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˟ - Functions or files with this symbol MUST be modified before they can be used

# Data Analysis

These functions are used to analyze the raw trial data stored in live\_table located in the database stored in the [Data Base Backup As 04-11-2023.zip.](https://doi.org/10.7910/DVN/QADUKS) From this analysis you can create clusters.

## [automizePsychometricFunctions.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/automizePsychomaticalFunction.m)

The purpose of this MATLAB file is to automatically create the y coordinates of a psychometric function of sessions performed on rats. All the following functions contribute to the overall goal of this file, and these functions can be modified to make the output of the file match your own goals.

1. createMap: Reads all rows of live\_table and returns a map where the keys are the date a trial was performed, and the values are what rats were tested on that date.
   1. There is a variable “query” that can be altered to affect what data is being mapped, this query can be written in PostgreSQL format and still work.
      1. SELECT \* FROM live\_table;
         1. Gets all columns and all rows from live\_table.
      2. SELECT referencetime, subjectid, mazenumber FROM live\_table WHERE genotype=’lg\_boost’;
         1. Gets the columns reference time, subject id, and maze number from live\_table where the genotype is listed as lg\_boost.
2. formatTheDate: reads the given date and returns it into a MM/DD/YYYY format.
3. CreateRewardChoicePsychometricFunctions(searchResults): Takes the results of PostgreSQL query stored inside of a nx8 MATLAB table where the following columns are used in the SELECT statement of the query. Order must be maintained. Will return an average of approach/avoid for each of the four feeders.

|  |  |
| --- | --- |
| Column1 | subjectid |
| Column 2 | referencetime |
| Column 3 | feeder |
| Column 4 | approachavoid |
| Column 5 | rewardconcentration1 |
| Column 6 | rewardconcentration2 |
| Column 7 | rewardconcentration3 |
| Column 8 | rewardconcentration4 |
| SELECT  subjectid, referencetime, feeder, approachavoid, rewardconcentration1, rewardconcentration2,  rewardconcentration3, rewardconcentration4 FROM live\_table  WHERE SOME CONDITION; | |

Table 1: Displays the order in which the columns of searchResults must be structured for the CreateRewardChoicePyschometricFunctions function

1. createReactionTimePsychometricFunctions(searchResults): Takes the results of PostgreSQL query stored inside of a nx8 MATLAB table where the following columns are used in the SELECT statement of the query. Returns the average of Reactiontime1st across all four feeders.

|  |  |
| --- | --- |
| Column1 | id |
| Column 2 | referencetime |
| Column 3 | subjectid |
| Column 4 | reactiontime1st |
| SELECT  id, referencetime, subjectid, reactiontime1st FROM featuretable2  WHERE SOME CONDITION; | |

Table 2: Displays the order in which the columns of the searchResults Variable must be structured for the createReactionTimePsychometricFunctions function.

1. createRotationPointsPsychometricFunctions: Takes the results of a PostgreSQL query stored inside of a nx8 MATLAB table where the following columns are used in the SELECT statement of the query. Returns the average of rotationptsmethod1 across all 4 feeders.

|  |  |
| --- | --- |
| Column1 | id |
| Column 2 | referencetime |
| Column 3 | subjectid |
| Column 4 | rotationptsmethod1 |
| SELECT  id, referencetime, subjectid, rotationptsmethod1 FROM featuretable2  WHERE SOME CONDITION; | |

Table 3: Displays the order in which the columns of the searchResults Variable must be structured for the createRotationPointsPsychometricFunctions function.

1. createStoppingPointsPsychometricFunctions(searchResults): Takes the results of a PostgreSQL query stored inside of a nx8 MATLAB table where the following columns are used in the SELECT statement of the query. Returns the average stoptimemethod6 across 4 feeders.

|  |  |
| --- | --- |
| Column1 | id |
| Column 2 | referencetime |
| Column 3 | subjectid |
| Column 4 | stoptimemethod6 |
| SELECT  id, referencetime, subjectid, stoptimemethod6 FROM featuretable2  WHERE SOME CONDITION; | |

Table 4: Displays the order in which the columns of the searchResults Variable must be structured for the createStoppingPointsPsychometricFunction function.

1. createTravelPixelPsychometricFunctions(searchResults): Takes the results of a PostgreSQL query stored inside of a nx8 MATLAB table where the following columns are used in the SELECT statement of the query. Returns the average distanceaftertoneuntillimitingtimestamp across 4 feeders.

|  |  |
| --- | --- |
| Column1 | id |
| Column 2 | referencetime |
| Column 3 | subjectid |
| Column 4 | distanceaftertoneuntillimitingtimestamp |
| SELECT  id, referencetime, subjectid, distanceaftertoneuntillimitingtimestamp FROM featuretable2  WHERE SOME CONDITION; | |

Table 5: Displays the order in which the columns of the searchResults Variable must be structured for the createTravelPixelPsychometricFunctions function.

