How to run GDFlex

- To execute GDFlex, specify the target dataset ID from ML/UCR and the mode used in the Ablation study (baseline, znormBias, intra, locMis, inter, interNoise) described in the paper, then run PUB_GDFlex_exec from the command line. Among these modes, 'interNoise' represents the final version of GDFlex.
- To specify the target data, use either a data ID or "all".
- When a specific data ID is specified, the following outputs are generated: the spreadsheet (result_all.csv), an intermediate result file (InfoDemo_(dataId).mat), and plotted five figures explaining the intermediate results.
- Note that selecting "all" will execute all 250 datasets, which may take several hours. With "interNoise", execution takes approximately 7 hours on a laptop with an Intel(R) Core(TM) i5-1335U CPU (1.30GHz) and 16GB of RAM. The baseline mode does not restrict the target data, so it takes more than a day. The other modes take less time than "interNoise".

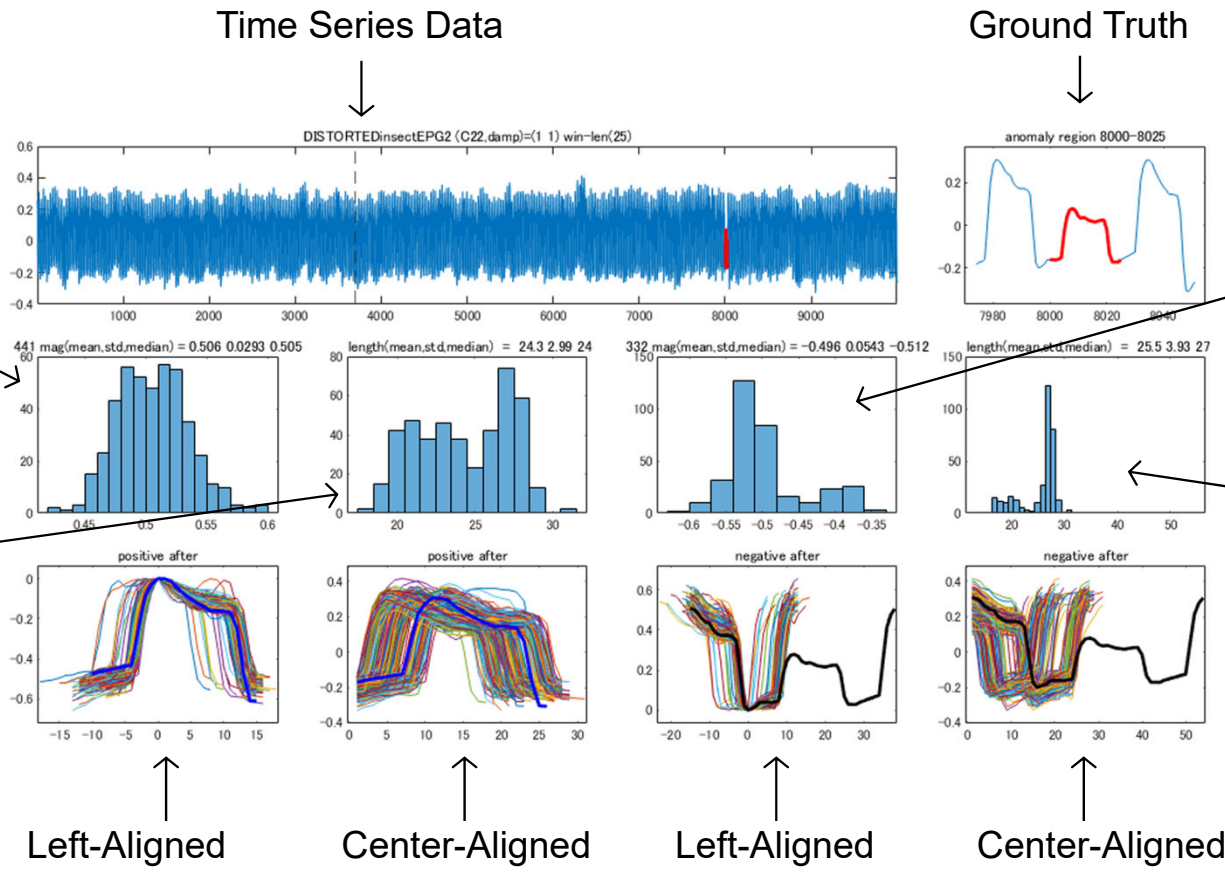
% Change the directory to 'src' in the directory obtained by unzipping 'Code_forSupportingPage.zip'.
>> cd ./src

