# Web 2.0 for R scripts & workflows: Tiki & PluginR - *UseR 2011*

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**Slides**: http://ueb.ir.vhebron.net/2011+UseR

**Keywords**: GUI, Web 2.0, Free/libre Software, Tiki Wiki CMS Groupware, PluginR.

# 1. Introduction: Our goal

1. Web interfaces for R scripts (& reports)
   (~ Sweave or org-mode: mixing templates with R code but with simpler syntax, for the crowds)
2. Using some multipurpose-versatile tool: for Bioinformatics and for anything
   1. free/libre open source software (FLOSS)
   2. multi-platform & multi-browser
   3. mature & maintained software
   4. documented
   5. standard technology & programing languages
   6. extend-able by us or by others easily
   7. versatile enough for multi-purpose with single learning curve,
   8. quick & easy web output or reports

# 2. Web GUIs for R (i): many but (apparently) unreliable

- A few listed in R FAQ's, but...
  - most seem either unmaintained (= risky in the mid term)
  - or doesn't work anymore,
  - or too difficult (for an averaged researcher or technician)

Reinvention of the wheel (once more)?

- diversity of designs: let evolution rule...
  (we ended up extended a previous development branch in php)


cran.r-project.org/doc/FAQ/R-FAQ.html#R-Web-Interfaces

Next: R Add-On Packages, Previous: R and S, Up: Top

4 R Web Interfaces

**Rweb** is developed and maintained by Jeff Banfield. The Rweb Home Page provides access to all three versions of Rweb—a simple text entry form that returns output and graphs, a more sophisticated JavaScript version that provides a multiple window environment, and a set of point and click modules that are useful for introductory statistics courses and require no knowledge of the R language. All of the Rweb versions can analyze Web accessible datasets if a URL is provided.

# 3. Web GUIs for R (ii): similar conclusions by others*

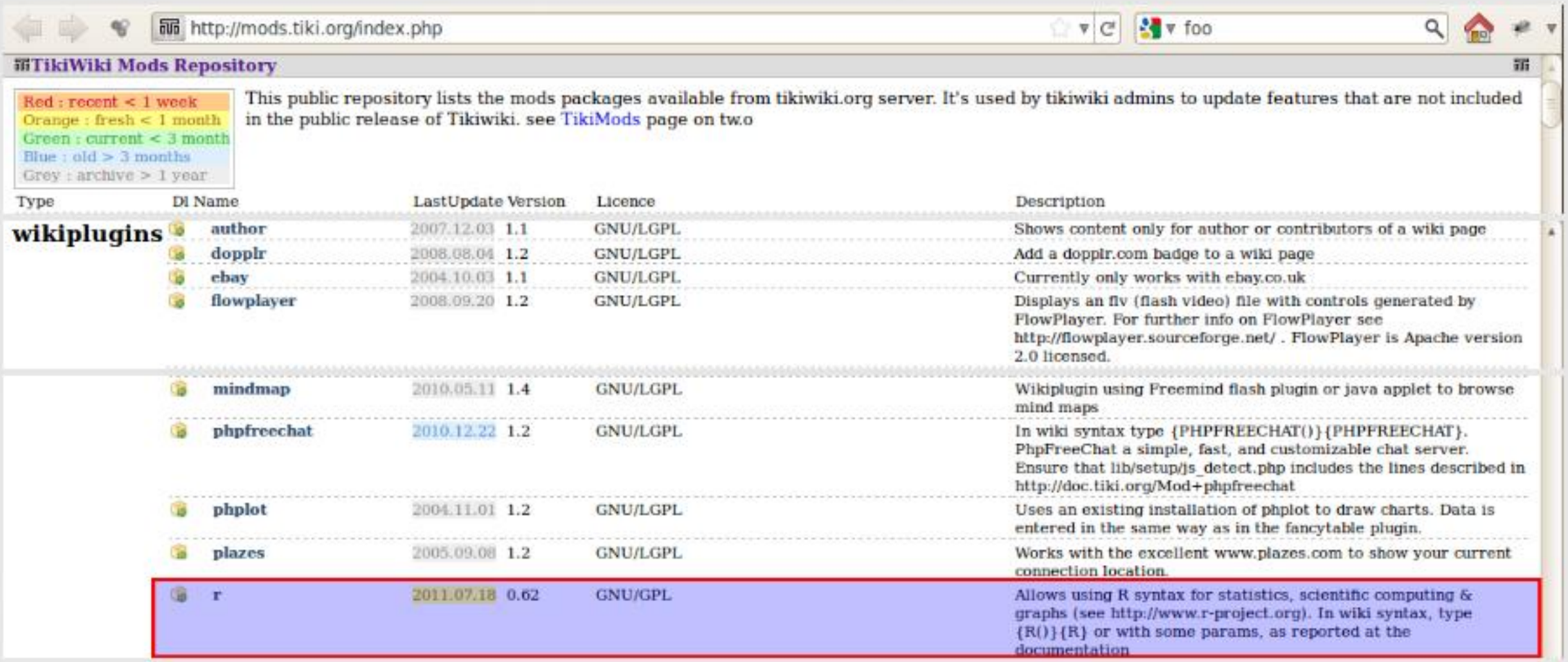
| Software | Brief notes |
|---|---|
| Rweb | Page last updated 1999. Of the 3 example links on the page one ran very slowly, the second not at all and the third is broken. |
| R-Online | Or rather, not online. Unless this CGI form is the same thing. I tried Example 1, it returned a server error. |
| Rcgi | Links to several CGI forms, none of which worked for me. |
| CGI-based R access | Link did not load. |
| CGIwithR | Package now maintained at Omegahat. Did not attempt installation. Last updated 2005. |
| Rpad | I could not connect to this URL. |
| RApache | The pick of the bunch. Provides server-side access to R through an Apache module. I was able to install RApache on 32-bit (but not 64-bit) Ubuntu 9.10 and get it running. Could use more documentation. |
| Rserve | Serves R via TCP/IP. Last updated 2006. |
| OpenStatServer | Broken link. No longer exists, so far as I can tell. |
| R PHP Online | Link out of date (but you can follow it to the newer page). Last updated 2003, so unlikely to be much use. |
| R-php | Last updated 2006; the example that I tried gave a server error. |
| webbioc | A Bioconductor package. Did not investigate further. |
| Rwui | An application to create R web interfaces. My browser hung at 'waiting for cache'. I gave up. |

