Brief summary of this function.

Detailed explanation of this function.

```
function FinalOutput = ACA_Analysis_Live(FileName)
load(FileName);
```

ACA Analysis

Use this script to analyze ACA assessments before and after training. User must load ACA assessment .mat file before running this script.

IMPORTANT: User should run participant's pre-training assessment BEFORE their post-training assessment.

Note: add a 'which PRL' to the large script

Below is specific to our pilot study, will probably be changed afterwards. First this deciphers whether the .mat file came from a pre- or post-training assessment, and send them to the necessary directory. The concept, I think should stay the same.

```
if c(2) == 10
    Directory = [cd '\PilotFigures\'];
    Subject = baseName(70:71);
    Post = 0;
    AnalysisName = [Directory Subject '_ACA_Analysis_PreTraining'];
elseif c(2) == 12
    Directory = [cd '\PostPilotFigures\'];
    Subject = baseName(70:71);
    Post = 1;
    AnalysisName = [Directory Subject '_ACA_Analysis_PostTraining'];
end
```

Variable Naming and Grouping, just for personal preference

User accuracy = rispo

Response time in seconds = time_stim

Matrices represent task setup for each of the task sections length is specific to length of each task section (acuity, then crowding, then attention), but increases as it encompasses each task section before it.

```
UserAcc = rispo;
ResponseTime = time_stim;
Acuity_Matrix = mixtrVA;
Crowding_Matrix = mixtrCW;
Attention_Matrix = mixtrAtt;
A_Length = length(Acuity_Matrix);
A_C_Length = (length(Acuity_Matrix)+length(Crowding_Matrix));
A_C_A_Length = (length(Acuity_Matrix)+length(Crowding_Matrix)+length(Attention_Matrix));
```

Note: Complete data output from a participant in each trial of each section should be as follows ...

Acuity: (1) Location, (2) Orientation, (3) Did participant get correct?, (4) How long did participant take?

Crowding: (1) Location, (2) Tangential or Radial, (3) Orientation, (4) Did participant get correct?, (5) How long did participant take?

Attention: (1) Location, (2) Was this a short cued (one), short uncued (two), long cued (three) or short uncued (four) trial?, (3) Did participant get correct?, (4) How long did participant take?

```
ACAAcuity = [Acuity_Matrix UserAcc(1:A_Length)' ResponseTime(1:A_Length)'];
ACACrowding = [Crowding_Matrix UserAcc(A_Length + 1:A_C_Length)' ResponseTime(A_Length + 1:A_C_

if totaltrial == 560
    ACAAttention = [Attention_Matrix UserAcc(A_C_Length + 1:A_C_A_Length)' ResponseTime(A_C_Len
else
    ACAAttention = [Attention_Matrix(1:trial,:) UserAcc(A_C_Length + 1:(A_C_A_Length-(480-lengt
end
```

Specify which trials are short cued/uncued and long cued/uncued within the attention matrix, as well as which trials the participant got correct -- we are only using trials the participant got correct to determine RT, as a control (said by Aaron 12/14/22).

```
Length_Correct_Attention_Trials_Short_Cued = length(ACAAttention(ACAAttention(:,2)==1));
Length_Correct_Attention_Trials_Short_UnCued = length(ACAAttention(ACAAttention(:,2)==2));
Length_Correct_Attention_Trials_Long_Cued = length(ACAAttention(ACAAttention(:,2)==3));
Length_Correct_Attention_Trials_Long_UnCued = length(ACAAttention(ACAAttention(:,2)==4));

Correct_Attention_Trials = ACAAttention(ACAAttention(:,3)==1,:);
Correct_Attention_Trials_Short_Cued = Correct_Attention_Trials(Correct_Attention_Trials(:,2)==1
Correct_Attention_Trials_Short_UnCued = Correct_Attention_Trials(Correct_Attention_Trials(:,2)=
Correct_Attention_Trials_Long_Cued = Correct_Attention_Trials(Correct_Attention_Trials(:,2)==3,
Correct_Attention_Trials_Long_UnCued = Correct_Attention_Trials(Correct_Attention_Trials(:,2)==
```

Take the "clean" trials (from my understanding, reaction times that have RT less than the mean + 3 standard deviations)) nanmean, nanstd removes any NaNs

```
Clean_Correct_Attention_Trials_Short_Cued = Correct_Attention_Trials_Short_Cued(Correct_Attenti
Clean_Correct_Attention_Trials_Short_UnCued = Correct_Attention_Trials_Short_UnCued(Correct_Att
Clean_Correct_Attention_Trials_Long_Cued = Correct_Attention_Trials_Long_Cued(Correct_Attentior
Clean_Correct_Attention_Trials_Long_UnCued = Correct_Attention_Trials_Long_UnCued(Correct_Atter
```

Use these clean trials to redefine reaction time for correct trials in each attention cue condition.

```
Attention_ShortCued_RT = nanmean(Clean_Correct_Attention_Trials_Short_Cued);
Attention_ShortUnCued_RT = nanmean(Clean_Correct_Attention_Trials_Short_UnCued);
Attention_LongCued_RT = nanmean(Clean_Correct_Attention_Trials_Long_Cued);
Attention_LongUnCued_RT = nanmean(Clean_Correct_Attention_Trials_Long_UnCued);
```

Determine amount of trials participant got correct in each.

```
Attention_Short_Cued_Percent_Correct = length(Correct_Attention_Trials_Short_Cued)/Length_Corre
Attention_Short_UnCued_Percent_Correct = length(Correct_Attention_Trials_Short_UnCued)/Length_C
Attention_Long_Cued_Percent_Correct = length(Correct_Attention_Trials_Long_UnCued)/Length_Corre
Attention_Long_UnCued_Percent_Correct = length(Correct_Attention_Trials_Long_UnCued)/Length_Cor
```