1. rewardChoiceLoop(T, tableToWriteIn)
   1. T – the map created by the function createMap.
   2. tableToWriteIn – a string name of the table you want to write in the database, if the table does not exist it will be created automatically.
   3. This function automatically queries data from live\_table, and puts it in a format suitable for CreateRewardChoicePsychometricFunctions, then calls that function. It then writes the results of this function to the table specified in tableToWriteIn.
2. reactionTimeLoop(T, tableToWriteIn)
   1. T – the map created by the function createMap.
   2. tableToWriteIn – a string name of the table you want to write in the database, if the table does not exist it will be created automatically.
   3. This function automatically queries data from live\_table, and puts it in a format suitable for CreateReactionTimePsychometricFunctions, then calls that function. It then writes the results of this function to the table specified in tableToWriteIn.
3. rotationPointsLoop(T, tableToWriteIn).
   1. T – the map created by the function createMap.
   2. tableToWriteIn – a string name of the table you want to write in the database, if the table does not exist it will be created automatically.
   3. This function automatically queries data from live\_table, and puts it in a format suitable for CreateRotationPointsPsychometricFunctions, then calls that function. It then writes the results of this function to the table specified in tableToWriteIn.
4. stoppingPointsLoop(T, tableToWriteIn)
   1. T – the map created by the function createMap.
   2. tableToWriteIn – a string name of the table you want to write in the database, if the table does not exist it will be created automatically.
   3. This function automatically queries data from live\_table, and puts it in a format suitable for CreateStoppingPointsPsychometricFunctions, then calls that function. It then writes the results of this function to the table specified in tableToWriteIn.
5. travelPixelLoop(T, tableToWriteIn)
   1. T – the map created by the function createMap.
   2. tableToWriteIn – a string name of the table you want to write in the database, if the table does not exist it will be created automatically.
   3. This function automatically queries data from live\_table, and puts it in a format suitable for CreateTravelPixelPsychometricFunctions, then calls that function. It then writes the results of this function to the table specified in tableToWriteIn.

## [sigmoidAnalysis.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/sigmoidAnalysis.m)

This MATLAB file will creates folders in the current directory where data will be stored, and then calls the following function 5 times to actually store the data.

1. createSigmoidFigures(results, feature)
   1. results – the results of a querying all data from a table created from any of the following functions: rewardChoiceLoop, reactionTimeLoop, rotationPointsLoop, stoppingPointsLoop, travelPixelLoop.
      1. SELECT \* FROM tableToWriteIn;
   2. feature: one of the following strings: “tp”, ”sp”, ”rp”, ”rc”, “rt”. The string specified tells the function which folder to store its output to. “tp” will make the function store all output to the travel pixel folders, “sp” will make the function store all output to the stopping points folder etc.
   3. This function will take each row of results and fit the (x,y) coordinates stored within that row with a parabola model, a linear model, a 2 parameter sigmoid model, a 3 parameter sigmoid model, and a 4 parameter sigmoid model. It then takes a measure of how well the data fits those models’ using coefficient of determination (R-squared). It then stores both the graph of the best model, and the fitting parameters into the folders indicated by feature

## [createThePlot.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/createThePlot.m)

1. createThePlot(param1, param2, param3,param4,param5,param6,param7)
   1. This function servers 3 utilities
      1. It utilizes Fuzzy C-Means clustering to cluster a given nx2 array (param1), with string labels (param2), with a desired number of clusters (param 3) and displays it into a figure.
      2. It will print a 0-1 score of your clustering with 1 being better.
      3. It will create a directory "All Clusters In Dataset" in your current directory and write all of the desired clusters with labels to this dataset
         1. Note that while multiple running of this function might produce the same clusters, different names might be assigned to them.
         2. This is because Fuzzy C-Means clustering picks a random starting point.
         3. You may overwrite old clusters by running this function multiple times.
         4. To avoid this change param7
   2. param1: an n row by 2 column array which contains the x & y data for the clusters you are trying to create.
   3. param2: an n row by 2 column string array that has the session labels for each data point, both columns should be identical.
   4. param3: This is how many clusters you expect in the data.
      1. This number should be altered to maximize the score printed by running this.
   5. param4: A string representing what will go along the x-axis of the figure.
   6. param5: A string representing what will go along the y-axis of the figure.
   7. param6: A string representing what feature is being clustered.
   8. param7: An arbitrary letter used when writing the found clusters to a file.
      1. This letter should be changed for each feature you are analyzing.
      2. The ideal letters to be used for each feature should be A=Travel Pixel, D= Stopping Points, G = Rotation Points, J = Reaction Time, M = Reward Choice
      3. These are ideal because the creation of Probability Tables relies on these names, but if one is inclined, they can rewrite the Probability Tables Code to accept different names.

