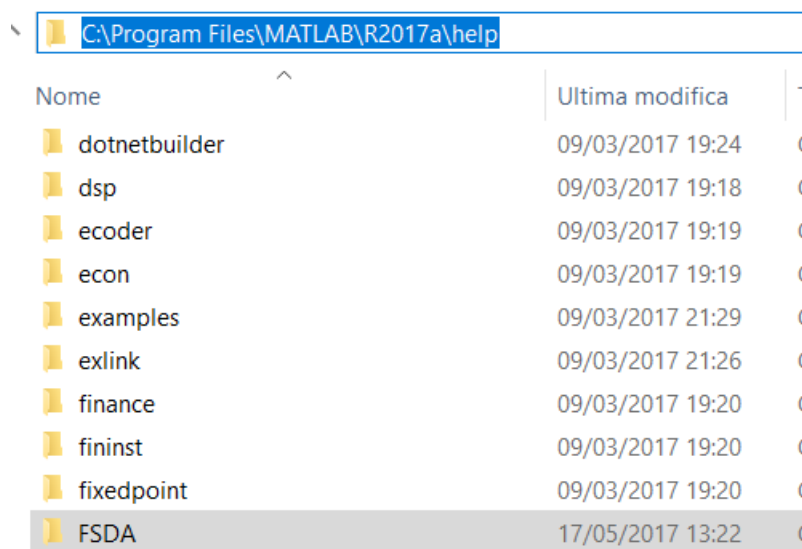




Installation notes (highlights)

The installation procedure of FSDA relies on a setup executable (or Linux bash script) which should execute all the necessary steps automatically in less than one minute. The most critical part of the installation concerns the FSDA documentation system, which consists in a series of HTML files that follow the typical MATLAB style and are completely integrated inside the MATLAB documentation system.

In order to achieve this goal from MATLAB release 2012b, it is necessary that all FSDA html files are located inside the subfolder help of the main root where MATLAB is installed. For example, if you have release 2017a of MATLAB installed inside C:\program files\MATLAB\R2017a, it is necessary that our documentation files are inside C:\program files\MATLAB\R2017a\help



C:\Program Files\MATLAB\R2017a\help		
Nome	Ultima modifica	
dotnetbuilder	09/03/2017 19:24	(
dsp	09/03/2017 19:18	(
ecoder	09/03/2017 19:19	(
econ	09/03/2017 19:19	(
examples	09/03/2017 21:29	(
exlink	09/03/2017 21:26	(
finance	09/03/2017 19:20	(
fininst	09/03/2017 19:20	(
fixedpoint	09/03/2017 19:20	(
FSDA	17/05/2017 13:22	(

Our SETUP should automatically put our html files inside the appropriate MATLAB folder. If, due to restrictions on user permissions this was not possible, you will find the FSDA documentation folder inside subfolder called _tmp_helpfiles. If you do not find it, it means that everything went well and you do not have to do anything, otherwise the subfolder FSDA in “_tmp_helpfiles” must be moved manually (possibly by your system administrator) inside the subfolder help of the main root where MATLAB is installed (see screenshot above).



Installation notes (details)

In recent years MATLAB undertook several important changes, which made difficult for us to keep FSDA aligned to the MATLAB system. For example, from R2012b a Toolstrip replaced menus and toolbars in the MATLAB Desktop, a gallery of apps was introduced in the desktop and the documentation system was redesigned, for the first time after years of stability; with R2014a third party software documentation was moved to a separate section without filtering and searching possibilities; with R2014b there was a major update of the MATLAB graphics system that forced us to revisit most of the FSDA plotting functions; with R2015a the third party documentation was changed again, and was partly reintegrated in the MATLAB documentation system. This is why you may find these installation notes rather intricate: we apologise if this is going to happen and we invite you to signal problems or bugs that you think are in contradiction with, or should be reported in, these notes. With your help, it will be easier for us to make these installation notes ... superfluous.

1. FSDA works from the release R2009b of MATLAB and uses the Statistics toolbox.
2. FSDA can be installed:
 - a. Automatically with our setup program for Windows platforms. The automatic installation updates your MATLAB search path and installs the FSDA documentation pages in:

`(docroot folder)\FSDA`, If your release of MATLAB is $\leq 2012a$

`(FSDA root folder)\helpfiles\FSDA`, if your release of MATLAB is $> 2012a$.

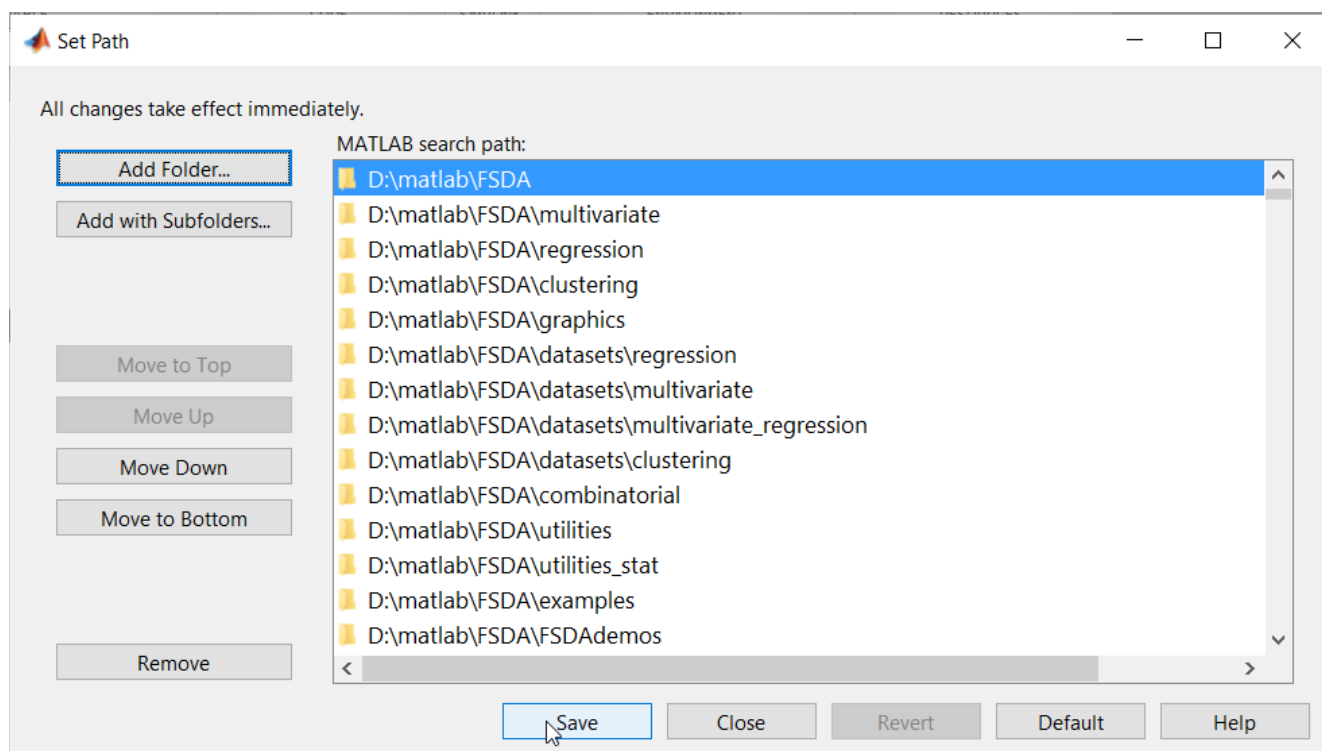
To find out where your `docroot` folder is located it is enough to type `docroot` in the command prompt.

- b. Manually by unpacking the compressed tar file `FSDA.tar.gz` under a folder of your choice (say `programs`). The search path update can be done by running the MATLAB scripts `addFSDA2path.m` that is located in the `FSDA root folder`. If your release is $> 2012a$ the files present inside `(FSDA root folder)\helpfiles\FSDA` must be moved to `(docroot folder)\FSDA`.
3. If there are multiple releases of MATLAB installed in your computer, our setup program will ask you to **choose to which release the FSDA Toolbox has to be associated and where** (under which folder) it has to be installed. The search path update and documentation setup are modified accordingly. However, if other MATLAB releases are present and the user intends to run FSDA also on them, the two steps should be completed manually by using the already mentioned `addFSDA2path.m` (see 2b) as follows (now assuming a MS Windows platform installation under `D:\programs\FSDA`):

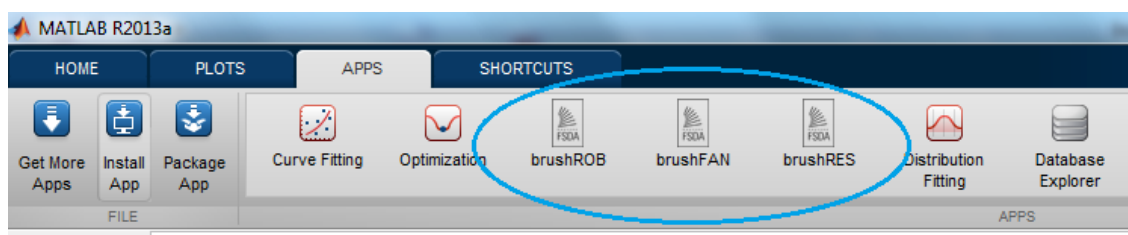
```
>> addFSDA2path('D:\programs\FSDA')
```

4. If FSDA has been installed properly (in what follows without loss of generality we assume, for example, that FSDA has been installed in folder `D:\matlab\FSDA`), after the installation the **“Set Path” window**

of MATLAB should include the following FSDA search paths (the last three being introduced with FSDA V3.0 (i.e. starting with MATLAB R2015a).