* Table 1. From Neil Saunders, personal communication in his blog

# 4. Our choice (i): "Tiki" as a base application & framework

Tiki: "**Tightly Integrated Knowledge Infrastructure**" (tiki.org)

# 5. Our choice (ii): Tiki + PluginR (external mod)



# 6. Examples

A few examples of usage follow after the parameter list.

## PluginR params

| Parameters | Accepted Values | Description | Default |
|---|---|---|---|
| *attId* | int | AttId from a tracker Item attachment. ex: 1. (Optional) | |
| *type* | text/csv<br>text/xml | Choose the source file type in the appropriate mimetype syntax (Optional). Options: csv\|xml. ex: csv. (default). For xml, see documentation for more details on the additional R packages required | |
| *wikisyntax* | 0<br>1 | Choose whether the output should be parsed as wiki syntax (Optional). Options: 0 (no parsing, default), 1 (parsing) | |
| *width* | int | Width of the graph (Optional). Options: an integer number in pixels (default) or in units specified. If ommitted but height is set, width will be proportional to keep aspect ratio | |
| *height* | int | Height of the graph (Optional). Options: an integer number in inches (default) or in units specified. If ommitted but width is set, height will be proportional to keep aspect ratio | |
| *units* | alpha | Choose units for the width and/or height parameters (Optional). Options: px (default) for pixels, in (inches), cm or mm | |
| *pointsize* | int | The default pointsize of plotted text, interpreted as big points (1/72 inch) at res dpi (optional). Options: interger number such as 12 or bigger | |
| *bg* | any string except for HTML and PHP tags | The initial background colour (optional). Options: white, yellow, grey, ... and transparent | |
| *res* | int | The nominal resolution in dpi which will be recorded in the bitmap file (if any). Also used for units other than the default, and to convert points to pixels (Optional). Options: a positive integer (default: 72 dpi). Values higher than 150 usually seem to be too much | |
| *x11* | int | Choose whether the server can use X11 to produce graphs in R, or alternatively use dev2bitmap instead (Optional). Options: 1 (R has support for X11, default), 0 (no support for X11 thus using dev2bitmap). These capabilities can be checked in the server with the command in the R console: capabilities() | |
| *loadandsave* | 0<br>1 | Load a previous R session (.RData, if any) for the same wiki page so that R object will be used while you work within the same page. For pretty trackers are used (wiki pages with itemId), the R session data (.RData) will be shared for the same itemId across wiki pages | |

# Example 1a - "Hello world" (Basic R syntax)

This code:

```
{R()}
# Foo
cat(1:10)
{R}
```

Produces:

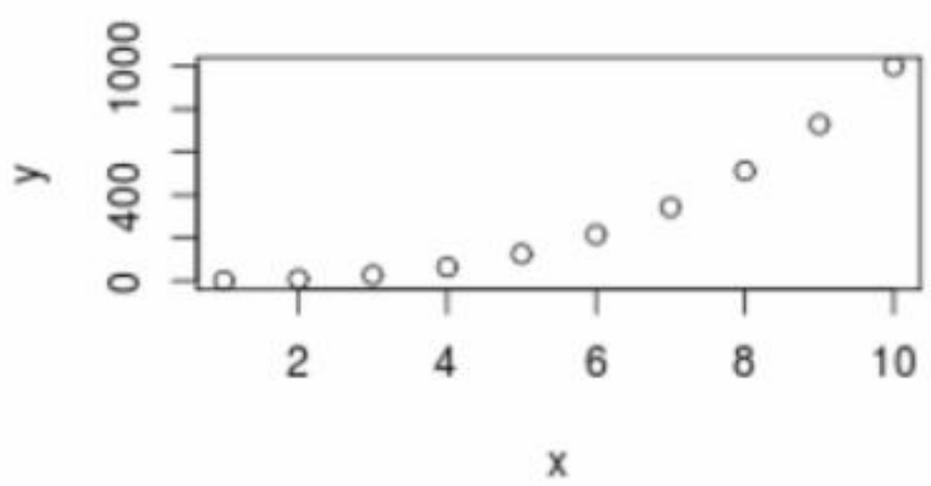
```
1 2 3 4 5 6 7 8 9 10
```

# Example 1b - "Hello world" (Basic R syntax)

This code:

```
{R(width="300", height="200")}
# A plot
x<-1:10
y<-x*x*x
plot(x,y)
{R}
```

Produces:



# Example 1c: "Risky" calls?

This code:

```
{R(width="300", height="300")}
# A plot with custom location
for image on disk
x<-1:10
y<-x*x*x
png("/home/xavi/tmp/foo.png")
plot(x,y)
{R}
```

Produces:

^Blocked commands found: png.

