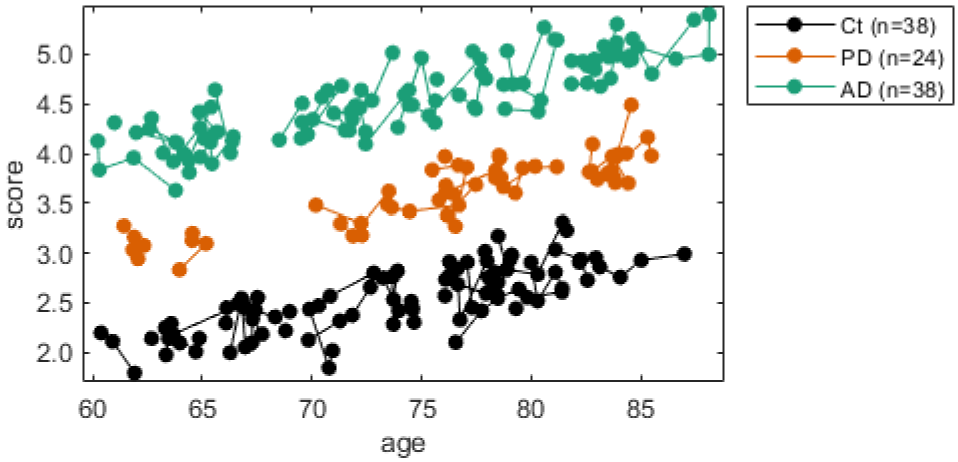
spaghetti_plot

Table of Contents

Use this function to plot longitudinal data where participants belong to different groups.



Intro

Let's start loading synthetic data that simulates the measurement of a given score that was obtained from control participants and from people affected by Parkinson's or Alzheimer's disease.

```
load('T_for_spaghetti_plot.mat')
```

Let's take a look at the first `n_show` elements on this table

```
n_show=16;
T(1:n_show,:)
```

```
ans =

  16×4 table
```

```
id     dx       age       score
__    ____    ______    ______

1     'Ct'    69.836    2.1222
1     'Ct'    71.263    2.3148
1     'Ct'    71.834    2.3739
1     'Ct'    72.659    2.6551
2     'AD'    82.571    4.8825
2     'AD'    82.895    4.8473
2     'AD'    83.864     5.093
2     'AD'    83.922    4.9901
3     'Ct'    66.612     2.489
3     'Ct'    67.421    2.4267
3     'Ct'    67.519    2.5527
4     'Ct'    78.451     2.574
4     'Ct'    79.023    2.9371
5     'Ct'     79.82    2.5536
5     'Ct'    81.387    2.6074
6     'AD'    63.207    4.0064
```

You can see that the data is formatted in a tidy format such that each row corresponds to a unique observation and each column has the `id` of each unique participant, diagnosis, age and score.

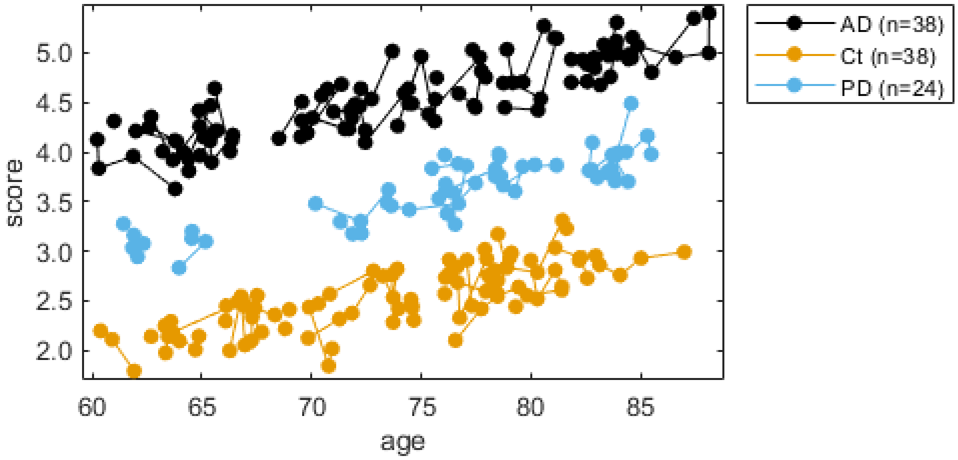
This function links with lines data from the same *id* colorcoding traces by *group*.