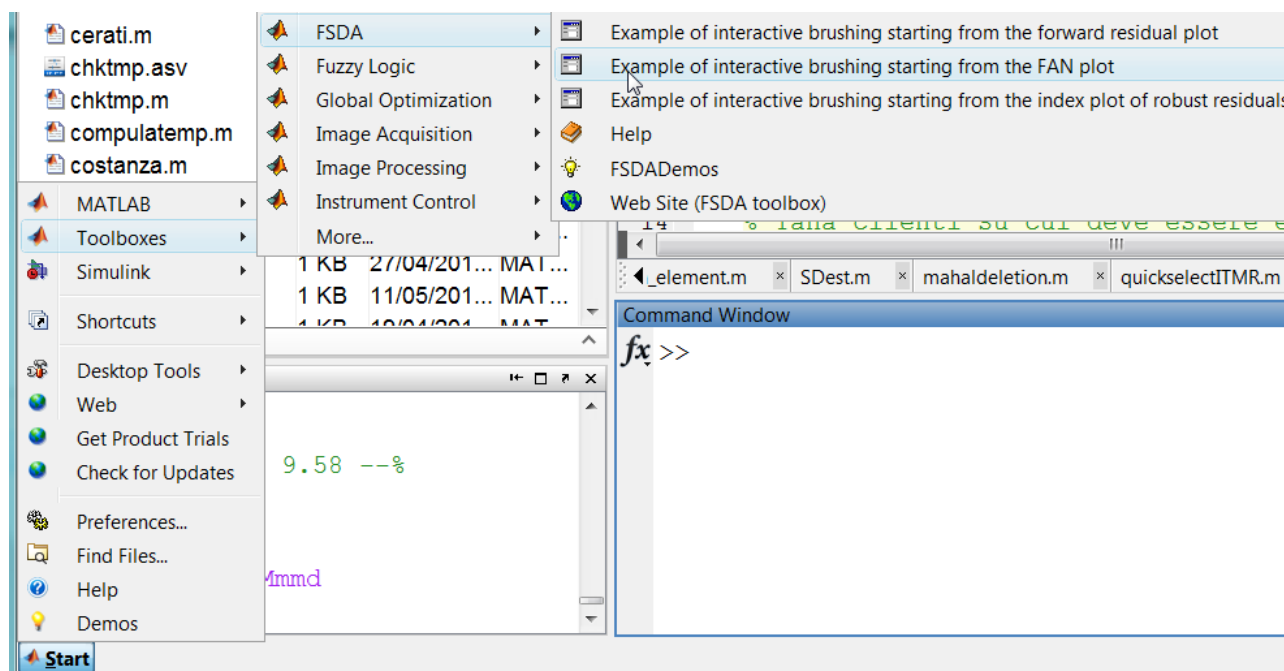
- If FSDA is installed in MATLAB R2012b or subsequent releases, three APPS (brushRES, brushFAN and brushROB) are automatically installed:



Remark: if the three APPS have not been automatically installed, you can easily install them manually by double clicking on the files brushFAN.mlappinstall, brushRES.mlappinstall and brushROB.mlappinstall contained in the root folder of FSDA.

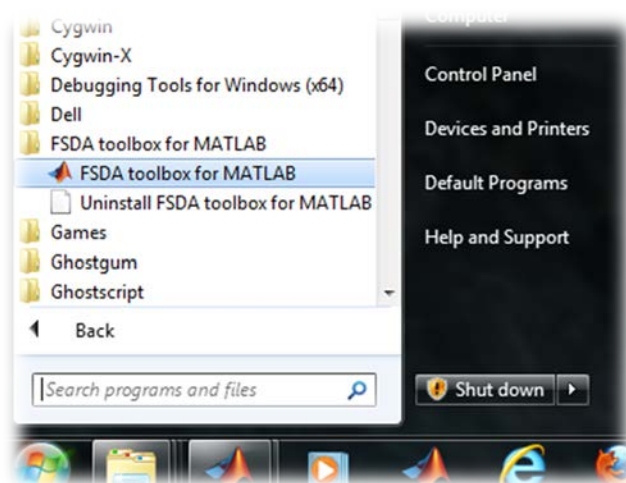
Current Folder		Workspace	
Name	Type	Date...	Size
InstallationNotes.pdf	Adobe Acrobat Document	30/04...	869 ...
brushFAN.mlappinstall	MATLAB App Installer	30/04...	44 KB
brushRES.mlappinstall	MATLAB App Installer	30/04...	34 KB
brushROB.mlappinstall	MATLAB App Installer	30/04...	11 KB

If FSDA is installed in MATLAB 2012a or earlier the three APPS appear inside MATLAB Start button | Toolboxes | FSDA.



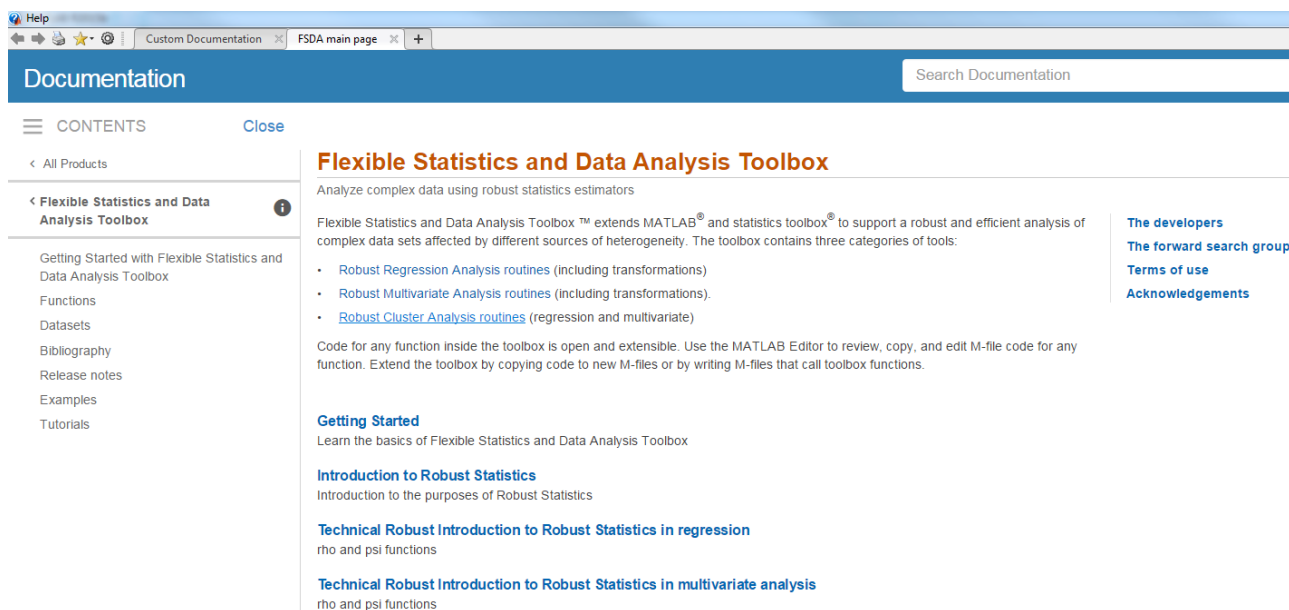
These APPS are graphical user interfaces conceived to demonstrate some functionalities of FSDA.

6. Our setup program, if successfully executed, adds to the “Program Files” Windows Menu the entry “FSDA toolbox for MATLAB”, including a **FSDA uninstall program** that should be used by the user to remove an obsolete FSDA release, before an update:



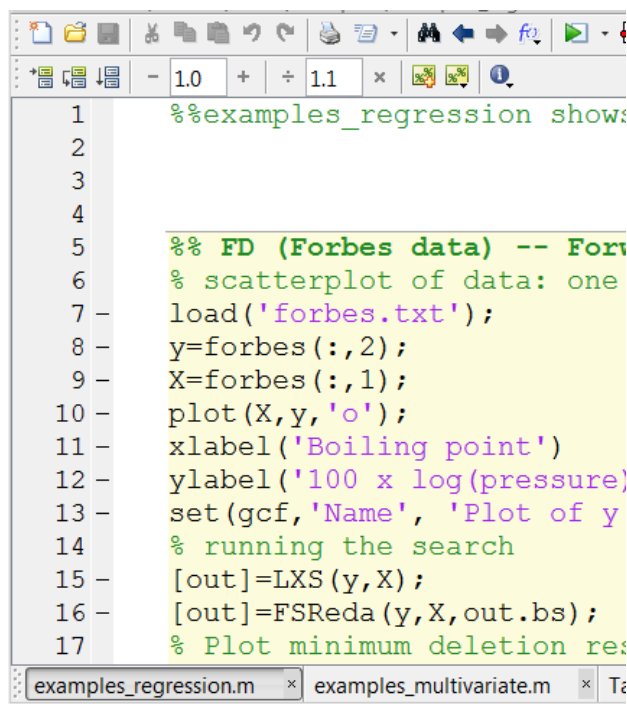
7. Nonetheless, to avoid problems that may occur if FSDA is installed with our setup program more than once, the setup program tries to locate and remove (with the agreement of the user) previous FSDA installations.
8. If everything went well with an automatic or manual installation, when you open MATLAB, the MATLAB “Help” pages should include FSDA with all its submenus.

a. The MATLAB “Help” pages should include FSDA, as shown below:



The screenshot shows the MATLAB Help Documentation interface. The top bar includes a search box labeled "Search Documentation". The left sidebar shows a "CONTENTS" menu with a "Flexible Statistics and Data Analysis Toolbox" section expanded. The main content area displays the title "Flexible Statistics and Data Analysis Toolbox" and a description: "Analyze complex data using robust statistics estimators". It lists three categories of tools: Robust Regression Analysis routines, Robust Multivariate Analysis routines, and Robust Cluster Analysis routines. Below this, there are sections for "Getting Started", "Introduction to Robust Statistics", and "Technical Robust Introduction to Robust Statistics in regression" and "Technical Robust Introduction to Robust Statistics in multivariate analysis".

b. With the setup installer, two example files named “examples_regression.m” and “examples_multivariate.m” should be opened automatically. These files contain a series analysis of several well-known datasets in the literature of robust statistics and have the purpose to let the user familiarize with the toolbox (these two files are contained in (main folder of FSDA)\examples).



```

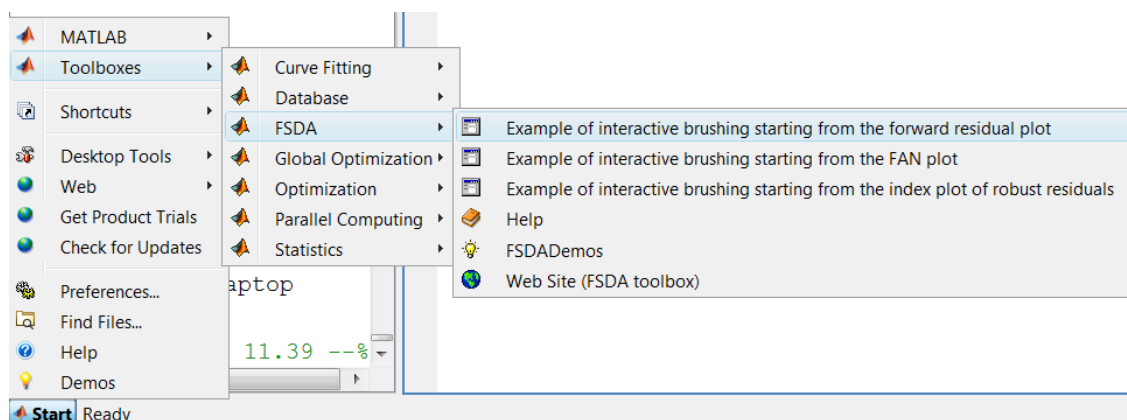
1 %%examples_regression shows
2
3
4
5 %% FD (Forbes data) -- Forbes
6 % scatterplot of data: one
7 load('forbes.txt');
8 y=forbes(:,2);
9 X=forbes(:,1);
10 plot(X,y,'o');
11 xlabel('Boiling point')
12 ylabel('100 x log(pressure)')
13 set(gcf,'Name','Plot of y
14 % running the search
15 [out]=LXS(y,X);
16 [out]=FSReda(y,X,out.bs);
17 % Plot minimum deletion res

