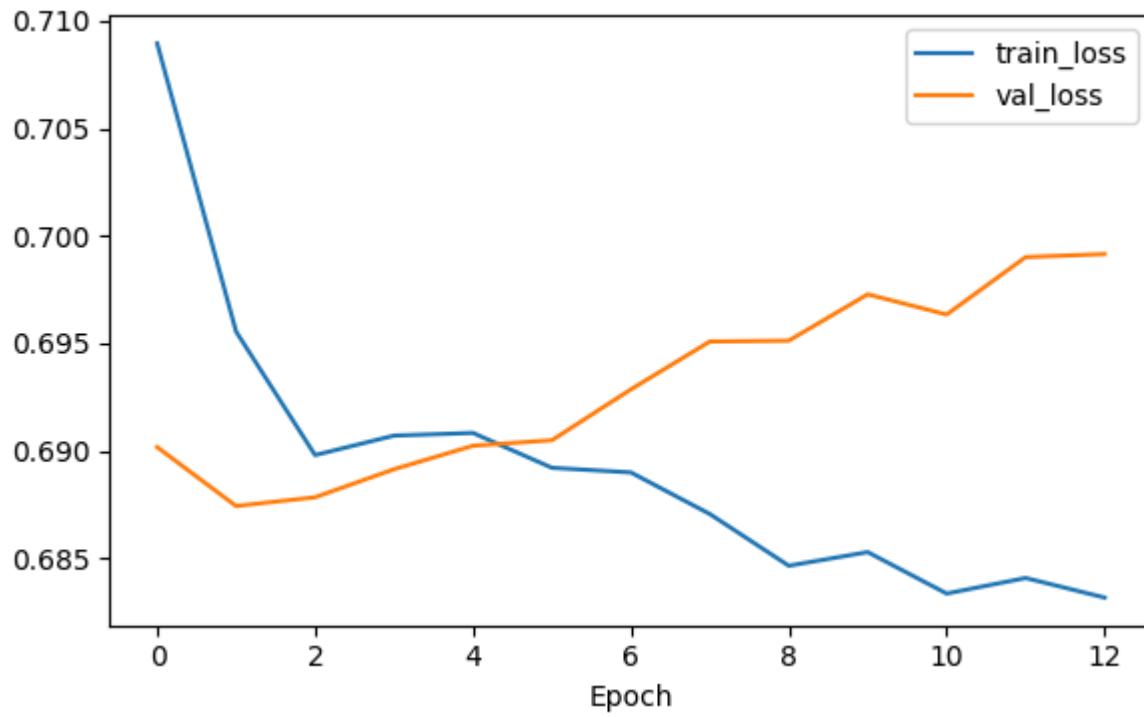


Task A MLP ETH 2023-07-05..2023-12-31

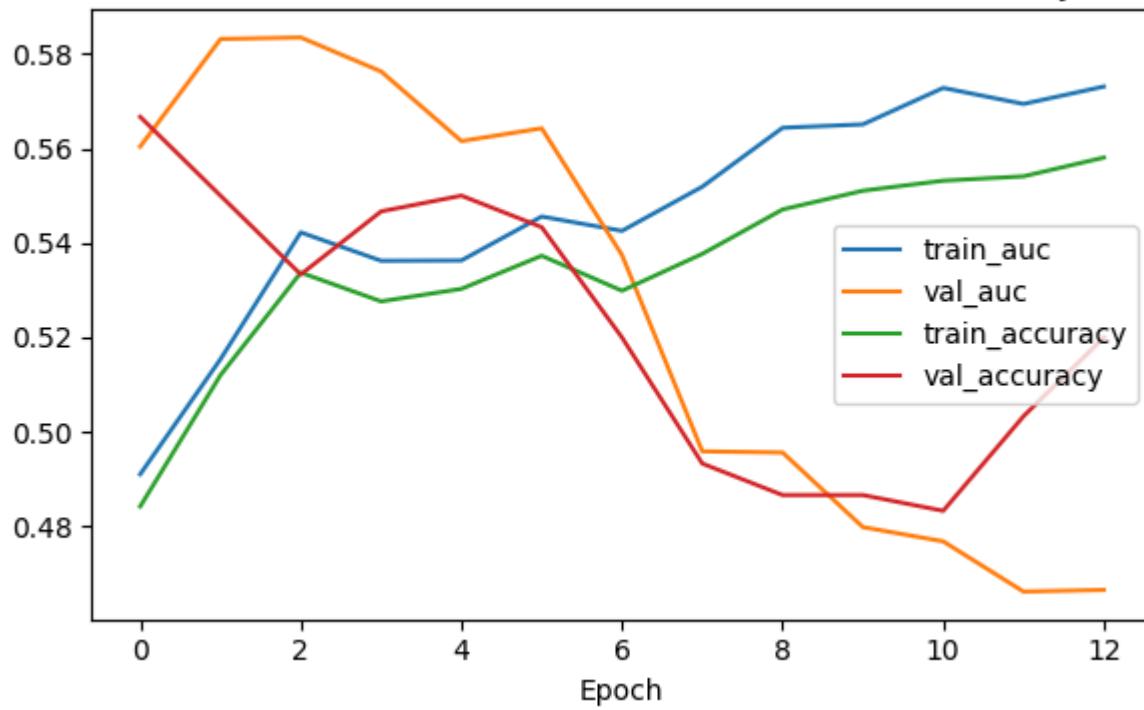


Training LSTM for Task A (next-day direction)...

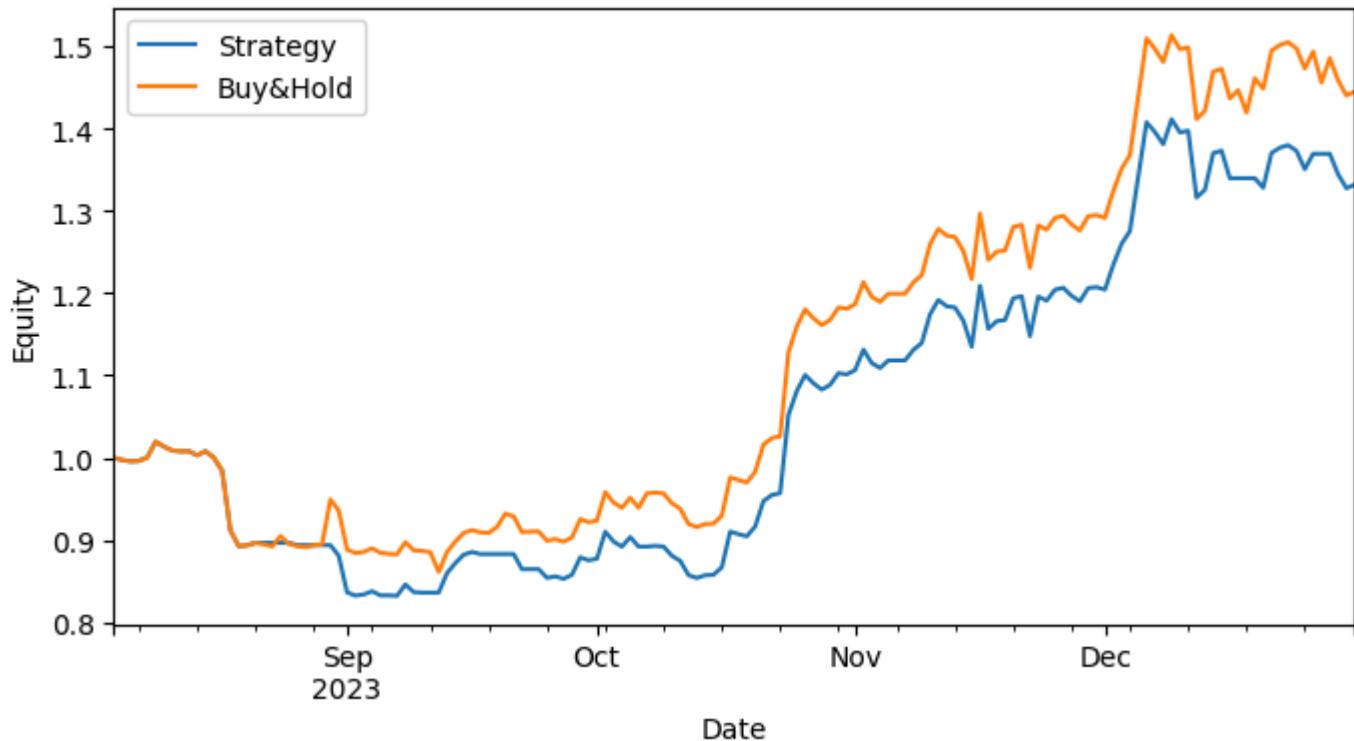
LSTM Task A 2023-07-05..2023-12-31 - Loss



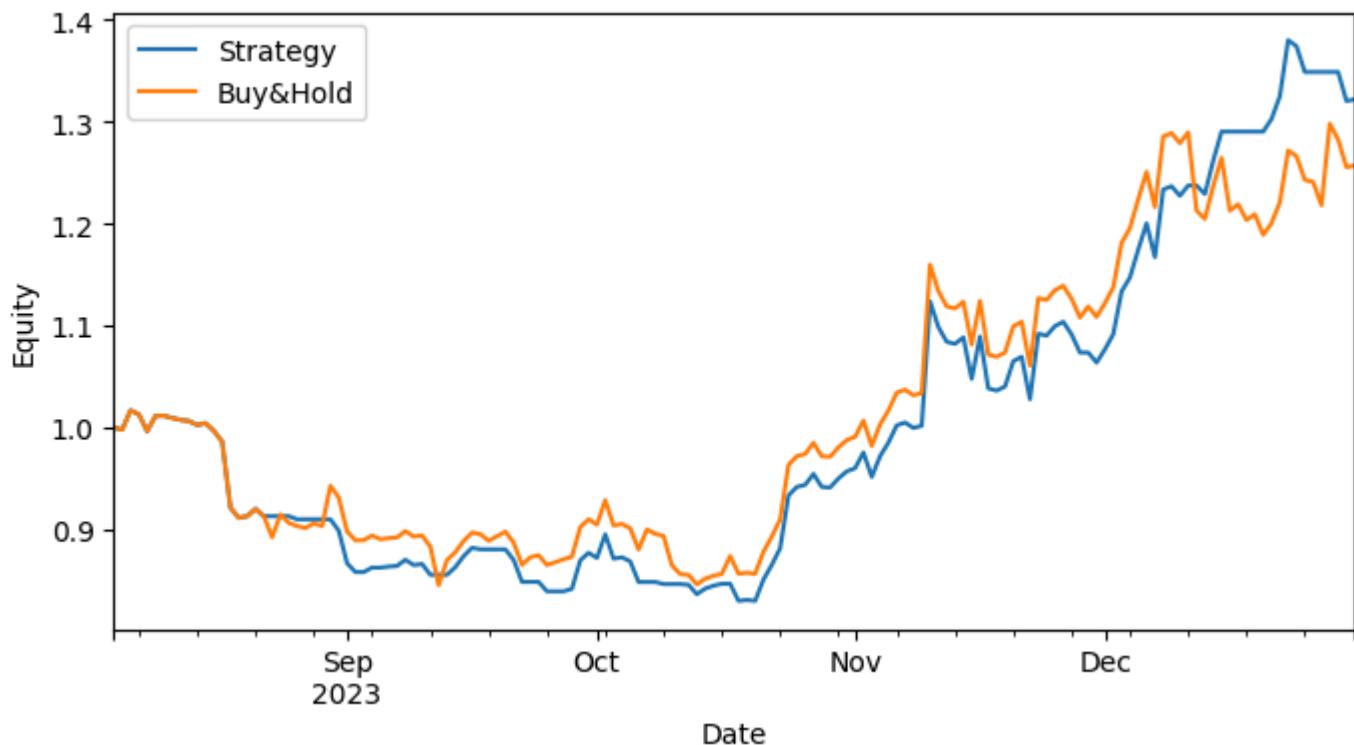
LSTM Task A 2023-07-05..2023-12-31 - AUC / Accuracy