GRAPHING THRESHOLDS FOR ACUITY AND CROWDING TASK SEGMENTS

```
Acuity_Thresholds = ThreshlistVA;
if Post == 0
    figure
    scatter(1:length(Acuity_Thresholds), Acuity_Thresholds, 50,'b', 'filled')
    title([Subject ' Acuity'])
    xlabel('Trial Number')
    ylabel('Degrees of Visual Angle')
    Max_Acuity_Threshold_Pre = (max(Acuity_Thresholds));
    ylim([0 (Max_Acuity_Threshold_Pre*1.2)])
    set(gca, 'FontSize',17)
    savefig([Directory Subject 'ACAAcuityPreTraining.fig'])
    % close(gcf)
else
    %PreDirectory = ['./Pilot Assessments/' Subject '_ACA_Analysis_PreTraining'];
    openfig(['./PilotFigures/' Subject 'ACAAcuityPreTraining.fig']);
    hold on
    scatter(1:length(Acuity_Thresholds), Acuity_Thresholds, 50,'r','filled')
    legend('Baseline', 'Post')
    print([Directory Subject 'ACAAcuity'], '-dpng')
end
```

CROWDING

radial should be on same graph, tangential shoudl be on same graph. dont make them separate for pre and post

```
figure
Radial_Trial_Thresholds = ThreshlistCW(1,:)';
Tangential_Trial_Thresholds = ThreshlistCW(2,:)';

if Post == 0
    figure
    scatter(1:length(Radial_Trial_Thresholds), Radial_Trial_Thresholds + 0.031, 50 , 'k','fille
    ylabel('Degrees of Visual Angle')
    title([Subject ' Radial'])
    set(gca, 'FontSize',12)
    savefig([Directory Subject 'ACACrowdingRadPreTraining.fig'])

    figure
```

```
    scatter(1:length(Tangential_Trial_Thresholds), Tangential_Trial_Thresholds - 0.031, 50 , 'k
    title([Subject ' Tangential'])
    xlabel('Trial Number')
    ylabel('Degrees of Visual Angle')
    set(gca, 'FontSize',12)
    savefig([Directory Subject 'ACACrowdingTanPreTraining.fig'])
else
    openfig(['./PilotFigures/' Subject 'ACACrowdingRadPreTraining.fig']);
    %findaxes = findobj(Pre_CW,'Type','Axes');
    %findaxes(2);
    hold on
    scatter(1:length(Radial_Trial_Thresholds), Radial_Trial_Thresholds + 0.031, 50 , 'r','fille
    legend('Baseline', 'Post')
    print([Directory Subject 'ACAACrowdingRad'], '-dpng')

    openfig(['./PilotFigures/' Subject 'ACACrowdingTanPreTraining.fig']);
    hold on
    scatter(1:length(Tangential_Trial_Thresholds), Tangential_Trial_Thresholds - 0.031, 50 , 'r
    legend('Baseline', 'Post')
    set(gca, 'FontSize',12)
    print([Directory Subject 'ACAACrowdingTan'], '-dpng')
end
```

ATTENTION

First, run t-tests for both accuracy and reaction time between cued and uncued trials.

Note from kristina: add confidence intervals as error bars to these graphs.

put accuracy and rt on the same plane (doesnt have to be in same graph but across)

```
% Reaction Time
[ShortCued_vs_Uncued_RT_h ShortCued_vs_Uncued_RT_p ShortCued_vs_Uncued_RT_ci] = ttest2(Clean_Co
[LongCued_vs_Uncued_RT_h LongCued_vs_Uncued_RT_p LongCued_vs_Uncued_RT_ci] = ttest2(Clean_Corre


% Percent Correctness
[ShortCued_vs_Uncued_Acc_h ShortCued_vs_Uncued_Acc_p ShortCued_vs_Uncued_Acc_ci] = ttest2(Atten
[LongCued_vs_Uncued_Acc_h LongCued_vs_Uncued_Acc_p LongCued_vs_Uncued_Acc_ci ] = ttest2(Attenti
```