[Example 1: Execution with a Specified Data ID]
>> Pub_GDFlex_execute(66, "interNoise")

[Example 2: Execution with All Data]
>> Pub_GDFlex_execute("all","interNoise")

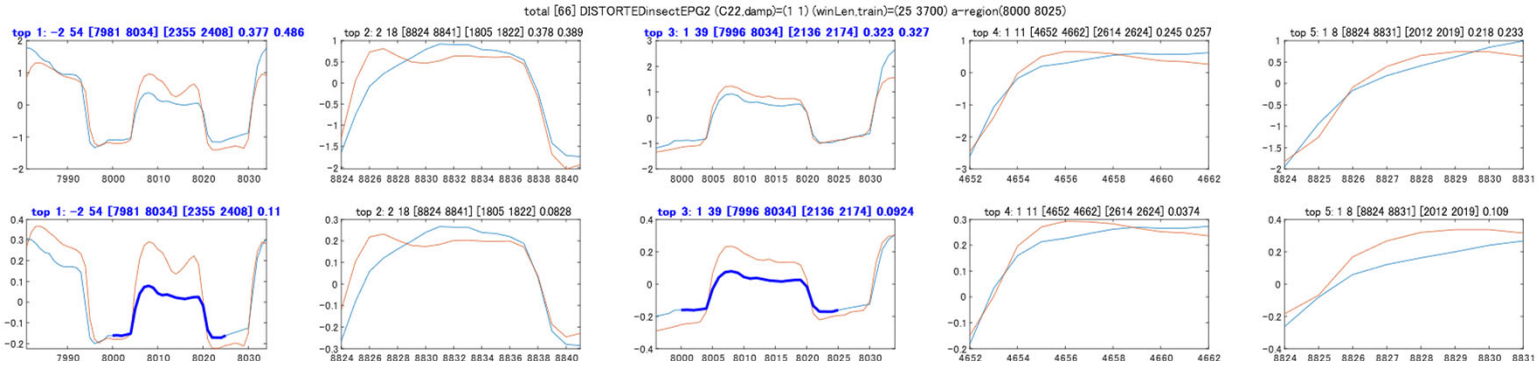
Output Figures When Executing with a Specified Data ID – Subsequence extraction -