Task A LSTM BTC 2023-07-05..2023-12-31

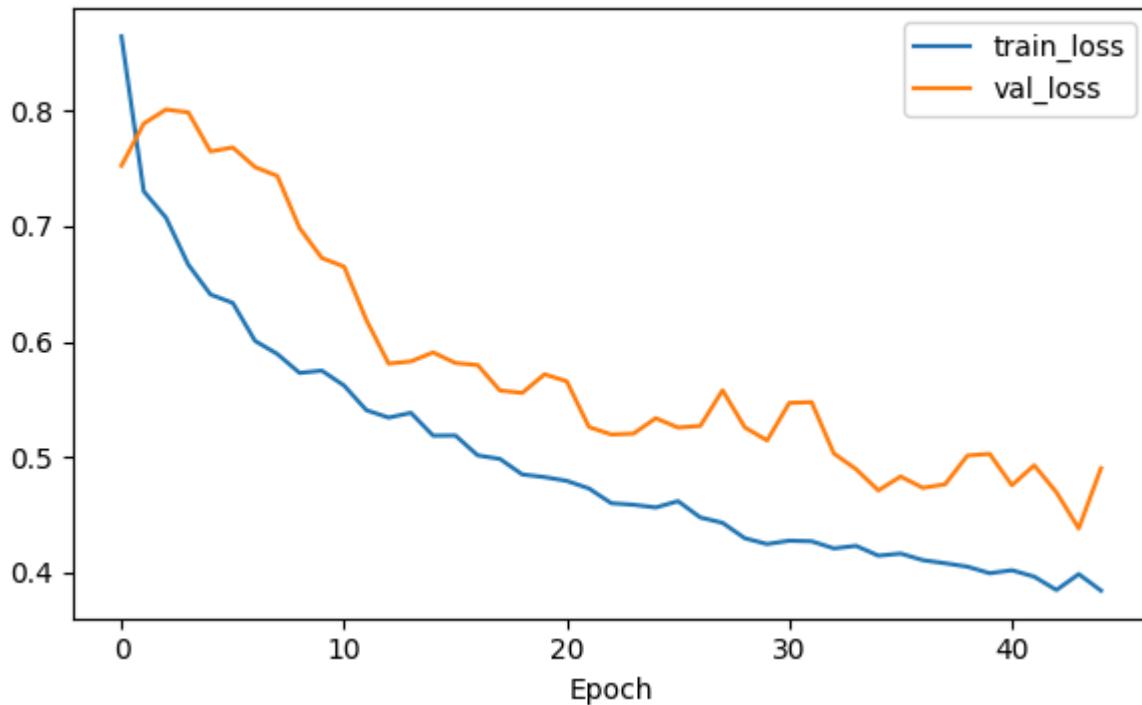


Task A LSTM ETH 2023-07-05..2023-12-31

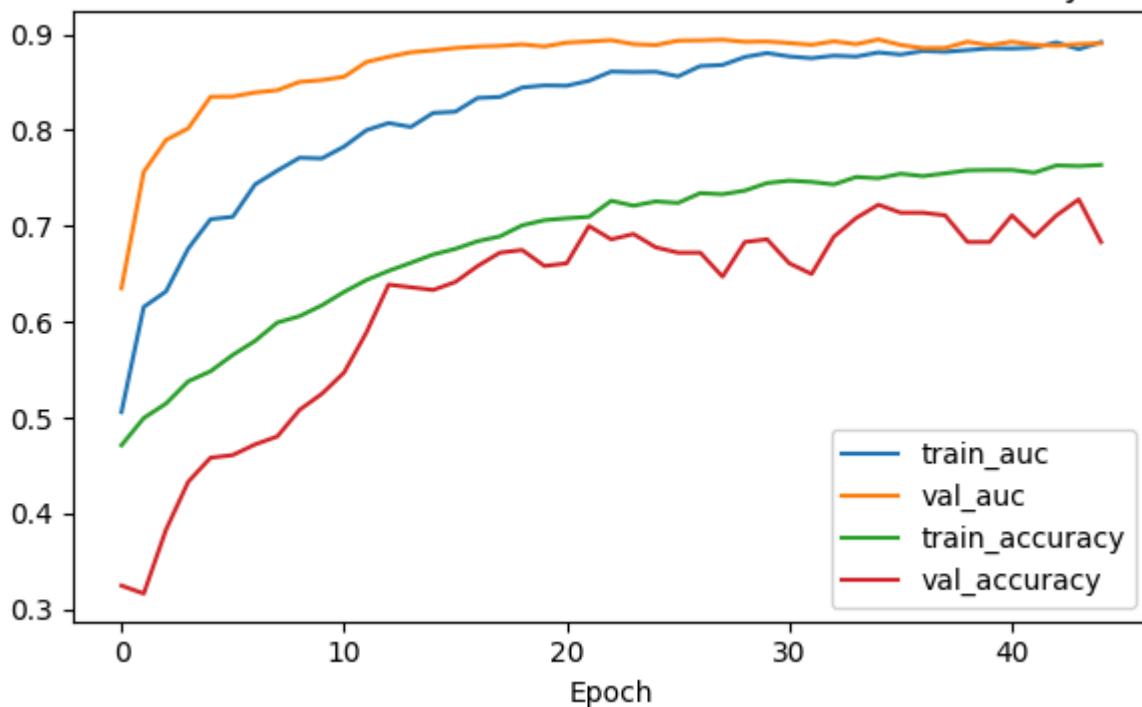


Training MLP for Task B_MIN (y_local_min_7)...

MLP for Task B 2023-07-05..2023-12-31 - Loss

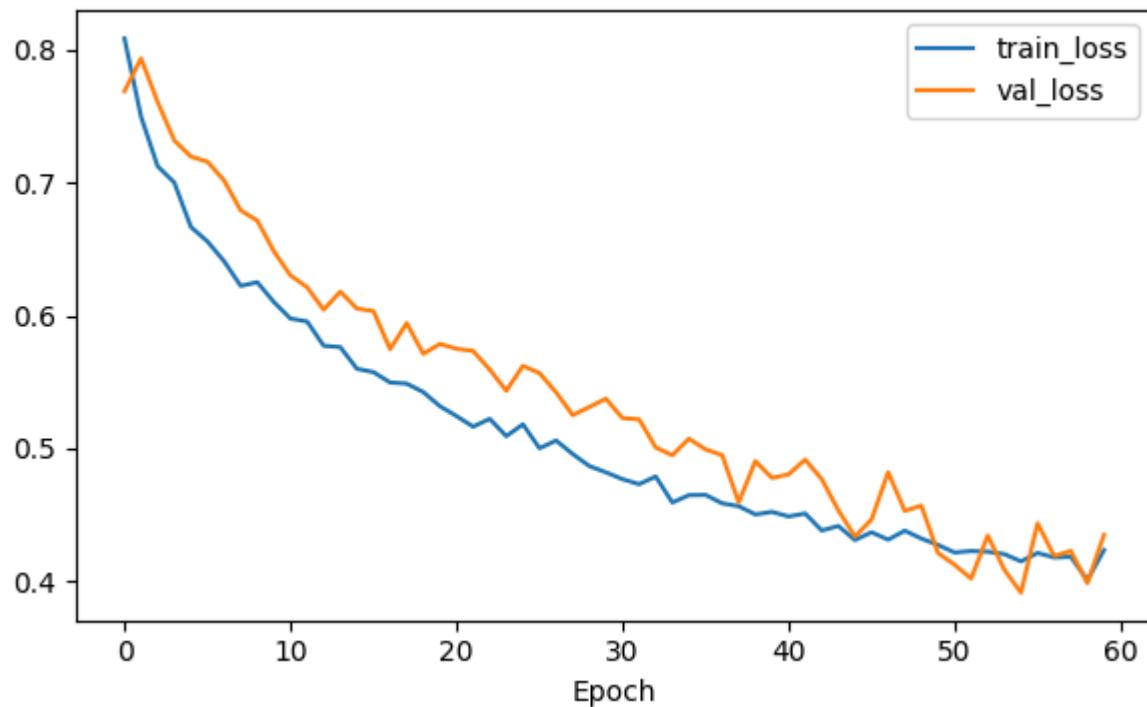


MLP for Task B 2023-07-05..2023-12-31 - AUC / Accuracy

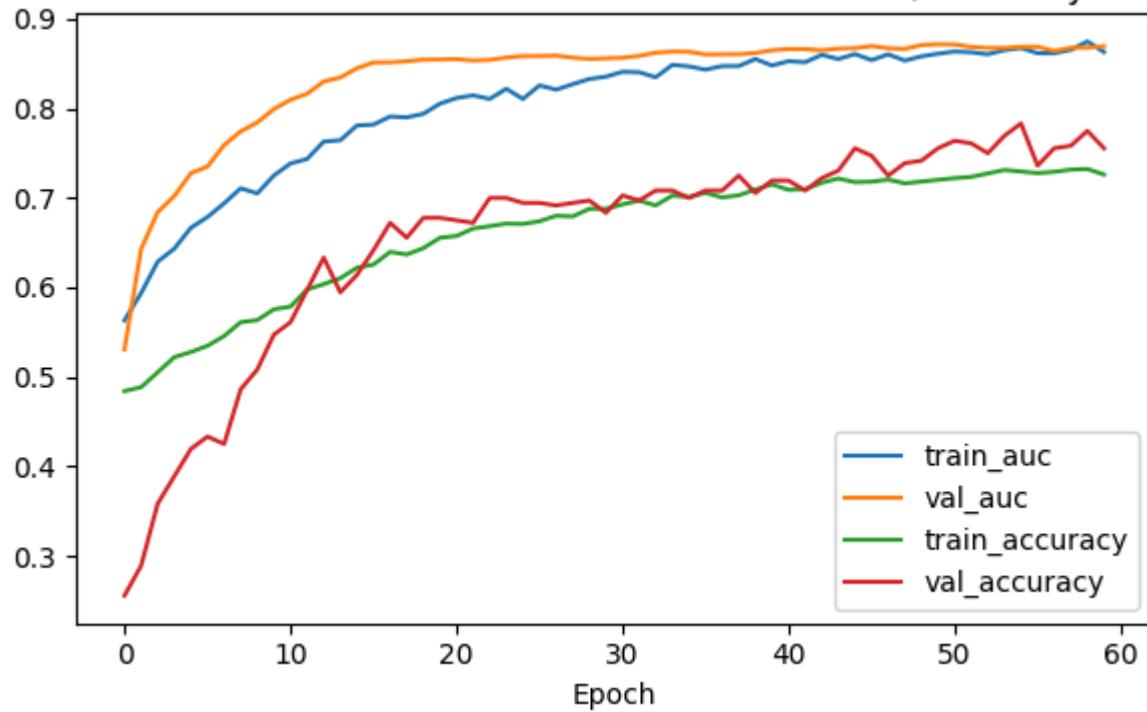


Training MLP for Task B_MAX (y_local_max_7)...

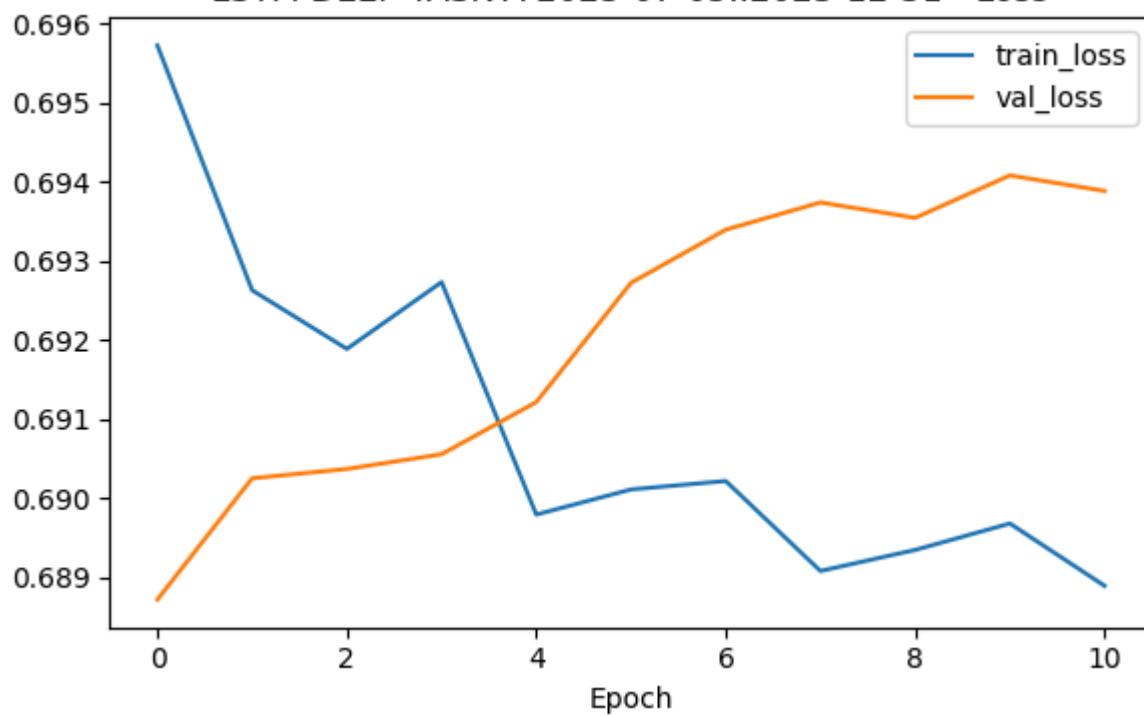
MLP for Task B 2023-07-05..2023-12-31 - Loss



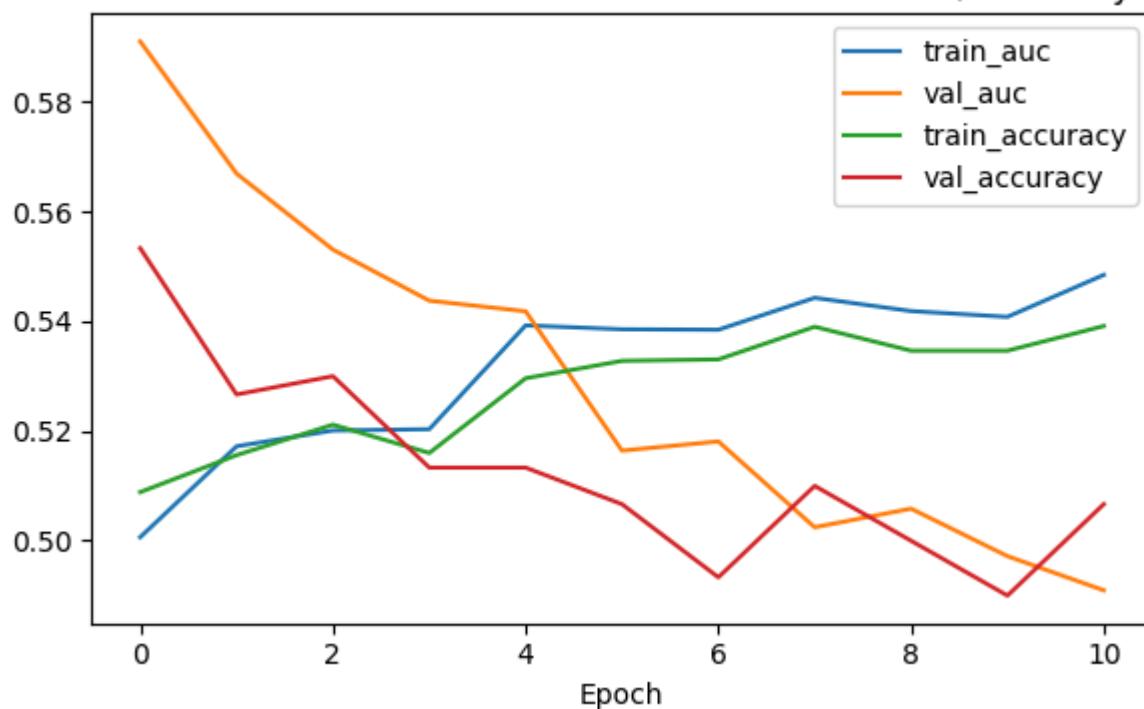
MLP for Task B 2023-07-05..2023-12-31 - AUC / Accuracy