Use Plugin RR instead and validate your plugin call, or contact a site admin to have the plugin call validated for you^

# Example 1c: "Risky" calls - only after RR & admin validation

This code (using an RR call):

```
{RR(width="300", height="300")}
# A plot with custom location
for image on disk
x<-1:10
y<-x*x*x
png("/home/xavi/tmp/foo.png")
plot(x,y)
{RR}
```

Produces:

**Plugin execution pending approval**

This plugin was recently added or modified. Until an editor of the site validates the parameters, execution will not be possible. You are allowed to:

- View arguments
- Execute the plugin in preview mode (may be dangerous)
- Approve the plugin for public execution

View Details

# Example 2 - PluginR with (optional) params

**a using loadandsave=1**

```
{R(loadandsave="1")}
rm(list = ls());
ls();
a<-12;
cat("\na = 12\n");
{R}
```

```
character(0)

a = 12
```

**b using loadandsave=1**

```
{R(loadandsave="1")}
ls();
b<-a*3;
cat("\nb = a*3 = ");
cat(b);
{R}
```

```
[1] "a"

b = a*3 = 36
```

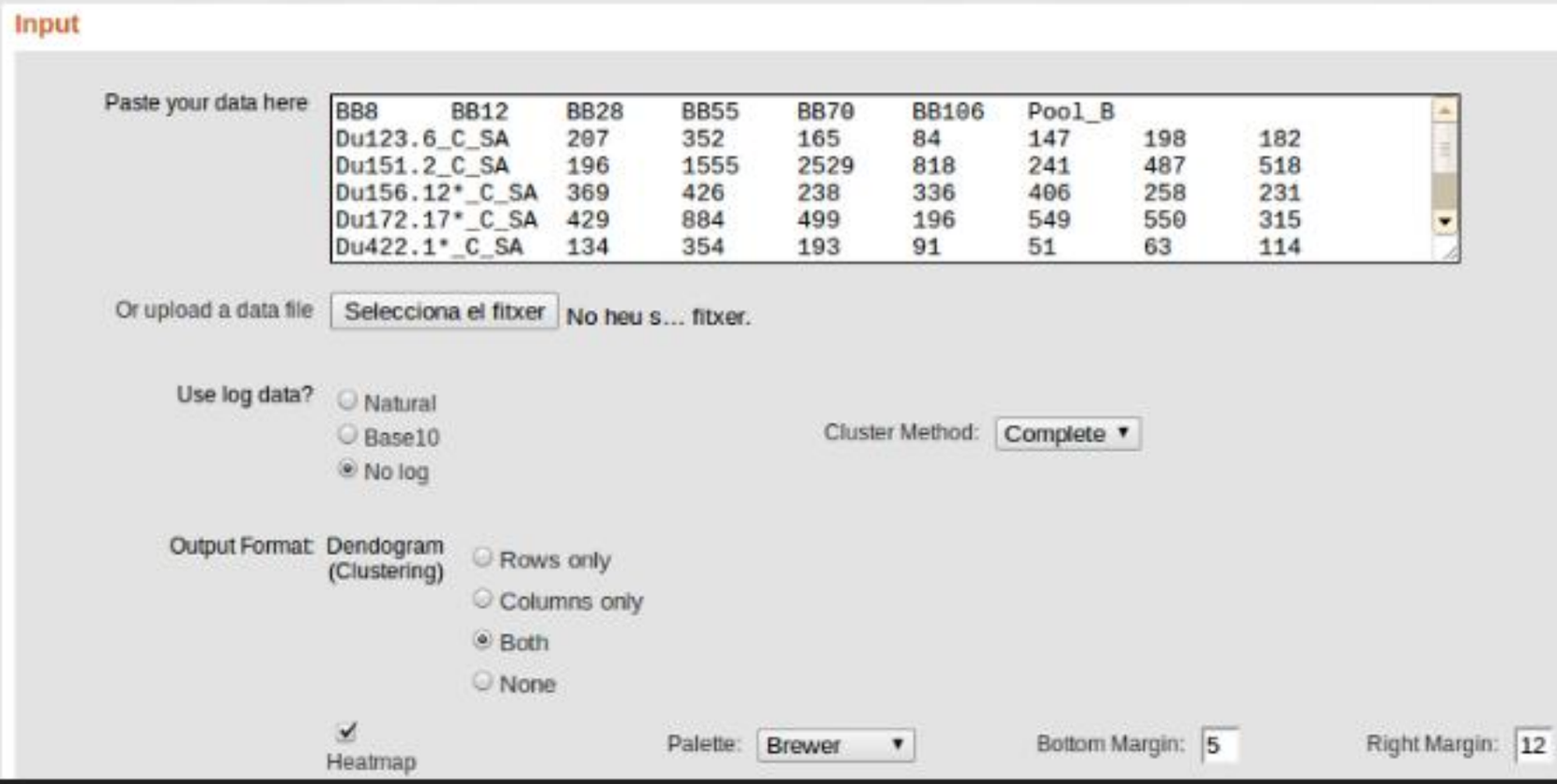
**c using loadandsave=0**

```
{R(loadandsave="0")}
ls();
cat("\nc = b*2 = ");
c<-b*2;
cat(c);
{R}
```

```
character(0)

c = b*2 =
Error: object 'b' not found
Execution halted
```

# Example 3 - R Scripts: Web-based Easy Heatmaps

# (Ex. 3) What we have, need & do.

## We have

1. Heatmaps R package (local or remote *.tgz)
2. R script to use functions from the package and to produce some figure and/or report

## We need

1. Table describing parameters which need to be fed to R by the web interface
2. Tiki (FLOSS Web 2.0 engine) + PluginR set up on a server.

