EECS 152B
Matlab Assignment 2
Lab Session: Lab 1A

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Chapter 1

Conditions

1.1 Problem

For this lab since we are asking to modulate this lab by using Matlab do a linear prediction(LP), There are three files are given which are user1, user2 and user3 at sample at 48KHz from three different speakers. Therefore, before we really start to work on the lab. There are some code we should run and know what is really going are.

Matlab Code

```
clear all;
clc;
Fs=48000; %sampling frequency
load('user1.mat');
load('user2.mat');
load('user3.mat');
p=2;
word1=isolate(user1,Fs);
word2=isolate(user2,Fs);
word3=isolate(user3,Fs);
for n=1:15
asdlfjsa{1,n}=word1{n};
asdlfjsa{2,n}=word2{n};
asdlfjsa{3,n}=word3{n};
end
for people=1:3
[mu{people},ck{people}]=sdfa(asdlfjsa(people,1:15),p);
end
for time=16:length(word3)
testpart=word3{time};
test(testpart,p,mu,ck);
end
```

1.1.1 Result and Conclusion

Because the program is really long. so I crate a program that can load all my functions. and when we load the the table, we should get result as below which in the figure 1.1, figure 1.2, and figure 1.3. By looking at figures, what I can see they are similar, but they have different of peak value. Therefore we have to do word isolation, model order selection, training and testing which are shown in the Chapter 2, Chapter 3, Chapter 4 and Chapter 5.