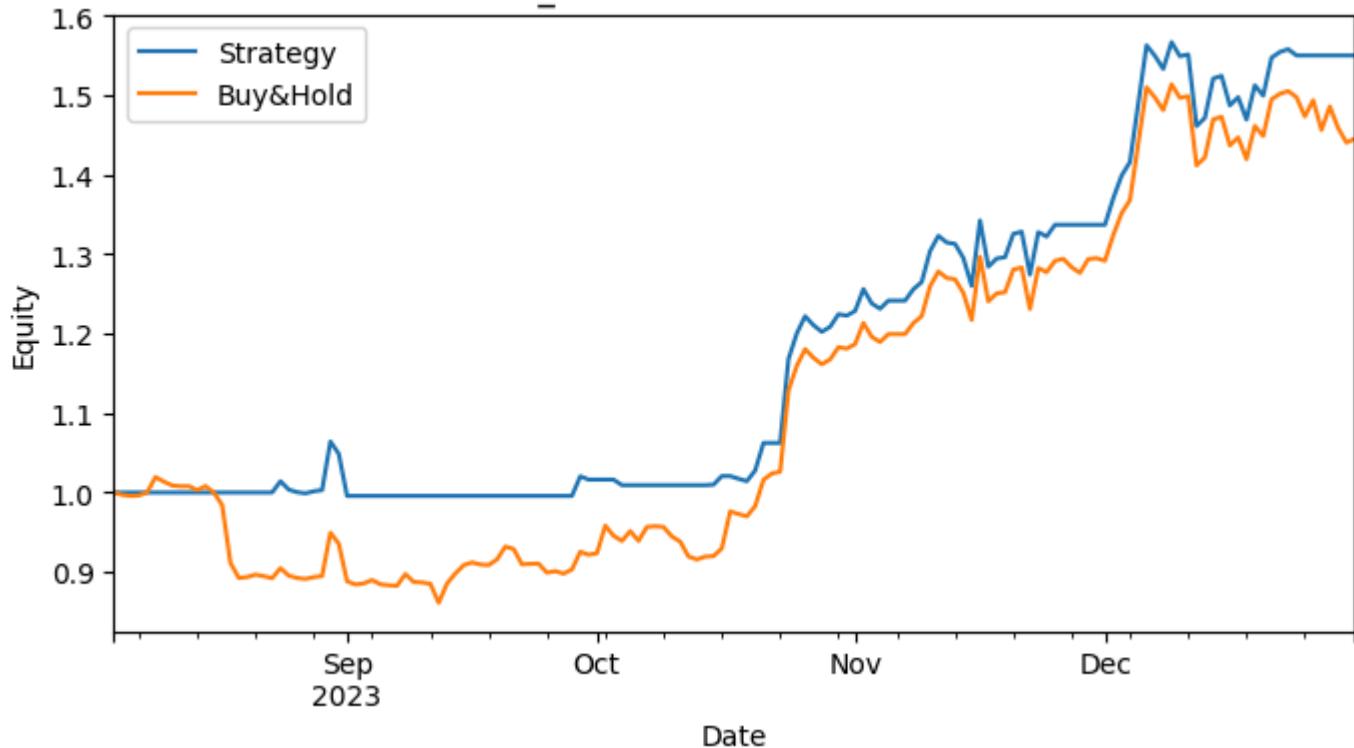
LSTM DEEP TASK A 2023-07-05..2023-12-31 - Loss



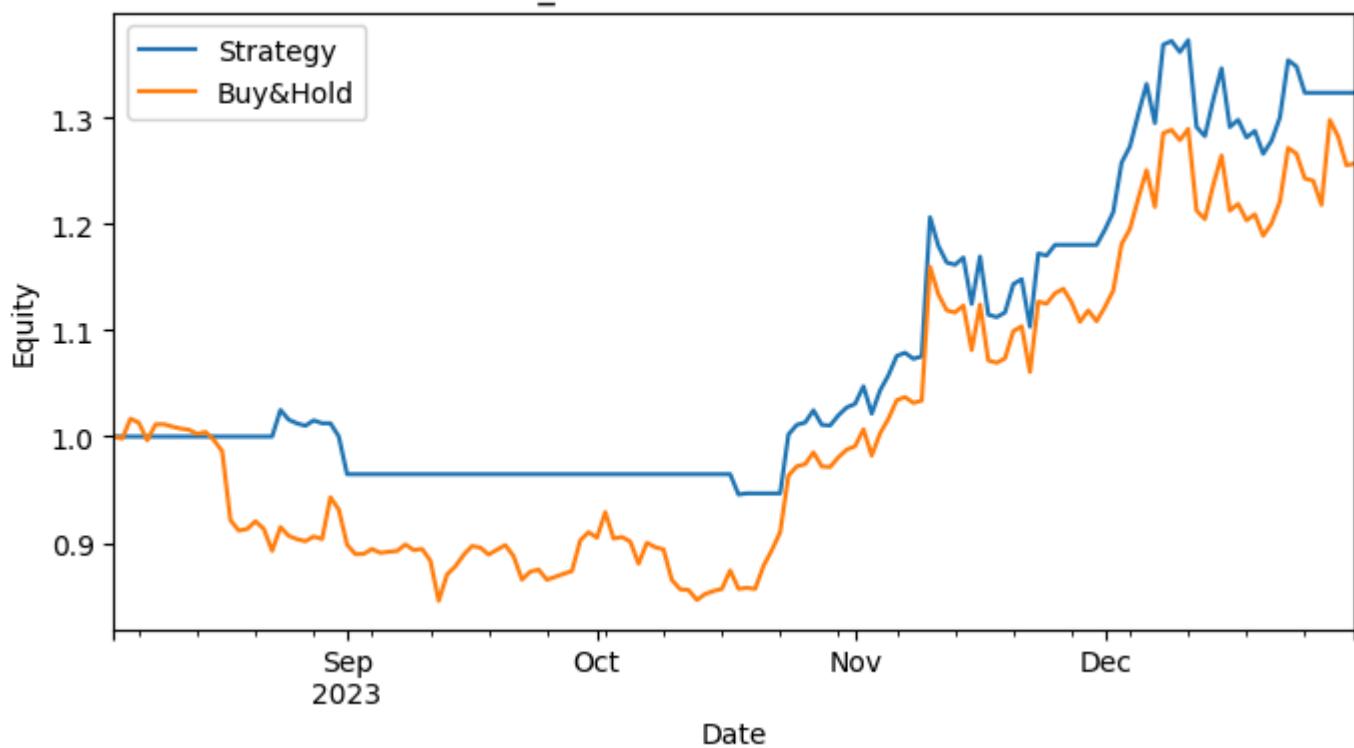
LSTM DEEP TASK A 2023-07-05..2023-12-31 - AUC / Accuracy



Task A LSTM_DEEP BTC 2023-07-05..2023-12-31

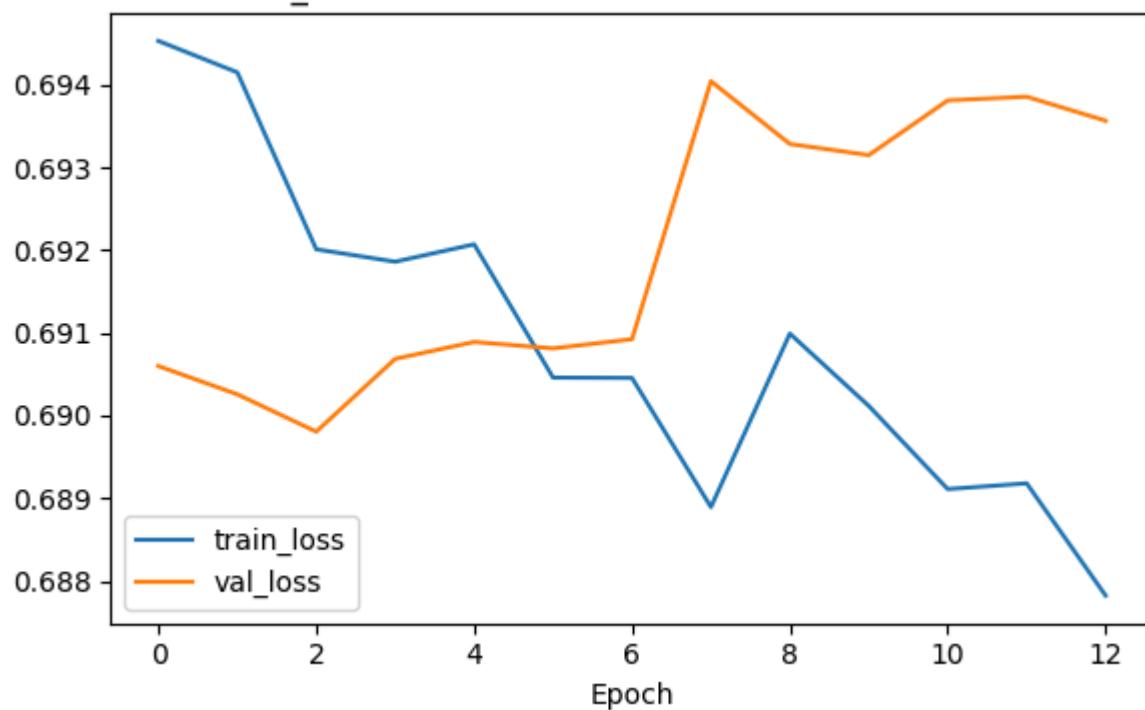


Task A LSTM_DEEP ETH 2023-07-05..2023-12-31

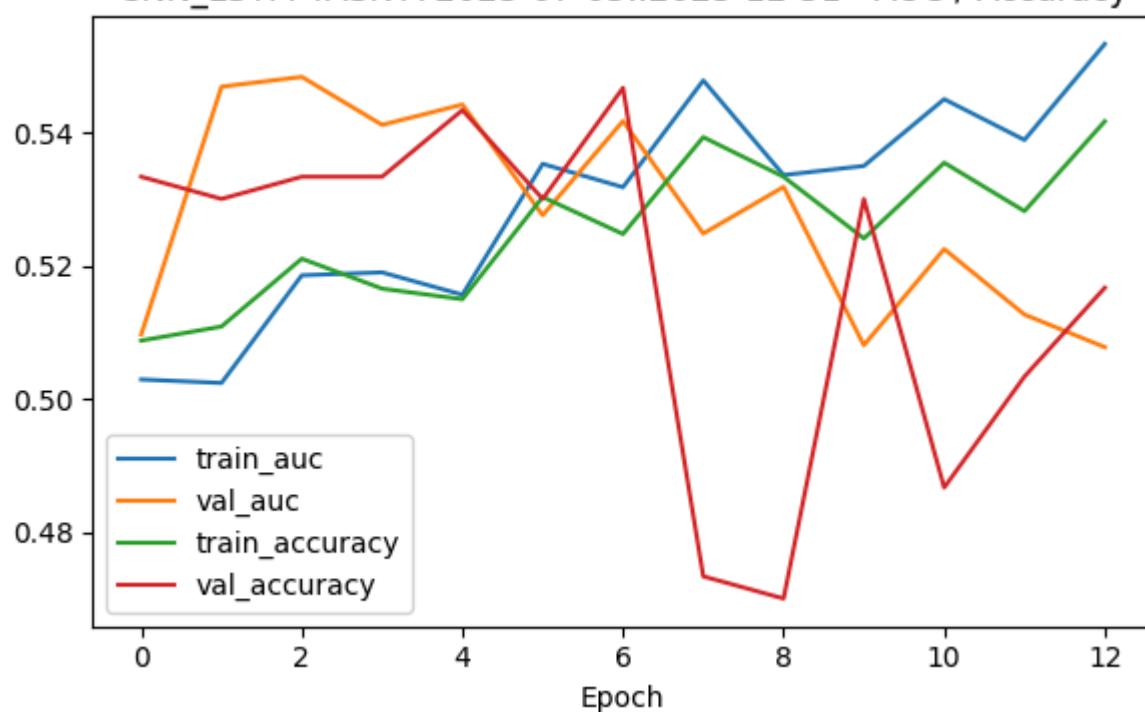


Training CNN-LSTM for Task A (next-day direction)...