## We do

1. Convert html table and its rows into a Tiki tracker and its fields (web database with forms and reports).
2. Create a simple Wiki page to
    1. display a form to collect the data from the user for the Tracker
    2. display a list of items already created in that tracker
3. Validate the potentially unsafe R calls from wiki pages (admin or user with enough permissions required)
4. Create a Smarty template (~ Sweave template but for web pages) to combine Tracker data (input from the user stored in a tracker)
5. Edit the simple wiki page to convert it into a Pretty Tracker page for the report display (instead of simple table with tracker data)
6. Feed the web interface and see the results

# (Ex. 3) Web HeatMaps (i): descriptive table

| PARAMETER LABEL | PARAMETER NAME (* = mandatory) | INPUT FIELD TYPE | OPTIONS & DEFAULT VALUE | TRACKER FIELD ID |
|---|---|---|---|---|
| Expressions file name: | expresFileName * | file upload | | |
| Expressions file type: | fileType | selection list | txt,csv,csv2 | |
| Name for this plot: | comparisonName | text | | |
| Title to show in plot: | Title | text | Heatmap | |
| Distance function to group rows | rowDistance | selection list | cor,euclidean,manhattan,maximum, canberra,binary,minkowski | |
| Distance Function to group columns: | colDistance | selection list | euclidean,manhattan,maximum, canberra,binary,minkowski,cor | |
| Group rows and plot dendrogram? | RowVals | checkbox | TRUE | |
| Group columns and plot dendrogram? | ColVals | checkbox | TRUE | |
| Scale data by | row | selection list | row,column,none | |
| Color palette to use | colorsSet | selection list | redblue(64),heat.colors(64), topo.colors(64),rainbow(36) | |
| File with color names for columns | colsForGroupsFileName | file upload | | |
| Type of information about density | densityInfo | selection list | density,histogram,none | |
| Expansion coeficient for fonts in columns | cexForColumns | selection list | 0.8,0.7,0.9,1.0,1.1,1.2,1.3 | |
| Expansion coeficient for fonts in rows | cexForRows | selection list | 0.7,0.8,0.9,1.0,1.1,1.2,1.3 | |

# (Ex. 3) Web HeatMaps (ii): Tracker & fields

localhost/6x/tiki-admin_tracker_fields.php?trackerId=2

## Admin Tracker: HeatMap Generation

List Trackers | Admin Trackers | Edit This Tracker | View This Tracker's Items

Tracker fields | New tracker field | Import/Export Trackers Fields | No Tabs

Find | Find | 25 | Rows

| | Id | Name | Type | Options | Pos | Req. | List | Main | Multi-lingual | Search | Public | Hidden | Descr. | Validation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | Name | text field | | 10 | * | | y | n | | y | n | Some name... | | |
| | 8 | Description | textarea | 0 | 20 | - | - | n | n | - | y | n | | | |
| | 9 | Added by | user selector | 1 | 30 | - | | n | n | | y | n | | | |
| | 10 | Expressions file name | attachment | ntsu | 40 | - | | y | n | | y | n | | | |
| | 11 | Expressions file type | drop down | txt,txt,csv,csv2 | 50 | - | - | n | n | | y | n | | | |
| | 12 | Name for this plot | drop down with other textfield | My Plot,My Plot | 60 | - | | n | n | | y | n | | | |

# 6.1. Web HeatMaps (iii): descriptive table with *tracker field Ids*

| PARAMETER LABEL | PARAMETER NAME (* = mandatory) | INPUT FIELD TYPE | OPTIONS & DEFAULT VALUE | TRACKER FIELD ID |
|---|---|---|---|---|
| Expressions file name: | expresFileName * | file upload | | {$f_10} |
| Expressions file type: | fileType | selection list | txt,csv,csv2 | {$f_11} |
| Name for this plot: | comparisonName | text | | {$f_12} |
| Title to show in plot: | Title | text | Heatmap | {$f_13} |
| Distance function to group rows | rowDistance | selection list | cor,euclidean,manhattan,maximum, canberra,binary,minkowski | {$f_14} |
| Distance Function to group columns: | colDistance | selection list | euclidean,manhattan,maximum, canberra,binary,minkowski,cor | {$f_15} |
| Group rows and plot dendrogram? | RowVals | checkbox | TRUE | {$f_16} |
| Group columns and plot dendrogram? | ColVals | checkbox | TRUE | {$f_17} |
| Scale data by | row | selection list | row,column,none | {$f_18} |
| Color palette to use | colorsSet | selection list | redblue(64),heat.colors(64), topo.colors(64),rainbow(36) | {$f_19} |
| File with color names for columns | colsForGroupsFileName | file upload | | {$f_20} |
| Type of information about density | densityInfo | selection list | density,histogram,none | {$f_21} |
| Expansion coeficient for fonts in columns | cexForColumns | selection list | 0.8,0.7,0.9,1.0,1.1,1.2,1.3 | {$f_22} |
| Expansion coeficient for | cexForRows | selection list | 0.7,0.8,0.9,1.0,1.1,1.2,1.3 | {$f_23} |

# (Ex. 3) Web HeatMaps (iv): Wiki page1 "HeatMaps" (code)

localhost/tiki7svn/tiki-editpage.php?page=HeatMaps

## Edit: HeatMaps

Edit page | Properties

```
{TABS(name="HeatMap_List",tabs="Your HeatMaps|Create one")}
{TRACKERLIST(trackerId="2", fields="7:9:10", showlinks="y", popup="8", view="user",
url="HeatMaps+Edition&itemId")}{TRACKERLIST}
/////
{TRACKER(trackerId="2", url="HeatMaps+Edition&itemId")}{TRACKER}
{TABS}
```

# (Ex. 3) Web HeatMaps (v): Wiki page1 "HeatMaps" (output)

vhebron.net https://ueb.ir.vhebron.net/HeatMaps

Google

Quick Admin:

Statistics & Bioinformatics Unit UEB KB

UCTS

Vall d'Hebron Institut de Recerca VHIR

Log out

Home | Resources | Seminars | Teaching | Contact us

English

Child Add Page

UEB » Cursos Seminaris i Congressos » 2011 UseR » HeatMaps

Your HeatMaps | Create one

No Tabs

| Name | Added by | Expressions file name | LastModif |
|---|---|---|---|
| Another heatmap | Xavi | expres.filtered.ALL.txt [70.08 Kb] | 2011-08-16 19:41 |
| A third one | Xavi | expres.filtered.ALL.txt [70.08 Kb] | 2011-08-16 19:42 |