To use this function the data needs to be formatted as a table. The table needs to have columns for id, group, x values and y values:

- *id*: Column use to identify each unique subject. By default is the first column on the table. You can also provide explicitly the column number used for `id`
- *group*: Column use to colorcode the data. By default is the `last -2` column on the table. You can also provide explicitly the column number used for `group`
- *X*: Column use as independent variable. So far it only works for numerical data. By default is the `last-1` column on the table. You can also provide explicitly the column number used for `X`
- *Y*: Column use as dependent variable. By default is the last column on the table. You can also provide explicitly the column number used for `Y`

If the data is formatted properly, you can just make the figure as follows:

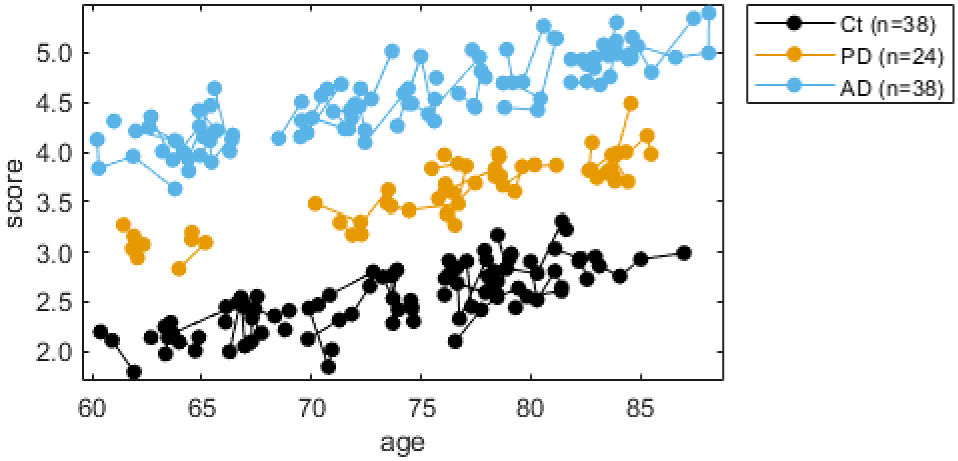
```
spaghetti_plot(T);
```



Resort data

If you like to resort the groups shown in the legend, you need to provide the additional argument `resort_groups` as follows:

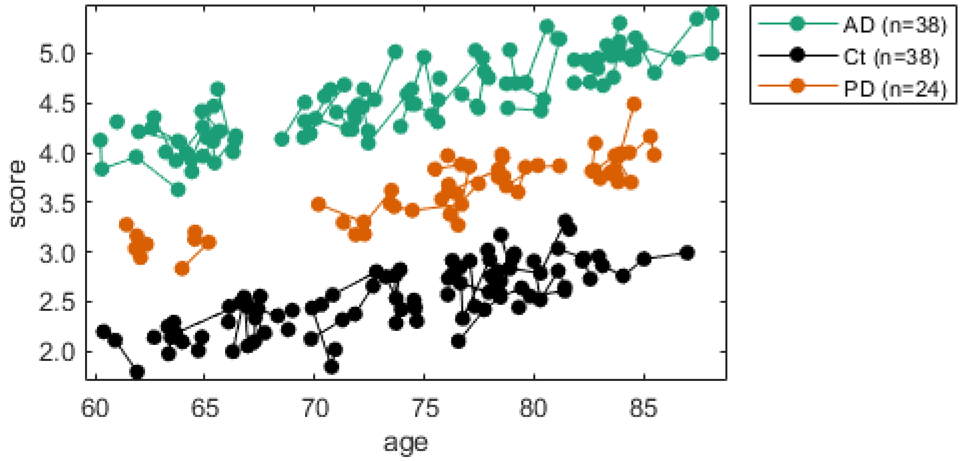
```
resort_groups={'Ct','PD','AD'};
f = spaghetti_plot(T,...
    'resort_groups',resort_groups);
```