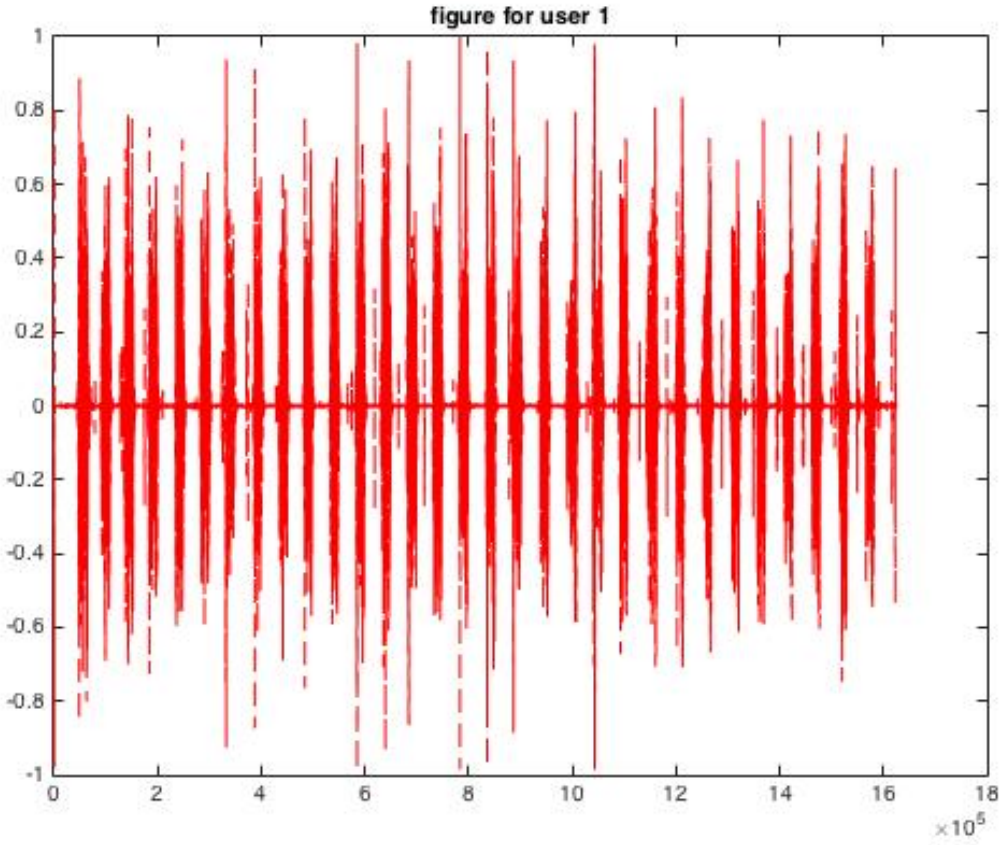

Figure 1.1: Plot for User1

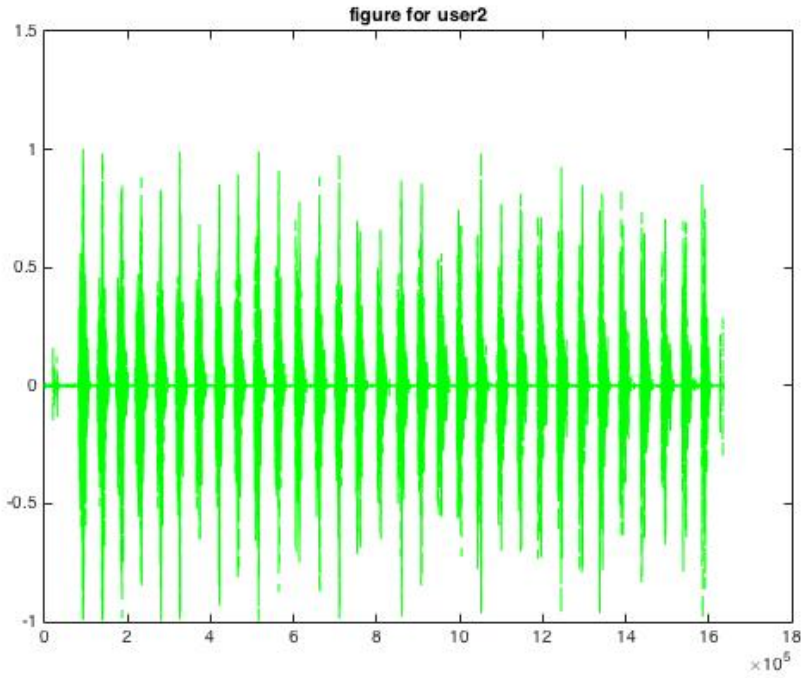

Figure 1.2: Plot for User2

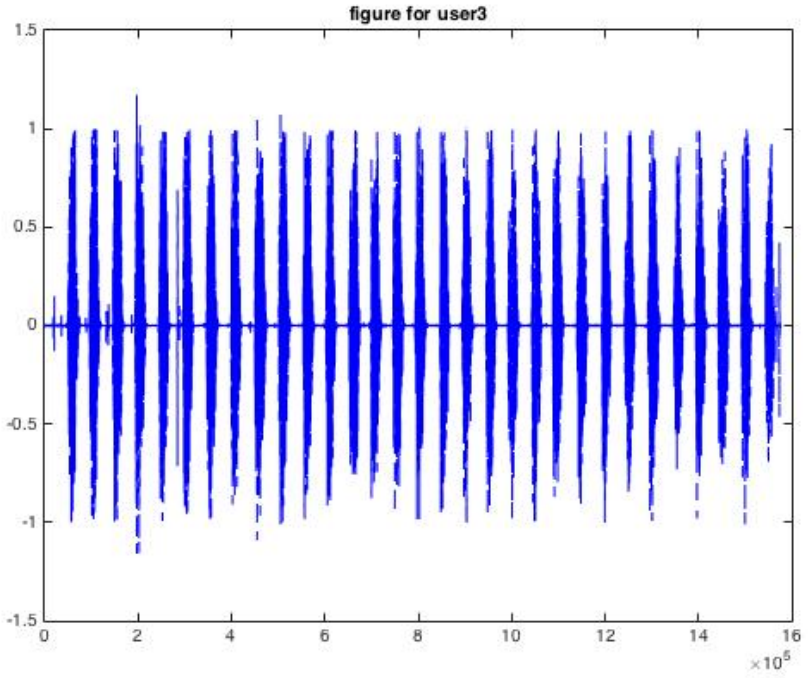

Figure 1.3: Plot for User3

Chapter 2

Question 1

2.1 Problem Statement:

Write a Matlab function that isolates each spoken word.

Matlab Code

```
function cut=isolate(signal,Fs)
tt=abs(signal); %plot(tt) %Plot for Reflected Signal
mal=ones(400,1);
Maverage=filter(mal,1,tt);%Find moveing Average for user
t=(1:length(Maverage))/Fs;
figure(1),plot(signal),hold on
count=0;
m=0;
low=4;
for i=1:length(Maverage)
if Maverage(i)>4
count=count+1;
else
if count>0.2*Fs
isolate=signal(i-count:i);
figure(1),plot([i-count i-count],[-1 1],'r--')
figure(1),plot([i i],[-1 1],'r--')
s=i;
m=m+1;
cut{m}=isolate;
end
count=0;
end
end
t=(1:length(isolate))/Fs;
figure(2),plot(isolate),hold on;
```

2.2 Result and Conclusion

To deal this problem first of all I get reflected signal, Then I try to get move average picture. After getting these. I will get my isolate picture

For **Reflected Signal** those figures shown below as figure 2.1,figure 2.2, and figure 2.3