# Creating Probability Tables

The following files and functions are used to create a table of probabilities that displays what probability of a point belonging to any given cluster in the dataset. To figure out how to create the clusters please reference Data Analysis

1. [collectAllDataMap(dataSets)](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Create%20Probability%20Tables/collectAllDataInAMap.m): ˟
   1. This function will return a map of all data specified in dataSets.
      1. The keys of the map are specified in the dataSets variable.
      2. The values of the map are MATLAB cluster tables created by the createThePlot () function.
   2. dataSets is a string array specified as follows
      1. dataSets = ["Experiment you're analyzing|Travel Pixel","Experiment you're analyzing|Stopping Points","Experiment you're analyzing|Rotation Points","Experiment you're analyzing|Reward Choice"];
   3. This function has a variable “filePathWithData” which MUST be modified to specify the file path on your local machine which contains the experiment data.



Figure 1: example of collectAllDataInAMap() being called with the lg\_boost data set

1. [getSizeOfAllDataSets(mapOfData)](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Create%20Probability%20Tables/getSizeOfAllDataSets.m)
   1. This function returns a map of sizes of the datasets stored inside the “mapOfData” variable,
   2. Returns the map dataSetToSize, where the keys are the name of the dataset, and the values are the number of data points in the dataset
   3. It requires that that keys of the mapOfData map, take the format of the variable “dataSets” found in collectAllDataMap(dataSets)



Figure 2: example of using getSizeOfAllDataSets() function using the lg\_boostData variable

1. [getSizesOfEachCluster(directoryOfClusters)](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Create%20Probability%20Tables/getSizesOfEachCluster.m) ˟
   1. This function must be modified before it can be used.
   2. Returns the map clusterSize, where the keys are the name of the cluster, and the value is the number of data points in the cluster.
   3. Will navigate into the specified directory.
   4. It will read all files in the specified folder, which should be cluster files created in the createThePlot (param1, param2, param3,param4,param5,param6,param7) function
   5. By default, it will only read .xlsx files with the following list of names
      1. {'A1','A2','A3','D1','D2','D3','G1','G2','G3','G4', 'M1','M2','M3','M4'}
      2. To change this list go into the file and change the “keyset variable”



Figure 3: example of using getSizesOfEachCluster() function using the "lg\_boost clusters" directory

1. [calculatePopulationProbabilities (mapOfAllClusterSizes, mapOfAllDataSetSizes)](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Create%20Probability%20Tables/calculatePopulationProbabilities.m) ˟
   1. This function has to be modified before it can be used.
   2. Returns the variable: mapOfProbabilities which is a map where the keys is the name of the cluster, and the value is the probability of a cluster existing
      1. Probability is defined as # of data points in the cluster/#of total data points for the set
   3. By default it will only read .xlsx files with the following list of names
      1. {'A1','A2','A3','D1','D2','D3','G1','G2','G3','G4', 'M1','M2','M3','M4'}
      2. To change this list, go into the file and change the “keyset variable”.
   4. The following lines of code can be used to turn the data gotten from these functions into a csv file where it can be transformed to a figure suitable for demonstration purposes.

Text

Description automatically generated

Figure 4: This code takes the mapOfProbabilities variable gotten from the calculatePopulationProbabilities (mapOfAllClusterSizes, mapOfAllDataSetSizes) function, and turns it into a readable table

# Recreating Figures

Before beginning the figure recreation, be sure to clone the following GitHub directory to your local machine.

<https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/tree/main>

When cloned you will get a folder on your local machine with the following file path.

*YourMachineInfo\UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App*

From this point forward I will assume that you have all the necessary files and directories.

All navigation will assume that you are starting in the UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App directory for consistency in instructions.

Please keep in mind that while some colors may have been changed in the paper for purely aesthetic purposes, the figures should still be produce the same figure.

## Fig 4d, SF4a Baseline Travel Pixel Figures

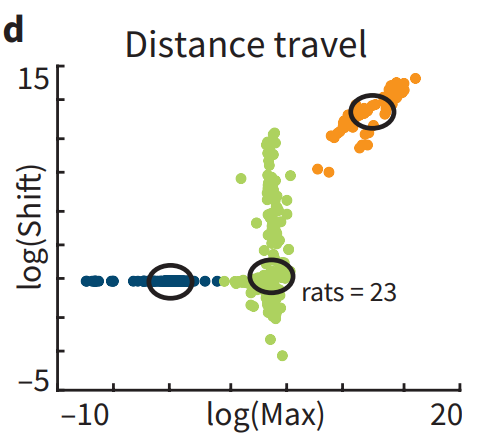


Figure 5: Travel Pixel Max Vs Shift MPC: 0.8925

A graph with different colored circles

Description automatically generated

Figure 6: Travel Pixel Max Vs Steepness, MPC: 0.8925

A graph of a graph with red blue and green circles

Description automatically generated with medium confidence

Figure 7: Travel Pixel Shift Vs Steepness, MPC: 0.8628

1. Navigate into Data Analysis Directory
2. Navigate into Old Base Data Directory
3. Navigate into Travel Pixel Directory
4. Open TravelPixelSigmoidClustering.m and make the following edits
   1. Modify the “myDir” variable so it points to “All Sigmoids” which is in the Travel Pixel Directory specified in step 3



Figure 8: example of the variable that has to be modified in travelPixelSigmoidClustering.m

* 1. Modify the fullFileName variable with the same path used in myDir variable.