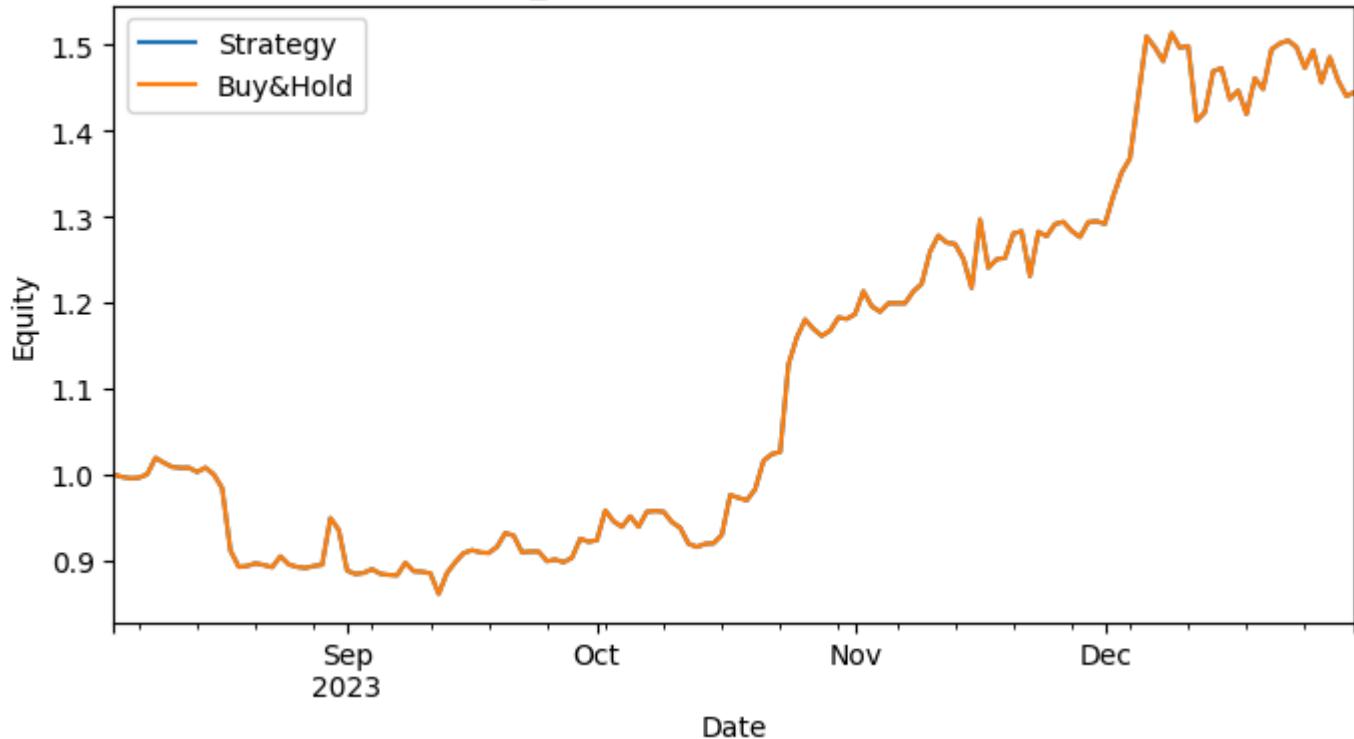
CNN_LSTM TASK A 2023-07-05..2023-12-31 - Loss



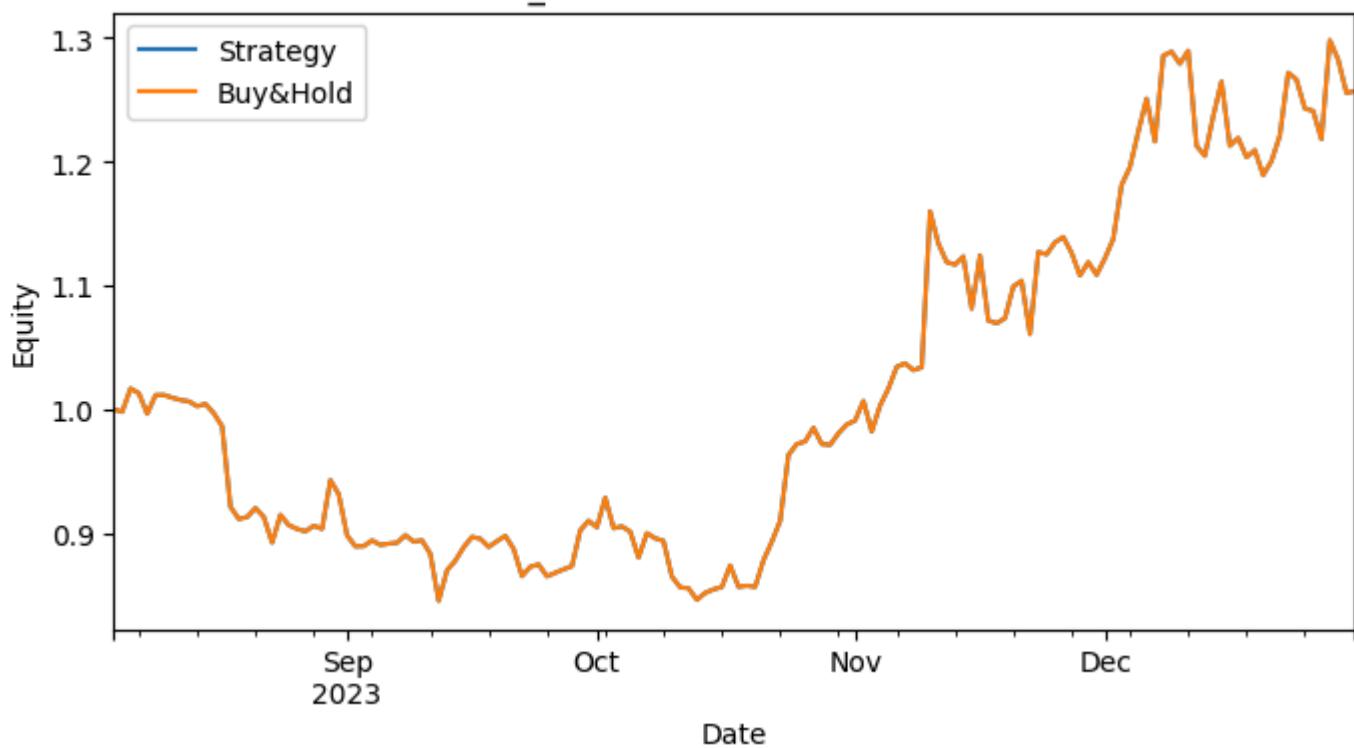
CNN_LSTM TASK A 2023-07-05..2023-12-31 - AUC / Accuracy



Task A CNN_LSTM BTC 2023-07-05..2023-12-31

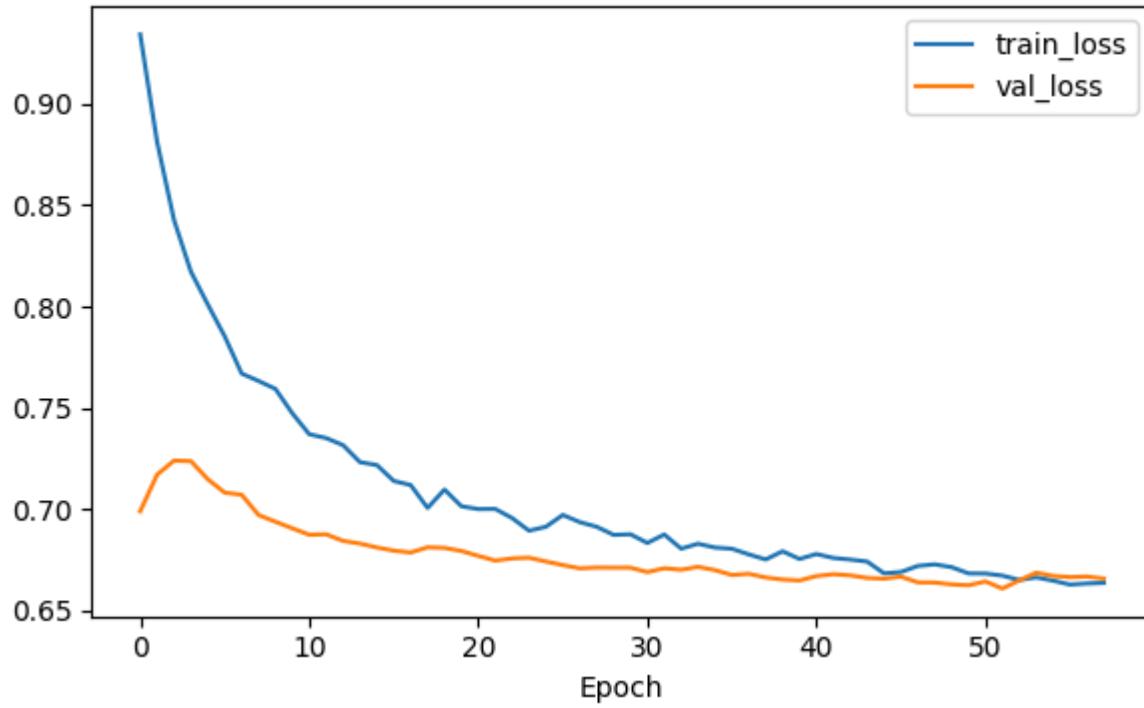


Task A CNN_LSTM ETH 2023-07-05..2023-12-31

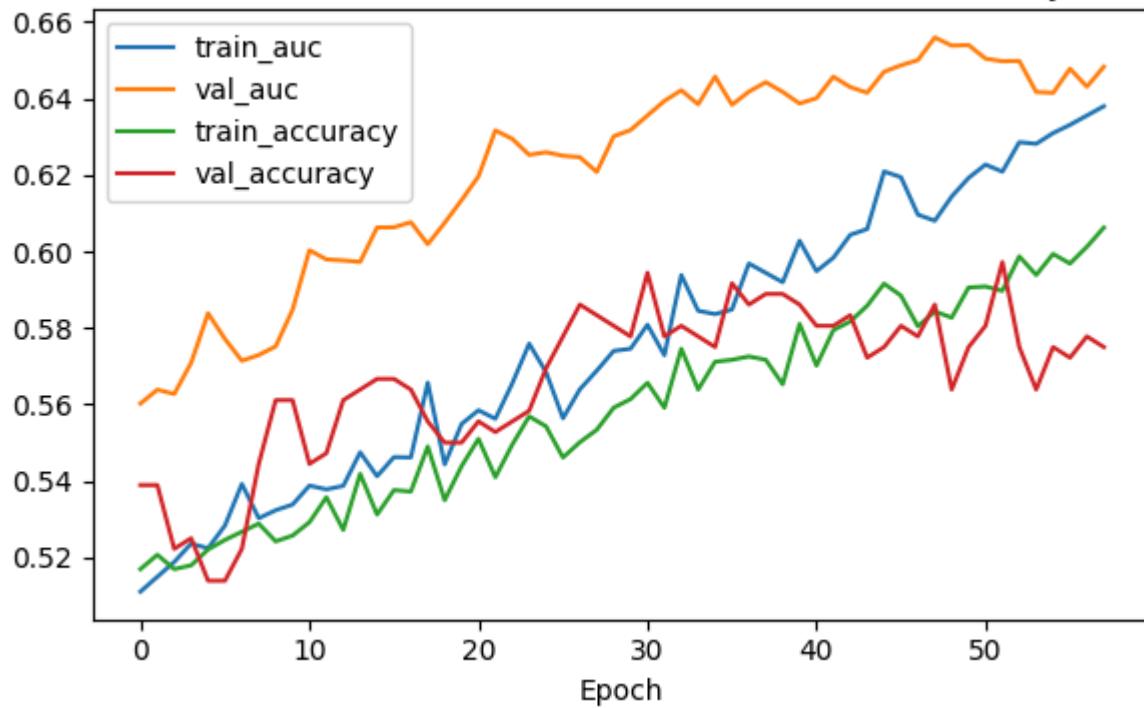


== Split 2024-01-01..2024-06-28 | Train 7982, Val 360 ==
Training MLP for Task A (next-day direction)...

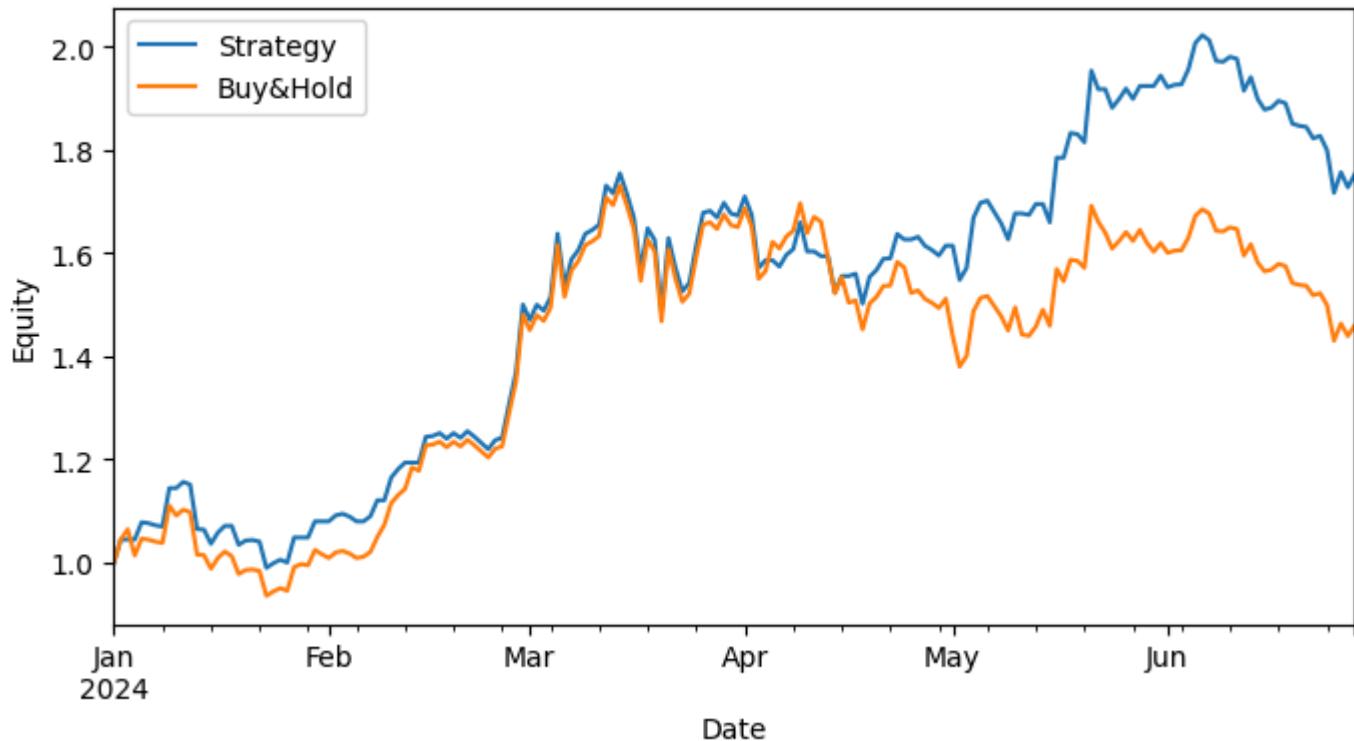
MLP Task A 2024-01-01..2024-06-28 - Loss