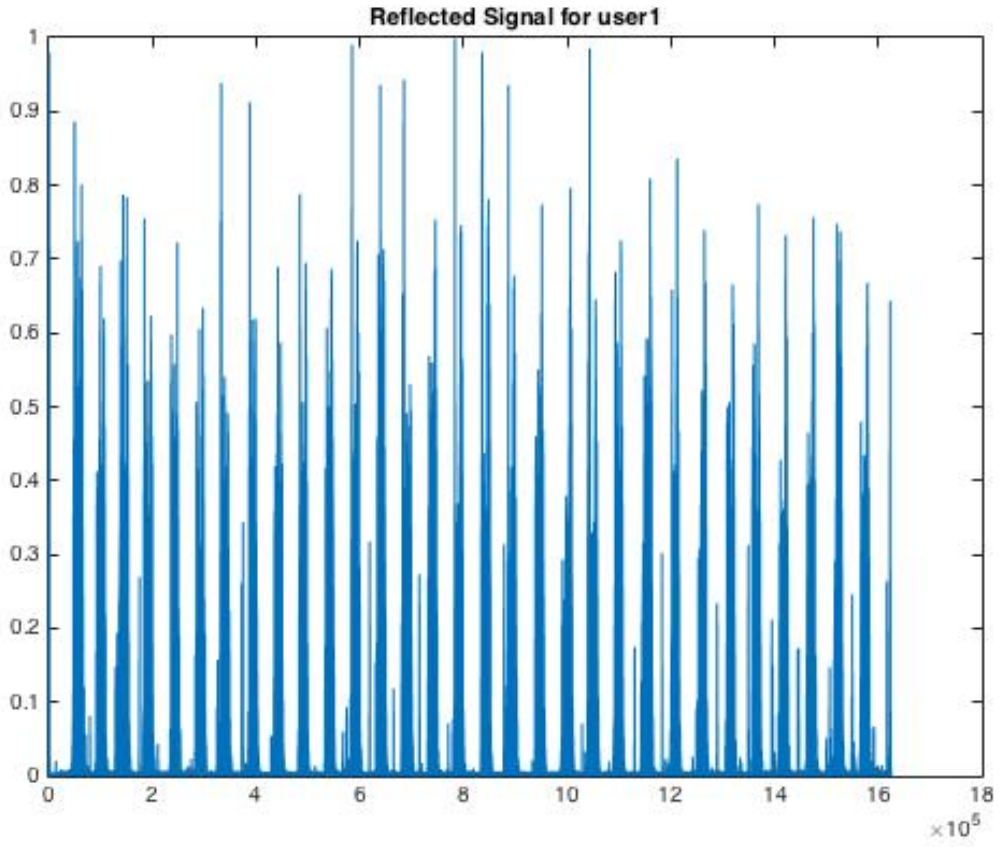

Figure 2.1: Reflected Signal for User1

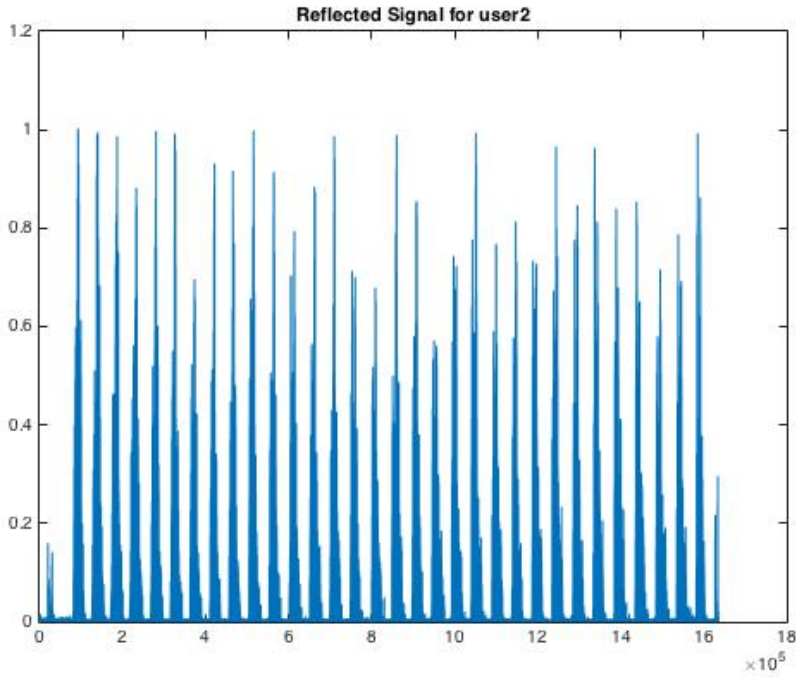

Figure 2.2: Reflected Signal for User2

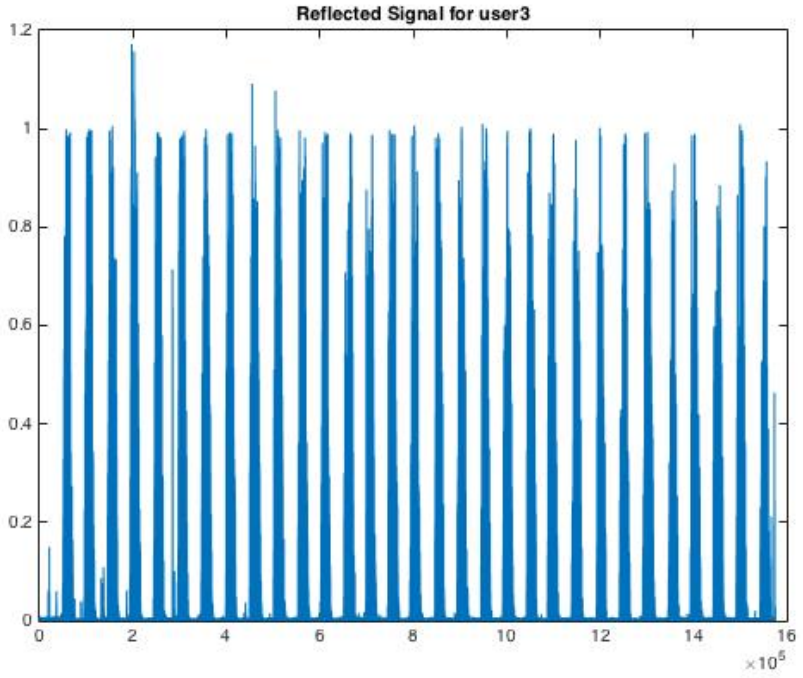

Figure 2.3: Reflected Signal for User3

Since reflected signal looks correct for me then I am trying to get move average and compare with original and draw the grid which shown in figure 2.4,figure 2.5, and figure