Figure 9: example of the fullFileName variable which needs to be changed in travelPixelSigmoidClustering.m to work

* 1. travelPixelSigmoidClustering.m will create a variable called newTable which contains all the data obtained from fitting the raw data with a sigmoid.

1. Run travelPixelMaxVsShift.m, travelPixelMaxVsSteepness.m, and travelPixelShiftVsSteepness.m .

To create an updated figure from our raw data run the following functions. Keep in mind that these figures will likely include the data seen in the figures above, as well as new data. If there is a desire to recreate figure 5, figure 6, and figure 7 directly from raw data you must filter data down to the date ranges found in the file where you downloaded all the data.

|  |  |
| --- | --- |
| Beginning Date Range | End Date Range |
| 11-11-2021 | 05-23-2022 |

Table 6: Table of date ranges for base data sigmoid figures

[automizeTravelPixelPsychomaticalFunction.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Travel%20Pixel/automizeTravelPixelPsychomaticalFunction.m) ˟

This file will read from featuretable, located in the database backup found in [Data Base Backup As 04-11-2023.zip.](https://doi.org/10.7910/DVN/QADUKS) For each trial in a session that a rat performs it will take the average measured travel pixel, for each of the 4 feeder values. It will write these values to the table found in the database “travelPixelPsychomaticalFunctions”.

1. createMap ()
   1. This function returns a Map T
      1. Keys are dates.
      2. The values are a list of all rats to run a session on this date.
   2. This function must be modified.
      1. The variable “query” located in line 3 of the file must be modified to exclude any experiment data.



Figure 10: Example query that filters out all experiment data.

* + 1. This must be modified because at the date of this figure creation no experiments were being run and as a result there was no need to filter, but the database now includes experiment data.

1. createPsychomaticalFunction(searchResults)
   1. This function returns xcoordinates, ycoordinates.
   2. xcoordinates is the following array of values.
      1. [0.005, 0.01, 0.02, 0.09]
      2. Each of these values represents the percentage of glucose located in a feeder which is present during the trials.
   3. searchResults is a MATLAB in the following form.

|  |  |
| --- | --- |
| id | travelpixel |
| 1 | 10000 |

Table 7: Example of how the searchResults table must be formatted.

* 1. You can get a table like this by using the following query
     1. date is a date that is formatted in MM-shortened Month-YYYY format
     2. animalsubjectid is any name of an animal in the table

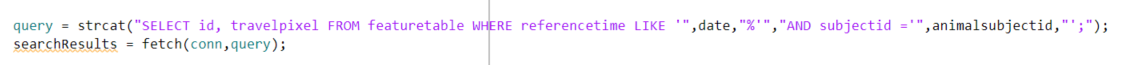


Figure 11: Query that will return searchResults in a format that will work for createPsychomaticalFunction().

* 1. ycoordinates is the averages of travel pixel recorded during each of these feeder values.
     1. The average is calculated by summing the travel pixel based on which feeder was active during the trial, and dividing by the number of trials that used that feeder.

1. Once the functions above are run they will automatically write the results to a table in the database named “travelPixelPsychomaticalFunctions” in the following format

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| subjectid | date | x1 | x2 | x3 | x4 | y1 | y2 | y3 | y4 |
| example id | example date | 0.005 | 0.01 | 0.02 | 0.09 | average | average | average | average |

Table 8: Example of travelPixelPsychomaticalFunctions table

### [travelPixelSigmoidAnalysis.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Travel%20Pixel/travelPixelSigmoidAnalysis.m)

1. This function will read from the “travelPixelPsychomaticalFunctions” table created by automizeTravelPixelPsychomaticalFunction.m and fit the data there with a parabola, a sigmoid, and a line.
2. Coefficient of determination (R-Squared) is used to measure goodness of fit
3. Each row of data in the “travelPixelPsychomaticalFunctions” table will be sorted into folders based on which model fits it better, determined by which produces a higher R-Squared value.

After these functions are run, you can now run travelPixelMaxVsShift.m, travelPixelMaxVsSteepness.m, and travelPixelShiftVsSteepness.m. This should create updated figures.

## Fig 4d, SF4a Baseline Stopping Point Figures

A graph with numbers and circles

Description automatically generated

Figure 12: Stopping Points Max Vs Shift MPC: 0.9279

A graph with colored circles and lines

Description automatically generated

Figure 13: Stopping Points Max Vs Steepness 0.9279

A graph of a graph with circles and lines

Description automatically generated with medium confidence

Figure 14: Stopping Points Shift Vs Steepness MPC: 0.9279

1. Navigate into Data Analysis Directory
2. Navigate into Old Base Data Directory
3. Navigate into Stopping Points Directory
4. Open stoppingPointsSigmoidClustering.m and make the following edits.
   1. Modify the “myDir” variable so it points to “All Sigmoids” which is in the Stopping Points Directory specified in step 3.