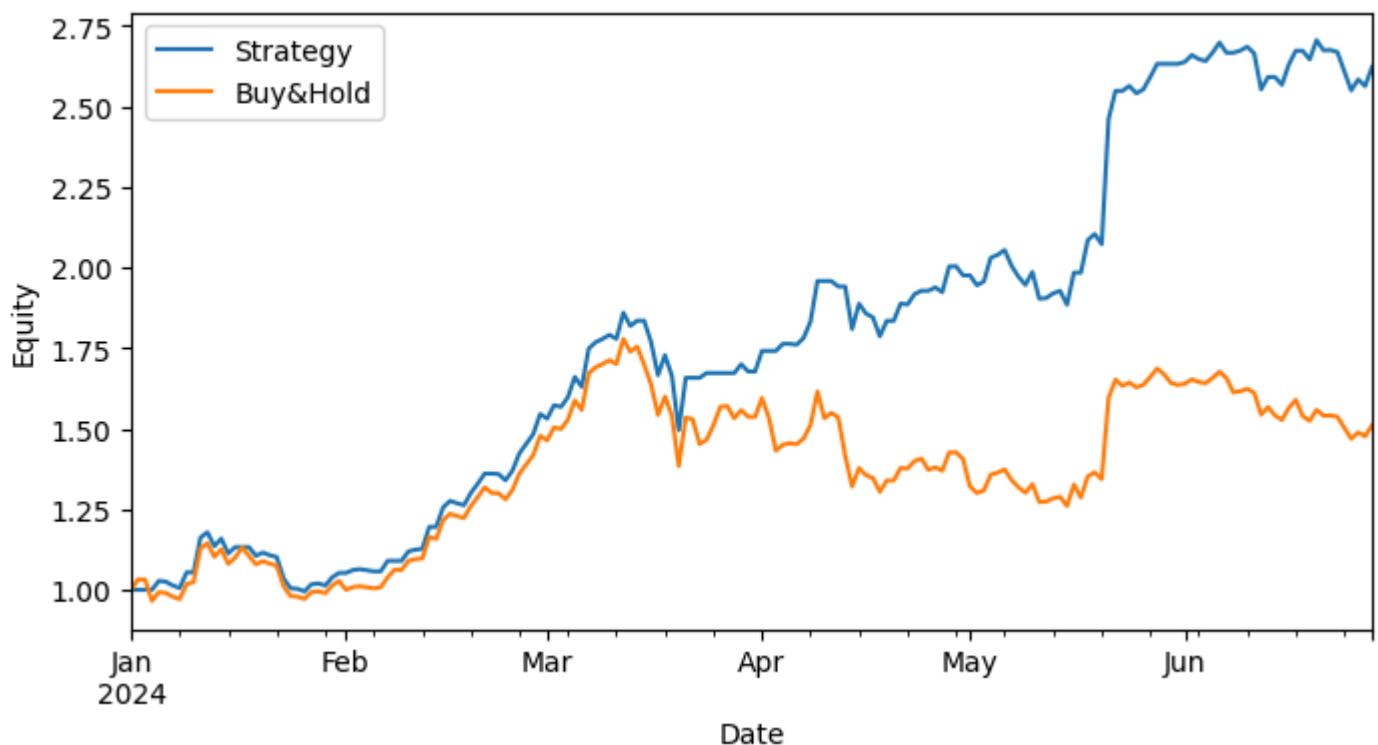
MLP Task A 2024-01-01..2024-06-28 - AUC / Accuracy



Task A MLP BTC 2024-01-01..2024-06-28

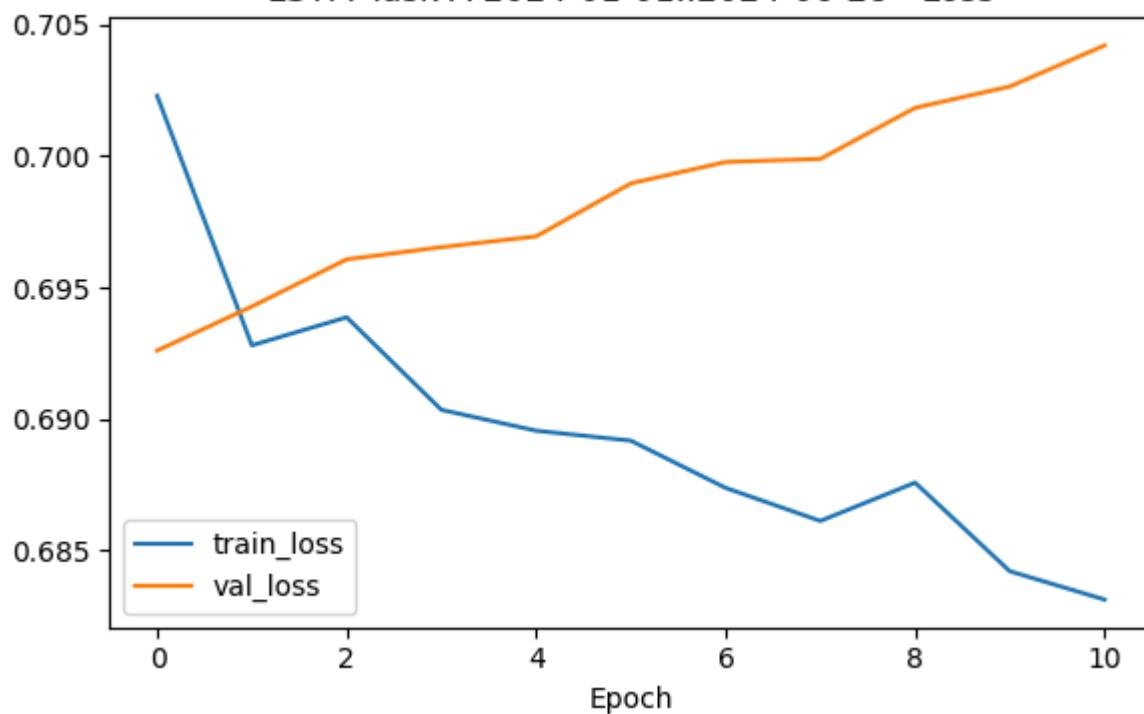


Task A MLP ETH 2024-01-01..2024-06-28

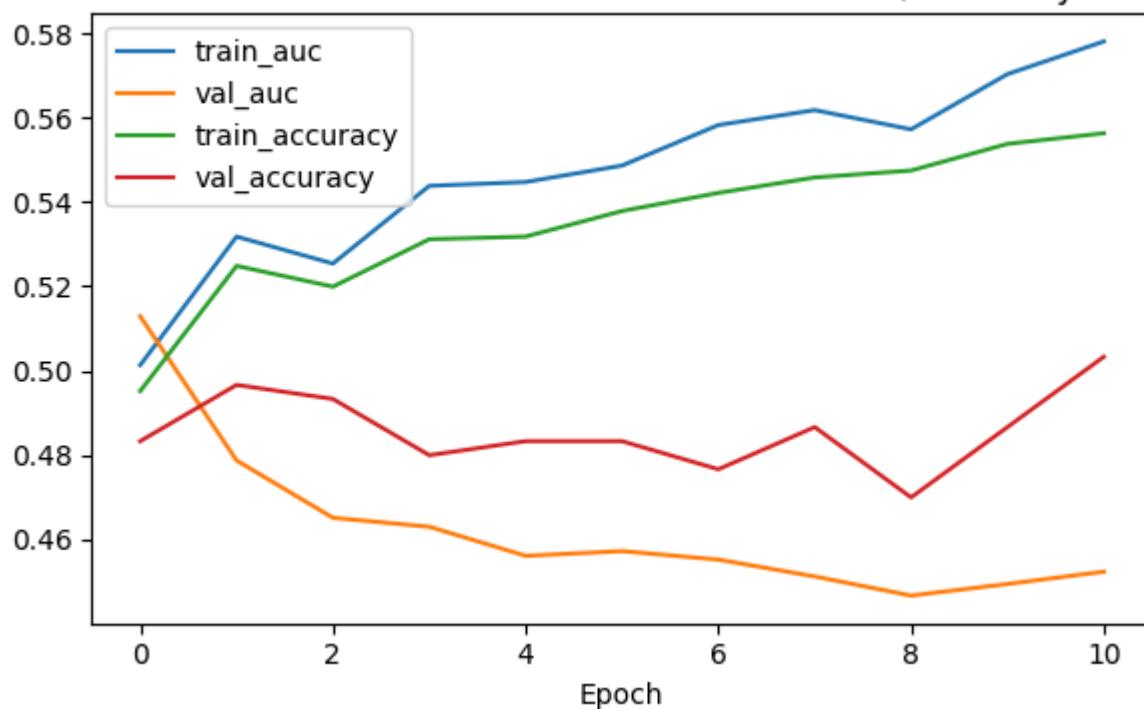


Training LSTM for Task A (next-day direction)...

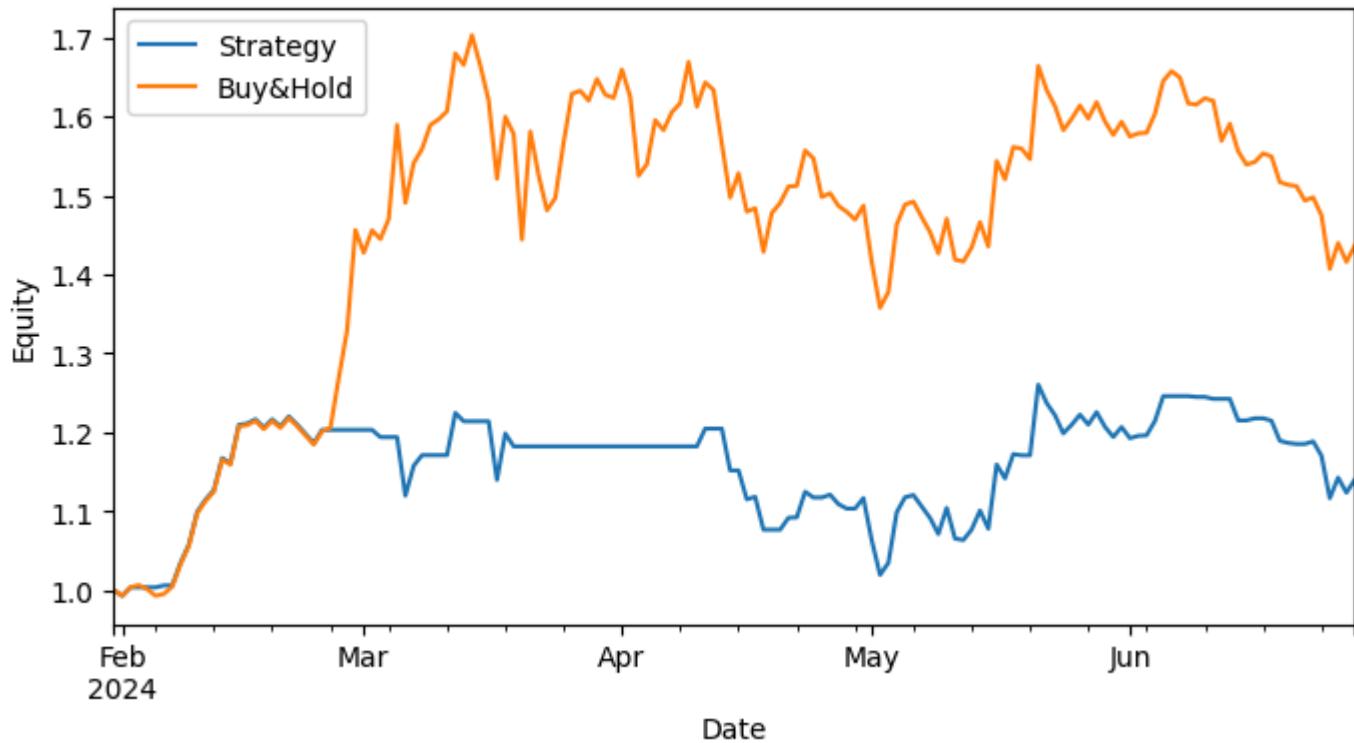
LSTM Task A 2024-01-01..2024-06-28 - Loss