Provide colormap

You can also provide your own colormap as a table:

```
RGB=[0 0 0;217 95 2;27 158 119]/255;% Define the RGB values
my_color=table(resort_groups',RGB); % Make a table with the colors
f = spaghetti_plot(T,...
    'my_color',my_color);
```

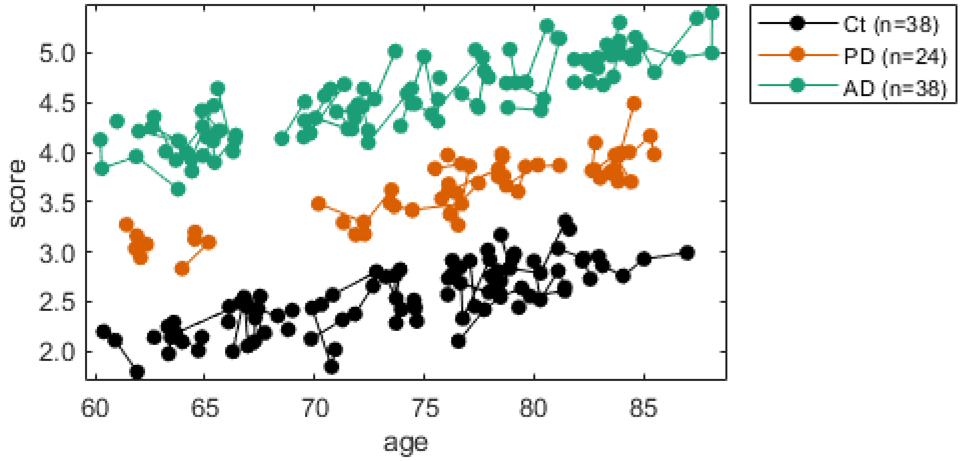


Notice that the groups are sorted in the default order.

Provide table with colormap and resort

You can resort and provide your own colormap as follows

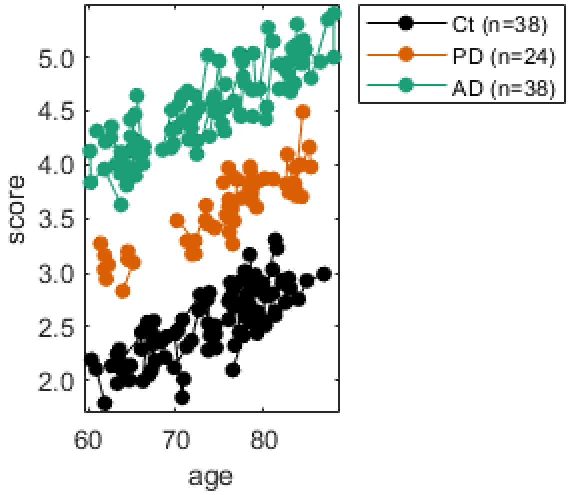
```
RGB=[0 0 0;217 95 2;27 158 119]/255;
my_color=table(resort_groups',RGB);
resort_groups={'Ct','PD','AD'};
f = spaghetti_plot(T,...
    'resort_groups',resort_groups,...
    'my_color',my_color);
```