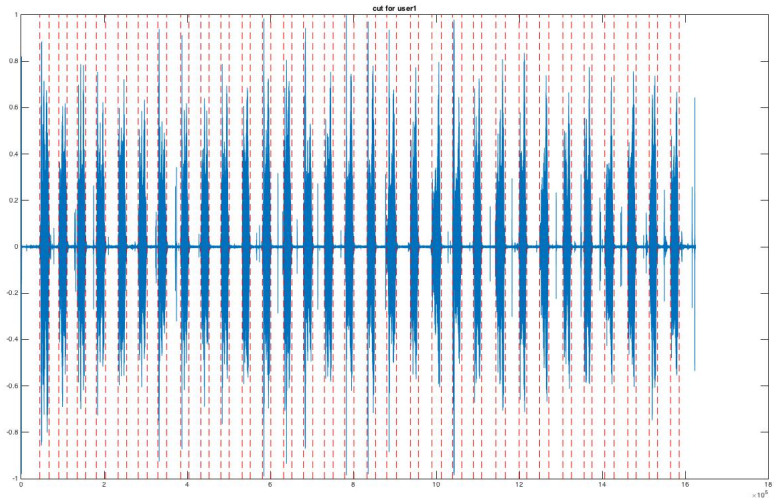

Figure 2.4: cut the grid for all the figure

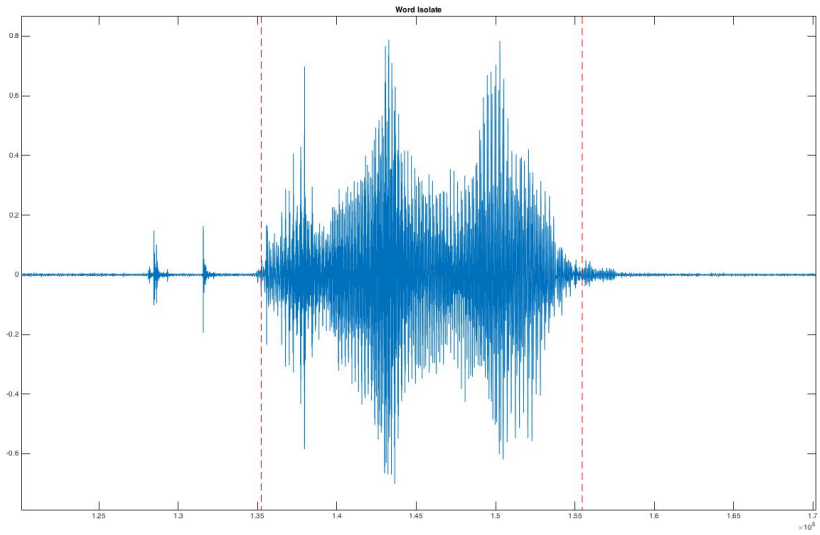

Figure 2.5: zoom in and see the word isolate figure

I was trying to add the gird on the program and get auto grid, but eventually I failed. I have talked with professor and hasan about the gird. As they said mine should be fine, still can see by zoom in and get word isolate should be cool, but since hard to reach then don't worry.

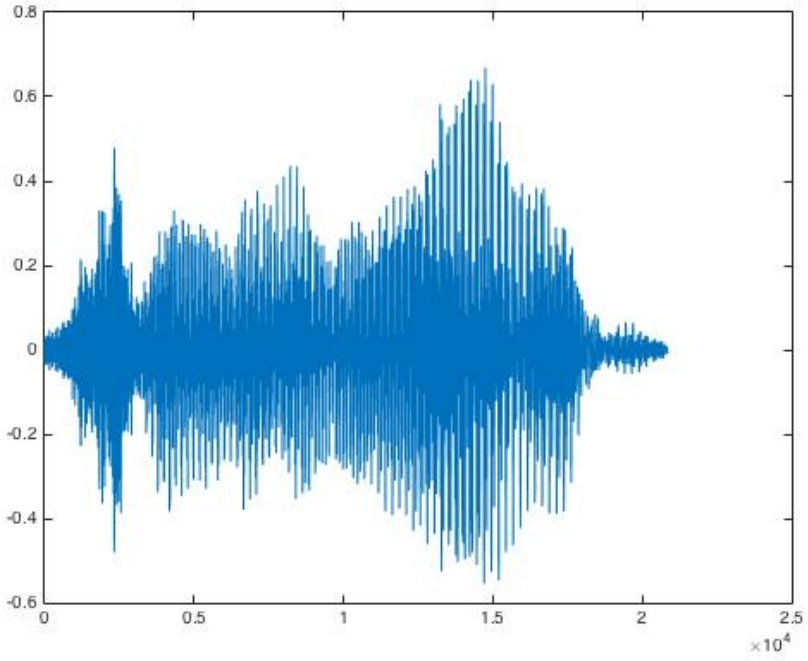

Figure 2.6: looking for tail and cut by the program to show word isolate

Chapter 3

Question2

3.1 Problem Statement:

Choose an order P for the linear prediction.

Form what question asked P can be many value, so in this case. First of all, I set my value of P equal to 2, If success then I can change to other value such as: 3,4,5,6,8,10, observe and see the behavior and find out the different.

Chapter 4

Question3

4.1 Problem Statement:

For utterance i in the training set for user k, calculate the corresponding LP coefficients a_{ik}. After calculating $a_{ik}$for i = 1, $\cdots$, 15, find the mean μ_k and covariance C_k of the estimated coefficients for each user.

Matlab Code(single words)

```
function a=lpc(cut,p)
for m=1:1
N=length(cut{m})
s=cut{m};
e=1;
R=zeros(p,p);
for n=(p+1):N
snn=zeros(p,1);
for k=1:p
snn(k)=s(n-k);
end
snew(:,e)=s(n)*snn;
sdsds=snn*snn';
R=R+snn*snn';
e=e+1;
end
r=sum(snew');
a=inv(R)*r
end
```

```
function [mu, ck] = sdfa(continuet, p) %each word
sum = zeros(p, 1);
for i=1:15
N=length(continuet{i});
s=continuet{i};
R = zeros(p, p);
r = zeros(p, 1);
for n = (p+1):N
snn = zeros(p, 1);
for k = 1:p
snn(k) = s(n-k);
end
r = r + s(n)*snn;
R = R + snn*snn';
end
a{i} = inv(R)*r;
b(i)=a{i}(1);
c(i)=a{i}(2);
sum = sum + a{i};
end
mu = sum/15;
sum = zeros(p, p);
for n = 1:15
ttt = a{n} - mu;
sum = sum + ttt*(ttt');
end
ck=sum/15;
figure(4),plot(b,c,'*'),hold on
```

4.2 Result and Conclusion

From the code 4.1(single words) we should be able to perform single word. but since we are looking for all the signals, Therefore, I development a new code which is the one I use that is the matlab upper above which is Development Code(Matlab Code 4.1)[1]. After run the program it showed when P(order) equal to 2 for user1, user2, and user3, and we are trying to find the mean value μ_k and covariance C_k. After Matlab run the program. I will received those data, and stored all the data into table 4.1. By observe we can see that mean value are different. which means my code can read all three users really easy. In covariance the diagonal side compare with off diagonal side we can see the signal is in the positive direction or negative direction different.