Figure 15: example of the variable that has to be modified in stoppingPointsSigmoidClustering.m

* 1. Modify the fullFileName variable with the same path used in myDir variable.



Figure 16: example of the fullFileName variable which needs to be changed in stoppingPointsSigmoidClustering.m to work

* 1. stoppingPointsSigmoidClustering.m will create a variable called newTable which contains all the data obtained from fitting the raw data with a sigmoid.

1. Now run the following files: [stoppingPointsMaxVsShift.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Stopping%20Points/StoppingPointsMaxVsShift.m), [stoppingPointsMaxVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Stopping%20Points/StoppingPointsMaxVsSteepness.m), [stoppingPointsShiftVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Stopping%20Points/StoppingPointsShiftVsSteepness.m).

To create an updated figure from our raw data run the following functions. Keep in mind that these figures will likely include the data seen in the figures above, as well as new data. If there is a desire to recreate figure 12, figure 13, and figure 14 directly from raw data you must filter data down to the date ranges found in the file where you downloaded all the data.

[automizestoppingptsPsychomaticalFunction.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Stopping%20Points/automizestoppingptsPsychomaticalFunction.m) ˟

This file will read from featuretable, located in the database backup found in [Data Base Backup As 04-11-2023.zip.](https://dataverse.harvard.edu/file.xhtml?fileId=7060611&version=DRAFT)  For each trial in a session that a rat performs it will take the average measured stopping points, for each of the 4 feeder values. It will write these values to the table found in the database “stoppingptsPsychomaticalFunctions”.

1. createMap ()
   1. This function returns a Map T
      1. Keys are dates.
      2. The values are a list of all rats to run a session on this date.
   2. This function must be modified.
      1. The variable “query” located in line 3 of the file must be modified to exclude any experiment data.



Figure 17: Example query that filters out all experiment data.

1. createPsychomaticalFunction(searchResults)
   1. This function returns xcoordinates, ycoordinates.
   2. xcoordinates is the following array of values. [0.005, 0.01, 0.02, 0.09]
      1. Each of these values represents the percentage of glucose located in a feeder which is present during the trials.
   3. searchResults is a MATLAB in the following form.

|  |  |
| --- | --- |
| id | stoppingpts |
| 1 | 10000 |

Table 9 Example of how the searchResults table must be formatted.

* 1. You can get a table like this by using the following query.
     1. date is a date that is formatted in MM-Shortened Month-YYYY format.
     2. animalsubjectid is any name of an animal in the table.

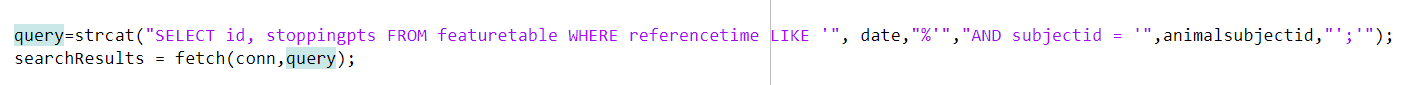


Table 10: Query that will return searchResults in a format that will be accepted by createPsychomaticalFunction().

1. Once the functions above are run they will automatically write the results to a table in the database named “stoppingptsPsychomaticalFunctions” in the format seen in table 8.

### [stoppingptsSigmoidAnalysis.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Stopping%20Points/stoppingptsSigmoidAnalysis.m)

1. This function will read from the “stoppingptsPsychomaticalFunctions” table created by automizestoppingptsPsychomaticalFunction.m and fit the data there with a parabola, a sigmoid, and a line.
2. Coefficient of determination (R-Squared) is used to measure goodness of fit
3. Each row of data in the “travelPixelPsychomaticalFunctions” table will be sorted into folders based on which model fits it better, determined by which produces a higher R-Squared value.

After these functions are run, you can now run stoppingPtsMaxVsShift.m,

stoppingPtsMaxVsSteepness.m, and stoppingPtsShiftVsSteepness.m. This should create updated figures.