```

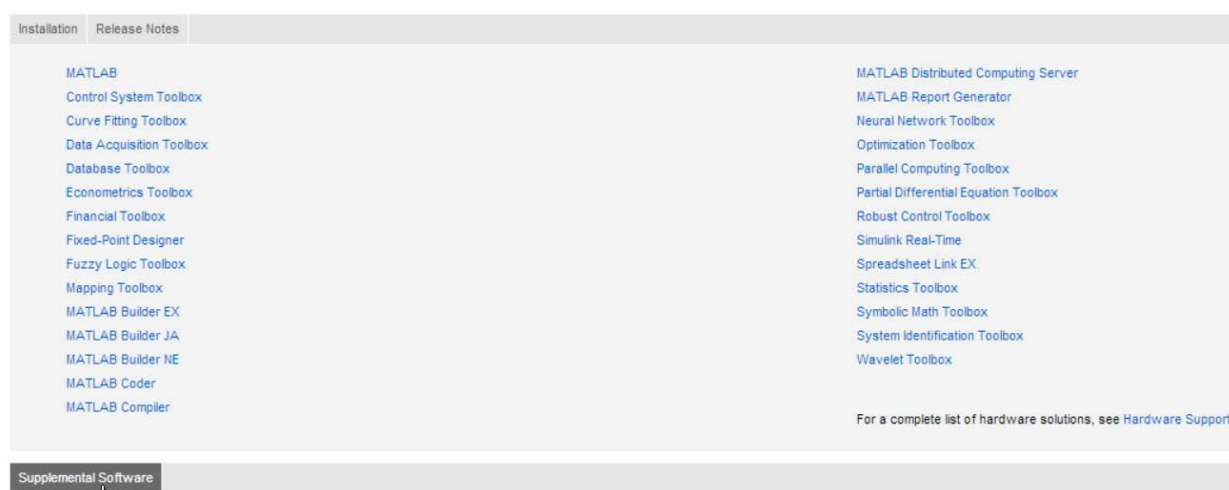
The screenshot shows a MATLAB script editor with the file "examples_regression.m" open. The script contains comments and code for loading the "forbes.txt" dataset, plotting it, and running the LXS and FSReda functions. The script is partially visible, showing lines 1 through 17.



- c. FSDA should appear among the installed “Toolboxes” in the MATLAB “Start Menu” (only for MATLAB releases before R2012b)



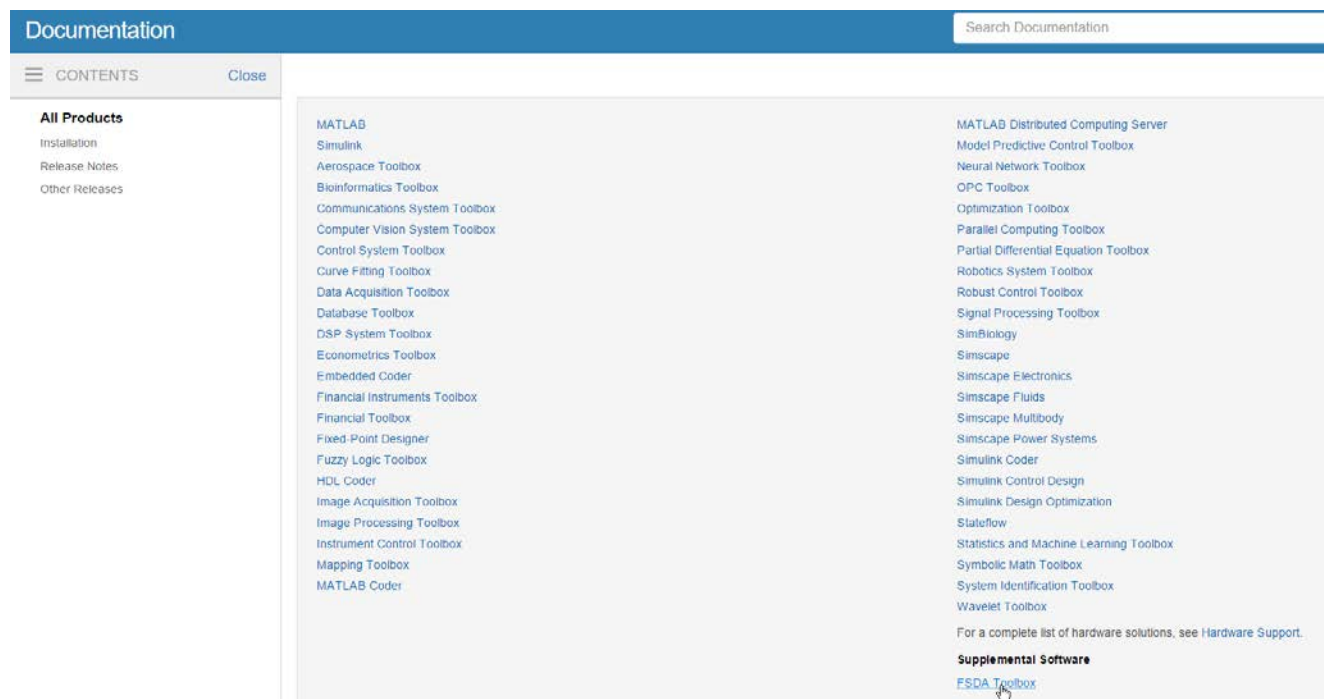
- d. For MATLAB R2012b to R2014b installations, the html help files can be found in the **Supplemental Software** tab which appears at the bottom of the Doc Center home page (see screenshot below).



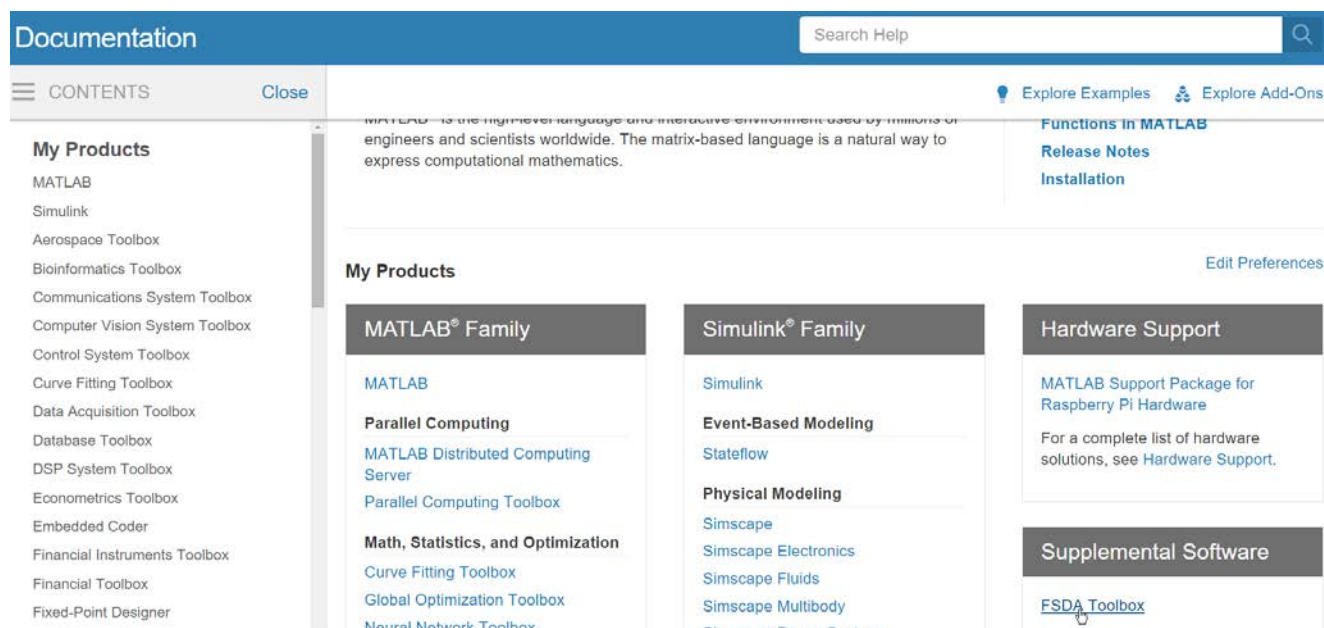


For MATLAB 2015a-2016b installations, the html help files can be found in the Supplemental Software link, (see screenshot below)

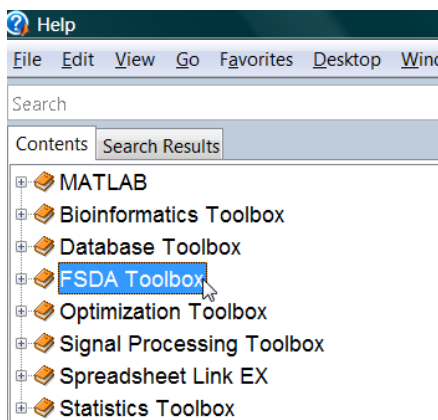
Screenshot for MATLAB 2016b



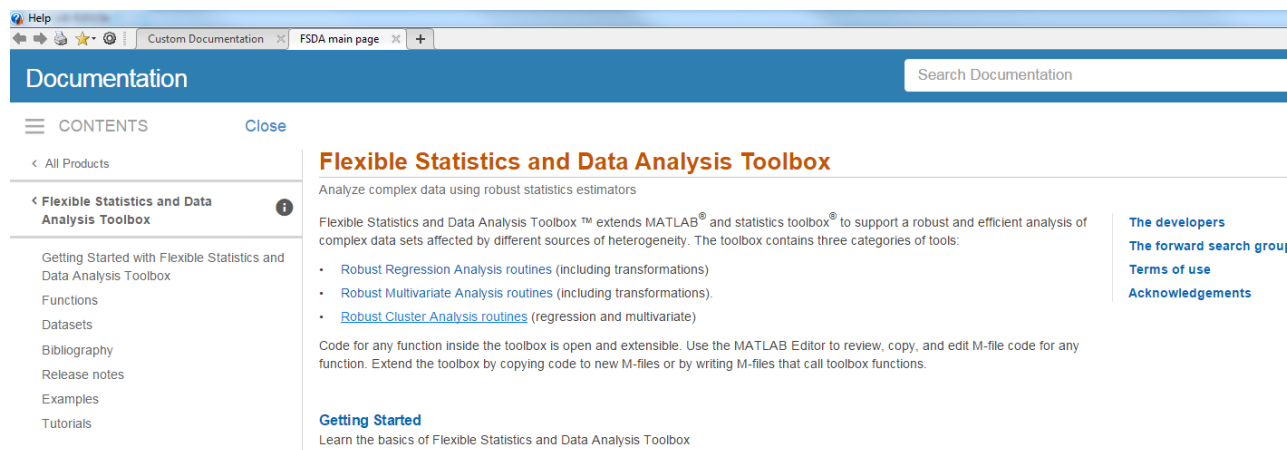
Screenshot for MATLAB 2017a and 2017b



e. For MATLAB installations earlier than 2012b, the documentation is located in the same place as all the other official Mathworks toolboxes (see bottom panel of screenshot below):



Independently from MATLAB version you use, once you click on the link FSDA Toolbox you should reach our main documentation page (see screenshot below)



Remark: you can reach our main documentation page also simply typing `docsearchFS` in the command prompt

```
>> docsearchFS
```

From our main documentation page you can go to the Examples page (see screenshot below),

< All Products

< Flexible Statistics and Data Analysis Toolbox

Getting Started with Flexible Statistics and Data Analysis Toolbox

Functions

Datasets

Bibliography

Release notes

Examples

Tutorials

Flexible Statistics and Data Analysis Toolbox

Analyze complex data using robust statistics estimators

Flexible Statistics and Data Analysis Toolbox™ extends MATLAB® and statistics toolbox® to affected by different sources of heterogeneity. The toolbox contains three categories of tools:

- [Robust Regression Analysis routines](#) (including transformations)
- [Robust Multivariate Analysis routines](#) (including transformations).
- [Robust Cluster Analysis routines](#) (regression and multivariate)

Code for any function inside the toolbox is open and extensible. Use the MATLAB Editor to re toolbox by copying code to new M-files or by writing M-files that call toolbox functions.