Internal Information on Extracting Candidate Anomalous Subsequences

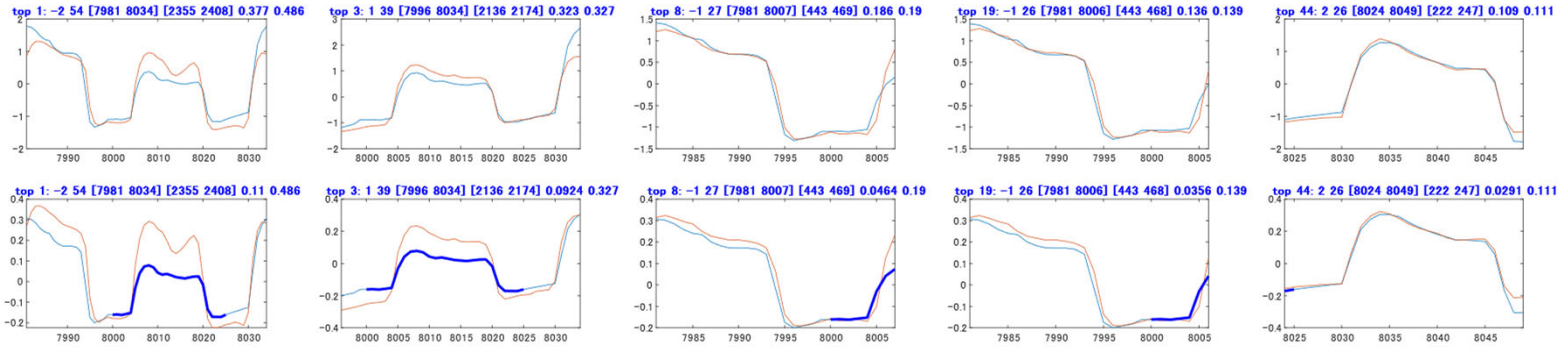


Output Figures When Executing with a Specified Data ID - Anomaly candidates 1 -

Top:
Top-5 anomaly candidates

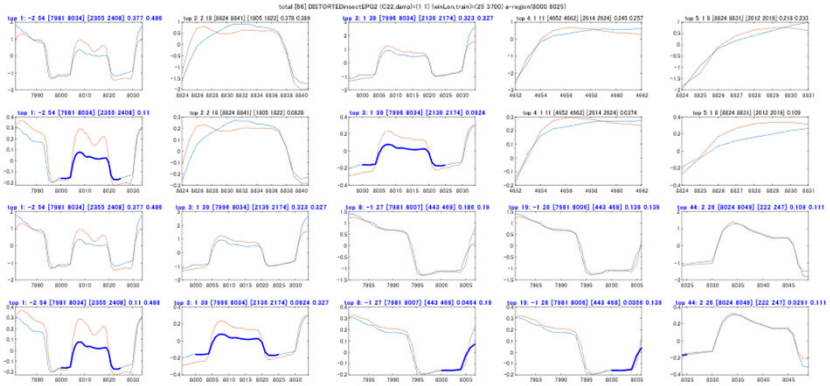


Bottom:
Anomaly candidates, including the ground truth

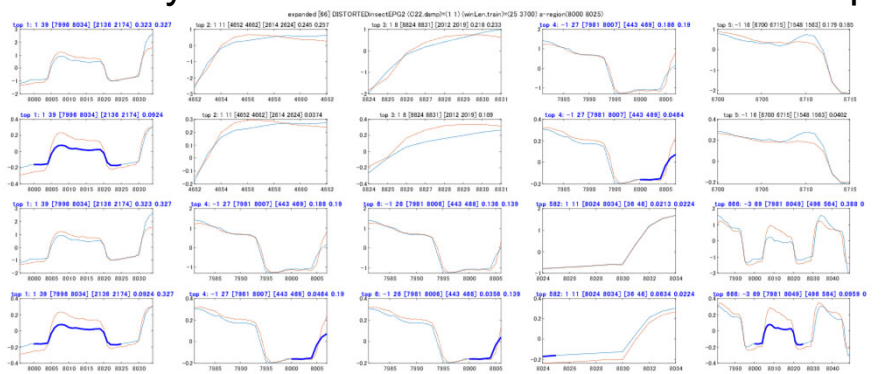


Output Figures When Executing with a Specified Data ID - Anomaly candidates 2 -

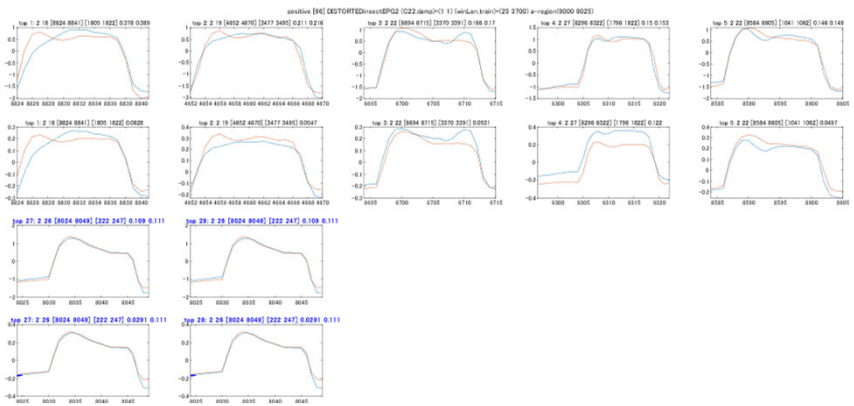
Full anomaly candidates



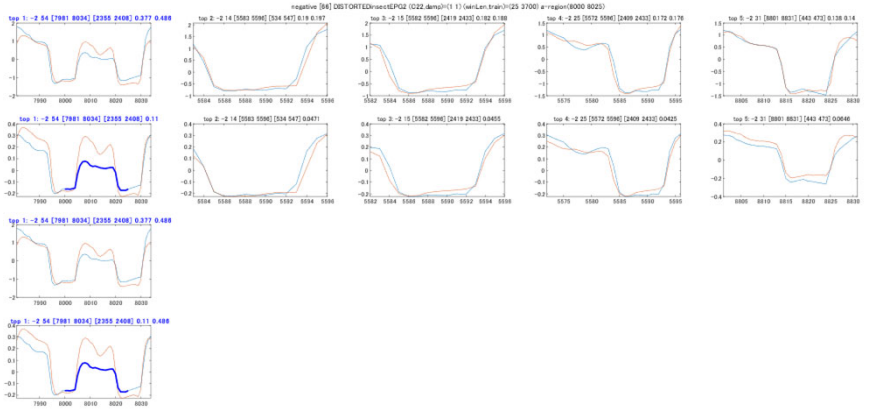
Anomaly candidates limited to intra or inter spikes



Anomaly candidates limited to positive spikes



Anomaly candidates limited to negative spikes



Output Spreadsheet (result_all.csv)

- The result_all.csv file presents the success or failure results of anomaly detection. The table below provides an example of execution with All Data for 250 datasets in the ML/UCR dataset. When a specific data ID is specified, a CSV file containing only a single row is generated.
- The first column contains the data ID.
- The 3rd, 8th, and 9th columns represent the success or failure results for GDFlex, DAMP, and $C^{22}MP$, respectively. The accuracy of each algorithm can be obtained by averaging the values in each column.
- The 6th column indicates the ranking of the score for the subsequence containing the correct answer, while the 5th column is set to 1 if it is included in the top-K. The average of this column represents the top-K accuracy.
- The 21st column shows the execution time for each dataset. From these execution times, the minimum time (0.7 sec), maximum time (1100 sec), and average time (71 sec) were calculated.