**Messages**

You have 0 new messages

**Menu**

- Home
- Search
- Contact Us
- Categories
- Freetags
- Calendar
- MyTiki
- Wiki

# (Ex. 3) Web HeatMaps (vi): Wiki page2 "HeatMaps Edition" (code)

localhost/tiki7svn/tiki-editpage.php?page=HeatMaps%20Edition

## Edit: HeatMaps Edition

Edit page | Properties | No Tabs

```
{FADE(label="Click here to edit this HeatMap figure")}
{tracker trackerId="2" url="tiki-index.php?page=HeatMaps+Edition&itemId"}
{FADE}

{TRACKERLIST(trackerId="2",  showlinks="n", tplwiki="HeatMaps_template", view="user", max="1", showpagination="n")}
{TRACKERLIST}
```

# (Ex. 3) Web HeatMaps (vii): Wiki page3 "HeatMaps Template" (code)

## Edit: HeatMaps_template

Edit page | Properties | No Tabs

```
{if $smarty.get.itemId gt 0}

{wikiplugin _name=rr loadandsave=1 wikisyntax=0}

  ######################################
  ### Check and get File 1
  ######################################

if (file_type == "text/csv" | file_type == "text/comma-separated-values" | file_type == "text/plain") {literal} { {/literal}
fileurl1 <- "http://{$smarty.server.SERVER_NAME}{$smarty.server.PHP_SELF|replace:'/tiki-index.php':'/'}tiki-
download_item_attachment.php?itemId={$f_itemId}&fieldId=10&display=inline"
expresFileNameTmp <- read.csv(fileurl1, sep=",");

if ( length(expresFileNameTmp) == 1) {literal} { {/literal}
if ( length(unlist(strsplit(as.character(expresFileNameTmp[[1]]), ";") ) ) >
length(unlist(strsplit(as.character(expresFileNameTmp[[1]]), "\t") ) ) ) {literal} { {/literal}
expresFileNameTmp <- read.csv(fileurl1, sep = ";") {literal} } {/literal} else {literal} { {/literal}   # end of case for semicolon
expresFileNameTmp <- read.csv(fileurl1, sep = "\t")
{literal} } {/literal}   # end of case for "tabs"
{literal} } {/literal}   # end of if length(file) == 1
```

# (Ex. 3) Web HeatMaps (viii): Creating a figure

UEB » Cursos Seminaris i Congressos » 2011 UseR » HeatMaps » HeatMaps Edition

Click here to edit this HeatMap figure

**Name:** * My first HeatMap

*Some name to identify (and potentially recall in a later stage) this Heatmap from others in this site*

**Description:** Testing HeatMap generation and edition through a GUI

**Added by:** Xavi

**Expressions file name:** Navega...

expres.selected.ALL.txt

**Expressions file type:** txt

**Name for this plot:** Other: My first plot

**Title to show in plot:** Other: My Heatmap

**Distance function to group rows:** euclidean

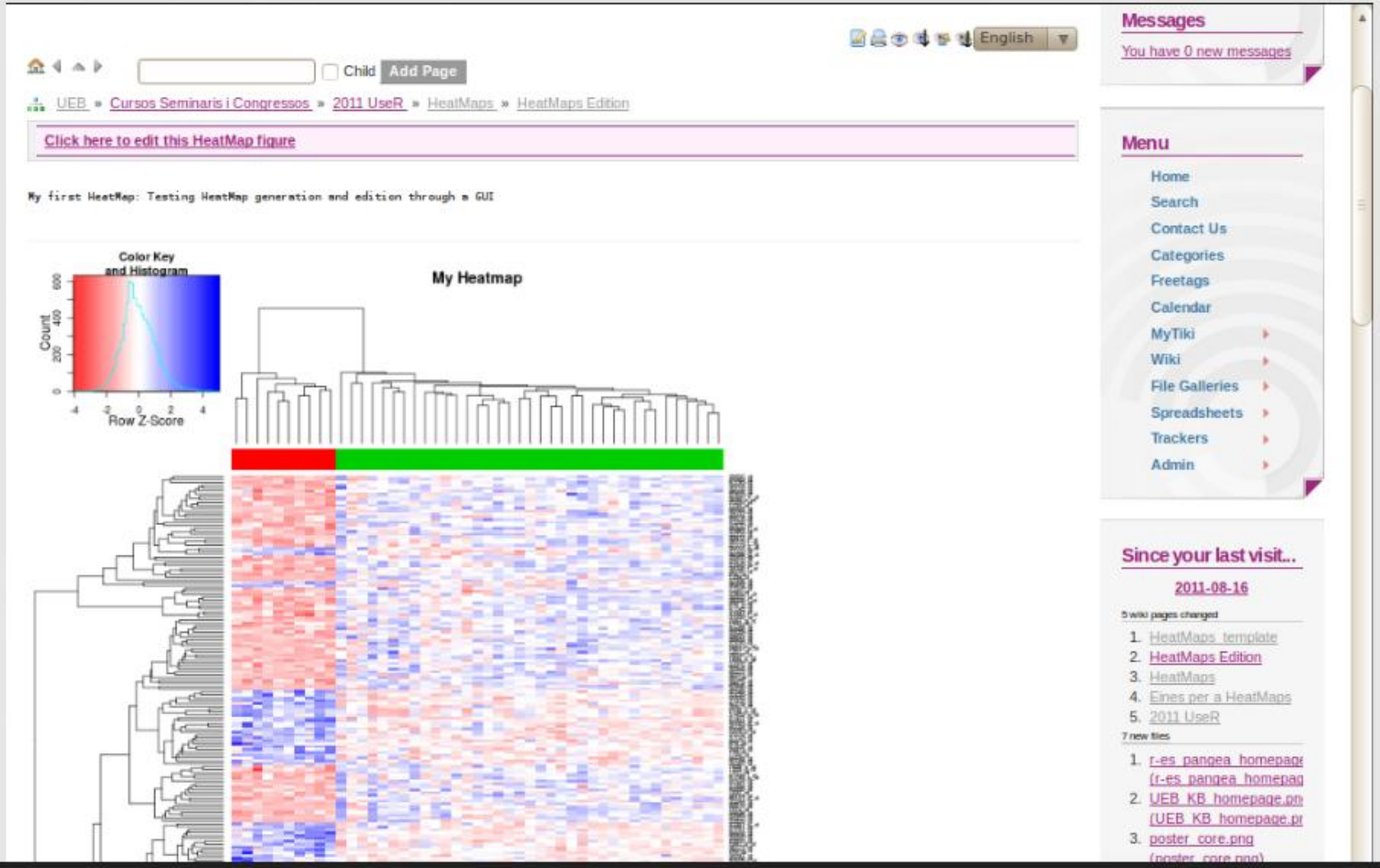
**Distance function to group columns:** manhattan