[1]click number and it will show where the code is.

Value of P	Mean μ_k	Covariance C_k
P = 2	$\begin{cases} \textbf{user1} = \begin{bmatrix} 1.1224 \\ -0.3084 \end{bmatrix} \\ \textbf{user2} = \begin{bmatrix} 1.3696 \\ -0.4155 \end{bmatrix} \\ \textbf{user3} = \begin{bmatrix} 1.1571 \\ -0.3533 \end{bmatrix} \end{cases}$	$\begin{cases} \textbf{user1} = \begin{bmatrix} 0.0161 & -0.0025 \\ -0.0025 & 0.0029 \end{bmatrix} \\ \textbf{user2} = \begin{bmatrix} 0.0018 & -0.0012 \\ -0.0012 & 0.0009 \end{bmatrix} \\ \textbf{user3} = \begin{bmatrix} 0.0067 & -0.0018 \\ -0.0018 & 0.0009 \end{bmatrix} \end{cases}$

Table 4.1: Table for three users' mean and covariance

Chapter 5

Question4

5.1 Question A

Unweighted distance from the mean:$min_k(a_{jm} - \mu_k)^T(a_{jm} - \mu_k)$

5.2 Question B

Mahalanobis distance: $min_k(a_{jm} - \mu_k)^T C_i^{-1}(a_{jm} - \mu k)$

Matlab Code(Find Unweighted distance and Mahalanobis distance)

```
function test(s, p, mu, ck)
N = length(s);
R = zeros(p, p);
r = zeros(p, 1);
for n = (p+1):N
snn = zeros(p, 1);
for k = 1:p
snn(k) = s(n-k);
end
r = r + s(n)*snn;
R = R + snn*snn';
end
a = inv(R)*r;
%
for num=1:length(mu)
dis(num)=(a-mu{num})'*inv(ck{num})*(a-mu{num});
end
[x y]=min(dis);
fprintf('user%d\n',y);
```

5.3 Reslut and Conclusion

To find the distance for unweighted and mahalanobis, I was using the code above(code 5.2) to calculate the distance for Mahalanobis and the distance for unweighted. therefore, we can table[1] below.

[1] First three rows for users is when input is user1, 4-6 rows are when the input is user2, 7-9 rows are when the input is user3

Table 5.1: table for Distance(user1 when P=2)

	user1	user2	user3	user1	user2	user3	user1	user2	user3
Maha	0.9346	26.8736	16.8656	4.7038	2.0475	5.0164	1.1562	153.1652	1.3364
Maha	2.0177	56.2465	22.1704	6.2186	0.0492	7.4071	2.9399	33.8851	2.1203
Maha	3.6963	344.6914	12.4813	6.1253	0.1640	7.4756	1.2059	45.5630	0.3023
Maha	1.7589	30.4384	25.0834	5.6187	24.7305	6.3793	0.5279	144.0682	0.8922
Maha	1.1376	19.4976	16.2265	5.3019	4.7022	5.5993	2.6271	73.4960	2.2155
Maha	0.0128	1.1617	0.0546	4.3823	2.4622	4.6063	1.2159	52.2336	0.2443
Maha	0.6321	16.3002	11.2152	9.1800	3.2148	11.9520	1.5192	222.4415	3.2536
Maha	1.2234	26.1553	19.8593	7.2766	0.3718	8.8459	5.0775	52.5550	6.2930
Maha	0.8447	20.1488	15.1179	3.7178	8.9578	3.3806	0.6205	72.0358	0.0113
Maha	6.4195	3.0470	7.3128	6.3515	0.1960	7.4771	10.9540	28.2972	17.4769
Maha	0.4078	16.6615	7.2235	6.8052	1.8064	7.9474	1.1698	62.5237	0.1875
Maha	4.4217	56.0307	40.2116	5.3571	0.5116	6.0634	43.7415	108.4032	108.4209
Maha	0.9905	19.6533	15.9926	6.1392	24.1472	7.3239	0.4264	149.7651	1.5554
Maha	3.5151	45.8083	37.9672	4.9757	31.3313	5.4044	0.1264	50.2420	1.4848
Maha	20.1641	23.1541	36.8353	5.4845	0.0050	6.5373	3.1597	58.3587	2.8217
Maha	1.6309	29.8406	23.7945	4.2784	1.9796	4.5771	2.7736	43.4604	1.9594
Maha				1.7127	31.1742	0.8264			
Unwe	0.0026	0.0702	0.0077	0.0572	0.0010	0.0363	0.0029	0.0737	0.0029
Unwe	0.0097	0.1291	0.0240	0.0782	0.0001	0.0534	0.0255	0.0134	0.0115
Unwe	0.0608	0.2638	0.0855	0.0790	0.0001	0.0543	0.0097	0.0305	0.0022
Unwe	0.0057	0.0645	0.0103	0.0507	0.0036	0.0298	0.0025	0.0906	0.0063
Unwe	0.0106	0.0374	0.0086	0.0599	0.0009	0.0380	0.0153	0.0259	0.0046
Unwe	0.1210	0.3489	0.1422	0.0536	0.0015	0.0335	0.0088	0.0326	0.0017
Unwe	0.0065	0.0424	0.0053	0.1010	0.0028	0.0714	0.0062	0.1001	0.0096
Unwe	0.0039	0.0656	0.0084	0.0886	0.0009	0.0618	0.0369	0.0095	0.0190
Unwe	0.0052	0.0508	0.0063	0.0419	0.0044	0.0241	0.0030	0.0496	0.0000
Unwe	0.0727	0.0003	0.0482	0.0782	0.0001	0.0533	0.0949	0.0042	0.0649
Unwe	0.0058	0.0406	0.0036	0.0785	0.0003	0.0531	0.0072	0.0368	0.0009
Unwe	0.0170	0.1462	0.0349	0.0665	0.0001	0.0439	0.3350	0.1046	0.2747
Unwe	0.0074	0.0448	0.0071	0.0554	0.0029	0.0334	0.0042	0.1059	0.0108
Unwe	0.0092	0.1066	0.0216	0.0427	0.0059	0.0237	0.0012	0.0552	0.0007
Unwe	0.1879	0.0295	0.1449	0.0707	0.0000	0.0475	0.0215	0.0185	0.0084
Unwe	0.0045	0.0714	0.0104	0.0532	0.0015	0.0333	0.0218	0.0168	0.0089
Unwe				0.0164	0.0207	0.0060			

