The folder contains four MATLAB files. The files 'ESSA_I.m' and 'ESSA_F.m' are the raw interfaces of the proposed ESSA approaches, i.e., ESSA (Identity) and ESSA (Weight), respectively. The file 'run_single' is the script conducting the single experiment to intuitively show the applicability of our approach on analyzing the incomplete time series with different percentage of missing data (10% - 60%). The file 'run_repeated' is the script conducting the repeated simulations to obtain the statistical performance of the ESSA method.

For uses of 'ESSA_I.m' and 'ESSA_F.m', one may type the two commands:

```
Signal_I = ESSA_I(timeseries, index_miss L, k )
Signal_F = ESSA_F(formalerror, timeseries, index_miss L, k )
```

Input:

timeseries: the incomplete(available) time series;

index_miss: the locations of data missing,

L: window size

k: reconstruction order

Output:

signal: estimated signals

For example, given a complete noisy time series $\boldsymbol{x} = [x_1, x_2, \cdots, x_N]$, the associated formal errors are $\boldsymbol{\sigma} = [\sigma_1, \sigma_2, \cdots, \sigma_N]$. If some data in $\boldsymbol{x}(\boldsymbol{\sigma})$ are missing, i.e., $x_2 \sim x_{10}(\sigma_2 \sim x_{10})$, then we will obtain the incomplete data, $\boldsymbol{x}_1 = [x_1, x_{11}, \cdots, x_N]$ and $\boldsymbol{\sigma}_1 = [\sigma_1, \sigma_{11}, \cdots, \sigma_N]$. To use ESSA(Identity) or ESSA(Weight) to filter the time series $\boldsymbol{x}_1$, one may type the command,

```
Signal_I = ESSA_I(x_1, 2:10, L, k )
Signal_F = ESSA_F(σ_1, x_1, 2:10, L, k )
```