Map Correctness and RT between short cued and uncued trials. Also plot the p-value from the t-test on the graphs.

```
if Post == 0
    figure
    p = tiledlayout(2,2);
    p.Padding = "compact";
    p.TileSpacing = 'compact';
    nexttile(1)
    bar(1, Attention_Short_Cued_Percent_Correct,  'g')
    hold on
```

```
    bar(2, Attention_Short_UnCued_Percent_Correct, 'c')
    hold on
    legend('Cued', 'Uncued')
    ylabel('Percent Correct')
    title([Subject ' Short ISI Accuracy Baseline'])
    Max_Short_Acc = max([Attention_Short_Cued_Percent_Correct Attention_Short_UnCued_Percent_Co
   % text(0.1, Max_Short_Acc/2, ['p = ' num2str(ShortCued_vs_Uncued_Acc_p)]);
    text(0.65, Max_Short_Acc/2, [num2str(Attention_Short_Cued_Percent_Correct) '%'],'FontWeight
    text(1.7, Max_Short_Acc/2, [num2str(Attention_Short_UnCued_Percent_Correct) '%'],'FontWeigh
    ylim([0.3 100])

    nexttile(3)
    bar(1, Attention_ShortCued_RT, 'g')
    hold on
    bar(2, Attention_ShortUnCued_RT, 'c')
    hold on
    legend ('Cued', 'Uncued')
    ylabel('Reaction Time (s)')
    title([ Subject ' Short ISI RT Baseline'])
    Max_Short_ISI_RT = max([Attention_ShortCued_RT Attention_ShortUnCued_RT]);
    ylim([Max_Short_ISI_RT*0.3 Max_Short_ISI_RT*1.2])
    text(0.1, Max_Short_ISI_RT, ['p = ' num2str(ShortCued_vs_Uncued_RT_p)]);
    text(0.65, Max_Short_ISI_RT/2, [num2str(Attention_ShortCued_RT) 's'],'FontWeight','bold');
    text(1.7, Max_Short_ISI_RT/2, [num2str(Attention_ShortUnCued_RT) 's'],'FontWeight','bold');
    savefig([Directory Subject 'ACAAttentionPreTraining.fig'])
else
    openfig(['./PilotFigures/' Subject 'ACAAttentionPreTraining.fig']);
    hold on
    nexttile(2)
    bar(1, Attention_Short_Cued_Percent_Correct, 'g')
    hold on
    bar(2, Attention_Short_UnCued_Percent_Correct, 'c')
    hold on
    legend('Cued', 'Uncued')
    ylabel('Percent Correct')
    title([Subject ' Short ISI Attention Accuracy Post'])
    Max_Short_Acc = max([Attention_Short_Cued_Percent_Correct Attention_Short_UnCued_Percent_Co
    %text(0.1, Max_Short_Acc/2, ['p = ' num2str(ShortCued_vs_Uncued_Acc_p)]);
    text(0.65, Max_Short_Acc/2, [num2str(Attention_Short_Cued_Percent_Correct) '%'],'FontWeight
    text(1.7, Max_Short_Acc/2, [num2str(Attention_Short_UnCued_Percent_Correct) '%'],'FontWeigh
    ylim([0.3 100])

    nexttile(4)
    bar(1, Attention_ShortCued_RT, 'g')
    hold on
    bar(2, Attention_ShortUnCued_RT, 'c')
    hold on
    legend ('Cued', 'Uncued')
    ylabel('Reaction Time (s)')
    title([ Subject ' Short ISI Attention RT Post'])
```

```
    Max_Short_ISI_RT = max([Attention_ShortCued_RT Attention_ShortUnCued_RT]);
    ylim([Max_Short_ISI_RT*0.3 Max_Short_ISI_RT*1.2])
    text(0.1, Max_Short_ISI_RT, ['p = ' num2str(ShortCued_vs_Uncued_RT_p)]);
    text(0.7, Max_Short_ISI_RT/2, [num2str(Attention_ShortCued_RT) 's'],'FontWeight','bold');
    text(1.7, Max_Short_ISI_RT/2, [num2str(Attention_ShortUnCued_RT) 's'],'FontWeight','bold');