Resize figure

You can resize the figure as follows

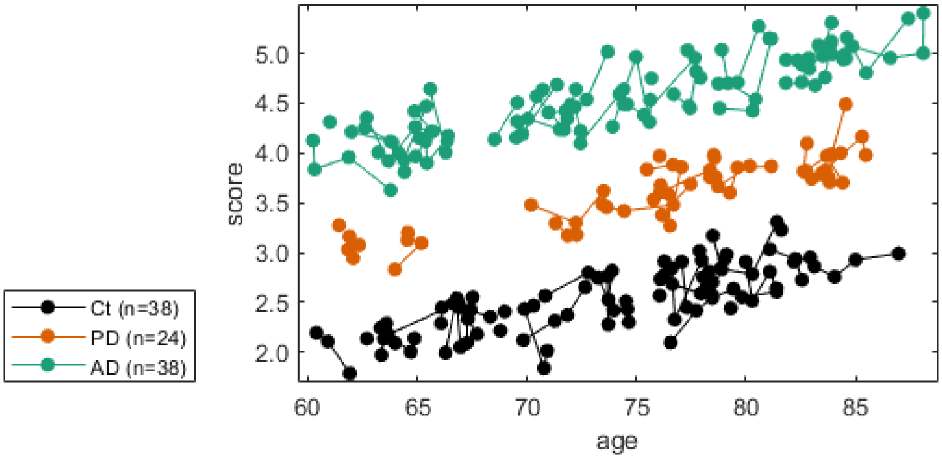
```
fig_wide=8;% wide of the figure in cm
fig_tall=7;% height of the figure in cm
f = spaghetti_plot(T,...
    'resort_groups',resort_groups,...
    'my_color',my_color,...
    'fig_wide',fig_wide,...
    'fig_tall',fig_tall);
```



Change legend location

You can specify the location of the legend as follows

```
fig_wide=16;
fig_tall=7;
legend_location='southwestoutside'; % for more options: https://
www.mathworks.com/help/matlab/ref/legend.html
f = spaghetti_plot(T,...
    'resort_groups',resort_groups,...
    'my_color',my_color,...
    'fig_wide',fig_wide,...
    'fig_tall',fig_tall,...
    'legend_location',legend_location);
```



Indicating explicitly which column to use for each data type

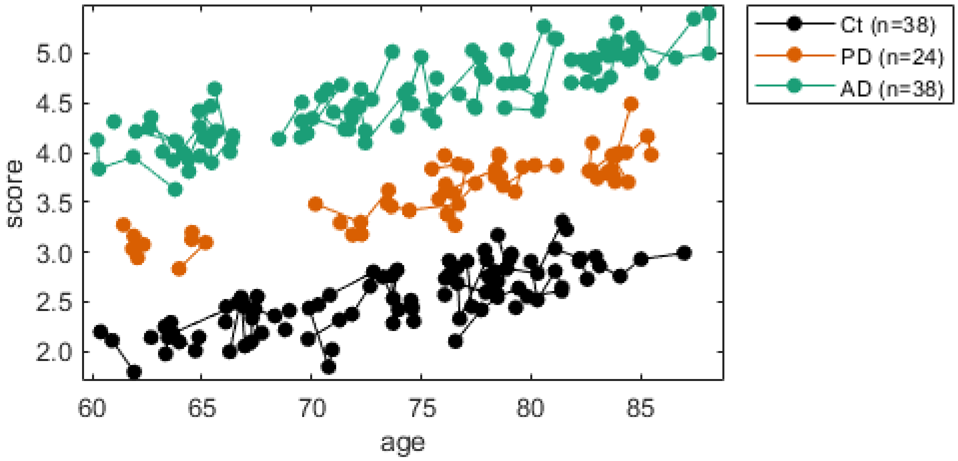
To show how to indicate explicitly which column to use for each type of variable, we'll use the original table plus junk data and will resort the columns: Make a copy of the original table

```
T2=T;
% Make junk data
n=size(T2,1);
junk=randn(n,1);
junk=array2table(junk);
% Combine the junk data with T2
T2=[T2 junk];
% Resort T2
T2=T2(:,[2 4 1 3 5]);
% Display the first n_show rows
n_show=16;
T2(1:n_show,:)
```

```

ans =

  16×5 table

     dx      score     id     age        junk
    _____    _______   __    _______    _________

    'Ct'     2.1222    1     69.836     -0.18688
    'Ct'     2.3148    1     71.263      0.60898
    'Ct'     2.3739    1     71.834       -2.246
    'Ct'     2.6551    1     72.659     -0.70279
    'AD'     4.8825    2     82.571       1.7788
    'AD'     4.8473    2     82.895      -1.5603
    'AD'      5.093    2     83.864      -1.7403
    'AD'     4.9901    2     83.922     -0.82828
    'Ct'      2.489    3     66.612      0.82277
    'Ct'     2.4267    3     67.421     -0.48616
    'Ct'     2.5527    3     67.519      -1.4963
    'Ct'      2.574    4     78.451      0.13032
    'Ct'     2.9371    4     79.023       1.1464
    'Ct'     2.5536    5      79.82     -0.23907
    'Ct'     2.6074    5     81.387     -0.84804
    'AD'     4.0064    6     63.207       1.4801
```