Getting Started

Learn the basics of Flexible Statistics and Data Analysis Toolbox

where you can find GUIs, example codes (see screenshot below),

CONTENTS Close

< All Products

< Flexible Statistics and Data Analysis Toolbox

Flexible Statistics and Data Analysis Toolbox Examples



ON THIS PAGE



- Robust Regression
- Robust Multivariate Analysis
- Robust Transformations
- Classification
- Dynamic scatter plot matrix
- Plotting



Flexible Statistics and Data Analysis Toolbox Examples

More Exam



Robust Regression



 Displays a GUI where it is possible to brush steps from the monitoring residuals plot  App

 Displays a GUI where it is possible to brush units from the index plot of residuals  App



 Examples of Robust Regression Using Robust Estimators  Script

Robust Multivariate Analysis

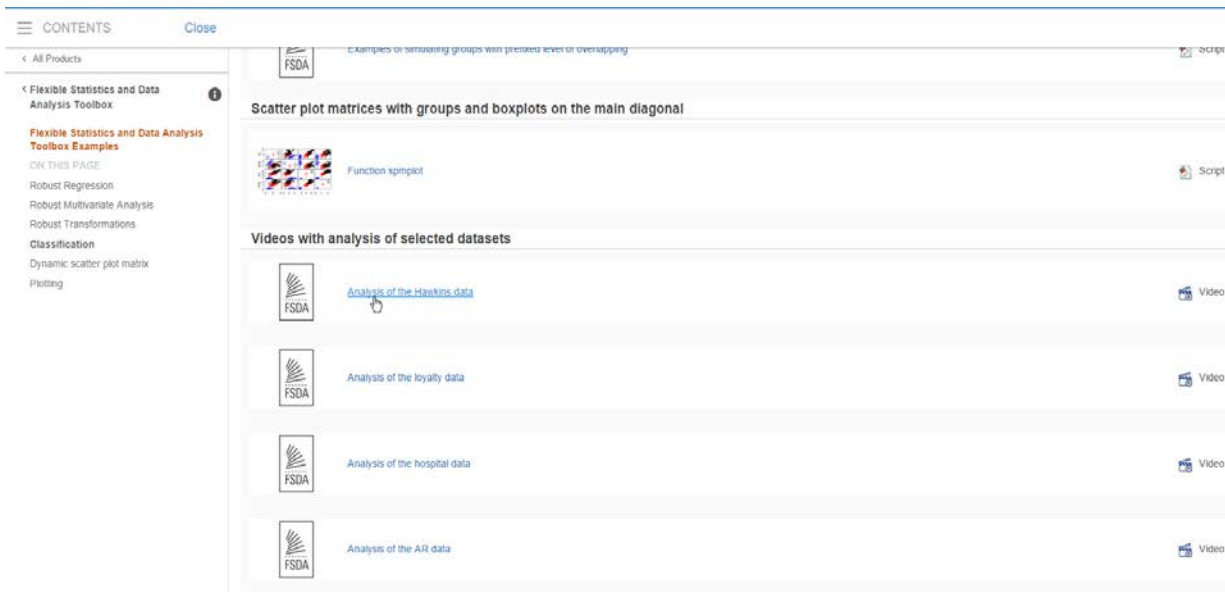
 Displays a GUI where it is possible to brush steps from the monitoring distances plot  App

 Examples of multivariate analysis using Robust Estimators  Script

Robust transformations Analysis

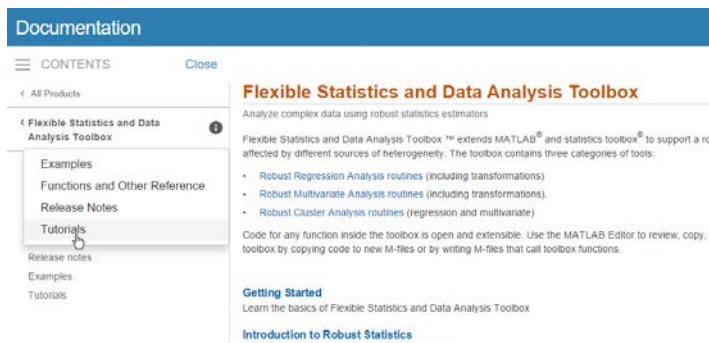
 Displays a GUI where it is possible to brush steps from the fan plot  App

and links to videos containing the analysis of selected examples (see screenshot below).



The screenshot shows the FSDA documentation interface. On the left, a sidebar contains a 'CONTENTS' menu with a 'Close' button. Below the menu, there are links to 'All Products' and 'Flexible Statistics and Data Analysis Toolbox'. The 'Flexible Statistics and Data Analysis Toolbox Examples' section is expanded, showing a list of topics: 'Robust Regression', 'Robust Multivariate Analysis', 'Robust Transformations', 'Classification', 'Dynamic scatter plot matrix', and 'Plotting'. The main content area displays a section titled 'Scatter plot matrices with groups and boxplots on the main diagonal' with a 'Function xplot' link. Below this, there is a section titled 'Videos with analysis of selected datasets' which lists four video links: 'Analysis of the Hawkins data', 'Analysis of the loyalty data', 'Analysis of the hospital data', and 'Analysis of the AR data'.

From any point of our documentation system you can go to the “Tutorials” page (see screenshot below)



The screenshot shows the FSDA documentation interface with the 'Tutorials' page selected. The sidebar on the left has a 'CONTENTS' menu with a 'Close' button. Below the menu, there are links to 'All Products' and 'Flexible Statistics and Data Analysis Toolbox'. The 'Flexible Statistics and Data Analysis Toolbox' section is expanded, showing a list of topics: 'Examples', 'Functions and Other Reference', 'Release Notes', 'Tutorials', 'Release notes', 'Examples', and 'Tutorials'. The 'Tutorials' link is highlighted. The main content area displays the title 'Flexible Statistics and Data Analysis Toolbox' and a description: 'Analyze complex data using robust statistics estimators'. It also lists the contents of the toolbox: 'Robust Regression Analysis routines (including transformations)', 'Robust Multivariate Analysis routines (including transformations)', and 'Robust Cluster Analysis routines (regression and multivariate)'. Below this, there is a section titled 'Getting Started' with a link to 'Introduction to Robust Statistics'.

where you can find several tutorials about robust statistics and dynamic statistical visualization, transformations.... (see screenshot below).

Documentation

≡ CONTENTS

Close

< All Products

< Flexible Statistics and Data Analysis Toolbox

Examples

Functions and Other Reference

Release Notes

Tutorials

Release notes

Examples

Tutorials

Tutorials

Introduction to robust statistics

[Introduction](#)
[Technical introduction to robust statistics in regression](#)
[Technical introduction to robust statistics in multivariate analysis](#)
[Introduction to the forward search philosophy of data analysis](#)

Dynamic Statistical Visualization

[Introduction to dynamic visualization](#)
[Dynamic visualization in the context of the forward search](#)
[Dynamic visualization in the index plot of residuals](#)
[Dynamic visualization in the monitoring residuals plot](#)
[Dynamic visualization in the minimum deletion residuals plot](#)
[Dynamic visualization in the fan plot](#)
[Dynamic visualization in the yXplot](#)
[Dynamic visualization in the candlestickplot](#)

Robust regression analysis

[Introduction to robust estimators in linear regression](#)
[Robust linear regression using LMS and LTS estimators](#)
[Robust linear regression using S and MM estimators](#)
[Robust forward linear regression with exploratory purposes](#)
[Robust forward linear regression with automatic outlier detection procedure](#)

Tranformations

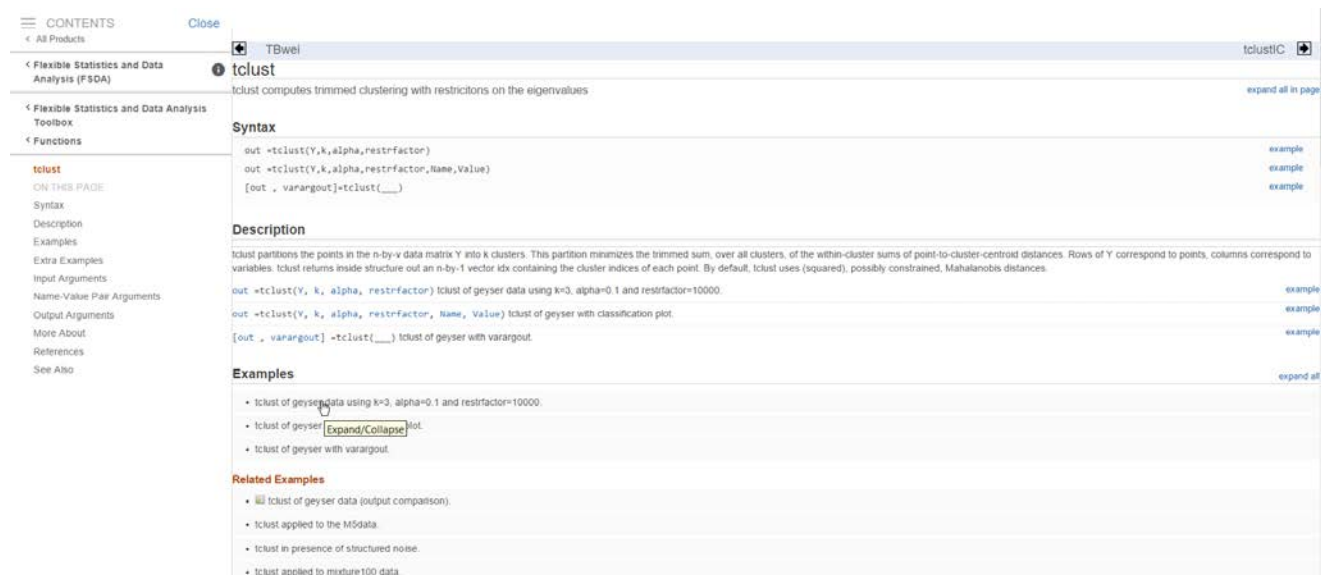
[Introduction to robust transformations in linear regression](#)
[Score test for transformation](#)
[Forward score test](#)

Model selection


[Introduction to variable selection](#)
[Variable selection using forward added-t-test](#)
[Robust model selection using Cp](#)

On the other hand, if from the left menu one clicks on “Functions and Other References” (see screenshot above), it is possible to get the categorical list of functions present in the toolbox (see screenshot below).