    print([Directory Subject 'ACAattentionShort'], '-dpng', '-r300');
end
```

Do the same with the trials with a long ISI.

```
if Post == 0
    figure
    p = tiledlayout(2,2);
    p.Padding = "compact";
    p.TileSpacing = 'compact';
    nexttile(1)
    bar(1, Attention_Long_Cued_Percent_Correct, 'g')
    hold on
    bar(2, Attention_Long_UnCued_Percent_Correct, 'c')
    hold on
    legend('Cued', 'Uncued')
    ylabel('Percent Correct')
    title([Subject ' Long ISI Accuracy Baseline'])
    Max_Long_Acc = max([Attention_Long_Cued_Percent_Correct Attention_Long_UnCued_Percent_Corre
    %text(0.1, Max_Long_Acc/2, ['p = ' num2str(LongCued_vs_Uncued_Acc_p)]);
    text(0.65, Max_Long_Acc/2, [num2str(Attention_Long_Cued_Percent_Correct) '%'],'FontWeight',
    text(1.7, Max_Long_Acc/2, [num2str(Attention_Long_UnCued_Percent_Correct) '%'],'FontWeight
    ylim([0.3 100])

    nexttile(3)
    bar(1, Attention_LongCued_RT, 'g')
    hold on
    bar(2, Attention_LongUnCued_RT, 'c')
    hold on
    legend ('Cued', 'Uncued')
    ylabel('Reaction Time (s)')
    title([ Subject ' Long ISI RT Baseline'])
    Max_Long_ISI_RT = max([Attention_LongCued_RT Attention_LongUnCued_RT]);
    ylim([Max_Long_ISI_RT*0.3 Max_Long_ISI_RT*1.2])
    text(0.1, Max_Long_ISI_RT, ['p = ' num2str(LongCued_vs_Uncued_RT_p)]);
    text(0.65, Max_Long_ISI_RT/2, [num2str(Attention_LongCued_RT) ' s'],'FontWeight','bold');
    text(1.7, Max_Long_ISI_RT/2, [num2str(Attention_LongUnCued_RT) ' s'],'FontWeight','bold');
    savefig([Directory Subject 'ACAAttentionLongPreTraining.fig'])
else
    openfig(['./PilotFigures/' Subject 'ACAAttentionLongPreTraining.fig']);
    hold on
    nexttile(2)
    bar(1, Attention_Long_Cued_Percent_Correct, 'g')
    hold on
    bar(2, Attention_Long_UnCued_Percent_Correct, 'c')
```

```
    hold on
    legend('Cued', 'Uncued')
    ylabel('Percent Correct')
    title([Subject ' Long ISI Accuracy Post'])
    Max_Long_Acc = max([Attention_Long_Cued_Percent_Correct Attention_Long_UnCued_Percent_Corre
    %text(0.1, Max_Long_Acc/2, ['p = ' num2str(LongCued_vs_Uncued_Acc_p)]);
    text(0.65, Max_Long_Acc/2, [num2str(Attention_Long_Cued_Percent_Correct) '%'],'FontWeight',
    text(1.7, Max_Long_Acc/2, [num2str(Attention_Long_UnCued_Percent_Correct) '%'],'FontWeight'
    ylim([0.3 100])

    nexttile(4)
    bar(1, Attention_LongCued_RT, 'g')
    hold on
    bar(2, Attention_LongUnCued_RT, 'c')
    hold on
    legend ('Cued', 'Uncued')
    ylabel('Reaction Time (s)')
    title([ Subject ' Long ISI RT Post'])
    Max_Long_ISI_RT = max([Attention_LongCued_RT Attention_LongUnCued_RT]);
    ylim([Max_Long_ISI_RT*0.3 Max_Long_ISI_RT*1.2])
    text(0.1, Max_Long_ISI_RT, ['p = ' num2str(LongCued_vs_Uncued_RT_p)]);
    text(0.65, Max_Long_ISI_RT/2, [num2str(Attention_LongCued_RT) ' s'],'FontWeight','bold');
    text(1.7, Max_Long_ISI_RT/2, [num2str(Attention_LongUnCued_RT) ' s'],'FontWeight','bold');
    print([Directory Subject 'ACAattentionLong'], '-dpng', '-r300');
end
```