**Group rows and plot dendrogram?:** TRUE FALSE

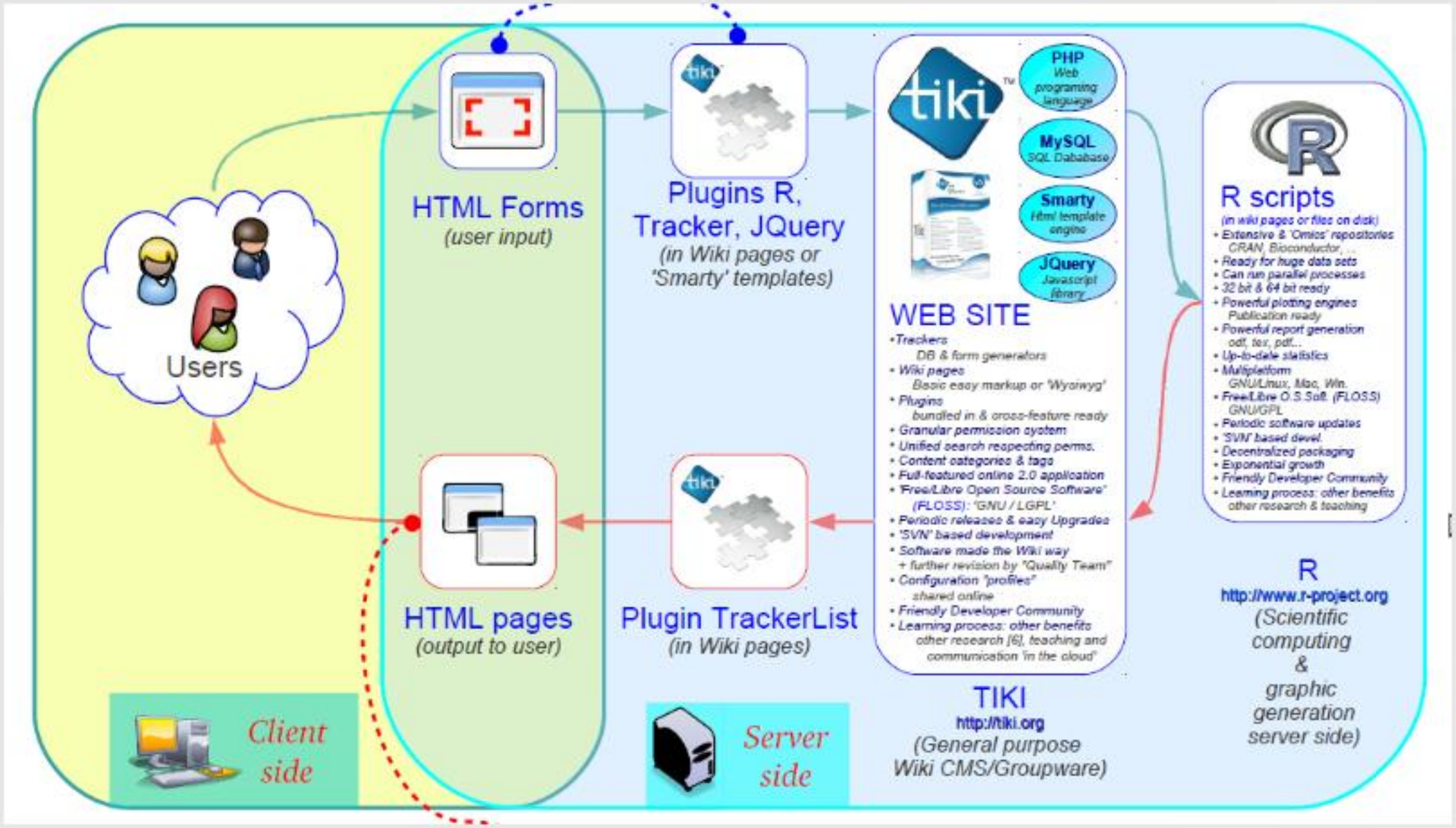
**Group columns and plot dendrogram?:** TRUE FALSE