## Fig 4d, SF4a Baseline Rotation Points Figures

A graph with numbers and circles

Description automatically generated

Figure 18: Rotation Points Max Vs Shift MPC 0.9300

A graph with colored circles and numbers

Description automatically generated

Figure 19: Rotation Points Max Vs Steepness: 0.9422

A graph with red green and blue circles

Description automatically generated

Figure 20: Rotation Points Shift Vs Steepness MPC: 0.8946

1. Navigate into Data Analysis Directory
2. Navigate into Old Base Data Directory
3. Navigate into Rotation Points Directory
4. Open rotationPointsSigmoidClustering.m
   1. Modify the “myDir” variable so it points to the “All Sigmoids”, which is in the Rotation Points directory specified in step 3, as shown in figure 8.
   2. Modify the fullFileName variable with the same path used in myDir variable, see figure 9 for an example.
   3. RotationPtsSigmoidClustering.m will create a variable called newTable which contains all the data obtained from fitting the raw data with a sigmoid
5. Now run the following files: [rotationPtsMaxVsShift.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/rotationPtsMaxVsShift.m), [rotationPtsMaxVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/rotationPointsMaxVsSteepness.m), [rotationPtsShiftVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/rotationPointsShiftVsSteepness.m)

To create an updated figure from our raw data run the following functions. Keep in mind that these figures will likely include the data seen in the figures above, as well as new data. If there is a desire to recreate figure 18, figure 19, and figure 20 directly from raw data you must filter data down to the date ranges found in the file where you downloaded all the data.

### [automizeRotationPtsPsychomaticalFunction.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/automizeRotationPtsPsychomaticalFunction.m)

This file will read from featuretable, located in the database backup found in [Data Base Backup As 04-11-2023.zip.](https://doi.org/10.7910/DVN/QADUKS)  For each trial in a session that a rat performs it will take the average measured rotation points, for each of the 4 feeder values. It will write these values to the table found in the database “rotationPtsPsychomaticalFunctions”.

1. This function works almost identically to [automizeTravelPixelPsychomaticalFunction.m](#_Creating_Baseline_Travel), but instead reference the following table instead of table 7 and figure 11.

|  |  |
| --- | --- |
| id | rotationPts |
| 1 | 10000 |

Table 11: Example of how the searchResults table must be formatted.

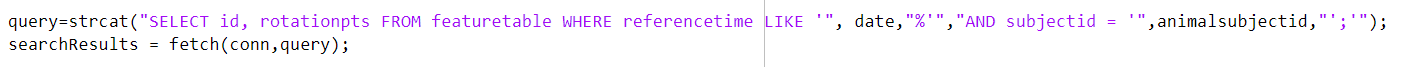


Table 12: Query that will return searchResults in a format that will work for createPsychomaticalFunction.

1. Once the function runs it will write results to a table in the database named “rotationPtsPsychomaticalFunctions”. See table 8 for the format.

### [RotationPtsSigmoidAnalysis.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/rotationPtsSigmoidAnalysis.m)

1. This function will read from the “rotationPtsPsychomaticalFunctions” table created by [automizeRotationPtsPsychomaticalFunction.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/automizeRotationPtsPsychomaticalFunction.m) and fit the data there with a parabola, a sigmoid, and a line.
2. Coefficient of determination (R-Squared) is used to measure goodness of fit
3. Each row of data in the “rotationPtsPsychomaticalFunctions” table will be sorted into folders based on which model fits it better, determined by which produces a higher R-Squared value.

After these functions are run, you can now run [rotationPtsMaxVsShift.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/rotationPtsMaxVsShift.m),

[rotationPtsMaxVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/rotationPointsMaxVsSteepness.m), and [rotationPtsShiftVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Rotation%20Points/rotationPointsShiftVsSteepness.m). This should create updated figures.

## Fig 4d, SF4a Baseline Reaction Time Figures

A graph of reaction time

Description automatically generated

Figure 21: Reaction Time Max Vs Shift MPC: 0.8950

A graph with colored dots and lines

Description automatically generated with medium confidence

Figure 22: Reaction Time Max VS Steepness MPC: 0.9046

A graph with colored circles and numbers

Description automatically generated

Figure 23: Reaction Time Shift Vs Steepness, MPC: 0.8575

1. Navigate into Data Analysis Directory.
2. Navigate into Old Base Data Directory.
3. Navigate into Reaction Time 1st Directory.
4. Open reactionTime1stSigmoidClustering.m.
   1. Modify the “myDir” variable so it points to “All Sigmoids” in the Reaction Time 1st directory, specified in step 3, for an example see figure 8.
   2. Modify the fullFileName variable with the same path used in myDir variable, see figure 9 for an example.
   3. [automizereactiontime1stPsychomaticalFunction.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/automizereactiontime1stPsychomaticalFunction.m) will create a variable called newTable which contains all the data obtained from fitting the raw data with a sigmoid.
5. Now run the following files: [reactionTime1stMaxVsShift.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/reactionTime1stMaxVsShift.m), [reactionTime1stMaxVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/reactionTime1stMaxVsSteepness.m), [reactiontime1stShiftVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/reactionTime1stShiftVsSteepness.m)

To create an updated figure from our raw data run the following functions. These figures will include the data seen in the figures above, as well as new data. If you want to recreate figure 21, 22, 23 directly from raw data you must filter the data down to the date ranges found in the file where you downloaded all the data.

