Example for using detectBlink function

detectBlink is a function that could find blink locations in an one to three channels EEG signal collect from Fp1, Fp2 and Fz electrodes.

Syntax

locations = detectBlinks(signals,samplingRate)

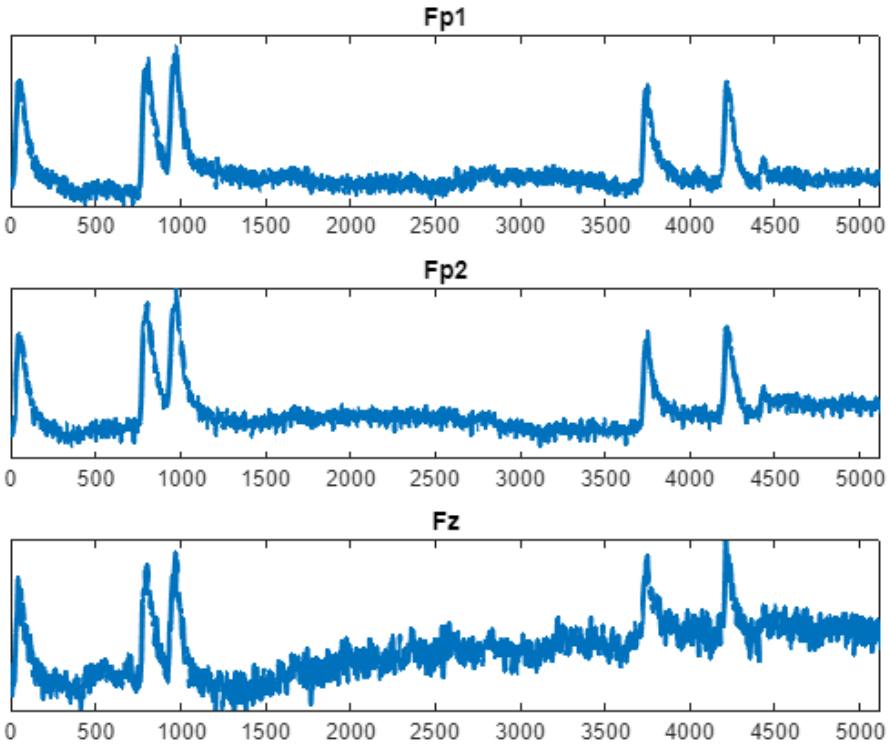
locations = detectBlinks(signals,samplingRate,options)

locations = detectBlinks(signals,samplingRate,outputOptions)

Prepare data

The input signal could be matix or table. detectBlink function can work with 1 to 3 channel input.

```
Ds = load("Package\sampleData.mat").Ds;
samplingRate = 512;
signalMultiple = Ds{1,1}{1,1};
signalSingle = signalMultiple.Fp1;
figure;
l = {'Fp1','Fp2','Fz'};
hold("on");
data = signalMultiple.Variables;
for i=1:3
    subplot(3,1,i);
    plot(data(:,i), LineWidth=2);
    xlim([0, 5120]);
    yticks([]);
    title([l{i}]);
end
hold("off");
```



Detet the blinks in provided signal

Input signal and sampling rate of the signal (seccond). The signal should shape as:

```
tableSignal = signalMultiple(1:10,:), type = class(signalMultiple)
```

```
tableSignal = 10×3 table
```

	Fp1	Fp2	Fz
1	-1.8559e+04	-1.0134e+04	-7.2353e+03
2	-1.8559e+04	-1.0130e+04	-7.2395e+03
3	-1.8550e+04	-1.0135e+04	-7.2420e+03
4	-1.8549e+04	-1.0142e+04	-7.2422e+03
5	-1.8550e+04	-10141	-7.2392e+03
6	-1.8550e+04	-1.0140e+04	-7.2389e+03
7	-1.8552e+04	-1.0140e+04	-7.2409e+03
8	-1.8550e+04	-1.0138e+04	-7.2411e+03
9	-1.8548e+04	-1.0138e+04	-7.2410e+03
10	-1.8545e+04	-1.0139e+04	-7.2384e+03

```
type =
'table'
```