**Scale data by:** row

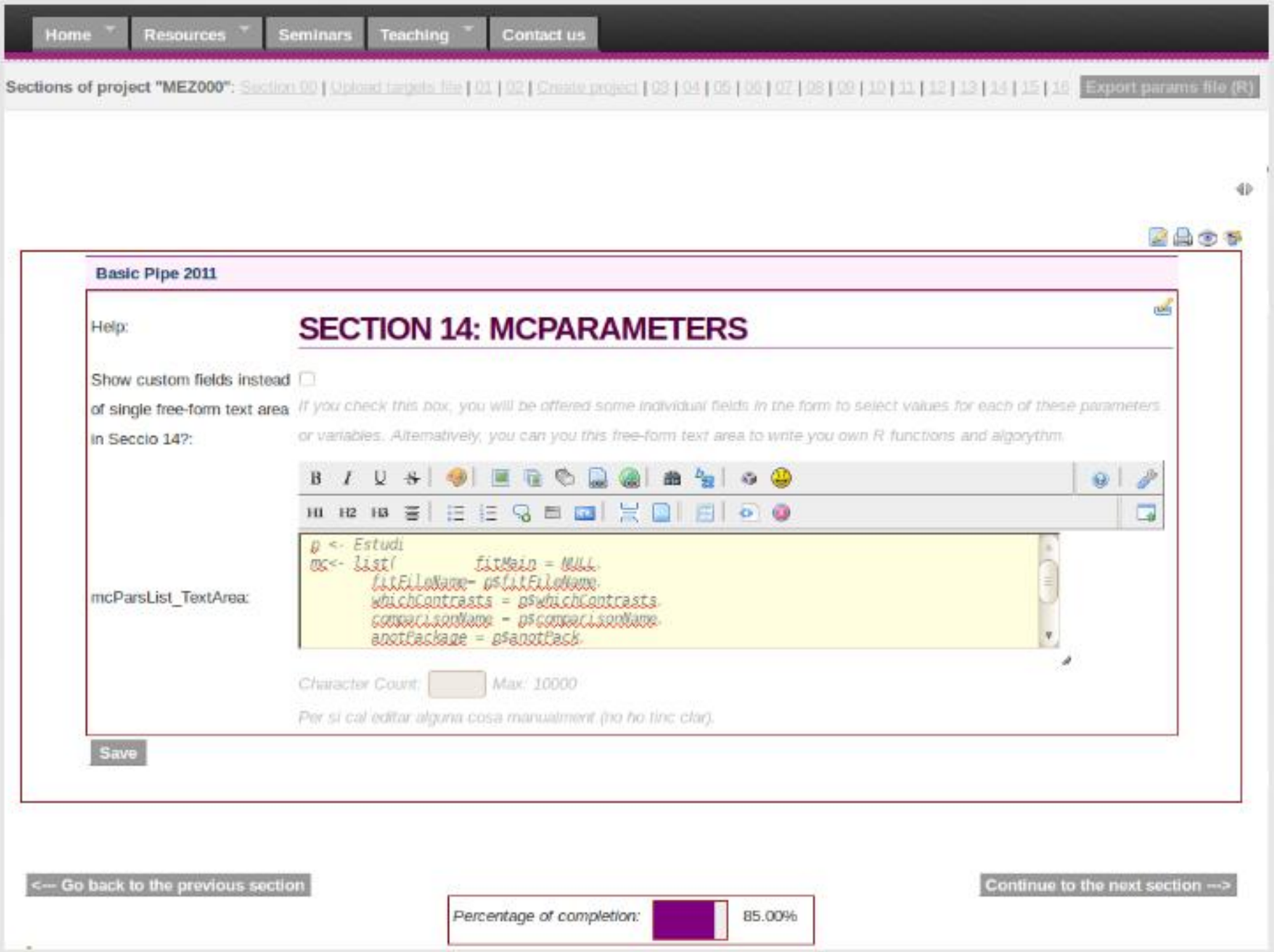
# (Ex. 3) Web HeatMaps (ix): Results and edition



# 6.2. Tiki & PluginR internals



# 6.3. Example 4 - Microarray Pipe Line Workflow



# 6.4. Example 5 - Other Goodies (i): Website for "local" R community (ES)

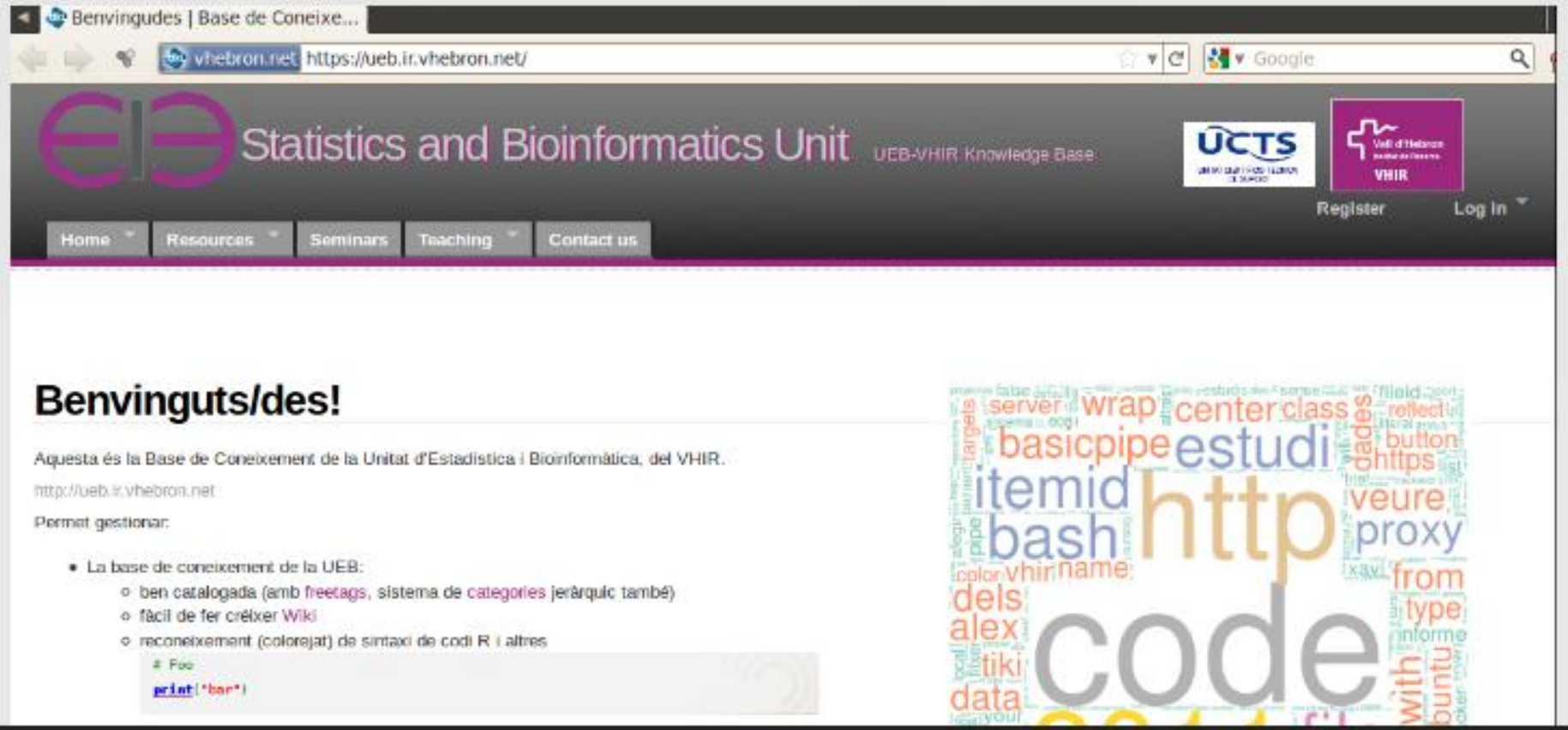
*Proposal* (currently in review by the Spanish R users community)

