timeseries_analysis

May 9, 2018

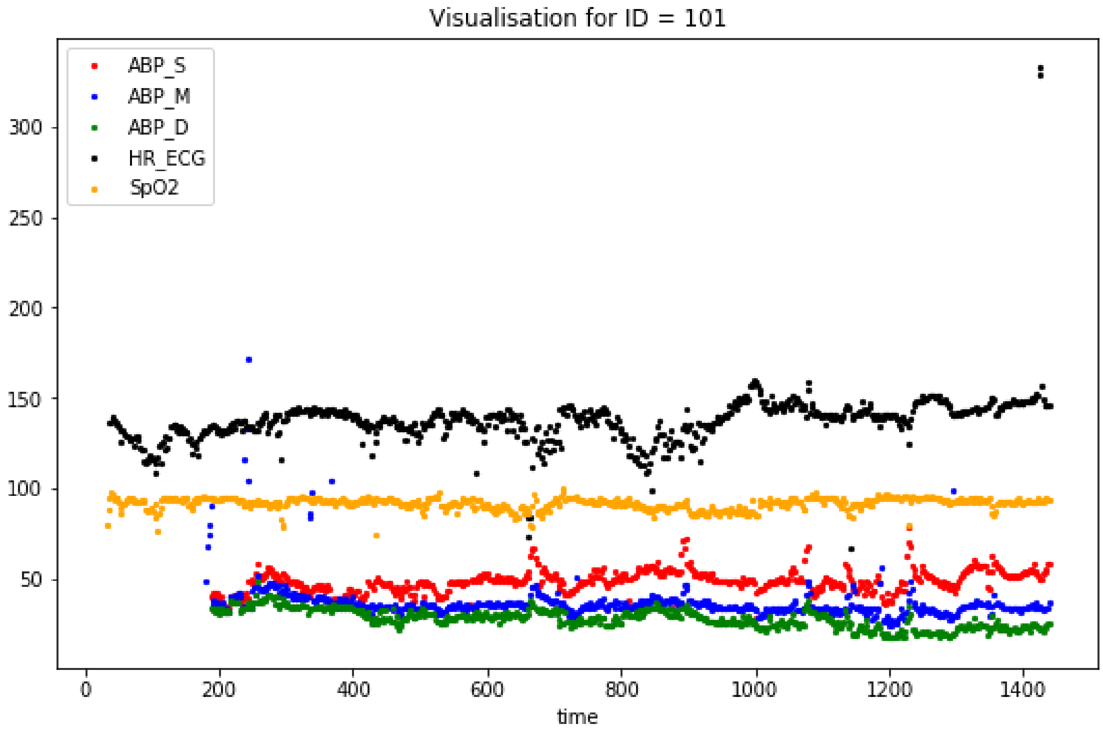
```
In [2]: import pandas as pd
        import numpy as np
        import matplotlib.pyplot as plt
        import seaborn as sns
        from sklearn import  linear_model
```

0.1 Importing the data

```
In [3]: data = pd.read_csv("neonatal_24h.csv", names=[
            'ID', 'time', 'ABP_S', 'ABP_M', 'ABP_D','HR_ECG', 'SpO2'])

        IDs = np.unique(data['ID'])

        data_per_ID = []
        for ID in IDs:
            data_per_ID.append(data.loc[data['ID']==ID].sort_values('time'))
```

0.1.1 Visualisation of one ID

```
In [4]: features = ['ABP_S', 'ABP_M', 'ABP_D','HR_ECG', 'SpO2']
        col = ['red', 'blue', 'green', 'black' , 'orange']

        fig = plt.figure(figsize=(1.61 * 6, 6))
        ax = fig.add_subplot(1, 1, 1)
        ID = 100

        for y, c in zip(features, col):
            data_per_ID[ID].plot(x='time', y=y,
                                 marker='.', kind='scatter', ax=ax, label=y, color=c)
        plt.title('Visualisation for ID = ' + str(IDs[ID]) )
        plt.ylabel('');
```



0.1.2 extract additional features like mean and variance and also slope and intercept of a linear regression

```
In [42]: mean = []
         var = []
         slope = []
         intercept = []

         for i in range(len(IDs)):
             m = []
             v = []
             s = []
             inter = []
             for j, feature in enumerate(features):
                 # extract mean and variance
                 m.append(np.nanmean(data_per_ID[i], axis=0)[j])
                 v.append(np.nanvar(data_per_ID[i], axis=0)[j])

                 # create linear regression object
                 regr = linear_model.LinearRegression(fit_intercept=True)

                 # select time as x and feature as y
                 df = data_per_ID[0][['time', feature]].dropna()
                 x = np.array(df['time']).reshape(-1, 1)
                 y = df[feature]

                 if len(df) > 1:
                     # train the model using the training sets
                     regr.fit(x,y)
                     s.append(regr.coef_[0])
                     inter.append(regr.intercept_)
                 else:
                     s.append(np.nan)
                     inter.append(np.nan)

             mean.append(m)
             var.append(v)
             slope.append(s)
             intercept.append(inter)

         mean = np.array(mean)
         var = np.array(var)
         slope = np.array(slope)
         intercept = np.array(intercept)
```

```
/usr/local/lib/python2.7/dist-packages/ipykernel_launcher.py:13: RuntimeWarning: Mean of empty
  del sys.path[0]
/usr/local/lib/python2.7/dist-packages/ipykernel_launcher.py:14: RuntimeWarning: Degrees of fre
```

0.1.3 save arrays for future analysis

```
In [45]: np.savetxt('mean.csv', mean, delimiter=',')
         np.savetxt('var.csv', var, delimiter=',')
         np.savetxt('slope.csv', slope, delimiter=',')
         np.savetxt('intercept.csv', intercept, delimiter=',')
         np.savetxt('IDs.csv', IDs, delimiter=',', fmt='%i')
```

```
In [46]: timeseries = []
         for i in range(len(IDs)):
             ts = []
             ts.append(IDs[i])
             for j in range(mean.shape[1]):
                 ts.append(mean[i][j])
                 ts.append(var[i][j])
                 ts.append(slope[i][j])
                 ts.append(intercept[i][j])
             timeseries.append(ts)
         timeseries = np.array(timeseries)
```

```
In [47]: np.savetxt('timeseries.csv', timeseries, delimiter=',')
         # order of the file:

         # ID1         mean ABP_S                 var ABP_S                 slope ABP_S
         #                mean ABP_M                 var ABP_M                 slope ABP_M
         #                mean ABP_D                 var ABP_D                 slope ABP_D
         #                mean HR_ECG                 var HR_ECG                 slope HR_ECG
         #                mean SpO2                 var SpO2                 slope SpO2

         # in total ID + (mean, var, slope, intercept) * ('ABP_S', 'ABP_M', 'ABP_D','HR_ECG',
```

```
In [48]: print(timeseries.shape)
```

```
(700, 21)
```