- For calculating the execution speed of 5000Hz per second in the ECG dataset, six files with data IDs ranging from 119 to 115 were used.

data ID ↓ GDFlex ↓ Top5 ↓ Ranking ↓ DAMP ↓ $C^{22}MP$ Time ↓

data_id	spike_id	spikelet	inRange	top5	rank	damp	c22	anomaly_label_from	anomaly_label_to	window_label	spikelet_type	spikelet_from	spikelet_to	from_NN	to_NN	window_spikelet	distLengthNorm	numSpikelet	numSlidingWindow	time	total_length	testNumRate	adjust
1	81168	1	1	1	1	1	1	52000	52620	150	3	52115	52500	31631	32016	386	0.85497	1766	44647	55.98916	79795	1	NaN
2	56993	1	1	1	1	1	1	56600	56900	150	2	56590	57005	9668	10083	416	1.103953	1779	44853	51.45226	80001	0.881365	1
3	80073	1	1	1	1	1	1	46600	46900	140	0	46860	46893	20956	20989	34	1.013992	1767	44862	50.10473	80000	0.452827	NaN
4	5486	1	1	1	1	1	1	5400	5600	75	-2	5432	5592	2280	2440	161	1.388078	533	8427	2.167597	11000	0.423077	1
5	5391	1	1	1	1	1	1	5391	5392	20	-2	5390	5392	2406	2408	3	0.747031	691	4166	3.414245	8184	0.032766	NaN
246	303791	1	1	1	1	0	0	270800	271070	250	-3	270778	270933	87716	87871	156	0.884948	6162	199408	760.3078	299867	0.724544	NaN
247	121775	1	1	1	1	0	0	121900	121980	200	-2	121735	122113	15648	16026	379	1.163985	4857	149591	296.9652	200000	0.949531	1
248	6431	0	1	1	3	0	0	4702	4707	25	-2	6254	6435	664	845	182	1.067845	2151	6409	6.662975	8432	0.963716	NaN
249	8285	1	1	1	1	0	0	8285	8315	25	-2	8268	8302	2455	2489	35	0.764426	2674	7748	13.70504	10524	0.570798	NaN
250	12588	0	1	0	434	0	0	7290	7296	25	4	3860	3922	1753	1815	63	0.959683	2624	7494	10.75143	10468	0.822084	NaN
		0.728		0.808		0.536	0.568												55972.45	70.85711			