1. Documentation with syntax highlighting:
    1. in wiki pages
    2. blog posts
    3. potentially forums (nor used right now, since an email list seems to be the preferred option)
2. Job offers (blog)
3. RSS feeds (offered, and fetched)
4. freetags
5. i18n (internationalization) tools

# 6.5. Example 6 - Other Goodies (ii): UEB Knowledge Base (Intranet)

1. Wiki & tracker based project management
2. Documentation
3. ToDo lists
4. several levels of user groups, with fine-grained permission system

http://ueb.ir.vhebron.net



# 7. Similarities between R & Tiki

## R & Tiki Softwares

1. SVN
2. FLOSS (Free/Libre...)
3. Distributed model (R packages and Tiki mods)
4. Frequent releases of stable versions (6 months, + LTS in Tiki every few years)
5. Stable version 1.0 released around a decade ago (2000 in R; 2002 in Tiki).
6. Multilatform (runs on GNU/Linux, Mac, Windows, ...).
7. Oriented towards **console users** typing on keyboards as much as possible: scripting in R & wiki-wiki writing (quick) in Tiki.
8. Powerful reporting system based on layout templates and R code (R: using Sweave .Rnw files in R alone; Tiki: using Smarty .tpl files (or Wiki pages) with Trackers and R code).
9. "InfoWorld Bossie Awards 2010" for both of them: R & Tiki!

## R & Tiki Communities

1. Open
2. Supportive
3. International
4. Mailman e-mail lists
5. Irc channel
6. Using your own software for your internal needs ("dogfooding")

# 8. Differences between R & Tiki: *Software*

| R | Tiki |
|---|---|
| 1. Package system for most features<br>2. Core team to accept changes in core<br>3. Allows writing code on web pages (Rapid application Development & documentation) with R-Studio (*in theory*)<br>4. Documentation: highly structured & compulsory<br>5. License: GPL<br>6. Ohloh:<br>  1. Lines: 660 k<br>  2. Weight: 22 Mb (40Mb .exe) - 260 Mb (svn R 2.14)<br>  3. Estimated cost: $ 7 M (179 person-years) | 1. All-in-one approach for most features also highly integrated among them.<br>2. Wiki-way of doing software<br>3. Allows writing code on web pages (Rapid application Development & documentation) **+ its web interface**<br>4. Documentation: Loose and community-wide effort.<br>5. License: **L**GPL<br>6. Ohloh:<br>  1. Lines: 1.300 k<br>  2. Weight: 23Mb (.tgz) - 460 Mb (svn 7x)<br>  3. Estimated cost: $ 20 M (367 person-years)<br>7. Fine-grained permission management (user groups)<br>  1. 3 levels: object, content category, global<br>8. Configuration profiles<br>  1. Community-created<br>  2. Applicable in one click<br>  3. Hosted at profiles.tiki.org (public) |

# 9. Differences between R & Tiki: *Community*

| R | Tiki |
|---|---|
| 1. R core team (20) manages R roadmap *"R core team is a self-perpetuating oligarchy"* [Brian Ripley] | 1. Tiki: Self-managed Community using Tiki + (devel) email list to help community management. Tiki Software Community Association (created in 2010) protecting trademarks, hosting of community servers, etc. |
| 2. **Not** needed for LTS branch (!!!, ~ "all" are supported 2 y.) | 2. LTS evey few years: 3.x (2009), 6.x (2011)... (9.x likely 2013) |
| 3. Many bloggers about R developments | 3. Just a few bloggers about Tiki (afaik) |
| 4. Many printed books | 4. Just 2 printed books (so far) **BUT** extensive wiki collaborative documentation early days (**"dogfooding!"**); 1000+ pp. |

# 10. Thanks. Questions?

- PDF: http://www.warwick.ac.uk/statsdept/useR-2011/abstracts/030411-depedroxavier_sanchezalex.pdf
- Slides: http://ueb.ir.vhebron.net/2011+UseR
- contact: xavier.depedro@vhir.org

## Acknowledgements


- Tiki Devs
  - Sylvie Greverend (FR, USA)
  - Jonny Bradley (UK)
  - Robert Plummer (USA)
  - Louis-Philippe Huberdeau (CA)

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