## [Automizereactiontime1stPsychomaticalFunctions.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/automizereactiontime1stPsychomaticalFunction.m)

This file will read from featuretable, located in the database backup found in [Data Base Backup As 04-11-2023.zip.](https://doi.org/10.7910/DVN/QADUKS)  For each trial in a session that a rat performs it will take the average measured rotation points, for each of the 4 feeder values. It will write these values to the table found in the database “basePsychometricFunctions”.

|  |  |
| --- | --- |
| id | reactionTime |
| 1 | 20 |

1. This function works almost identically to automizeTravelPixelPsychomaticalFunction.m, but instead reference the following table instead of table 7 and figure 11.

Table 13: Example of how the searchResults table must be formatted for reactionTime1st.

A picture containing text, font, screenshot, purple

Description automatically generated

Figure 24: Query that will return searchResults in a format that will work for automizereactiontime1stPsychomaticalFunctions.m

1. Once the function runs it will write results to a table in the database named “basePsychometricFunctions”. See table 8 for the format.

## [ReactionTime1stSigmoidAnalysis.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/reactionTime1stSigmoidAnalysis.m)

1. This function will read from the “basePsychometricFunctions” table created by automizereactiontime1stPsychomaticalFunction.m and fit the data there with a parabola, a sigmoid, and a line.
2. Coefficient of determination (R-Squared) is used to measure goodness of fit.
3. Each row of data in the “basePsychometricFunctions” table will be sorted into folders based on which model fits it better, determined by which produces a higher R-Squared value.

After these functions are run, you can now run [reactionTime1stMaxVsShift.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/reactionTime1stMaxVsShift.m),

[reactionTime1stMaxVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/reactionTime1stMaxVsSteepness.m), and [reactionTime1stShiftVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reaction%20Time%201st/reactionTime1stShiftVsSteepness.m). This should create updated figures.

## Fig 4d, SF4a Reward Choice Figures

A graph with numbers and circles

Description automatically generated with medium confidence

Figure 25: Reward Choice Max Vs Shift, MPC: 0.9057

A graph with red green and blue circles

Description automatically generated

Figure 26: Reward Choice Max Vs Steepness, MPC: 0.9057

A graph of a graph with numbers and circles

Description automatically generated with medium confidence

Figure 27: Reward Choice Shift Vs Steepness, MPC: 0.9057

1. Navigate Into Data Analysis Directory
2. Navigate into Old Base Data directory.
3. Navigate into Reward Choice directory.
4. Open [RewardChoiceSigmoidClustering.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/RewardChoiceSigmoidClustering.m)
   1. Modify the “myDir” variable so it contains the file path to “All Sigmoids” directory located in the Reward Choice directory specified in step 3, refer to figure 8 for an example.
   2. Modify the “fullFileName” variable with the same path used in myDir variable, refer to figure 9 for an example.
   3. RewardChoiceSigmoidClustering.m will create a variable called newTable which contains all the data obtained from fitting the raw data with a sigmoid.
5. Now run the following files: [rewardChoiceMaxVsShift.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/rewardChoiceMaxVsShift.m), [rewardChoiceMaxVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/rewardChoiceMaxVsSteepness.m), [rewardChoiceShiftVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/rewardChoiceShiftVsSteepness.m).

To create an updated figure from our raw data run the following functions, these updated figures will contain the old data and more. To recreate figures 26, 27, and 28 from raw data you must filter data down to the date ranges found in the file where you downloaded all the data.

## [automizePsychomaticalFunction.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/automizePsychomaticalFunction.m)

This file will read from live\_table, located in the database backup found in [Data Base Backup As 04-11-2023.zip.](https://doi.org/10.7910/DVN/QADUKS) For each trial in a session that a rat performs it will take the average measured reward choice for each of the 4 feeder values. It will write these values to the table found in the database “psychomaticalFunctions”.

This function works almost identically to automizeTravelPixelPsychomaticalFunction.m, but instead reference the following table instead of table 7 and figure 11.

A picture containing text, font, screenshot, line

Description automatically generated

Figure 28: Query that will return searchResults in a format that will work for automizePsychomaticalFunction.m

Once the function runs it will write results to a table in the database named “psychomaticalFunctions”. See table 8 for the format.

## [sigmoidAnalysis.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/sigmoidAnalysis.m)

1. This function will read from “psychomaticalFunctions” table created by automizePsychomaticalFunction.m and fit the data there with a parabola, a sigmoid, and a line.
2. Coefficient of determination (R-Squared) is used to measure goodness of fit.
3. Each row of data in the “psychomaticalFunctions” table will be sorted into folders based on which model fits it better, determined by which produces a higher R-Squared value.

After these functions are run, you can now run [rewardChoiceMaxVsShift.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/rewardChoiceMaxVsShift.m), [rewardChoiceShiftVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/rewardChoiceShiftVsSteepness.m), and [rewardChoiceMaxVsSteepness.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Data%20Analysis/Old%20Base%20Data/Reward%20Choice/rewardChoiceMaxVsSteepness.m). This should create updated figures.