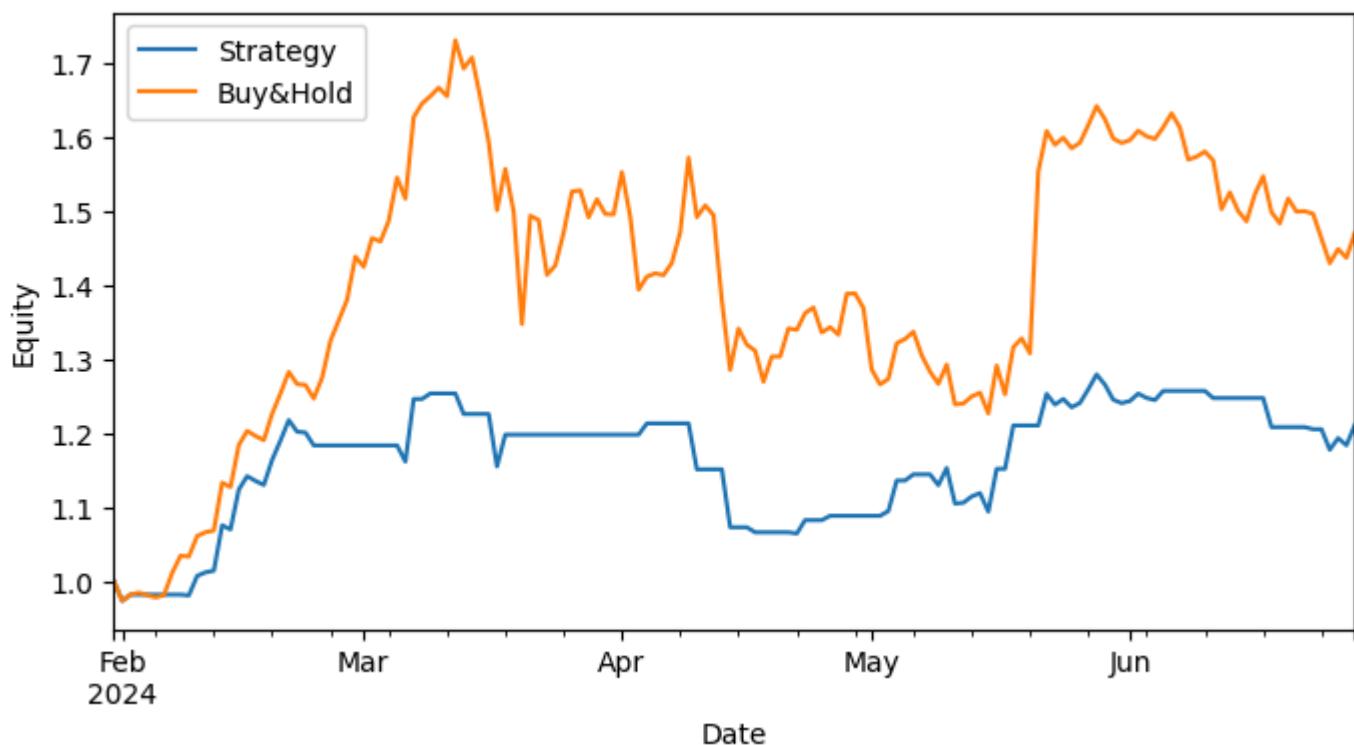
LSTM Task A 2024-01-01..2024-06-28 - AUC / Accuracy



Task A LSTM BTC 2024-01-01..2024-06-28

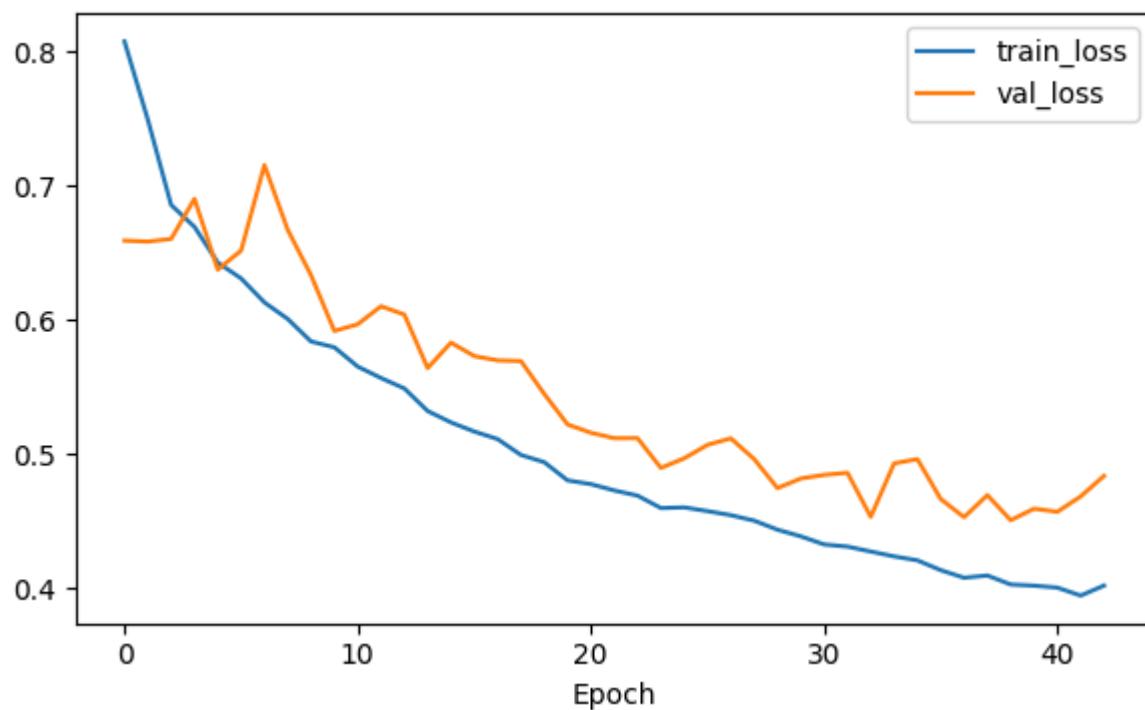


Task A LSTM ETH 2024-01-01..2024-06-28

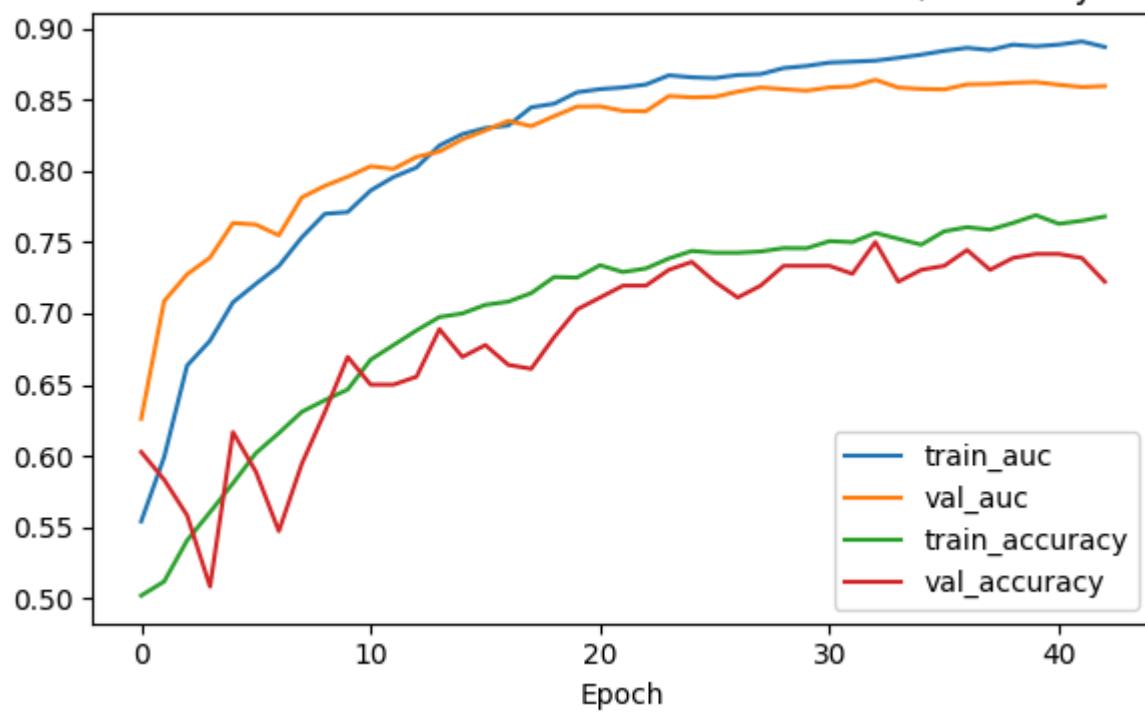


Training MLP for Task B_MIN (y_local_min_7)...

MLP for Task B 2024-01-01..2024-06-28 - Loss

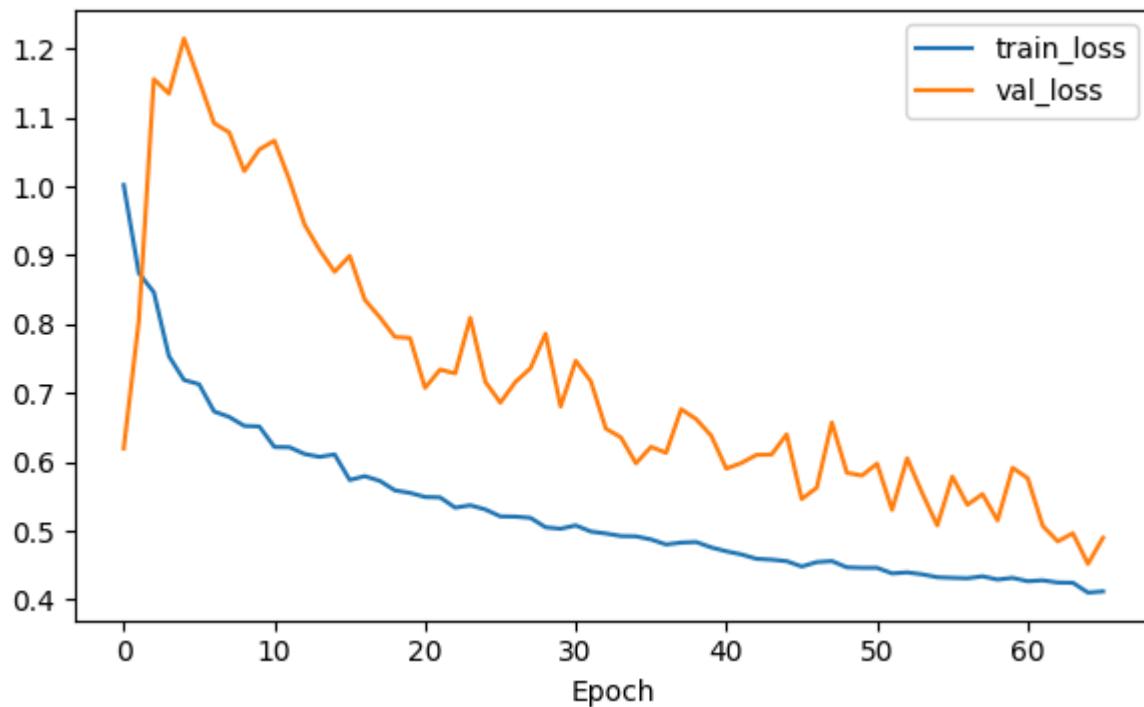


MLP for Task B 2024-01-01..2024-06-28 - AUC / Accuracy

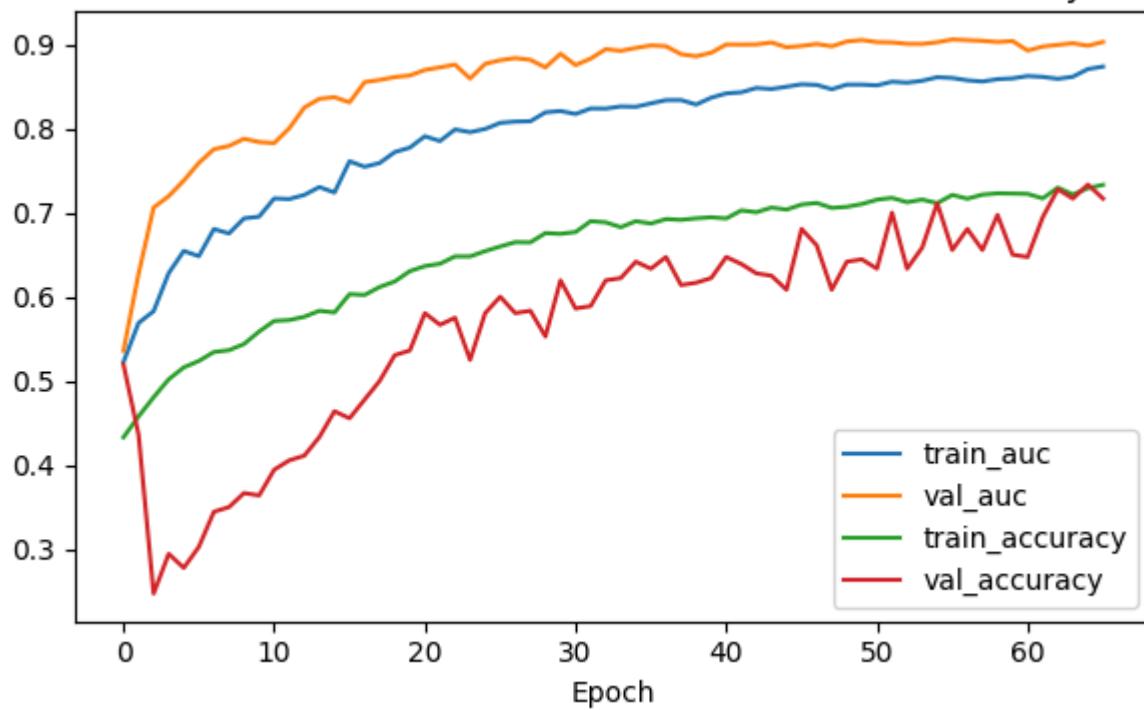


Training MLP for Task B_MAX (y_local_max_7)...