PRL-specific Analysis: Acuity

Here, take the acuity section and separate each by the PRL location that appeared during the trial. Then, we want to clean it up (like before, (from my understanding, reaction times that have RT less than the mean + 3 standard deviations)). Then, only use the correct trials for RT, but also separate accuracy itself for analysis. Due to processing, trials with negative reaction times have appeared, those are removed in lines 249-255 (turned into NaNs then removed when nanmean is used).

NOTE: add

```
AcuityThreshList = [Acuity_Matrix nan(length(Acuity_Matrix),1) ResponseTime(1:length(Acuity_Mat

for iu=1:length(xlocs)
    AcuityThreshListPRL(:,:,iu)=AcuityThreshList(AcuityThreshList(:,1)==iu,:);
end

for iu = 1:length(xlocs)
    CleanAcuityThreshListPRL{:,:,iu}=AcuityThreshListPRL(AcuityThreshListPRL(:,4,iu)<(nanmean(A
end
```

```
for i = 1:length(xlocs)
    for iu = 1:length(CleanAcuityThreshListPRL{i}(:,4,1))
        if CleanAcuityThreshListPRL{i}(iu,4,1) < 0
            CleanAcuityThreshListPRL{i}(iu,4,1) = nan;
        end
    end
end

for iu=1:length(xlocs)
    Accuracy_Acuity_PRL(iu)=sum(AcuityThreshListPRL(:,5,iu))/length(AcuityThreshListPRL(:,5,iu)

    RT_Acuity_PRL(iu)=nanmean(CleanAcuityThreshListPRL{iu}(:,4,1));
end

if Post == 0
    figure
    subplot(2,1,1)
    scatter(0,0, 'k', 'filled')

    for ui=1:length(xlocs)
        hold on
        score = num2str(Accuracy_Acuity_PRL(ui));
        if length(score)>4
            score = score(1:4);
        end
        Acuity_Acc(ui)=str2num(score);
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Acuity Accuracy'])
    set (gca,'YDir','reverse');

    subplot(2,1,2)
    scatter(0,0, 'k', 'filled')

    for ui = 1:length(xlocs)
        hold on
        score = num2str(RT_Acuity_PRL(ui));

        if length(score)>4
            score = score(1:4);
        end
        Acuity_RT(ui)=str2num(score);
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')

        hold on
    end
    xlim([-20 20])
```

```
    ylim([-15 15])
    title([Subject ' Acuity RT'])
    set (gca,'YDir','reverse');
    savefig([Directory Subject 'ACAAcuityPRLPreTraining.fig'])
else
    Pre_PRL_Acu = openfig(['./PilotFigures/' Subject 'ACAAcuityPRLPreTraining.fig']);
    hold on
    PreDirectory = ['./PilotFigures/' Subject '_ACA_Analysis_PreTraining.mat'];
    Past_PRLAcuityrectime = load(PreDirectory, 'RT_Acuity_PRL');
    Prev_PRL_Acuity_RT = Past_PRLAcuityrectime.RT_Acuity_PRL;
    Past_PRLAcuityacc = load(PreDirectory, 'Accuracy_Acuity_PRL');
    Prev_PRL_Acuity_Acc = Past_PRLAcuityacc.Accuracy_Acuity_PRL;
    findaxes = findobj(Pre_PRL_Acu,'Type','Axes');


    for i = 1:length(xlocs)
        if Accuracy_Acuity_PRL(i) > Prev_PRL_Acuity_Acc(i)
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(Accuracy_Acuity_PRL(i)),"Color",'g','FontSize',
        elseif Accuracy_Acuity_PRL(i) < Prev_PRL_Acuity_Acc(i)
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(Accuracy_Acuity_PRL(i)),"Color",'r','FontSize',
        else
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(Accuracy_Acuity_PRL(i)),"Color",'k','FontSize',
        end
    end


    for i = 1:length(xlocs)
        if RT_Acuity_PRL(i) < Prev_PRL_Acuity_RT(i)
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(RT_Acuity_PRL(i)),"Color",'g','FontSize',13,'Fo
        elseif RT_Acuity_PRL(i) > Prev_PRL_Acuity_RT(i)
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(RT_Acuity_PRL(i)),"Color",'r','FontSize',13,'Fo
        else
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(RT_Acuity_PRL(i)),"Color",'k','FontSize',13,'Fo
        end
    end
end
```