Define the columns that correspondes to each variable type:

```
X_column=4;
Y_column=2;
id_column=3;
group_column=1;
f = spaghetti_plot(T2,...
    'resort_groups',resort_groups,...
    'my_color',my_color,...
    'X_column',X_column,...
    'Y_column',Y_column,...
    'id_column',id_column,...
    'group_column',group_column);
```



Repo location

This function belongs to the toolbox plotting-tools:

https://gitlab.com/ascario/plotting-tools/

Dependencies:

- https://gitlab.com/Fair_lab/generic_for_functions
- https://gitlab.com/Fair_lab/text_manipulation

Credits

Developer: Oscar Miranda-Dominguez

First line of code: April 3, 2020

Use this section if you want to recalculate data to use this function

```
% Seed the randon number generator for reproducibility
seed=2020;
rng(seed)

% Start defining number of unique participants
n_ids=100;
% ids=randi(n_ids,[n_measurements,1]);
% n_ids=size(unique(ids),1);
% Let's assume each participant can have longitudinal data, that goes
 form
% one to max_number_visits
max_number_visits=4;
number_visits=randi(max_number_visits,[n_ids 1]);

% Assume there are 3 cases: Controls (Ct); Parkinsons's disease (PD);
 and
% Alzheimer's disease (AD)

cases={'Ct','PD','AD'};
n_cases=size(cases,2);
Dx_ix=randi(n_cases,[n_ids 1]);

% calculate total number of individual visits
n_all_visits=sum(number_visits);

% get age and score
age=nan(n_all_visits,1);
score=nan(n_all_visits,1);
id=nan(n_all_visits,1);
dx=cell(n_all_visits,1);

min_age=60;
max_age=85;

offset=0;
for i=1:n_ids

    local_n=number_visits(i);
    local_ix=offset+(1:local_n);
    local_dx=repmat(cases(Dx_ix(i)),local_n,1);
    local_id=repmat(i,local_n,1);
    % approach 1
    local_age=min_age+rand(local_n,1)*(max_age-min_age);

    % approach 2
    local_age=min_age+rand*(max_age-min_age);
    local_age=local_age+rand(local_n,1)*local_n;
    local_score=Dx_ix(i)+log10(local_age)+randn(local_n,1)/5;
    local_score=Dx_ix(i)+(local_age.^2)/min_age^2+randn(local_n,1)/5;

    age(local_ix)=local_age;
    score(local_ix)=local_score;
    id(local_ix)=local_id;
    dx(local_ix)=local_dx;

    offset=offset+local_n;
end

% Concatenate data as table
T=table(id, dx,age,score);
```

```
% Sort by ids and age
T=sortrows(T,[1 3]);
filename='T_for_spaghetti_plot.mat';
save(filename,'T')
close all
```

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