By clicking on one of these links (for example on `tcclust`, see screenshot above) it is possible to reach the HTML documentation of the function in a perfect new MATLAB documentation style (see screenshot below).




These HTML documentation pages have been created automatically by our routines `publishFS`. Every HTML documentation contains a series of **Examples** and **Related Examples**.

The icon  at the beginning of the line, indicates that the associated example has been executed and its output has been captured inside the HTML file. For example, if you click on the first of the Related Examples (see screenshot below),

Related Examples

-  `tcclust` of geyser data (output comparison).
[Expand/Collapse](#)
- `tcclust` applied to the M5data.

it is possible to see both the code (note that the code is displayed inside HTML using typical Matlab colouring) and the output which was generated (see the two screenshots below).

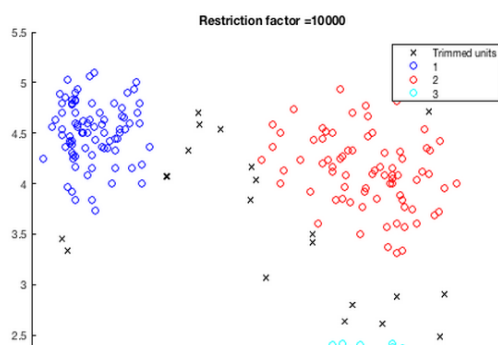
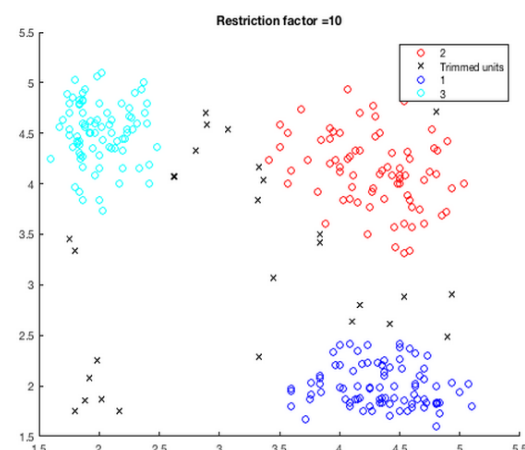
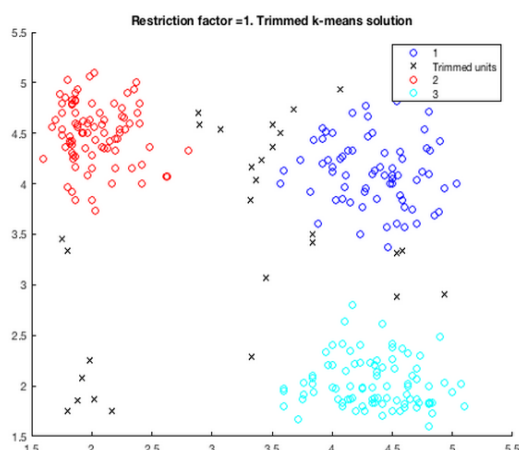
-  tclust of geyser data (output comparison).

[Expand/Collapse](#)

We compare the output using three different values of restriction factor.

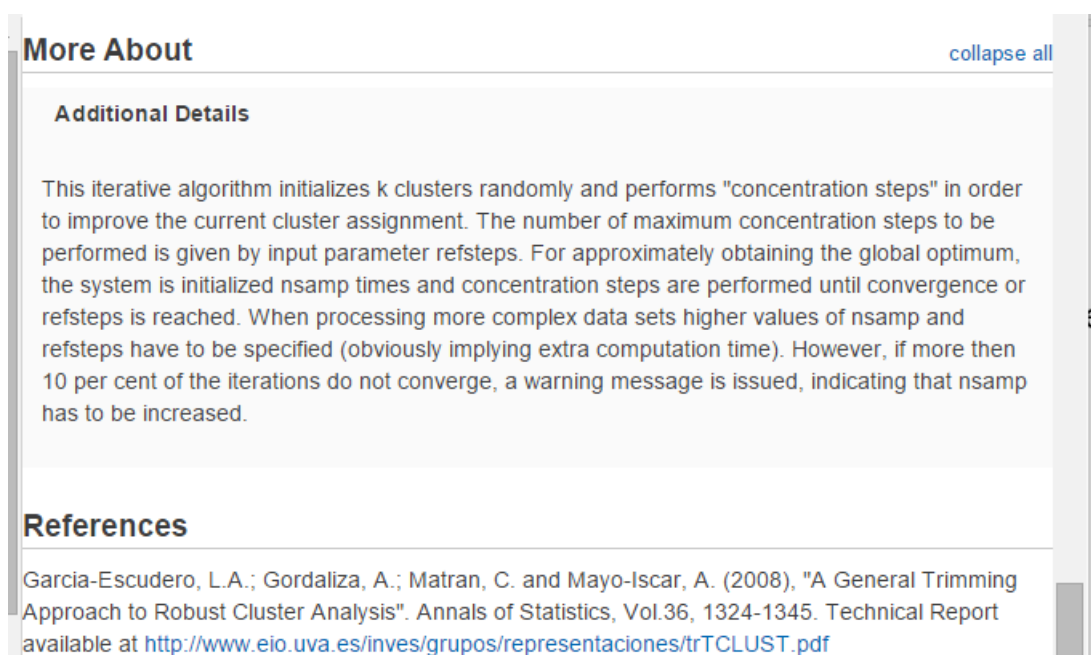
```
close all
Y=load('geyser2.txt');
restrfactor=10000;
% nsamp = number of subsamples which will be extracted
nsamp=500;
out=tclust(Y,3,0.1,restrfactor,'nsamp',nsamp,'plots',1);
title(['Restriction factor = ' num2str(restrfactor)])
restrfactor=10;
out=tclust(Y,3,0.1,restrfactor,'nsamp',nsamp,'refsteps',10,'plots',1);
title(['Restriction factor = ' num2str(restrfactor)])
% trimmed k-means solution restrfactor=1
restrfactor=1;
out=tclust(Y,3,0.1,restrfactor,'nsamp',nsamp,'refsteps',10,'plots',1);
title(['Restriction factor = ' num2str(restrfactor) ' . Trimmed k-means solution'])
cascade
```

Total estimated time to complete tclust: 4.16 seconds



In the `More About` section of our HTML files (see screenshot below), it is possible find the theoretical background which accompanies a particular function.

For example, the screenshot below shows what you get in the case of function `tclust`.



More About collapse all

Additional Details

This iterative algorithm initializes k clusters randomly and performs "concentration steps" in order to improve the current cluster assignment. The number of maximum concentration steps to be performed is given by input parameter `refsteps`. For approximately obtaining the global optimum, the system is initialized `nsamp` times and concentration steps are performed until convergence or `refsteps` is reached. When processing more complex data sets higher values of `nsamp` and `refsteps` have to be specified (obviously implying extra computation time). However, if more than 10 per cent of the iterations do not converge, a warning message is issued, indicating that `nsamp` has to be increased.

References

Garcia-Escudero, L.A.; Gordaliza, A.; Matran, C. and Mayo-Isacar, A. (2008), "A General Trimming Approach to Robust Cluster Analysis". *Annals of Statistics*, Vol.36, 1324-1345. Technical Report available at <http://www.eio.uva.es/inves/grupos/representaciones/trTCLUST.pdf>

Remark: there is a one to one correspondence between the documentation contained inside the `.m` file and the corresponding `.html` file.

The documentation inside the `.m` file can be easily accessed from the command prompt typing `help` and the name of the function.



For example, the screenshot below shows what you get if you type in the prompt “help MixSim”.

```
>> help MixSim
MixSim generates k clusters in v dimensions with given overlap

Link to the help function

Required input arguments:

    k: number of groups (components). Scalar.
        Desired number of groups.
        Data Types - int16|int32|int64|single|double
    v: number of dimensions (variables). Scalar.
        Desired number of variables.
        Data Types - int16|int32|int64|single|double

Optional input arguments:

    BarOmega : Requested average overlap. Scalar. Value of desired average
        overlap. The default value is ''
        Example - 'BarOmega',0.05
        Data Types - double
    MaxOmega : Requested maximum overlap. Scalar. Value of desired maximum
```

Sometimes inside the .m file (especially in the section “More About”) we have added a number of formulae in latex language (see screenshot below).

More About:

MixSim(k,v) generates k groups in v dimensions. It is possible to control the average and maximum or standard deviation of overlapping.

Given two generic clusters i and j with $i \neq j = 1, \dots, k$, indexed by $\phi(x; \mu_i, \Sigma_i)$ and $\phi(x; \mu_j, \Sigma_j)$ with probabilities of occurrence π_i and π_j , the misclassification probability with respect to cluster i (that is conditionally on x belonging to cluster i , which is called $w_{j|i}$) is defined as $\Pr[\pi_i \phi(x; \mu_i, \Sigma_i) < \pi_j \phi(x; \mu_j, \Sigma_j)]$. The matrix containing the misclassification probabilities $w_{j|i}$ is called OmegaMap

The probability of overlapping between groups i and j is given by:

$$\begin{aligned} &w_{j|i} + w_{i|j} \quad \quad \quad i, j = 1, 2, \dots, k \\ & \end{aligned}$$

The diagonal elements of OmegaMap are equal to 1.

The average overlap (which in the code is called below BarOmega) is

Clearly all these latex formulae will show up correctly (thanks to MathJax technology) in the corresponding HTML help page. For example, in the case of `MixSim` function, in the command window, by clicking on the link “Link to the help function”,

`MixSim` generates k clusters in v dimensions with given overlap

[Link to the help function](#)

one is redirected to the corresponding HTML documentation page. Here, in the “More About” section it is possible to see the code in proper mathematical style.

Flexible Statistics and Data Analysis Toolbox

Functions

MixSim

ON THIS PAGE

Syntax

Description

Examples

Extra Examples

Input Arguments

Name-Value Pair Arguments

BarOmega

MaxOmega

StdOmega

sph

hom

ecc

restrfactor

PiLow

Structure

More About

Additional Details

MixSim(k,v) generates k groups in v dimensions. It is possible to control the average and maximum or standard deviation of overlapping.