PRL-Specific Analysis: Crowding

```
xlocs = (xlocs-3.5);
xlocs(2) = 8;
xlocs(4) = -17;
CrowdingThreshList = [Crowding_Matrix separation(length(Acuity_Matrix) + 1:(length(Acuity_Matri
CrowdingThreshList_Radial = CrowdingThreshList(CrowdingThreshList(:,2) == 1,:);
```

```
CrowdingThreshList_Tangential = CrowdingThreshList(CrowdingThreshList(:,2) == 2,:);

for iu=1:length(xlocs)
    CrowdingThreshListPRL_Radial(:,:,iu)=CrowdingThreshList_Radial(CrowdingThreshList_Radial(:,
    CrowdingThreshListPRL_Tangential(:,:,iu)=CrowdingThreshList_Tangential(CrowdingThreshList_T
end



for iu = 1:length(xlocs)
    Crowding_Radial_Accuracy(iu) = sum(CrowdingThreshListPRL_Radial(:,6,iu))/length(CrowdingThr
    Crowding_Tangential_Accuracy(iu) = sum(CrowdingThreshListPRL_Tangential(:,6,iu))/length(Cro
    CleanCWRadThreshListPRL{:,:,iu}=CrowdingThreshListPRL_Radial(CrowdingThreshListPRL_Radial(:
    CleanCWTanThreshListPRL{:,:,iu}=CrowdingThreshListPRL_Tangential(CrowdingThreshListPRL_Tang
end


for i = 1:length(xlocs)
    for iu = 1:length(CleanCWRadThreshListPRL{i}(:,4,1))
        if CleanCWRadThreshListPRL{i}(iu,4,1) < 0
            CleanCWRadThreshListPRL{i}(iu,4,1) = nan;
        end
    end
end
for i = 1:length(xlocs)
    for iu = 1:length(CleanCWTanThreshListPRL{i}(:,4,1))
        if CleanCWTanThreshListPRL{i}(iu,4,1) < 0
            CleanCWTanThreshListPRL{i}(iu,4,1) = nan;
        end
    end
end

for iu=1:length(xlocs)
    Crowding_Radial_RT(iu)=nanmean(CleanCWRadThreshListPRL{iu}(:,4,1));
    Crowding_Tangential_RT(iu)=nanmean(CleanCWTanThreshListPRL{iu}(:,4,1));
end


% for i = 1:length(xlocs)
%     for iu = 1:length(Crowding_Radial_RT{i}(:,4,1))
%         if Crowding_Radial_RT{i}(iu,4,1) < 0
%             Crowding_Radial_RT{i}(iu,4,1) = nan;
%         end
%     end
%     for iu = 1:length(Crowding_Tangential_RT{i}(:,4,1))
%         if Crowding_Tangential_RT{i}(iu,4,1) < 0
%             Crowding_Tangential_RT{i}(iu,4,1) = nan;
%         end
%     end
% end
```

```
if Post == 0
    figure
    subplot(2,2,1)
    scatter(0,0, 'k', 'filled')

    for ui=1:length(xlocs)
        hold on
        score = num2str(Crowding_Radial_Accuracy(ui));
        if length(score)>4
            score = score(1:4);
        end
        Radial_Acc(ui)=str2num(score);
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Radial Accuracy'])
    set (gca,'YDir','reverse');

    subplot(2,2,2)
    scatter(0,0, 'k', 'filled')

    for ui = 1:length(xlocs)
        hold on
        score = num2str(Crowding_Radial_RT(ui));

        if length(score)>4
            score = score(1:4);
        end
        Radial_RT(ui)=str2num(score);
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')

        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Radial RT'])
    set (gca,'YDir','reverse');

    subplot(2,2,3)
    scatter(0,0, 'k', 'filled')

    for ui=1:length(xlocs)
        hold on
        score = num2str(Crowding_Tangential_Accuracy(ui));
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
```

```
        crowdingtangentialAcc(ui)=str2num(score);
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Tangential Accuracy'])
    set (gca,'YDir','reverse');

    subplot(2,2,4)
    scatter(0,0, 'k', 'filled')
    for ui=1:length(xlocs)
        %scatter(xlocs(ui),ylocs(ui))
        hold on
        score=num2str(Crowding_Tangential_RT(ui));
        crowdingtangentialRT(ui)=str2num(score);
        if length(score)>4
            score=score(1:4);
        end
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Tangential RT'])
    set (gca,'YDir','reverse');

    savefig([Directory Subject 'ACACrowdingPRLPreTraining.fig'])
else
    Pre_PRL_CW = openfig(['./PilotFigures/' Subject 'ACACrowdingPRLPreTraining.fig']);
    hold on
    PreDirectory = ['./PilotFigures/' Subject '_ACA_Analysis_PreTraining.mat'];
    Past_PRLCWRadrectime = load(PreDirectory, 'Crowding_Radial_RT');
    Prev_PRL_CW_Rad_RT = Past_PRLCWRadrectime.Crowding_Radial_RT;
    Past_PRLCW_Rad_acc = load(PreDirectory, 'Crowding_Radial_Accuracy');
    Prev_PRL_Rad_CW_Acc = Past_PRLCW_Rad_acc.Crowding_Radial_Accuracy;
    Past_PRLCWTanrectime = load(PreDirectory, 'Crowding_Tangential_RT');
    Prev_PRL_CW_Tan_RT = Past_PRLCWTanrectime.Crowding_Tangential_RT;
    Past_PRLCW_Tan_acc = load(PreDirectory, 'Crowding_Tangential_Accuracy');
    Prev_PRL_CW_Tan_Acc = Past_PRLCW_Tan_acc.Crowding_Tangential_Accuracy;
    findaxes = findobj(Pre_PRL_CW,'Type','Axes');



    for i = 1:length(xlocs)
        if Crowding_Radial_Accuracy(i) > Prev_PRL_Rad_CW_Acc(i)
            axes(findaxes(4))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Radial_Accuracy(i)),"Color",'g','FontS
        elseif Crowding_Radial_Accuracy(i) < Prev_PRL_Rad_CW_Acc(i)
            axes(findaxes(4))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Radial_Accuracy(i)),"Color",'r','FontS
```

```
        else
            axes(findaxes(4))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Radial_Accuracy(i)),"Color",'k','FontS
        end
    end

    for i = 1:length(xlocs)
        if Crowding_Radial_RT(i) < Prev_PRL_CW_Rad_RT(i)
            axes(findaxes(3))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Radial_RT(i)),"Color",'g','FontSize',1
        elseif Crowding_Radial_RT(i) > Prev_PRL_CW_Rad_RT(i)
            axes(findaxes(3))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Radial_RT(i)),"Color",'r','FontSize',1
        else
            axes(findaxes(3))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Radial_RT(i)),"Color",'k','FontSize',1
        end
    end

    for i = 1:length(xlocs)
        if Crowding_Tangential_Accuracy(i) > Prev_PRL_CW_Tan_Acc(i)
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Tangential_Accuracy(i)),"Color",'g','F
        elseif Crowding_Tangential_Accuracy(i) < Prev_PRL_CW_Tan_Acc(i)
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Tangential_Accuracy(i)),"Color",'r','F
        else
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Tangential_Accuracy(i)),"Color",'k','F
        end
    end


    for i = 1:length(xlocs)
        if Crowding_Tangential_RT(i) < Prev_PRL_CW_Tan_RT(i)
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Tangential_RT(i)),"Color",'g','FontSiz
        elseif Crowding_Tangential_RT(i) > Prev_PRL_CW_Tan_RT(i)
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Tangential_RT(i)),"Color",'r','FontSiz
        else
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(Crowding_Tangential_RT(i)),"Color",'k','FontSiz
        end
    end
end
```