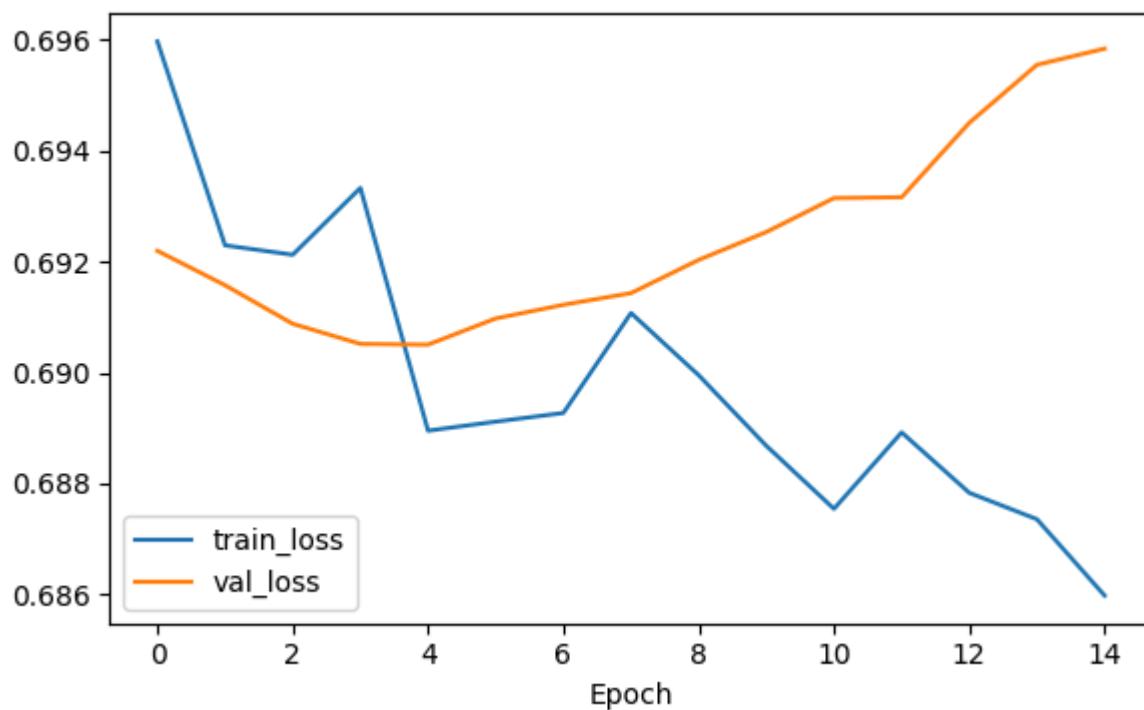
MLP for Task B 2024-01-01..2024-06-28 - Loss



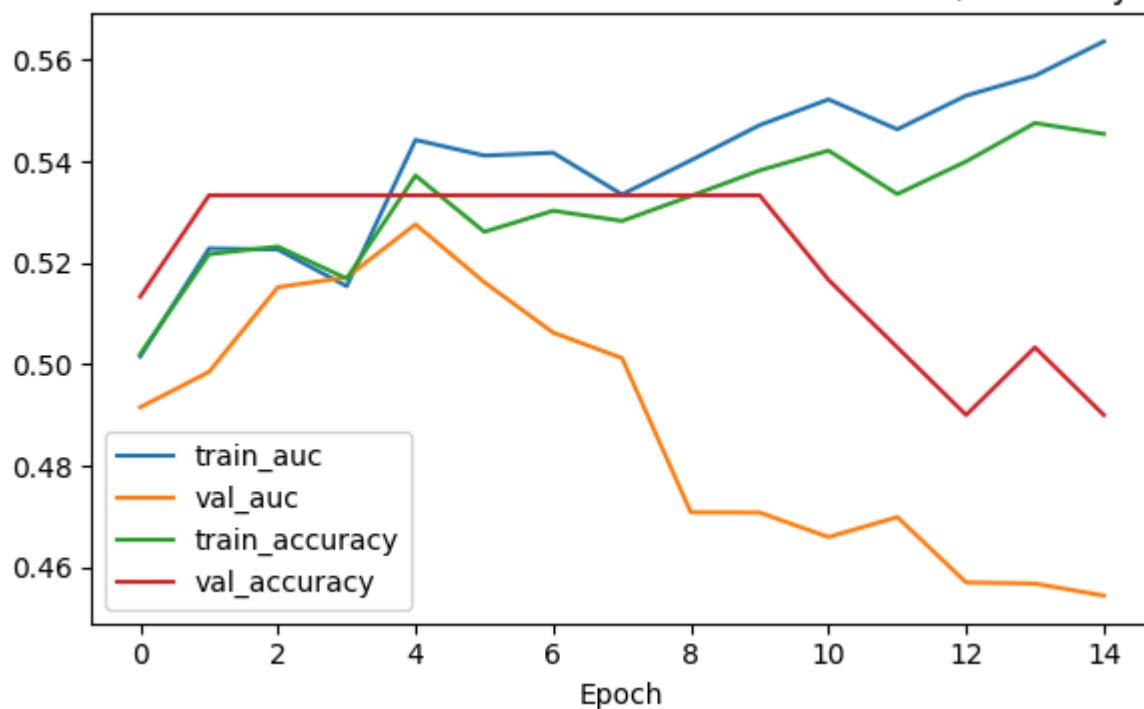
MLP for Task B 2024-01-01..2024-06-28 - AUC / Accuracy



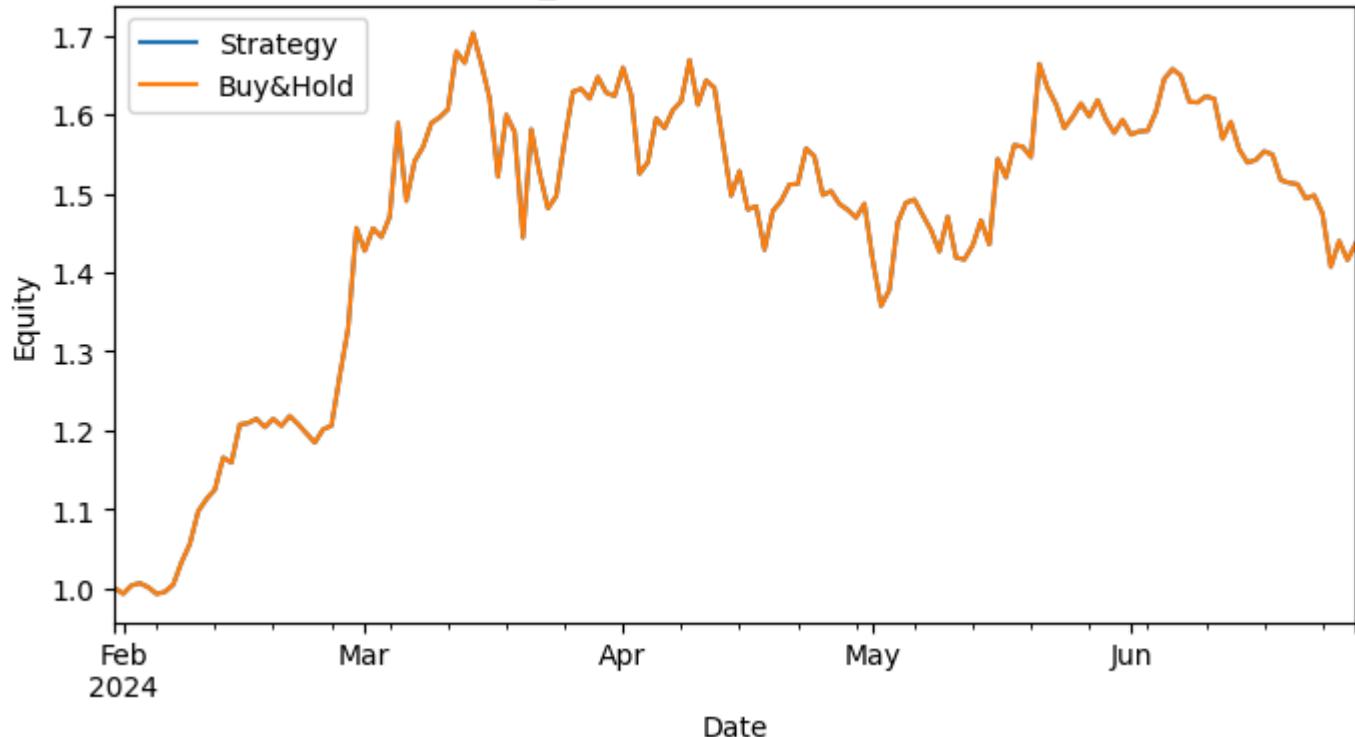
LSTM DEEP TASK A 2024-01-01..2024-06-28 - Loss



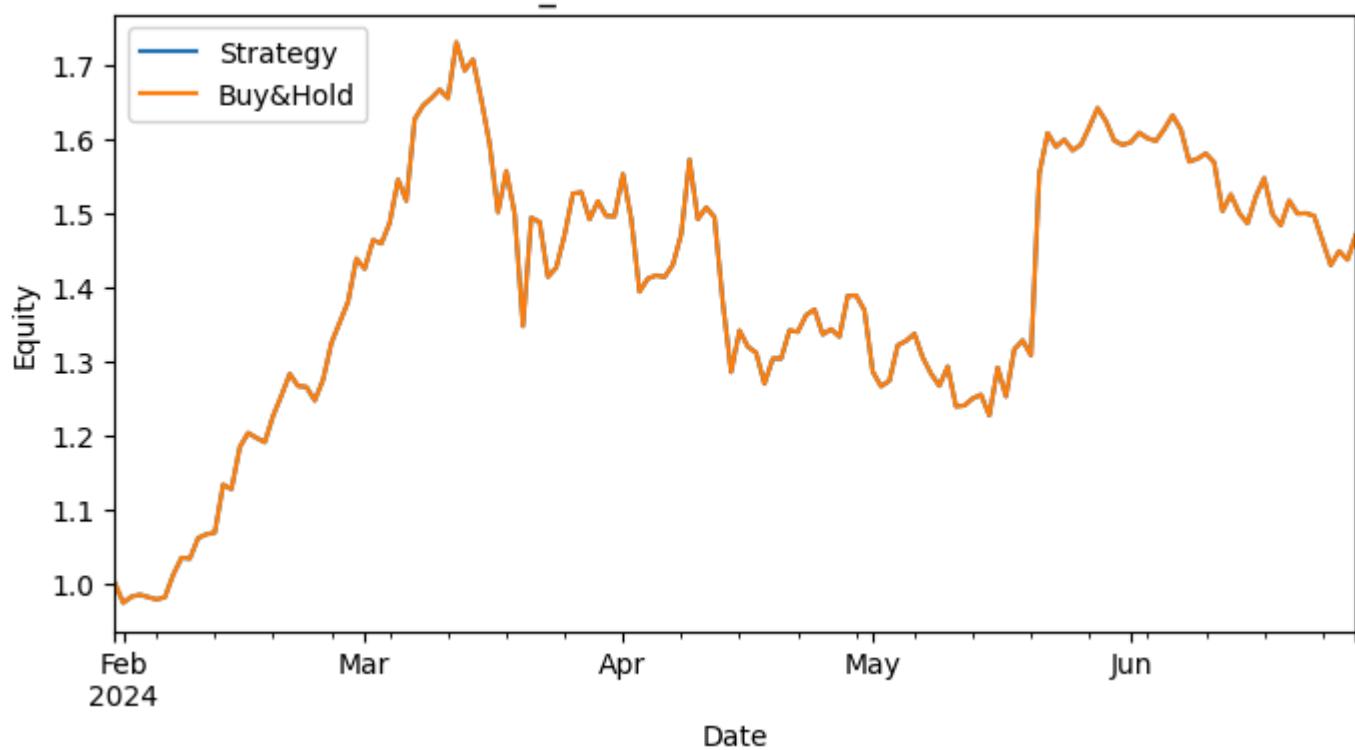
LSTM DEEP TASK A 2024-01-01..2024-06-28 - AUC / Accuracy