Also matrix is ok, and for a normal signal, the shape of channels by time or time by channels are both avaliable.

```
matrixSignal = signalMultiple(1:10,:).Variables, type = class(matrixSignal)
```

```
matrixSignal = 10×3
10^4 ×
   -1.8559   -1.0134   -0.7235
   -1.8559   -1.0130   -0.7240
   -1.8550   -1.0135   -0.7242
   -1.8549   -1.0142   -0.7242
   -1.8550   -1.0141   -0.7239
   -1.8550   -1.0140   -0.7239
   -1.8552   -1.0140   -0.7241
   -1.8550   -1.0138   -0.7241
   -1.8548   -1.0138   -0.7241
   -1.8545   -1.0139   -0.7238
type =
'double'
```

```
matrixSignal = matrixSignal'
```

```
matrixSignal = 3×10
10^4 ×
   -1.8559   -1.8559   -1.8550   -1.8549   -1.8550   -1.8550   -1.8552   -1.8550 ···
   -1.0134   -1.0130   -1.0135   -1.0142   -1.0141   -1.0140   -1.0140   -1.0138
   -0.7235   -0.7240   -0.7242   -0.7242   -0.7239   -0.7239   -0.7241   -0.7241
```

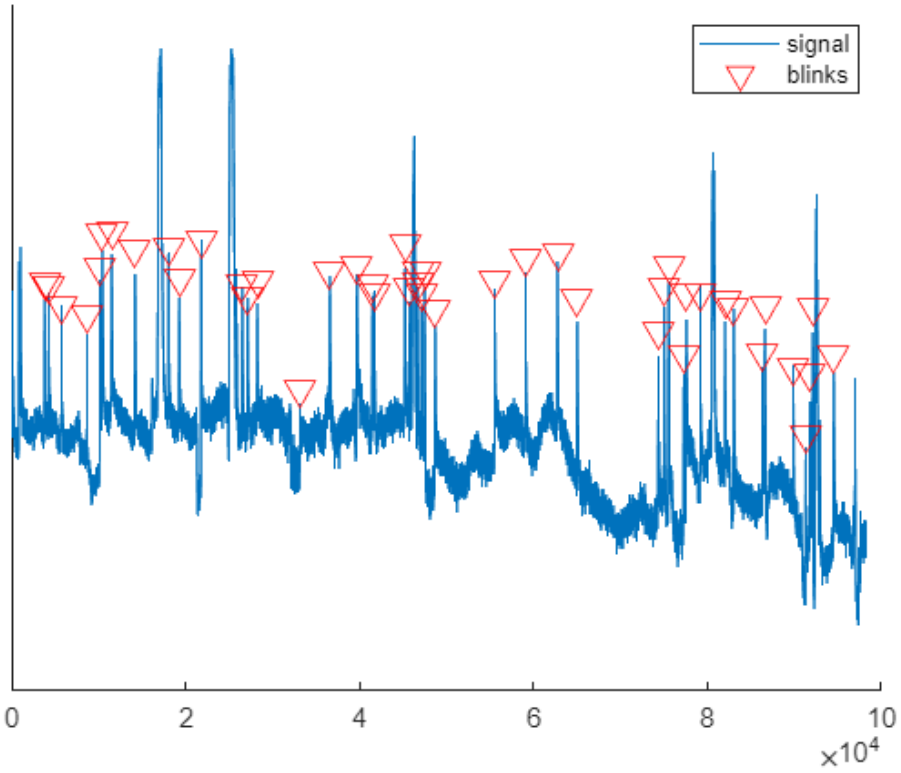
The default output is a list of indexs of the blinks in signal.

```
locations = detectBlinks(signalMultiple,samplingRate)
```

```
locations = 1×45
        3756        4232        5688        8620       10104       10392 ···
```

Plot the Fp1 signal and point out the blink locations.

```
coordinate = signalSingle(locations);
figure;
hold('on');
plot(signalSingle,'Color',[0,0.4470,0.7410]);
plot(locations,coordinate+50,'rv','MarkerSize',10);
legend(["signal","blinks"])
hold('off');
yticks([]);
```