Attention PRL

```

```

```
% if totaltrial == 560
%     ACAAttention=[Attention_Matrix ResponseTime(length(Acuity_Matrix)+1+length(Crowding_Matri
% else
%     ACAAttention=[Attention_Matrix((1:240-length(totaltrial)),:) ResponseTime(length(Acuity_M
% end
% %ACAAttention=[mixtrAtt time_stim(length(mixtrVA)+1+length(mixtrCW):(length(mixtrVA)+length(m

%[mixtrAtt rispo(length(mixtrVA)+length(mixtrCW)+1:(length(mixtrVA)+length(mixtrCW)+length(mixt


ACAAttentionshortcued=ACAAttention(ACAAttention(:,2)==1,:);
ACAAttentionshortuncued=ACAAttention(ACAAttention(:,2)==2,:);
ACAAttentionlongcued=ACAAttention(ACAAttention(:,2)==3,:);
ACAAttentionlonguncued=ACAAttention(ACAAttention(:,2)==4,:);

for iu=1:length(xlocs)
    %column 1: location
    %column 2: cue type (1:short cued, 2: short uncued, 3: long cued, 4: long
    %uncued)
    %column 3: RT
    %column 4: corr resp
    %ACAAttentionshortcuedPRL(:,:,iu)=ACAAttentionshortcued(ACAAttentionshortcued(:,1)==iu,:);
    %ACAAttentionshortuncuedPRL(:,:,iu)=ACAAttentionshortuncued(ACAAttentionshortuncued(:,1)==i
    %ACAAttentionlongcuedPRL(:,:,iu)=ACAAttentionlongcued(ACAAttentionlongcued(:,1)==iu,:);
    %ACAAttentionlonguncuedPRL(:,:,iu)=ACAAttentionlonguncued(ACAAttentionlonguncued(:,1)==iu,



    ACAAttentionshortcuedPRL{iu}=ACAAttentionshortcued(ACAAttentionshortcued(:,1)==iu,:);
    ACAAttentionshortuncuedPRL{iu}=ACAAttentionshortuncued(ACAAttentionshortuncued(:,1)==iu,:);
    ACAAttentionlongcuedPRL{iu}=ACAAttentionlongcued(ACAAttentionlongcued(:,1)==iu,:);
    ACAAttentionlonguncuedPRL{iu}=ACAAttentionlonguncued(ACAAttentionlonguncued(:,1)==iu,:);

end
%listOfThreshCW=[mixtrCW ThreshlistCW time_stim(1:length(mixtrVA))']

for iu=1:length(xlocs)
    CorrAttPRLshortcued(iu)=sum(ACAAttentionshortcuedPRL{iu}(:,4))/length(ACAAttentionshortcued
    RTAttPRLshortcued(iu)=nanmean(ACAAttentionshortcuedPRL{iu}(:,3));
    STDAttPRLshortcued(iu)=nanstd(ACAAttentionshortcuedPRL{iu}(:,3));

    %outlier removal
    clear upperborder lowerborder

    upperborder=RTAttPRLshortcued(iu)+2*STDAttPRLshortcued(iu);
    lowerborder=RTAttPRLshortcued(iu)-2*STDAttPRLshortcued(iu);

    for ui=1:length(ACAAttentionshortcuedPRL{iu}(:,3))
        if ACAAttentionshortcuedPRL{iu}(ui,3)> upperborder || ACAAttentionshortcuedPRL{iu}(ui,3
```

```
            ACAAttentionshortcuedPRL{iu}(ui,3)=NaN;

            shortcuedoutlier=1;
        end
    end
    if exist('shortcuedoutlier')
        RTAttPRLshortcued(iu)=nanmean(ACAAttentionshortcuedPRL{iu}(:,3));
    end

    CorrAttPRLshortuncued(iu)=sum(ACAAttentionshortuncuedPRL{iu}(:,4))/length(ACAAttentionshort
    RTAttPRLshortuncued(iu)=nanmean(ACAAttentionshortuncuedPRL{iu}(:,3));
    STDAttPRLshortuncued(iu)=nanstd(ACAAttentionshortuncuedPRL{iu}(:,3));

    %outlier removal
    clear upperborder lowerborder

    upperborder=RTAttPRLshortuncued(iu)+2*STDAttPRLshortuncued(iu);
    lowerborder=RTAttPRLshortuncued(iu)-2*STDAttPRLshortuncued(iu);

    for ui=1:length(ACAAttentionshortuncuedPRL{iu}(:,3))
        if ACAAttentionshortuncuedPRL{iu}(ui,3)> upperborder || ACAAttentionshortuncuedPRL{iu}(

            ACAAttentionshortuncuedPRL{iu}(ui,3)=NaN;

            shortuncuedoutlier=1;
        end
    end
    if exist('shortuncuedoutlier')
        RTAttPRLshortuncued(iu)=nanmean(ACAAttentionshortuncuedPRL{iu}(:,3));
    end




    CorrAttPRLlongcued(iu)=sum(ACAAttentionlongcuedPRL{iu}(:,4))/length(ACAAttentionlongcuedPRL
    RTAttPRLlongcued(iu)=nanmean(ACAAttentionlongcuedPRL{iu}(:,3));
    STDAttPRLlongcued(iu)=nanstd(ACAAttentionlongcuedPRL{iu}(:,3));

    %outlier removal
    clear upperborder lowerborder

    upperborder=RTAttPRLlongcued(iu)+2*STDAttPRLlongcued(iu);
    lowerborder=RTAttPRLlongcued(iu)-2*STDAttPRLlongcued(iu);

    for ui=1:length(ACAAttentionlongcuedPRL{iu}(:,3))
        if ACAAttentionlongcuedPRL{iu}(ui,3)> upperborder || ACAAttentionlongcuedPRL{iu}(ui,3)<

            ACAAttentionlongcuedPRL{iu}(ui,3)=NaN;

            longcuedoutlier=1;
```

```
        end
    end
    if exist('longcuedoutlier')
        RTAttPRLlongcued(iu)=nanmean(ACAAttentionlongcuedPRL{iu}(:,3));
    end

    CorrAttPRLlonguncued(iu)=sum(ACAAttentionlonguncuedPRL{iu}(:,4))/length(ACAAttentionlonguncu
    RTAttPRLlonguncued(iu)=nanmean(ACAAttentionlonguncuedPRL{iu}(:,3));
    STDAttPRLlonguncued(iu)=nanstd(ACAAttentionlonguncuedPRL{iu}(:,3));

    %outlier removal
    clear upperborder lowerborder
    upperborder=RTAttPRLlonguncued(iu)+2*STDAttPRLlonguncued(iu);
    lowerborder=RTAttPRLlonguncued(iu)-2*STDAttPRLlonguncued(iu);

    for ui=1:length(ACAAttentionlonguncuedPRL{iu}(:,3))
        if ACAAttentionlonguncuedPRL{iu}(ui,3)> upperborder || ACAAttentionlonguncuedPRL{iu}(ui

            ACAAttentionlonguncuedPRL{iu}(ui,3)=NaN;

            longcuedoutlier=1;
        end
    end
    if exist('longuncuedoutlier')
        RTAttPRLlonguncued(iu)=nanmean(ACAAttentionlonguncuedPRL{iu}(:,3));
    end


end

for i = 1:length(CorrAttPRLlonguncued)
        if CorrAttPRLlonguncued(i) < 0
            CorrAttPRLlonguncued(i) = 0;
        end
end

for i = 1:length(CorrAttPRLshortuncued)
        if CorrAttPRLshortuncued(i) < 0
            CorrAttPRLshortuncued(i) = 0;
        end
end

for i = 1:length(CorrAttPRLlongcued)
        if CorrAttPRLlongcued(i) < 0
            CorrAttPRLlongcued(i) = 0;
        end
end

for i = 1:length(CorrAttPRLshortcued)
        if CorrAttPRLshortcued(i) < 0
```

```
            CorrAttPRLshortcued(i) = 0;
        end
end
```