Chapter 6

Final Conclusion

Perform question 4 and question 5 for P = 2,3,4,5,6,8,10.

6.1 part 1

Question: For the case of P = 2, show a scatter plot of the coefficients for each of the three users. Does the resulting scatter plot seem reasonable given the measured classification accuracy for P = 2?

Compare the table 6.1 and the figures for scatter plot shows that for both Mahalanobis and unweighted distance at P=2 is not accurate. If we check datas. we can see when p increase the accuracy will get higher.

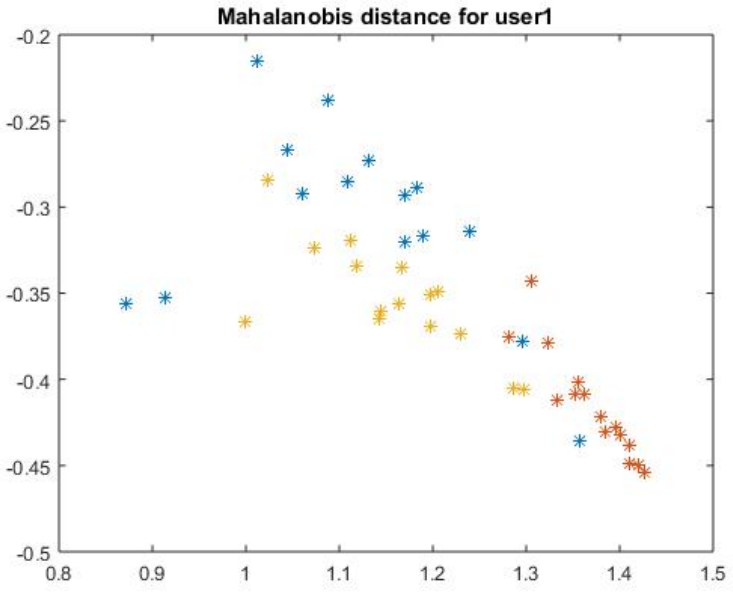

Figure 6.1: The scatter plot for user1 (Mahalanobis distance)

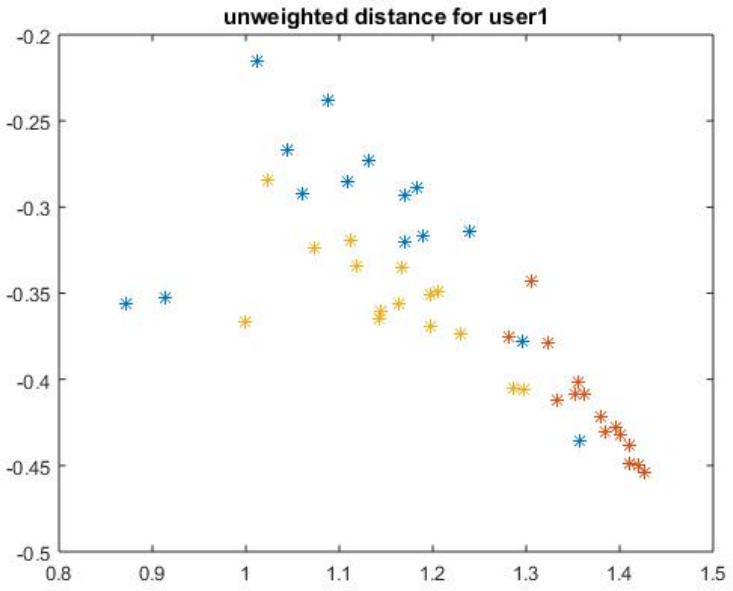

Figure 6.2: The scatter plot for user1 (Unweighted distance)

6.2 part 2

Question: What happens to performance as P gets larger?

By looking at tables above and below we can easily to observe that when P gets larger, we can conclude as below:

1. Mean value μ_k is getting larger
2. Covariance C_k gets more value in the matrix.
3. Unweighted distance gets more and more inaccurate
4. Mahalanobis distance gets more and more accurate

6.3 part 3

Question: How does the performance of the two distance metrics compare?