Task A LSTM_DEEP BTC 2024-01-01..2024-06-28

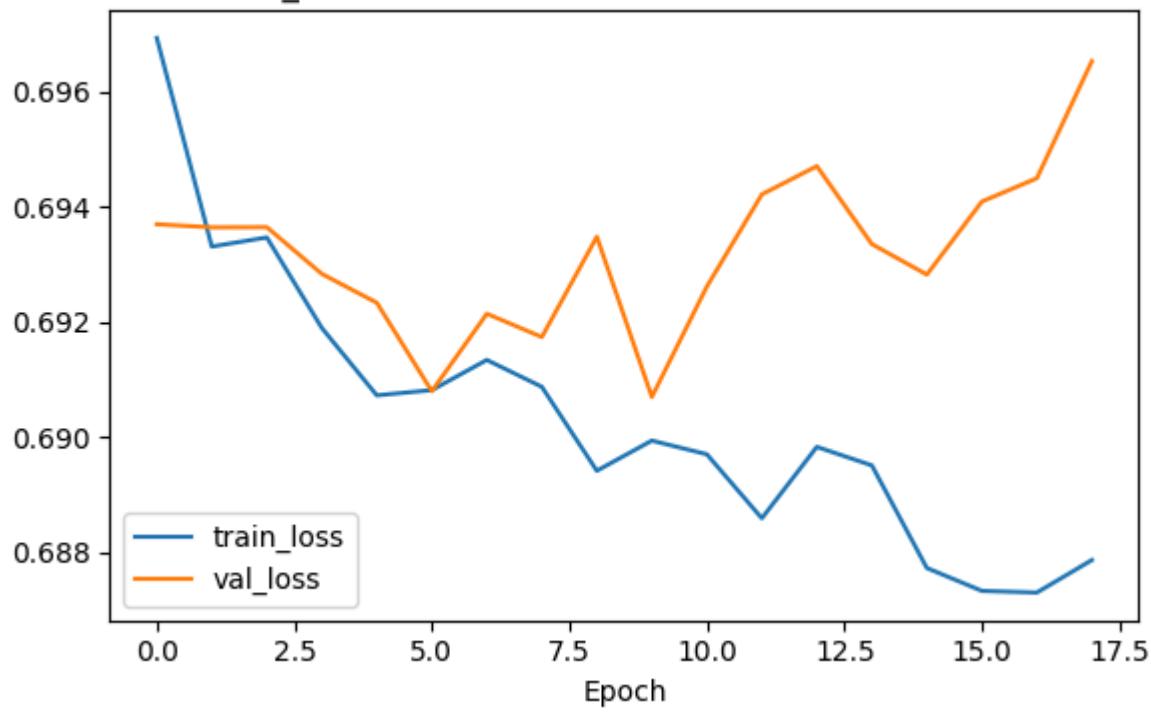


Task A LSTM_DEEP ETH 2024-01-01..2024-06-28

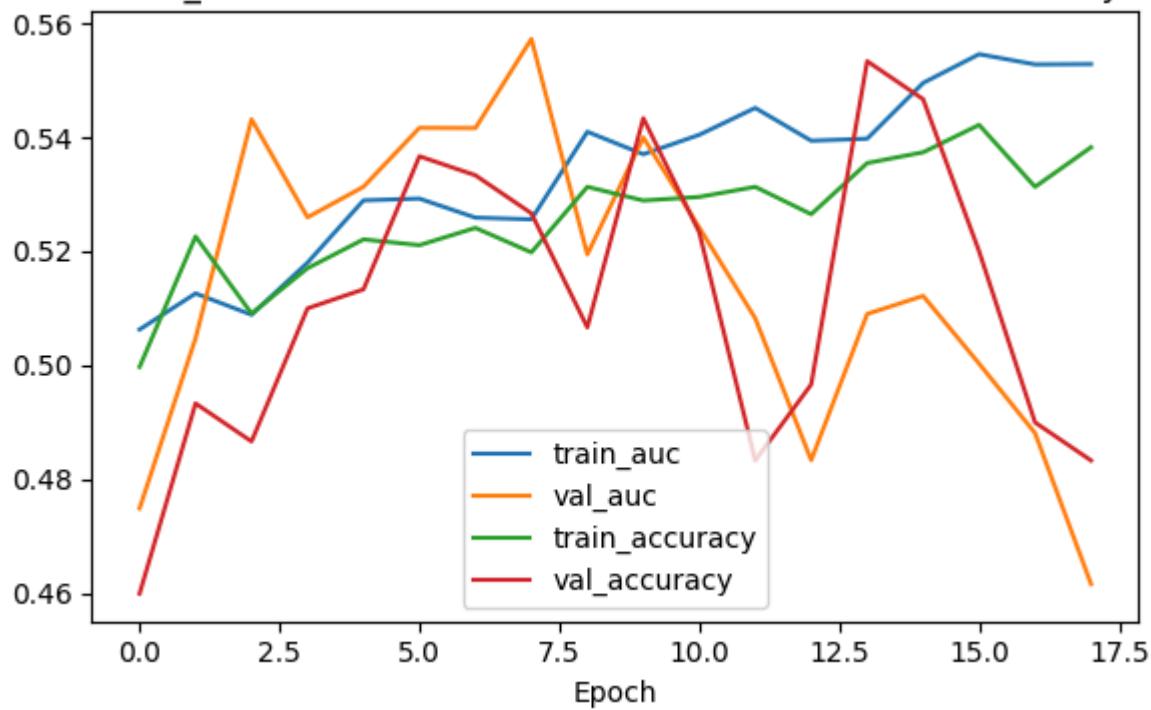


Training CNN-LSTM for Task A (next-day direction)...

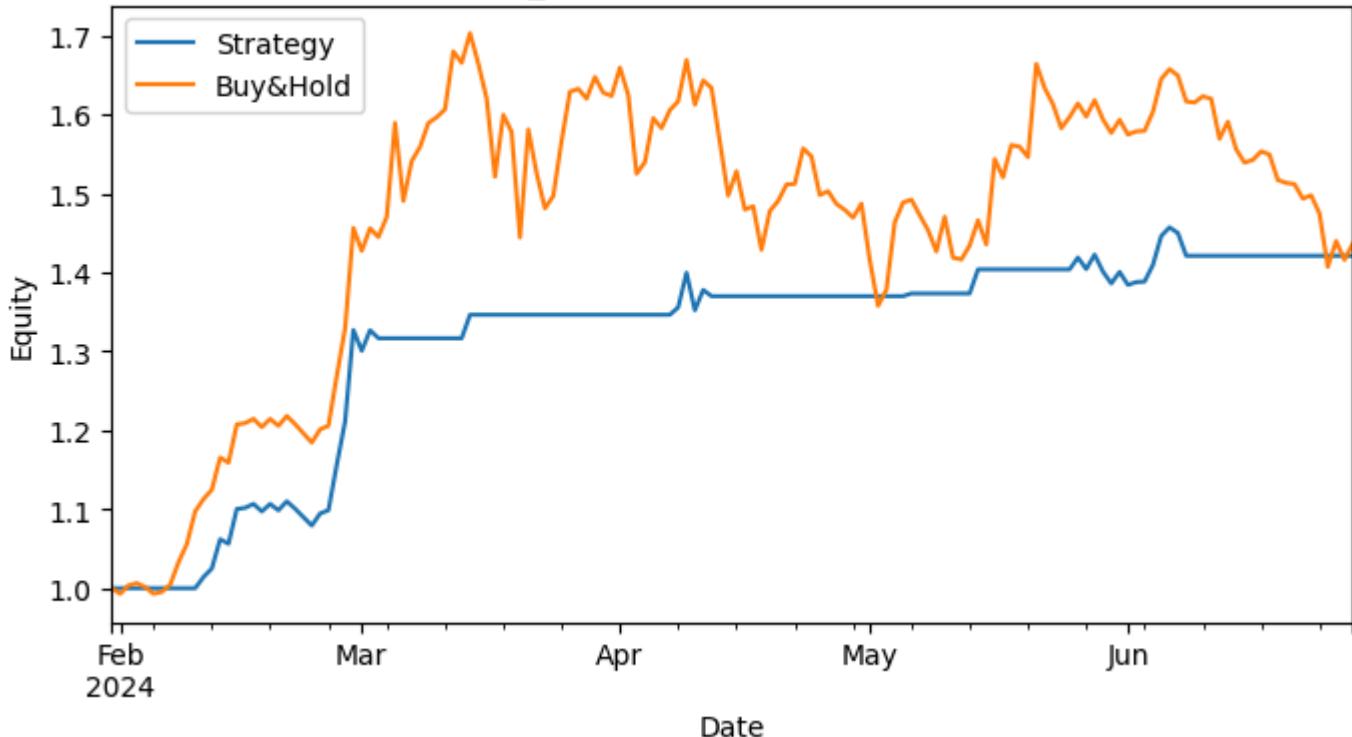
CNN_LSTM TASK A 2024-01-01..2024-06-28 - Loss



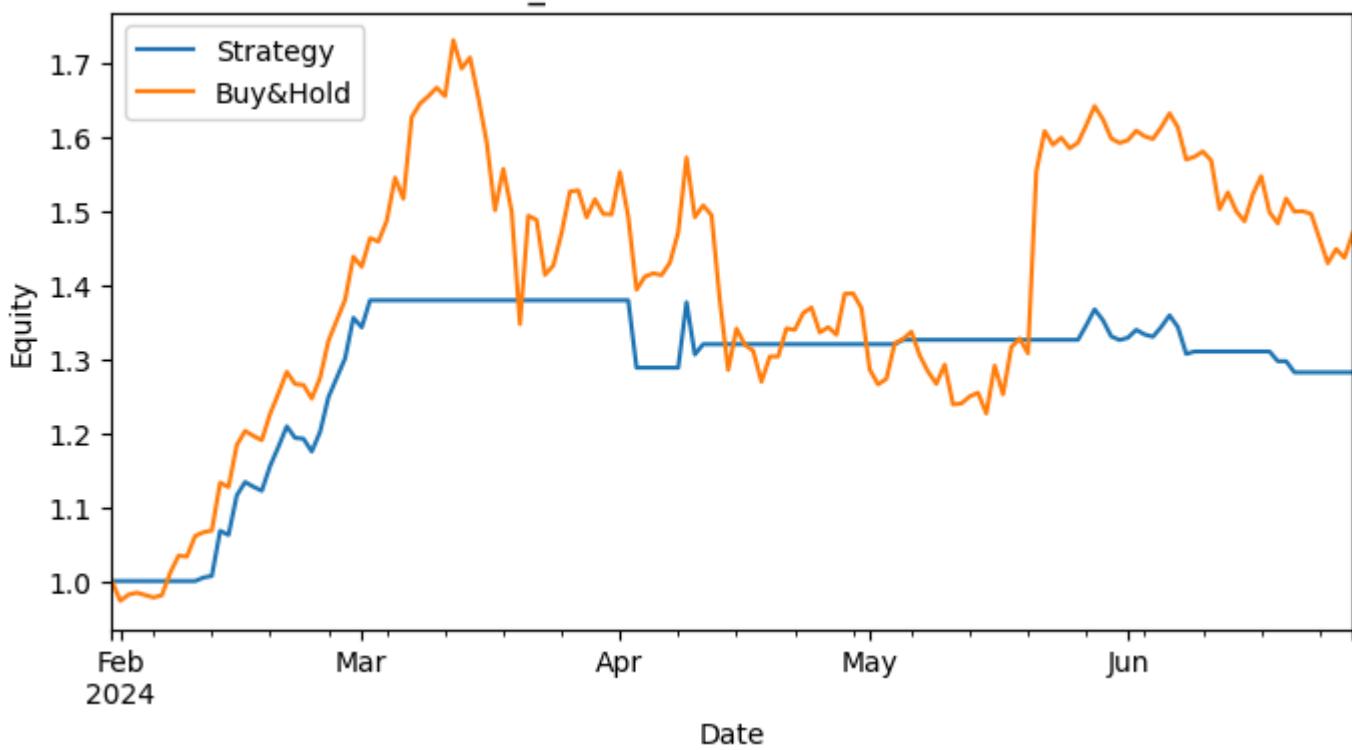
CNN_LSTM TASK A 2024-01-01..2024-06-28 - AUC / Accuracy



Task A CNN_LSTM BTC 2024-01-01..2024-06-28



Task A CNN_LSTM ETH 2024-01-01..2024-06-28



===== RESULTS SUMMARY =====

	task	model	coin	fold	auc	acc	sharpe	equity_end	bh_end
0	A	MLP	BTC	2023-01-06..2023-07-04	0.644896	0.622222	4.110076	2.055667	1.851228
1	A	MLP	ETH	2023-01-06..2023-07-04	0.644896	0.622222	3.806580	2.134470	1.563671

	task	model	coin	fold	auc	acc	sharpe	equity_end	bh_end
2	A	LSTM	BTC	2023-01-06..2023-07-04	0.477774	0.486667	0.269086	1.017839	1.336171
3	A	LSTM	ETH	2023-01-06..2023-07-04	0.466880	0.486667	-1.117027	0.922688	1.168391
4	B_MIN	MLP	POOLED	2023-01-06..2023-07-04	0.867626	0.797222	NaN	NaN	NaN
5	B_MAX	MLP	POOLED	2023-01-06..2023-07-04	0.900294	0.700000	NaN	NaN	NaN
6	A	LSTM_DEEP	BTC	2023-01-06..2023-07-04	0.491465	0.466667	-0.364964	0.908995	1.336171
7	A	LSTM_DEEP	ETH	2023-01-06..2023-07-04	0.497507	0.513333	0.103160	0.988722	1.168391
8	A	CNN_LSTM	BTC	2023-01-06..2023-07-04	0.478485	0.473333	1.218754	1.280771	1.336171
9	A	CNN_LSTM	ETH	2023-01-06..2023-07-04	0.487536	0.460000	0.551901	1.088456	1.168391
10	A	MLP	BTC	2023-07-05..2023-12-31	0.572108	0.566667	2.850123	1.346014	1.371341
11	A	MLP	ETH	2023-07-05..2023-12-31	0.572108	0.566667	1.850428	1.401919	1.190881
12	A	LSTM	BTC	2023-07-05..2023-12-31	0.583750	0.533333	1.696883	1.332114	1.445249
13	A	LSTM	ETH	2023-07-05..2023-12-31	0.583929	0.533333	1.657052	1.322044	1.257041
14	B_MIN	MLP	POOLED	2023-07-05..2023-12-31	0.894904	0.722222	NaN	NaN	NaN
15	B_MAX	MLP	POOLED	2023-07-05..2023-12-31	0.871608	0.755556	NaN	NaN	NaN
16	A	LSTM_DEEP	BTC	2023-07-05..2023-12-31	0.589286	0.560000	2.755544	1.550055	1.445249

	task	model	coin	fold	auc	acc	sharpe	equity_end	bh_end
17	A	LSTM_DEEP	ETH	2023-07-05..2023-12-31	0.588929	0.546667	1.745805	1.323734	1.257040
18	A	CNN_LSTM	BTC	2023-07-05..2023-12-31	0.562143	0.533333	2.029463	1.445249	1.445249
19	A	CNN_LSTM	ETH	2023-07-05..2023-12-31	0.556607	0.533333	1.245719	1.257041	1.257041
20	A	MLP	BTC	2024-01-01..2024-06-28	0.655338	0.586111	2.057179	1.752340	1.459970
21	A	MLP	ETH	2024-01-01..2024-06-28	0.655338	0.586111	3.180924	2.621051	1.509900
22	A	LSTM	BTC	2024-01-01..2024-06-28	0.505438	0.480000	0.852679	1.139912	1.436450
23	A	LSTM	ETH	2024-01-01..2024-06-28	0.528001	0.486667	1.319379	1.210722	1.470000
24	B_MIN	MLP	POOLED	2024-01-01..2024-06-28	0.863648	0.750000	NaN	NaN	NaN
25	B_MAX	MLP	POOLED	2024-01-01..2024-06-28	0.905630	0.655556	NaN	NaN	NaN
26	A	LSTM_DEEP	BTC	2024-01-01..2024-06-28	0.543769	0.526667	1.574382	1.436450	1.436450
27	A	LSTM_DEEP	ETH	2024-01-01..2024-06-28	0.508678	0.540000	1.502626	1.470005	1.470000
28	A	CNN_LSTM	BTC	2024-01-01..2024-06-28	0.546622	0.553333	3.009055	1.421085	1.436450
29	A	CNN_LSTM	ETH	2024-01-01..2024-06-28	0.551440	0.500000	2.024380	1.282045	1.470000