Analysis Platform based on Django & Keras

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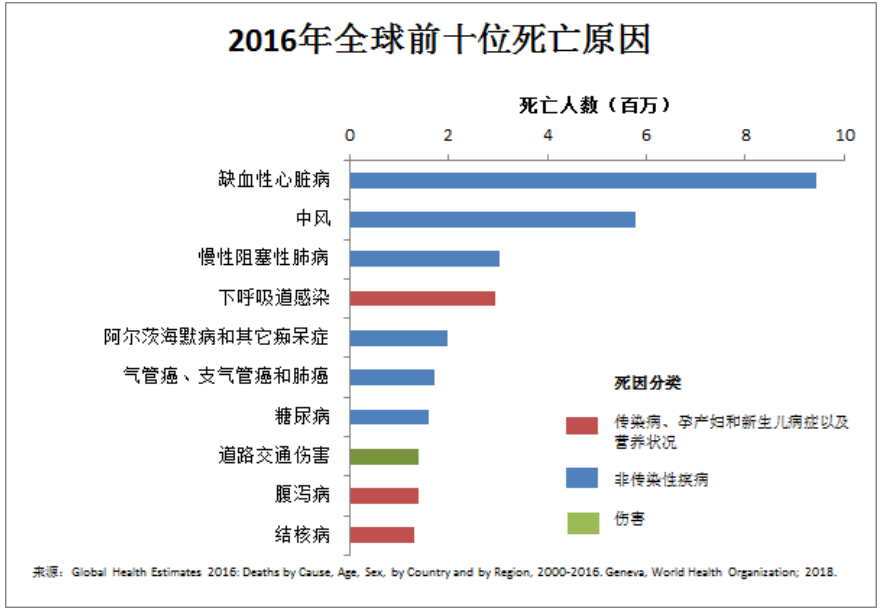
IOT Data Analysis and Applications Final Project

Outline

- 研究動機
- 研究目標
- 資料初探
- 前處理
- 實作過程
- 實驗結果

研究動機


2016年全球前十位死亡原因
死亡人数（百万）
0
2
4
6
8
10
缺血性心脏病
中风
慢性阻塞性肺病
下呼吸道感染
阿尔茨海默病和其它痴呆症
气管癌、支气管癌和肺癌
糖尿病
道路交通伤害
腹泻病
结核病
死因分类
传染病、孕产妇和新生儿病症以及营养状况
非传染性疾病
伤害
来源：Global Health Estimates 2016: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2016. Geneva, World Health Organization; 2018.

研究目標

1. 使用兩種以上的演算法，對ECG訊號進行心臟疾病辨識。
2. 能夠辨識出
   - 心室期外收縮（ Premature ventricular contraction ，PVC ）
   - 心房期外收縮心跳（ Atrial premature contraction，APC ）
   - 右分枝束阻斷心跳（ Right bundle branch block beat ，RBBB ）
   - 左分枝束阻斷心跳（ Left bundle branch block beat ，LBBB ）
   - 心室跳脫心跳 （Ventricular escape beat ）
   - 心室撲動 （Ventricular flutter wave ）等疾病。
3. 使用Django架置這個有EA系統的網站

資料初探

MIT-BIH Arrhythmia Database

Follow the links in this table to go directly to any record:

100 104 108 113 117 122 201 207 212 217 222 231
101 105 109 114 118 123 202 208 213 219 223 232
102 106 111 115 119 124 203 209 214 220 228 233
103 107 112 116 121 200 205 210 215 221 230 234

Record 100 (MLII, V5; male, age 69)

Medications: Aldomet, Inderal

Beats	Before 5:00	After 5:00	Total
Normal	367	1872	2239
APC	4	29	33
PVC	-	1	1
Total	371	1902	2273

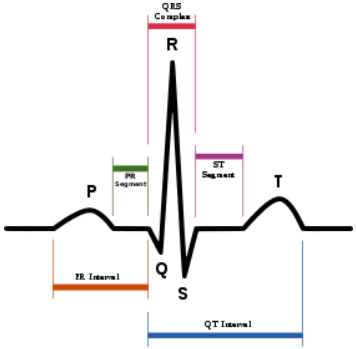
資料初探

- 100.atr
- 100.dat
- 100.hea

Time	Sample #	Type	Sub	Chan	Num
0:00.050	18	+	0	0	0
0:00.214	77	N	0	0	0
0:01.028	370	N	0	0	0
0:01.839	662	N	0	0	0
0:02.628	946	N	0	0	0
0:03.419	1231	N	0	0	0
0:04.208	1515	N	0	0	0
0:05.025	1809	N	0	0	0
0:05.678	2044	A	0	0	0
0:06.672	2402	N	0	0	0
0:07.517	2706	N	0	0	0
0:08.328	2998	N	0	0	0
0:09.117	3282	N	0	0	0
0:09.889	3560	N	0	0	0
0:10.728	3862	N	0	0	0
0:11.583	4170	N	0	0	0
0:12.406	4466	N	0	0	0
0:13.233	4764	N	0	0	0
0:14.056	5060	N	0	0	0

Symbol	
· *or* N	Normal beat
L	Left bundle branch block beat
R	Right bundle branch block beat
A	Atrial premature beat
a	Aberrated atrial premature beat
J	Nodal (junctional) premature beat
S	Supraventricular premature beat
V	Premature ventricular contraction
F	Fusion of ventricular and normal beat
[	Start of ventricular flutter/fibrillation
!	Ventricular flutter wave
]	End of ventricular flutter/fibrillation
e	Atrial escape beat
j	Nodal (junctional) escape beat
E	Ventricular escape beat
/	Paced beat
f	Fusion of paced and normal beat
x	Non-conducted P-wave (blocked APB)
Q	Unclassifiable beat
|	Isolated QRS-like artifact