Fig. 1

```
InfoFile = '../sample/InfoDemo_91.mat'; % InfoDemo_91.mat is generated as an output of Pub_GDFlex_execute(91, "interNoise").
DiscordPair = [123360,123609,12796,13045];
SpikeletPair = [113872,114433,25973,26534];
Pub_GDFlex_segStatistics_chap1_91(InfoFile,DiscordPair,SpikeletPair);
```

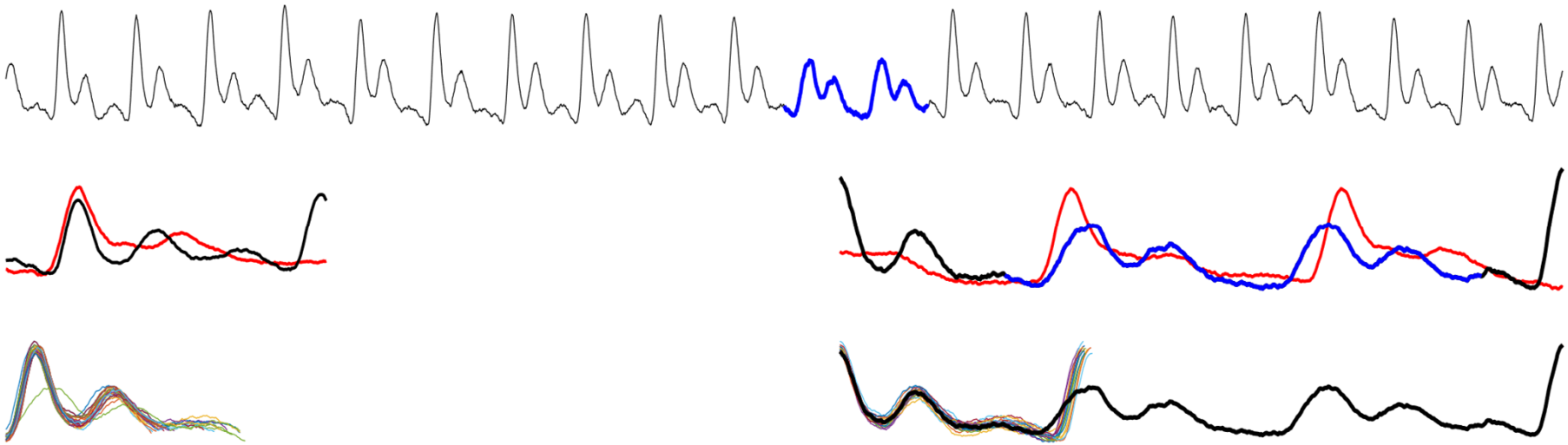


Fig. 7 (A), 7(B) and Fig. 7(C)

```
ClippingRange = [26001,30000];
AlignOption = "left";% "left" "center"
InfoFile = '../sample/InfoDemo_91.mat'; % InfoDemo_91.mat is generated as an output of Pub_GDFlex_execute(91, "interNoise").
Pub_GDFlex_segStatistics_chap4_91(InfoFile, ClippingRange, AlignOption);
```