plot attention

```
if Post == 0
    figure
    subplot(2,2,1)
    scatter(0,0, 'k', 'filled')
    for ui=1:length(xlocs)
        hold on
        %score=num2str(CorrAttPRL(ui));
        score=num2str(CorrAttPRLshortuncued(ui)-CorrAttPRLshortcued(ui));
        shortcueAcc(ui)=str2num(score);
        % if length(score)>4
        %     score=score(1:4);
        % end
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Short Acc (% Uncued - % Cued)'])
    set (gca,'YDir','reverse');

    subplot(2,2,3)

    scatter(0,0, 'k', 'filled')
    for ui=1:length(xlocs)
        hold on
        score=num2str(RTAttPRLshortcued(ui)-RTAttPRLshortuncued(ui));
        shortcueRT(ui)=str2num(score);
        % if length(score)>4
        %     score=score(1:4);
        % end
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Short Cued RT (cued-uncued)'])
    set (gca,'YDir','reverse');


    subplot(2,2,2)
```

```
    scatter(0,0, 'k', 'filled')
    for ui=1:length(xlocs)
        hold on
        score=num2str(CorrAttPRLlonguncued(ui)-CorrAttPRLlongcued(ui));
        longcueAcc(ui)=str2num(score);
        % if length(score)>4
        %     score=score(1:4);
        % end
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Long Acc (%uncued-%cued)'])
    set (gca,'YDir','reverse');


    subplot(2,2,4)

    scatter(0,0, 'k', 'filled')
    for ui=1:length(xlocs)
        hold on
        score=num2str(RTAttPRLlongcued(ui)-RTAttPRLlonguncued(ui));
        longcueRT(ui)=str2num(score);
        % if length(score)>4
        %     score=score(1:4);
        % end
        text(xlocs(ui),ylocs(ui), score,'FontSize',13,'FontWeight','bold')
        hold on
    end
    xlim([-20 20])
    ylim([-15 15])
    title([Subject ' Long Cue RT (cued-uncued)'])
    set (gca,'YDir','reverse');
    savefig([Directory Subject 'ACAAttentionPRLPreTraining.fig'])
else
    Pre_PRL_Att = openfig(['./PilotFigures/' Subject 'ACAAttentionPRLPreTraining.fig']);
    hold on
    PreDirectory = ['./PilotFigures/' Subject '_ACA_Analysis_PreTraining.mat'];
    Past_PRLAttLongrectime = load(PreDirectory, 'longcueRT');
    Prev_PRL_Att_Long_RT = Past_PRLAttLongrectime.longcueRT;
    Past_PRLAtt_Long_acc = load(PreDirectory, 'longcueAcc');
    Prev_PRL_Long_Att_Acc = Past_PRLAtt_Long_acc.longcueAcc;
    Past_PRLAttShortrectime = load(PreDirectory, 'shortcueRT');
    Prev_PRL_Att_Short_RT = Past_PRLAttShortrectime.shortcueRT;
    Past_PRLAtt_Short_acc = load(PreDirectory, 'shortcueAcc');
    Prev_PRL_Att_Short_Acc = Past_PRLAtt_Short_acc.shortcueAcc;
    findaxes = findobj(Pre_PRL_Att,'Type','Axes');
```

```
for ui=1:length(xlocs)
    hold on
    %score=num2str(CorrAttPRL(ui));
    score=num2str(CorrAttPRLshortuncued(ui)-CorrAttPRLshortcued(ui));
    shortcueAcc(ui)=str2num(score);
    % if length(score)>4
    %     score=score(1:4);
end
for ui=1:length(xlocs)
    hold on
    score=num2str(RTAttPRLshortcued(ui)-RTAttPRLshortuncued(ui));
    shortcueRT(ui)=str2num(score);
end
for ui=1:length(xlocs)
    hold on
    score=num2str(CorrAttPRLlonguncued(ui)-CorrAttPRLlongcued(ui));
    longcueAcc(ui)=str2num(score);
end
for ui=1:length(xlocs)
    hold on
    score=num2str(RTAttPRLlongcued(ui)-RTAttPRLlonguncued(ui));
    longcueRT(ui)=str2num(score);
end
for i = 1:length(xlocs)
    if longcueAcc(i) > Prev_PRL_Long_Att_Acc(i)
        axes(findaxes(4))
        text(xlocs(i),ylocs(i) + 3, num2str(longcueAcc(i)),"Color",'g','FontSize',13,'FontW
    elseif longcueAcc(i) < Prev_PRL_Long_Att_Acc(i)
        axes(findaxes(4))
        text(xlocs(i),ylocs(i) + 3, num2str(longcueAcc(i)),"Color",'r','FontSize',13,'FontW
    else
        axes(findaxes(4))
        text(xlocs(i),ylocs(i) + 3, num2str(longcueAcc(i)),"Color",'k','FontSize',13,'FontW
    end
end

for i = 1:length(xlocs)
    if longcueRT(i) < Prev_PRL_Att_Long_RT(i)
        axes(findaxes(3))
        text(xlocs(i),ylocs(i) + 3, num2str(longcueRT(i)),"Color",'g','FontSize',13,'FontWe
    elseif longcueRT(i) > Prev_PRL_Att_Long_RT(i)
        axes(findaxes(3))
        text(xlocs(i),ylocs(i) + 3, num2str(longcueRT(i)),"Color",'r','FontSize',13,'FontWe
    else
        axes(findaxes(3))
        text(xlocs(i),ylocs(i) + 3, num2str(longcueRT(i)),"Color",'k','FontSize',13,'FontWe
    end
end
```

```
    for i = 1:length(xlocs)
        if shortcueAcc(i) > Prev_PRL_Att_Short_Acc(i)
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(shortcueAcc(i)),"Color",'g','FontSize',13,'Font
        elseif shortcueAcc(i) < Prev_PRL_Att_Short_Acc(i)
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(shortcueAcc(i)),"Color",'r','FontSize',13,'Font
        else
            axes(findaxes(2))
            text(xlocs(i),ylocs(i) + 3, num2str(shortcueAcc(i)),"Color",'k','FontSize',13,'Font
        end
    end


    for i = 1:length(xlocs)
        if shortcueRT(i) < Prev_PRL_Att_Short_RT(i)
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(shortcueRT(i)),"Color",'g','FontSize',13,'FontW
        elseif shortcueRT(i) > Prev_PRL_Att_Short_RT(i)
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(shortcueRT(i)),"Color",'r','FontSize',13,'FontW
        else
            axes(findaxes(1))
            text(xlocs(i),ylocs(i) + 3, num2str(shortcueRT(i)),"Color",'k','FontSize',13,'FontW
        end
    end
end
```

```
save(AnalysisName);
FinalOutput = export("ACA_Analysis_Live.mlx",['./PilotAssessments/' Subject '.pdf']);
clear;
clc;
```