Optional inputs

Mode name

The default model is 'TCNOC', exept this, '1d-CNN', 'LSTM', 'biLSTM', 'TCN', 'WT-CNN', '1d-CNNOC', 'LSTMOC', 'biLSTMOC' and 'WT-CNNOC' are also avaliable. For example:

```
locations = detectBlinks(signalMultiple,samplingRate,'1d-CNN')
```

```
locations = 1×45
        3756        4232        5688        8620       10104       10392 ···
```

Shift factor

Inside the prdiction pipline, there are multiple predictors working on shifted signals. The number of it is pow2(shiftFactor). Increase this may increase accuracy but cost more time accordingly. The default factor is 3, uses 8 predictors.

```
timeWithFactor1 = detectBlinks(signalMultiple,samplingRate,shiftFactor=1,output={'time'})
```

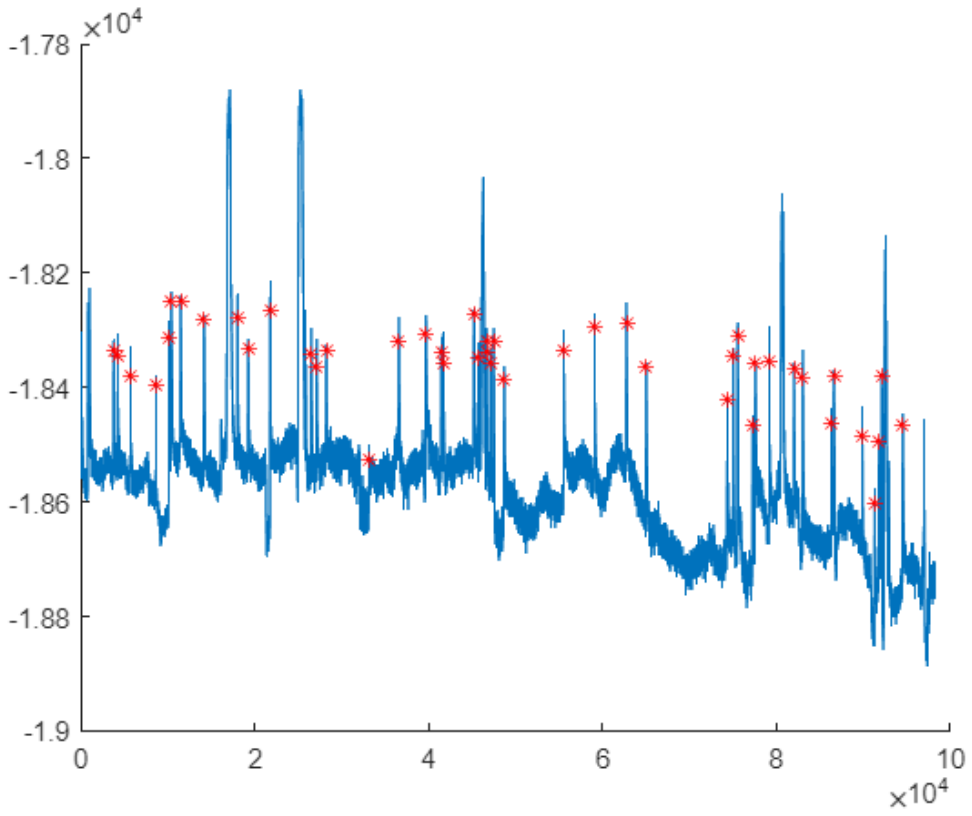
```
timeWithFactor1 = 11.7130
```

```
timeWithFactor5 = detectBlinks(signalMultiple,samplingRate,shiftFactor=5,output={'time'})
```

```
timeWithFactor5 = 49.5216
```

Plot

```
detectBlinks(signalMultiple,samplingRate,plot=true);
```



Optional outputs

The location index list is the default out put. Other two are time (runtime) and mask (model predicted label for every time step)

```
[labels,runtime] = detectBlinks(signalMultiple,samplingRate,output={'mask','time'});
labels(1000:1010),runtime
```

```
ans = 1×11 categorical
n/a          n/a          n/a          n/a          n/a          n/a          n/ ···
runtime = 17.4001
```