The distance metrics for Mahalnobis for off diagnose side the value is get small and small, but unweighted is getting bigger

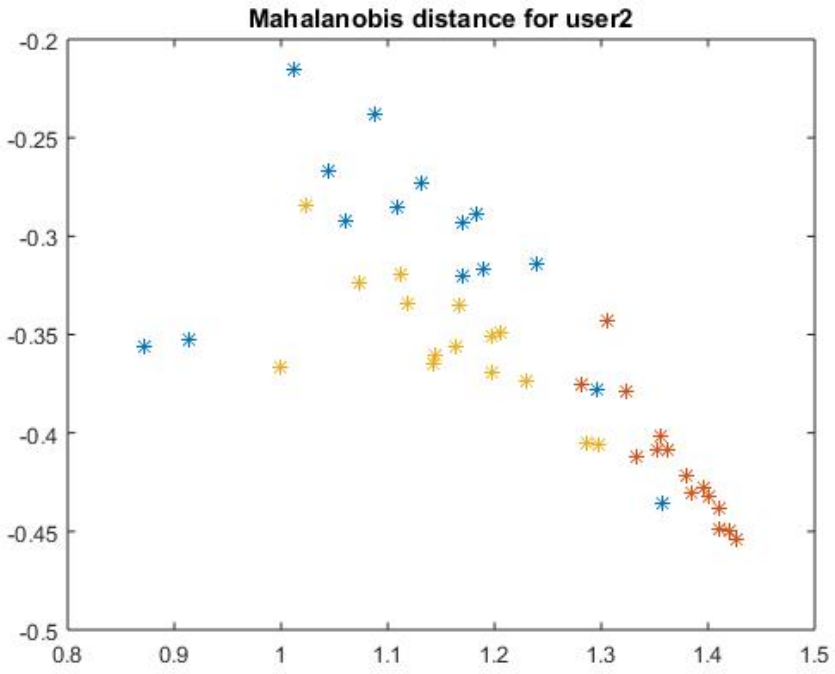

Figure 6.3: The scatter plot for user2 (Mahalanobis distance)

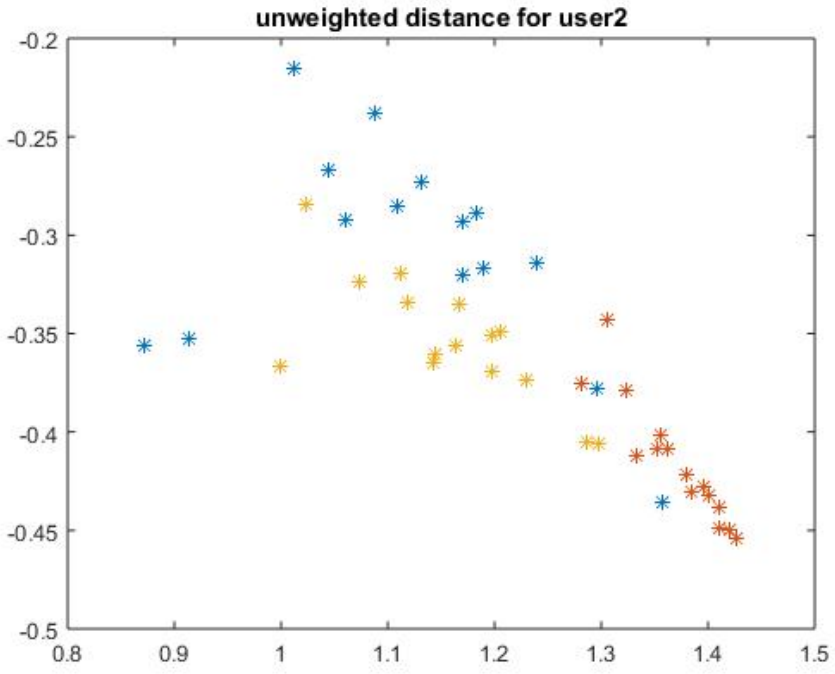

Figure 6.4: The scatter plot for user1 (Unweighted distance)

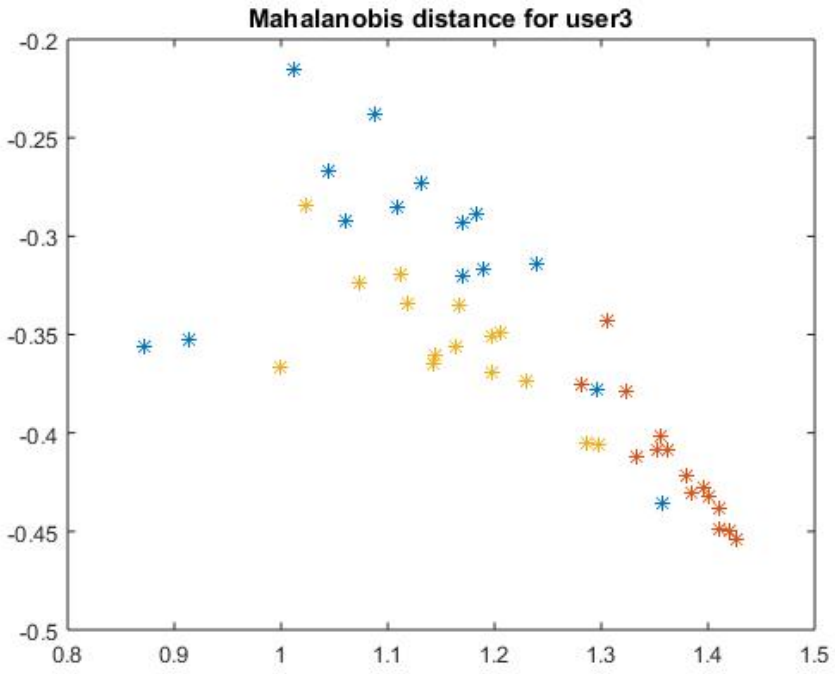

Figure 6.5: The scatter plot for user3 (Mahalanobis distance)