Given two generic clusters i and j with $i \neq j = 1, \dots, k$, indexed by $\phi(x; \mu_i, \Sigma_i)$ and $\phi(x; \mu_j, \Sigma_j)$ with probabilities of occurrence π_i and π_j , the misc cluster i , which is called w_{ji} , is defined as $Pr[\pi_i \phi(x; \mu_i, \Sigma_i) < \pi_j \phi(x; \mu_j, \Sigma_j)]$.

The matrix containing the misclassification probabilities w_{ji} is called OmegaMap. The probability of overlapping between groups i and j is given by:

$$w_{ji} + w_{ij} \quad i, j = 1, 2, \dots, k$$

The diagonal elements of OmegaMap are equal to 1.

The average overlap (which in the code is called below BarOmega) is defined as the sum of the off diagonal elements of OmegaMap (matrix of misclassification called MaxOmega) is defined as $\max(w_{ji} + w_{ij}), i \neq j = 1, 2, \dots, k$.

The probability of misclassification w_{ji} is nothing but the cdf of a linear combination of non central χ^2 distributions with 1 degree of freedom + a linear combination of non central χ^2 and $N(0, 1)$ depend on the eigenvalues and eigenvectors of matrix $\Sigma_{ji} = \Sigma_i^{0.5} \Sigma_j^{-1} \Sigma_i^{0.5}$.

Point c depends on the same eigenvalues and eigenvectors of matrix Σ_{ji} , the mixing proportions π_i and π_j and the determinants $|\Sigma_i|$ and $|\Sigma_j|$.

This probability is computed using routine `ncx2mixtcdf`

Finally, it is worthwhile to remark that it is possible to go directly to the HTML documentation page simply typing `docsearchFS` and the name of the requested function. For example, in the case of `tclust` to reach file `tclust.html` it is possible to type:

```
fx >> docsearchFS tclust
```

Generally, the output of our functions is a structure, which contains several fields, documented in detail inside the initial part of the .m function. For example, in the case of `tclust` inside `tclust.m` it is possible to navigate to section `Output` (see screenshot below):

```
% Output:
%
%      out:  structure which contains the following fields
%
%      out.muopt= k-by-v matrix containing cluster centroid locations.
%               Robust estimate of final centroids of the groups.
%      out.sigmapopt= v-by-v-by-k array containing estimated constrained
%                   covariance for the k groups.
%      out.idx  = n-by-1 vector containing assignment of each unit to
%               each of the k groups. Cluster names are integer
%               numbers from 1 to k. 0 indicates trimmed
%               observations.
%      out.siz  = matrix of size k-by-3
%               1st col = sequence from 0 to k
%               2nd col = number of observations in each cluster
%               3rd col = percentage of observations in each cluster
%               Remark: 0 denotes unassigned units
%      out.post = n-by-k matrix containing posterior probabilities
%               I out.post(i,j) contains posterior probabilitiy of unit
%               i from component (cluster) j. For the trimmed units
%               posterior probabilities are 0
%      out.MIXMIX = BIC which uses parameters estimated using the
```

In the corresponding HTML file our parser publishFS.m puts all the fields of input and output structure inside a HTML table (see screenshot below):

Output Arguments	
out — description Structure	Expand/Collapse
Structure which contains the following fields	
Value	Description
muopt	k-by-v matrix containing cluster centroid locations. Robust estimate of final centroids of the groups.
sigmaopt	v-by-v-by-k array containing estimated constrained covariance for the k groups.
idx	n-by-1 vector containing assignment of each unit to each of the k groups. Cluster names are integer numbers from k. 0 indicates trimmed observations.
siz	matrix of size k-by-3 1st col = sequence from 0 to k 2nd col = number of observations in each cluster 3rd col = percentage of observations in each cluster Remark: 0 denotes unassigned units
post	n-by-k matrix containing posterior probabilities out post(i,j) contains posterior probability of unit i from component (cluster) j. For the trimmed units posterior probabilities are 0
MIXMIX	BIC which uses parameters estimated using the mixture loglikelihood and the maximized mixture likelihood as good of fit measure. Remark: this output is present just if input option mixt is >0
MIXCLA	BIC which uses the classification likelihood based on parameters estimated using the mixture likelihood (in some cases this quantity is called ICL) Remark: this output is present just if input option mixt is >0
CLACLA	BIC which uses the classification likelihood based on parameters estimated using the classification likelihood Remark: this output is present just if input option mixt is =0
notconver	scalar: Number of subsets without convergence
bs	k-by-1 vector containing the units forming initial subset associated with muopt
obj	scalar: Value of the objective function which is minimized (value of the best returned solution) If input option mixt >1 the likelihood which is maximized is a mixture likelihood as follows $\prod_{t=1}^h \sum_{j=1}^k \pi_j \phi(y_t; \theta_j).$

Every subfolder of FSDA contains file contents.m (automatically created by our routine makecontentsfileFS.m) which contains a series of detailed information about all the .m files of the folder, which have the corresponding HTML documentation. For example, the screenshot referred to the left part of file contents.m inside subfolder “utilities” is given below.

% UTILITIES	
% File names, description, category and date last modified	
% Name - Description	
% -----	
% cabc	- Closes all open figures except the one in foreground (the current)
% cascade	- Is a third party function used in FSDA demos and examples
% clickableMultiLegend	- Hides/shows symbols inside all gplotmatrix subplots (or similar)
% findDir	- Finds recursively all directories in root
% findFile	- Finds recursively all files in root
% isfunction	- Checks if a function exists
% makecontentsfileFS	- Extends Matlab function makecontentsfile
% PoolClose	- Closes the pool of MATLAB instances opened with PoolPrepare to
% PoolPrepare	- Prepares a pool of MATLAB instances for executing code in parallel
% position	- Controls the position of the open figures
% publishFS	- Enables to create automatic HELP FILES from structured .m functions
% publishFunctionAlpha	- Enables to create web page which contains the alphabetical list
% publishFunctionCate	- Enables to create web page which contains the alphabetical list
% quickselectFS	- Finds the k-th order statistic
% triu2vec	- Extracts in a vector the linear indexes or the elements on and
% upperfracpos	- Positions two figures on the upper part of the screen
% zscoreFS	- Computes (robust) standardized z scores

Similarly, inside the main root of FSDA file contents .m lists in alphabetical order all files present in all subfolders of FSDA, which have the corresponding HTML page (see screenshot below):

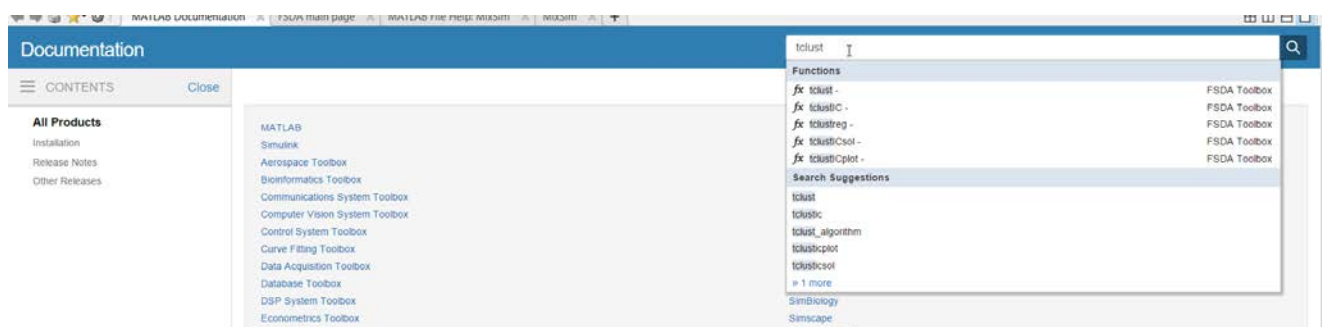
% FSDA	
%	
% File names, description, category and date last modified	
%	
% Name	- Description
% -----	
% add2spm	- Adds objects (personalized clickable multilegends and t
% add2yX	- Adds objects (personalized clickable multilegends and t
% addt	- Produces the t test for an additional explanatory varia
% barnardtest	- Barnard's unconditional test
% basicPower	- Computes the basic power transformation
% bc	- Returns the Binomial coefficient
% boxplotb	- Computes a bivariate boxplot
% boxtest	- Performs Box test of equality of covariance matrices
% brushFAN	- Displays a GUI which enables brushing in the fanplot
% brushRES	- Displays a GUI which enables brushing in resfwdplot
% brushROB	- Displays a GUI which enables brushing in resindexplot
% bwe	- Estimates the bandwidth smoothing parameter for kernel
% cabc	- Closes all open figures except the one in foreground (t
% carbikeplot	- Produces the carbike plot to find best relevant cluster
% cascade	- Is a third party function used in FSDA demos and exampl
% cdsplot	- Produces the candlestick plot for robust model selectio

FSDA html documentation files and MATLAB search engine

Particular attention has been devoted by the FSDA team to have all our HTML files indexed by the old and new search engine of MATLAB. Below we describe what you should get depending on the MATLAB version you have.

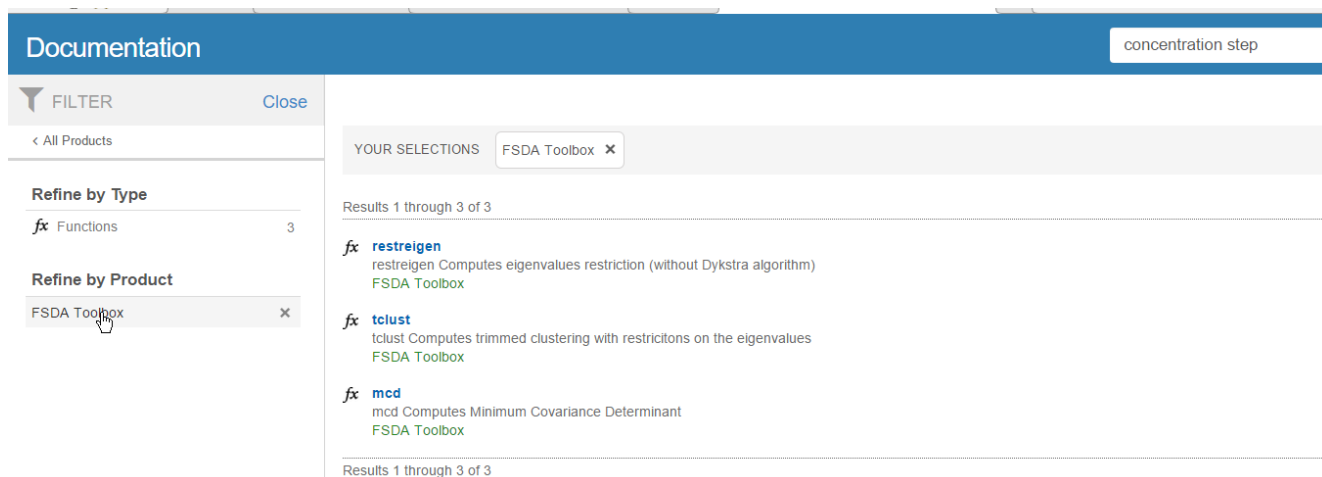
MATLAB 2015a-2017b

If your version of MATLAB is in the range 2015a-2017b, typing inside the engine a word you get also the results from the FSDA toolbox. For example, typing `tclust` you should automatically have the search suggestion from the drop down menu which automatically appears (see screenshot below)



and you should be brought directly to the `tclust` documentation page.