## Fig SF4cParabola Clustering

A graph of different types of data

Description automatically generated with medium confidence

Figure 31: Parabola Clustering

1. Navigate into Parabolas Analysis.
2. Run the following file: [getThreeParametersFromParabolas.m](https://github.com/lddavila/UTEP-Brain-Computation-Lab-Remote-Databases-and-Serendipity-App/blob/main/Parabolas%20Analysis/Baseline/getThreeParametersFromParabolas.m).
3. All the figures should be automatically created.

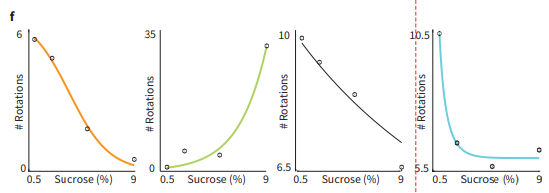
## Fig 4e Average Travel Pixel Sigmoid

A graph of different sizes and colors

Description automatically generated

1. Navigate into Create Probability Tables
2. Run createFig4e.m

## Fig 4f



1. Navigate into Data Analysis directory.
2. Navigate into Old Base Data directory.
3. Navigate into Rotation Points directory.
4. These example sigmoid functions above exist within Rotation Pts 2 Parameter Sigmoid, Rotation Pts 3 Parameter Sigmoid, Rotation Pts 4 Parameter Sigmoid.
5. Also included in these folders are all the sigmoid functions created by fitting rotation point data
6. If you wish to generate new sigmoid functions, please follow the steps outlined in “Fig 4d, SF4a Baseline Rotation Points Figures”

## Fig 4g Radar Plot

A diagram of a graph

Description automatically generated

1. Navigate into Raw Figures directory.
2. Navigate into All Clusters directory.
3. Run radarPlotExperiments.m.

## Fig 6t

A diagram of a cluster

Description automatically generated

1. Navigate in Create Probability Tables Directory.
2. Run createFig6t.

## Fig 6u,6v

A diagram of different colored circles and numbers with Ice hockey rink in the background

Description automatically generated with medium confidence

1. Navigate into Data Analysis directory.
2. Navigate into Oxy directory.
3. Run oxySigmoidClustering.m

## Fig SF4b

A graph of a person with a green line

Description automatically generated with medium confidence

1. Navigate into Data Analysis directory.
2. Navigate into Old Base Data
3. The directories Reward Choice 2 Parameter Sigmoid, Reward Choice 3 Parameter Sigmoid, Reward Choice 4 Parameter Sigmoid contain all sigmoid functions created from raw data including those seen above.

## Fig SF4d

A comparison of a graph

Description automatically generated with medium confidence

1. This figure was created by counting the total number of sessions, the total number of sessions fitted with a sigmoid, and the total number of sessions fit with a parabola. Then it is simply a matter of dividing the latter two by the former.

## Fig SF5o

A diagram of a star

Description automatically generated

1. Navigate in Create Probability Tables Directory.
2. Run createFigSF5o.m.

## Fig SF5p

A graph of a number of clusters

Description automatically generated with medium confidence

1. Navigate into Data Analysis directory.
2. Navigate into All Euclidian Distances directory.
3. Run createSPandTPDistributionFigures.m.

## Fig SF5q, SF5r

A diagram of a travel and a distance between two groups

Description automatically generated with medium confidence

1. Navigate into Data Analysis directory.
2. Navigate into Food Deprivation directory.
3. Run foodDeprivationSigmoidClustering.m.

## Fig SF6i

A diagram of different types of data

Description automatically generated with medium confidence

1. Navigate into Create Probability Tables directory.
2. Run createFigSF6i.m.

## Fig SF7k

A diagram of a diagram

Description automatically generated

1. Navigate in Create Probability Tables Directory.
2. Run createfigSF7k.m.

## Fig SF7l, SF7m

A diagram of a number of alcohol and alcohol

Description automatically generated with medium confidence

1. Navigate into Data Analysis directory.
2. Navigate into Alcohol directory.
3. Run alcoholSigmoidClustering.m

## Fig SF7n

A graph of alcohol and alcohol

Description automatically generated

1. Navigate into Data Analysis directory.
2. Navigate into All Euclidian Distances directory.
3. Run checkingSignificance.m.

## Fig SF7o, SF7p, SF7q

A diagram of a diagram of a diagram

Description automatically generated with medium confidence

1. Navigate into Data Analysis directory.
2. Run checkAllRadarPlotsFromFirstAndThirdBinsForEuclidianDistance.m.
3. Modify the if statement from lines 33-38 to see various examples including the ones shown above.
4. By default this file only looks at Base Data
5. Change the variables “listOfRadarPlots” and “currentFile” to point towards allRadarPlotsInAlc1 and directoryofAlcoholRadarPlots respectively to get radar graphs for alcohol data.