



پروژه درس هوش مصنوعی و محاسبات زیستی

اردلان گرامی

99102112

بهمن 1402

فاز 1

پارت اول)

تعدادی ویژگی را طبق آنچه در کد محاسبه شده معرفی کرده و سپس با استفاده داده‌های آموزش مقادیر آنان برای هر یک از 59 کانال معرفی شده محاسبه می‌کنیم.

- Average
- Variance
- Skewness
- Entropy
- Medium Frequency
- Mean Frequency
- Band Power
- 99 percent Bandwidth
- Maximum Power Frequency

پارت دوم)

با توجه به معیار فیشر معرفی شده در پروژه برای هر کانال بهترین ویژگی و برای هر گروه از ویژگی‌ها به ترتیب داریم :

```
Fisher score for best average is 0.019364 for channel 47
Fisher score for best variance is 0.015599 for channel 43
Fisher score for best skewness is 0.021747 for channel 11
Fisher score for best entropy is 0.01804 for channel 50
Fisher score for best medium frequency is 0.030914 for channel 43
Fisher score for best mean frequency is 0.02443 for channel 23
Fisher score for best band power is 0.015561 for channel 43
Fisher score for best 99 percent bandwidth = 0.016727 for channel = 41
Fisher score for best maximum power frequency is 0.023661 for channel 24
```

The best feature for channel 1 is Average, also its fisher score is 0.0019009
The best feature for channel 2 is Average, also its fisher score is 0.0037688
The best feature for channel 3 is Variance, also its fisher score is 0.0031948
The best feature for channel 4 is Skewness, also its fisher score is 0.0027699
The best feature for channel 5 is Band Power, also its fisher score is 0.0060464
The best feature for channel 6 is Band Power, also its fisher score is 0.01017
The best feature for channel 7 is Variance, also its fisher score is 0.010419
The best feature for channel 8 is Maximum Power Frequency, also its fisher score is 0.0075462
The best feature for channel 9 is Skewness, also its fisher score is 0.017609
The best feature for channel 10 is Band Power, also its fisher score is 0.0073606
The best feature for channel 11 is Skewness, also its fisher score is 0.021747
The best feature for channel 12 is Average, also its fisher score is 0.0070627
The best feature for channel 13 is Variance, also its fisher score is 0.013237
The best feature for channel 14 is 99 percent Bandwidth, also its fisher score is 0.016582
The best feature for channel 15 is Band Power, also its fisher score is 0.012481
The best feature for channel 16 is Skewness, also its fisher score is 0.0065819
The best feature for channel 17 is Medium Frequency, also its fisher score is 0.0055726
The best feature for channel 18 is Entropy, also its fisher score is 0.0065488
The best feature for channel 19 is Maximum Power Frequency, also its fisher score is 0.0037799
The best feature for channel 20 is Skewness, also its fisher score is 0.015047
The best feature for channel 21 is Maximum Power Frequency, also its fisher score is 0.010233
The best feature for channel 22 is Medium Frequency, also its fisher score is 0.0086331
The best feature for channel 23 is Mean Frequency, also its fisher score is 0.02443
The best feature for channel 24 is Maximum Power Frequency, also its fisher score is 0.023661
The best feature for channel 25 is Skewness, also its fisher score is 0.019899
The best feature for channel 26 is Medium Frequency, also its fisher score is 0.011656
The best feature for channel 27 is Average, also its fisher score is 0.0041086
The best feature for channel 28 is Average, also its fisher score is 0.0048091
The best feature for channel 29 is Average, also its fisher score is 0.0038141
The best feature for channel 30 is Maximum Power Frequency, also its fisher score is 0.0088957
The best feature for channel 31 is Mean Frequency, also its fisher score is 0.010787
The best feature for channel 32 is Mean Frequency, also its fisher score is 0.009191
The best feature for channel 33 is Medium Frequency, also its fisher score is 0.01948
The best feature for channel 34 is Maximum Power Frequency, also its fisher score is 0.0068616
The best feature for channel 35 is Entropy, also its fisher score is 0.0091957
The best feature for channel 36 is Variance, also its fisher score is 0.0085022
The best feature for channel 37 is Average, also its fisher score is 0.0054091
The best feature for channel 38 is Skewness, also its fisher score is 0.0071422
The best feature for channel 39 is Mean Frequency, also its fisher score is 0.0059759
The best feature for channel 40 is Maximum Power Frequency, also its fisher score is 0.014034
The best feature for channel 41 is 99 percent Bandwidth, also its fisher score is 0.016727
The best feature for channel 42 is Medium Frequency, also its fisher score is 0.0074065
The best feature for channel 43 is Medium Frequency, also its fisher score is 0.030914
The best feature for channel 44 is Average, also its fisher score is 0.011793
The best feature for channel 45 is 99 percent Bandwidth, also its fisher score is 0.0049097
The best feature for channel 45 is 99 percent Bandwidth, also its fisher score is 0.0049097
The best feature for channel 46 is Variance, also its fisher score is 0.0062347
The best feature for channel 47 is Average, also its fisher score is 0.019364
The best feature for channel 48 is 99 percent Bandwidth, also its fisher score is 0.010454
The best feature for channel 49 is Skewness, also its fisher score is 0.019747
The best feature for channel 50 is Entropy, also its fisher score is 0.01804
The best feature for channel 51 is Maximum Power Frequency, also its fisher score is 0.016668
The best feature for channel 52 is Entropy, also its fisher score is 0.011292
The best feature for channel 53 is Band Power, also its fisher score is 0.011215
The best feature for channel 54 is Medium Frequency, also its fisher score is 0.019513
The best feature for channel 55 is Medium Frequency, also its fisher score is 0.0093417
The best feature for channel 56 is Medium Frequency, also its fisher score is 0.019846
The best feature for channel 57 is Variance, also its fisher score is 0.006858
The best feature for channel 58 is Maximum Power Frequency, also its fisher score is 0.0035462
The best feature for channel 59 is Medium Frequency, also its fisher score is 0.019489