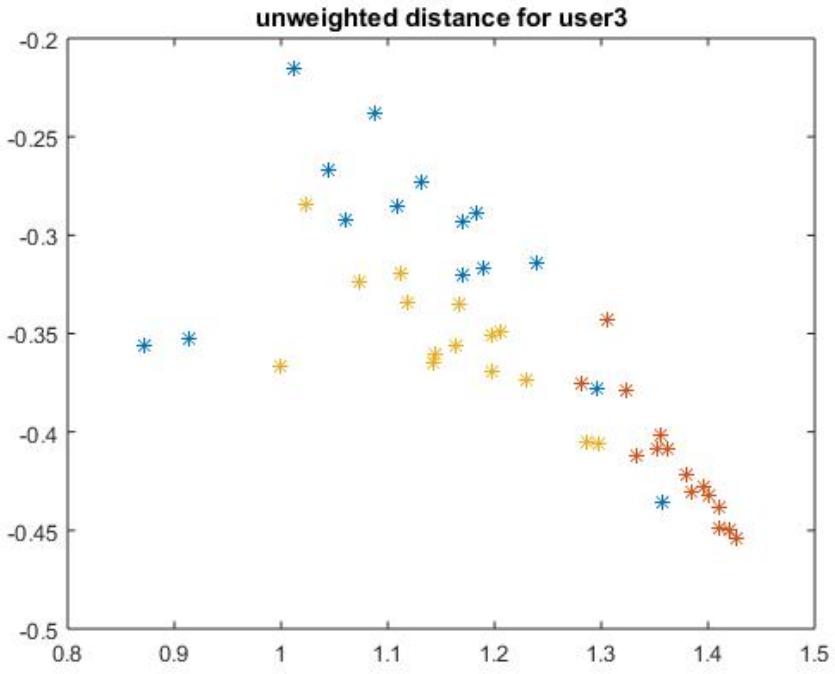

Figure 6.6: The scatter plot for user3 (Unweighted distance)

Table 6.1: table for accuracy(when P=2)

channel	user1.mat	user2.mat	user3.mat
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user1	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user3	user3
Mahalanobis result	user2	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user1	user1
Mahalanobis result	user1	user1	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result		user3	
Mahalanobis Accracy	15/16	13/17	8/16
unweighted result	user1	user2	user3
unweighted result	user1	user2	user3
unweighted result	user1	user2	user3
unweighted result	user1	user2	user1
unweighted result	user3	user2	user3
unweighted result	user1	user2	user3
unweighted result	user3	user2	user1
unweighted result	user1	user2	user2
unweighted result	user1	user2	user3
unweighted result	user2	user2	user2
unweighted result	user3	user2	user3
unweighted result	user1	user2	user2
unweighted result	user3	user2	user1
unweighted result	user1	user2	user3
unweighted result	user2	user2	user3
unweighted result	user1	user2	user3
unweighted result		user3	
Unweighted Accracy	10/16	16/17	10/16

Table 6.2: table for accuracy(when P=3)

channel	user1.mat	user2.mat	user3.mat
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result		user2	
Mahalanobis Accracy	16/16	17/17	16/16
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user1
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user1	user2	user1
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result		user2	
Unweighted Accracy	13/16	17/17	10/16

Table 6.3: table for accuracy(when P=4)

channel	user1.mat	user2.mat	user3.mat
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user3	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result		user2	
Mahalanobis Accracy	15/16	17/17	12/16
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user2
Unweighted result	user1	user2	user3
Unweighted result		user1	
Unweighted Accracy	12/16	17/17	14/16

Table 6.4: table for accuracy(when P=5)

channel	user1.mat	user2.mat	user3.mat
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result		user2	
Mahalanobis Accracy	16/16	17/17	12/16
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user1	user2	user2
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user2	user2	user3
Unweighted result	user1	user2	user3
Unweighted result		user2	
Unweighted Accracy	12/16	17/17	13/16

Table 6.5: table for accuracy(when P=6)

channel	user1.mat	user2.mat	user3.mat
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user3	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result		user2	
Mahalanobis Accracy	15/16	17/17	13/16
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user1	user3	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user3	user2	user2
Unweighted result	user1	user2	user3
Unweighted result		user2	
Unweighted Accracy	12/16	16/17	12/16

Table 6.6: table for accuracy(when P=8)

channel	user1.mat	user2.mat	user3.mat
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user1
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result		user2	
Mahalanobis Accracy	16/16	17/17	14/16
Unweighted result	user2	user2	user3
Unweighted result	user1	user1	user3
Unweighted result	user3	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user1	user1	user1
Unweighted result	user3	user2	user1
Unweighted result	user2	user2	user3
Unweighted result	user1	user2	user2
Unweighted result	user2	user1	user2
Unweighted result	user2	user1	user3
Unweighted result	user2	user2	user3
Unweighted result	user2	user2	user2
Unweighted result	user1	user2	user3
Unweighted result	user1	user2	user3
Unweighted result	user2	user2	user1
Unweighted result	user1	user2	user3
Unweighted result		user1	
Unweighted Accracy	7/16	11/17	10/16

Table 6.7: table for accuracy(when P=10)

channel	user1.mat	user2.mat	user3.mat
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user3	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result	user1	user2	user3
Mahalanobis result		user2	
Mahalanobis Accracy	15/16	17/17	14/16
Unweighted result	user1	user2	user3
Unweighted result	user1	user3	user3
Unweighted result	user1	user1	user1
Unweighted result	user2	user3	user3
Unweighted result	user1	user3	user1
Unweighted result	user3	user1	user1
Unweighted result	user2	user2	user3
Unweighted result	user1	user1	user2
Unweighted result	user2	user1	user2
Unweighted result	user1	user1	user3
Unweighted result	user2	user2	user3
Unweighted result	user2	user3	user2
Unweighted result	user2	user3	user3
Unweighted result	user2	user1	user3
Unweighted result	user2	user2	user1
Unweighted result	user1	user2	user3
Unweighted result		user3	
Unweighted Accracy	7/16	5/17	9/16