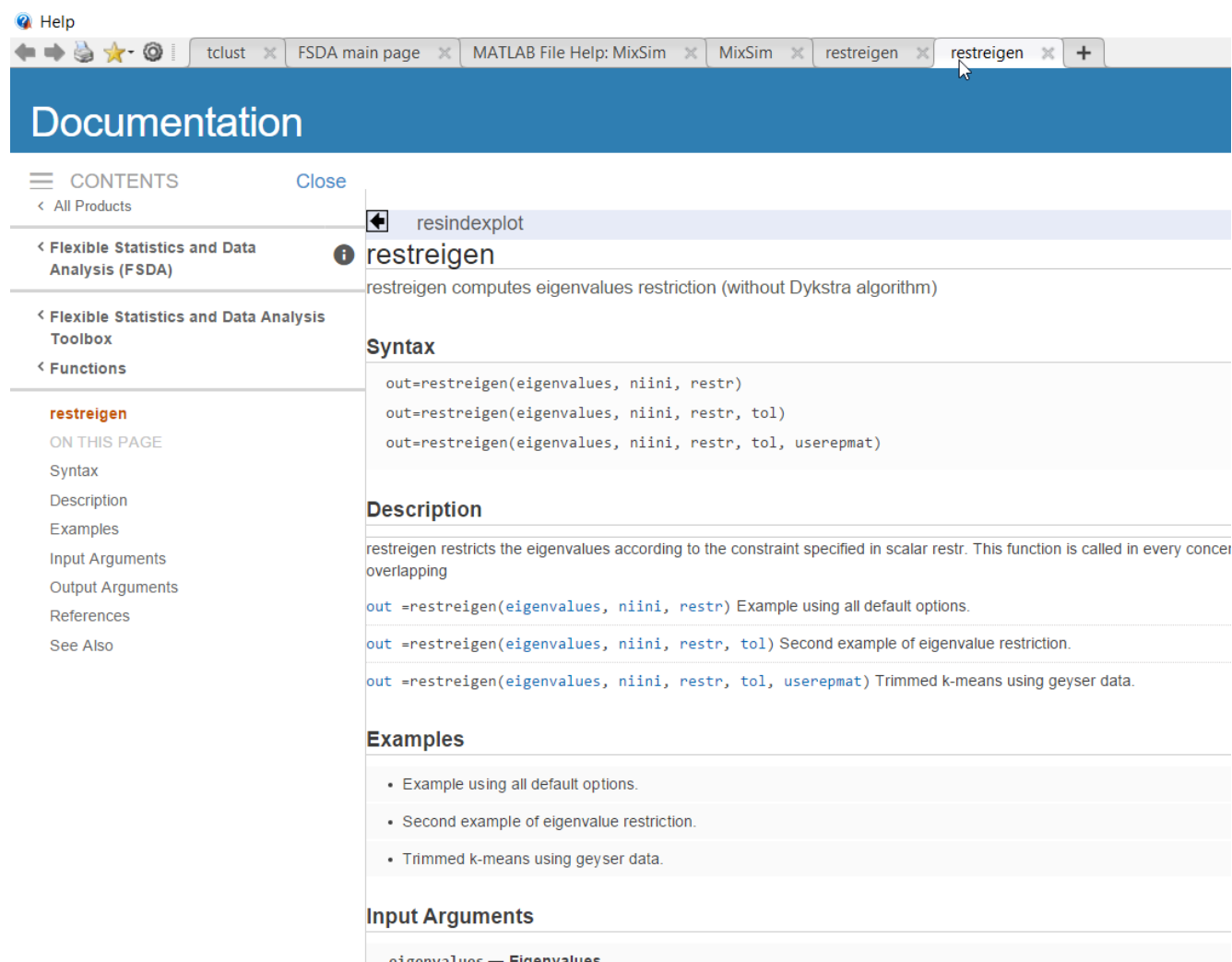
If, for example, you type “concentration step” and you do Refine by Product and select the FSDA toolbox these are the three instances you should get.



If you put your mouse on the word `restreigen` you can see from the status bar that the function is located inside (main FSDA folder)/helpfiles/pointersHTML, (screenshot of status bar is given below):

[FSDA/helpfiles/pointersHTML/restreigen.html?searchHighlight=concentration step product:3ptoolbox::fsda_toolbox](FSDA/helpfiles/pointersHTML/restreigen.html?searchHighlight=concentration%20step%20product:3ptoolbox::fsda_toolbox)

Once you click on `restreigen` you can go to page `restreigen.html` (see screenshot below) which is located inside `docrootFS/FSDA`.



Documentation

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- < Flexible Statistics and Data Analysis (FSDA)
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 - < Functions
 - restreigen**
 - ON THIS PAGE
 - Syntax
 - Description
 - Examples
 - Input Arguments
 - Output Arguments
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 - See Also

restreigen

restreigen computes eigenvalues restriction (without Dykstra algorithm)

Syntax

```
out=restreigen(eigenvalues, niini, restr)
out=restreigen(eigenvalues, niini, restr, tol)
out=restreigen(eigenvalues, niini, restr, tol, userepmat)
```

Description

restreigen restricts the eigenvalues according to the constraint specified in scalar `restr`. This function is called in every conce overlapping

`out =restreigen(eigenvalues, niini, restr)` Example using all default options.

`out =restreigen(eigenvalues, niini, restr, tol)` Second example of eigenvalue restriction.

`out =restreigen(eigenvalues, niini, restr, tol, userepmat)` Trimmed k-means using geyser data.

Examples

- Example using all default options.
- Second example of eigenvalue restriction.
- Trimmed k-means using geyser data.

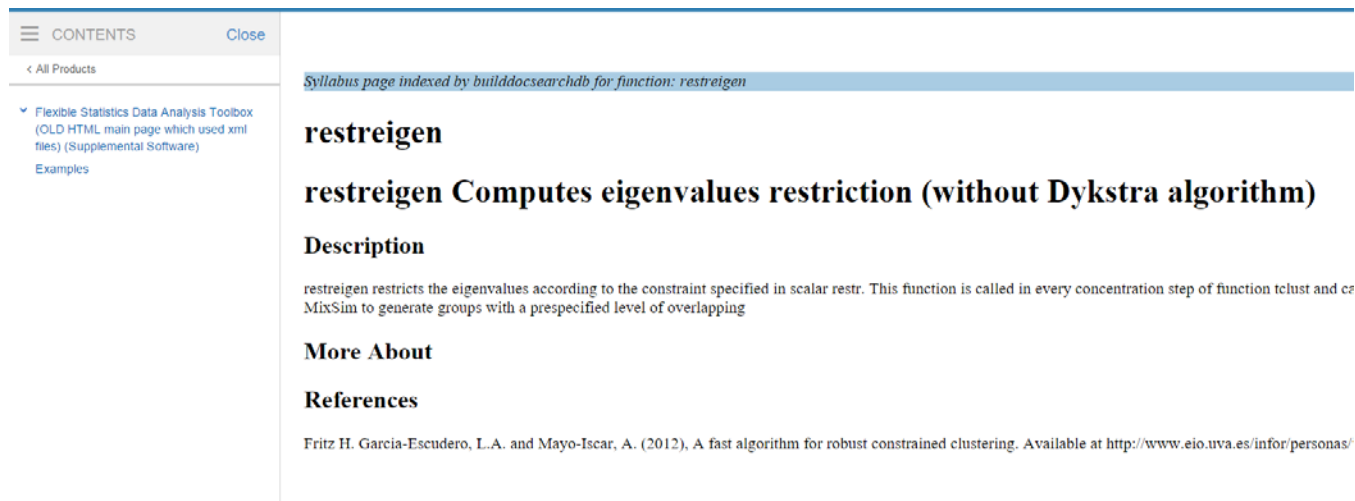
Input Arguments

`eigenvalues` — **Eigenvalues**

From the toolstrip on top you will notice that two instances of `restreigen` have been opened.



The first on the left is the page which has been indexed by MATLAB search engine which is located inside
(main FSDA folder)/helpfiles/pointersHTML (see screenshot below):



Syllabus page indexed by builddocsearchdb for function: restreigen

restreigen

restreigen Computes eigenvalues restriction (without Dykstra algorithm)

Description

restreigen restricts the eigenvalues according to the constraint specified in scalar restr. This function is called in every concentration step of function tclust and ceMixSim to generate groups with a prespecified level of overlapping

More About

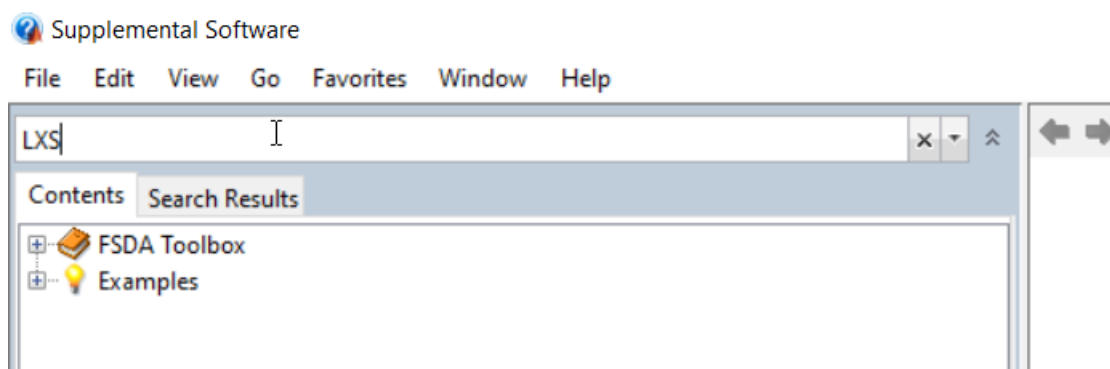
References

Fritz H. Garcia-Escudero, L.A. and Mayo-Iscar, A. (2012), A fast algorithm for robust constrained clustering. Available at <http://www.eio.urva.es/infor/personas/>

All these syllabus pages have been automatically created by our routine `createFSDAhelp.m`. It was necessary to have the intermediate pages because MATLAB forces these pages to be opened on the iframe on the right. All these syllabus pages contain a redirect to our final HTML pages, which are contained inside `docroot/FSDA`. Files inside `docroot/FSDA` are not forced to be opened on the iframe on the right.

MATLAB 2012b-2014b

If your version of MATLAB is between 2012b-2014b, it is necessary to use the old MATLAB search engine inside supplemental software (see screenshot below),





also, in this case, passing through the syllabus page contained in (FSDA root) \helpfiles\pointersHTML.