همچنین بهترین گروه از ویژگی‌ها (گروه 6 – اعداد شماره کانال‌ها هستند) :

- Medium frequency 43
- Medium frequency 59
- Medium frequency 33
- Mean frequency 23
- Maximum power frequency 24
- Maximum power frequency 56
- Skewness 11
- Skewness 25
- Skewness 49
- Average 47

```
for feature group 1 ---> J = 0.0062871
-----
for feature group 2 ---> J = 0.0085896
-----
for feature group 3 ---> J = 0.0083205
-----
for feature group 4 ---> J = 0.0032233
-----
for feature group 5 ---> J = 0.0028046
-----
for feature group 6 ---> J = 0.0020048
```

• نام گروه‌ها در

پارت سوم)

شبکه MLP با یک لایه پنهان :

```
Best Number of Neurons in MLP with activation function radbas is 11, and Accuracy = 0.62045
Best Number of Neurons in MLP with activation function logsig is 4, and Accuracy = 0.62273
Best Number of Neurons in MLP with activation function purelin is 18, and Accuracy = 0.59545
Best Number of Neurons in MLP with activation function satlin is 20, and Accuracy = 0.60227
Best Number of Neurons in MLP with activation function tansig is 19, and Accuracy = 0.61591
Best Number of Neurons in MLP with activation function hardlims is 14, and Accuracy = 0.56591
```

پارت چهارم)

شبکه RBF با یک لایه پنهان :

Best Number of Neurons in RBF is 4, Radius is 40 and Accuracy is 0.53333

پارت پنجم)

همانطور که مشاهده می‌کنیم شبکه MLP نتایج بهتری دارد.

فاز 2

در این فاز روند کلی مانند فاز اول است.

ابتدا کروموزمی به طول 59 در نظر می‌گیریم و برای دو شبکه RBF و MLP داریم :

```
Best Number of Neurons in MLP with activation function radbas is equal to 15, Accuracy = 0.58667
Best Number of Neurons in MLP with activation function logsig is equal to 6, Accuracy = 0.56889
Best Number of Neurons in MLP with activation function purelin is equal to 16, Accuracy = 0.57333
Best Number of Neurons in MLP with activation function satlin is equal to 8, Accuracy = 0.59556
Best Number of Neurons in MLP with activation function tansig is equal to 16, Accuracy = 0.6
Best Number of Neurons in MLP with activation function hardlims is equal to 8, Accuracy = 0.56444
Best Number of Neurons in RBF = 3, Radius = 39, Accuracy = 0.45455
```

متأسفانه دقت RBF بالاتر از 45 درصد نشد!