前處理



So and Chan

	id	Pamp	Ramp	Tamp	PR	QRS	QT	RRI	dRRI	label
0	1	-0.240	0.810	-0.270	133.333	47.222	352.778	788.889	22.222	N
1	2	-0.230	0.820	-0.305	183.333	41.667	344.444	791.667	2.778	N
2	3	-0.195	0.885	-0.280	138.889	44.444	372.222	788.889	2.778	N
3	4	-0.200	0.945	-0.270	138.889	44.444	366.667	816.667	27.778	N
4	5	-0.205	0.845	-0.305	163.889	41.667	369.444	652.778	163.889	A

正規化

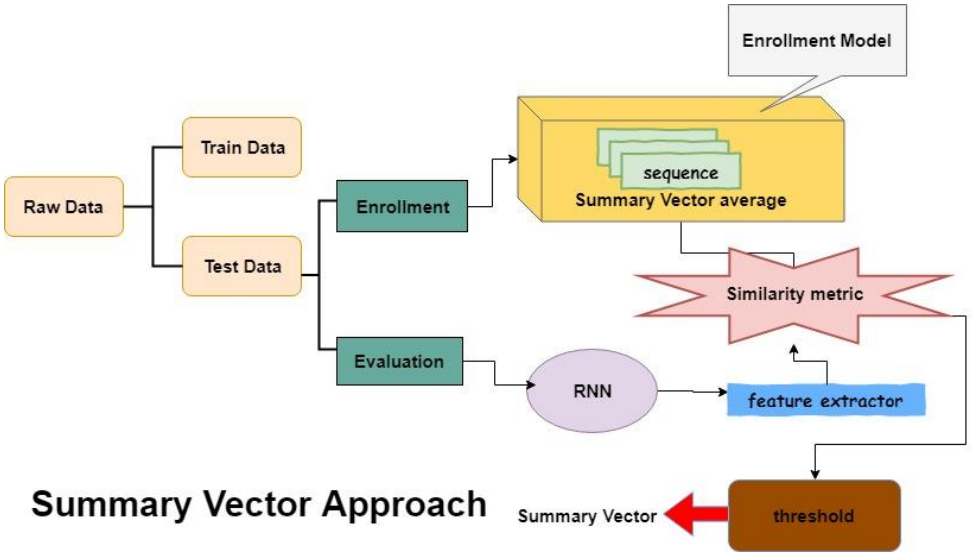
- MinMaxScaler:

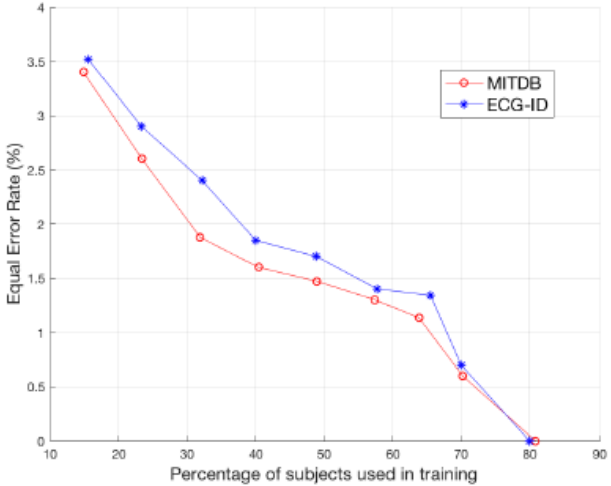
  Feature scaling is used to bring all values into the range [0,1].

$$X' = \frac{X - X_{\min}}{X_{\max} - X_{\min}}$$

LSTM Parameters

Reference: ECG-BASED BIOMETRICS USING RECURRENT NEURAL NETWORKS



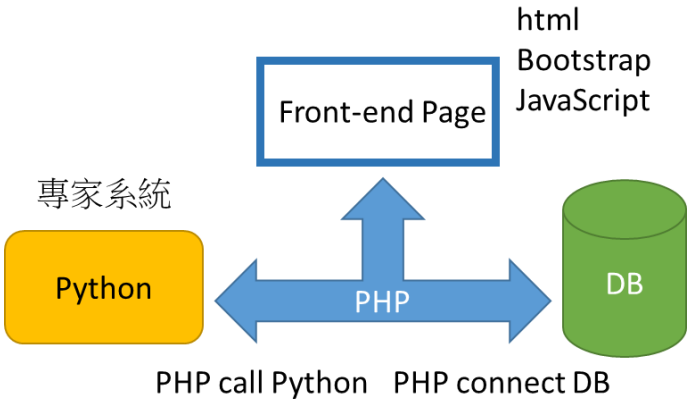


分類結果

Classifier	Naïve Bayes	Linear SVC	KNN	Random Forest	LSTM
Accuracy	48%	45%	89%	96%	97%

Django 架構

舊架構



新架構

Django 操作介面

ECG Analysis Platform

Input Data: all

Submit

Classifier	Accuracy
LSTM	0.969038015682
Naive Bayes	0.0304839439168
LinearSVC	0.363364993216
KNN	0.89579375848
RandomForest	0.966259611036

Django 操作介面

ECG Analysis Platform

Input Data:

Submit

Classifier	Accuracy
LSTM	
Naive Bayes	
LinearSVC	
KNN	
RandomForest	

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THANKS!