LXS

Contents Search Results

Type Relevance Product

LXS

by builddocsearchdb for function: LXS ... LXS Computes the Least Median of

FSDA Toolbox

publishFS

publishFS creates HTML files from structured .m file. To understand the char...

FSDA Toolbox

Syllabus page indexed by builddocsearchdb for function: LXS

LXS

LXS Computes the Least Median of Squares (LMS) or Least Trimmed Squares (LTS) estimators

Description

More About

References

Rousseeuw PJ, Leroy AM (1987). Robust regression and outlier detection. Wiley.

It is possible to automatically reach our page LXS.html contained inside docroot / FSDA .

Documentation

Search Documentation

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See Also

logmvpdfFS

mahalfFS

LXS

LXS computes the Least Median of Squares (LMS) or Least Trimmed Squares (LTS) estimators

Syntax

out =LXS(y,X)

out =LXS(y,X,Name,Value)

[out , varargout]=LXS(____)

Description

out =LXS(y, X) LXS with default input and output.

out =LXS(y, X, Name, Value) LXS with optional arguments.

[out , varargout] =LXS(____) LXS with optional output.

Examples

LXS with default input and output.

LXS with optional arguments.

LXS with optional output.

Related Examples

MATLAB <=2012a

In MATLAB older or equal than 2012a, there was no distinction between MATLAB toolboxes and third parties toolboxes (as concerns the documentation), therefore it is possible to search directly from the unique official MATLAB engine. For example searching for LXS,

LXS

Contents Search Results

MATLAB

FSDA Toolbox

Other Demos

MATLAB®

Functions:

By Category

Alphabetical List

Handle Graphics:

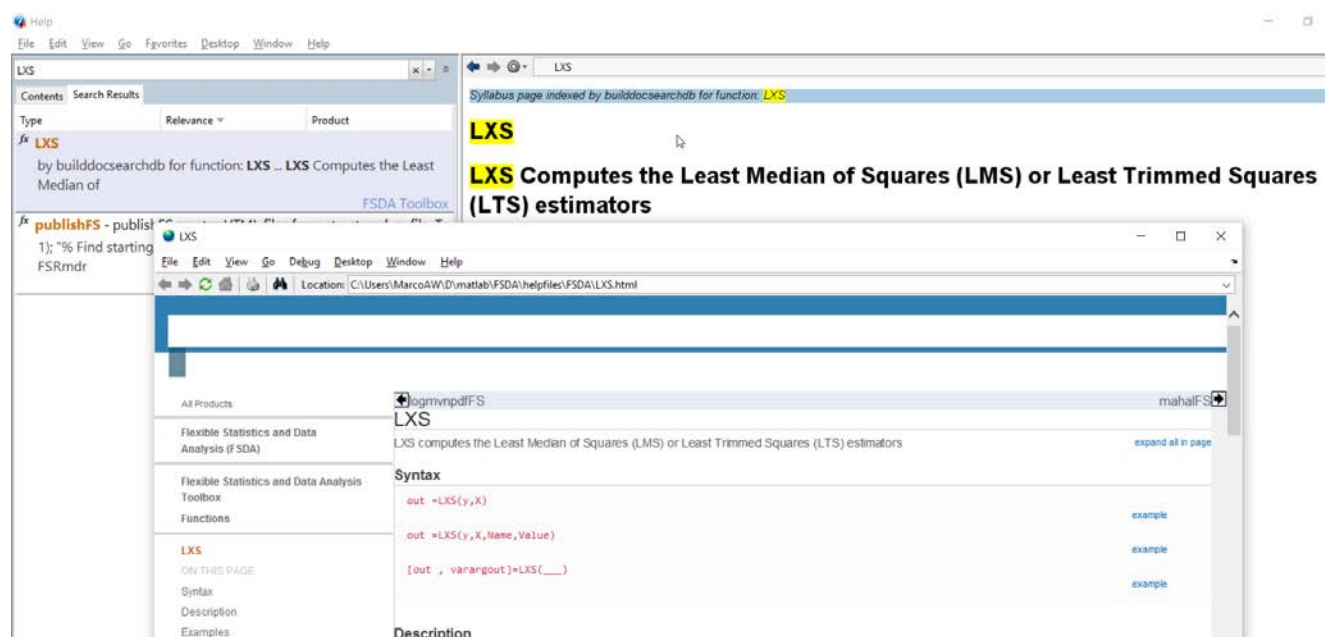
Object Properties

What's New

MATLAB Release Notes

Summarizes new features, bug fixes, upgrade issues, etc.

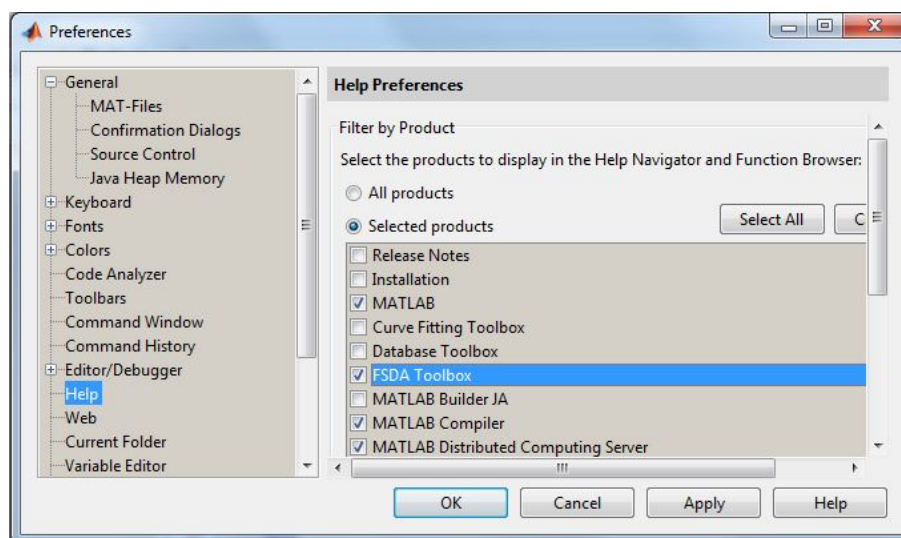
the output of the search is again the syllabus page which automatically redirects to the true HTML page (both are shown in the screenshot below):



Remark 1: note that the old MATLAB browser enables us to see correctly just 95% of the javascripts which characterize the new MATLAB help style.

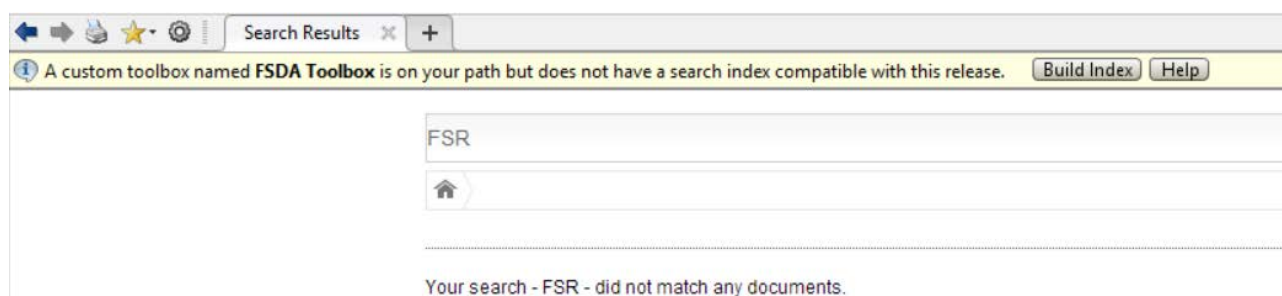
Remark 2: given that in MATLAB versions earlier than 2012b the new engine lucene did not exist, all the “true HTML files” during the installation are not moved to folder `docroot\FSDA` but are left inside (main root of FSDA) `/helpfiles\FSDA`.

Remark 3: If you are using a release lower than R2012b and you think that the MATLAB Help Browser is not producing proper search results for FSDA functions, check first that in the MATLAB Help Preferences FSDA is selected, as shown in Figure below:

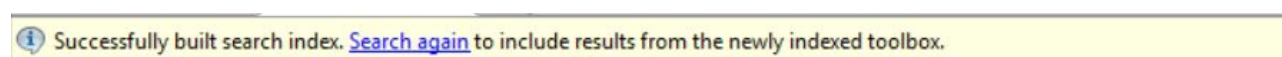


Remark 4: **From MATLAB R2015a**, when you search for a given third party function for the first time, the search results window will display a yellow message warning that a toolbox in the path does not have the

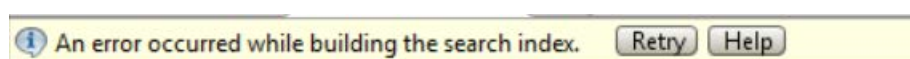
proper documentation index file. The window and message produced when attempting to search for documentation about 'FSR' function, are shown here:



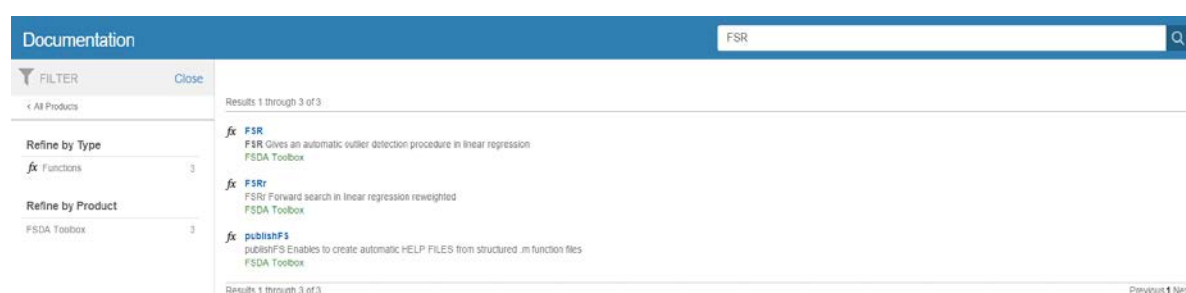
Only after clicking on the Build Index button you should start getting the desired documentation. You will be informed of the successful update of the search database with this message:



If, instead of this message and instead of receiving back the desired results, **you receive an error message** such as this one



again it is likely that you have installed FSDA in a location without proper permissions and, thus, the index building operation (i.e. the `builddocsearchdb` command) could not update the search database. The only solution in this case is to obtain the writing permissions or to change location for FSDA. What you should get if the search is successful, is something like the following:



Therefore, if by some obscure reason you cannot find our HTML files using old or new (lucene) engine, it might be necessary to run again `builddocsearchdb`. For example assuming that FSDA main folder is `D:\PACKAGES\FSDA`, then it is necessary to run:

```
Command Window
fx >> builddocsearchdb('D:\PACKAGES\FSDA\helpfiles\pointersHTML')
```

IF YOU THINK THAT SOMETHING NOT DESCRIBED IN THESE NOTES WENT WRONG

PLEASE DO NOT HESITATE TO SEND AN E-MAIL TO

FSDA@unipr.it