

ACAQ Visualizer

ACAQ: a Fiji and R toolkit targeted for automated confrontation assay quantification

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Host-pathogen interactions are ideally studied by imaging confrontation assays, where interacting cell types are monitored during and/or after their interaction. The resulting images are quantified via automated segmentation and classification algorithms, which help to unravel biological functions from host-pathogen interactions. Here we describe a modular and easily extendable segmentation and analysis framework designed both for fluorescently labeled and unlabeled cells participating in such interactions. Acquiring images of unlabeled biological samples has multiple advantages: it minimizes the side effects that fluorescence labeling may have on biological functions, and it saves the time and expense spent on fluorescence labeling. Our new high-throughput confrontation assay-analysis and -visualisation open-source toolkit, algorithm for confrontation assay quantification (ACAQ), is a Fiji macro extended by R. It consists of two parts: ACAQ Analyzer and ACAQ Visualizer. The former is designed to analyze cells in two-dimensional microscopy images, using either fluorescence labeling or transmitted light bright-field microscopy. In the absence of labeling, Hessian filter-based segmentation is used, which is able to distinguish between various types of cells that differ in size. The ACAQ toolkit computes a collection of phagocytosis measures and morphological descriptors. The results are summarized and exported by ACAQ Visualizer, providing immediate feedback to the user.

Running

To run ACAQ Visualizer, go into the ACAQ Visualizer directory.

- If you are on Linux, start a terminal in this folder and run `./run.sh`
- If you are on Windows, run `run.bat`

Requirements (Linux only)

If you are on Linux, install R version R version 3.5.1 (2018-07-02) or higher.

R packages

Package	Author	URL	License	Version
rmarkdown	JJ Allaire [aut], Yihui Xie [aut, cre] (https://orcid.org/0000-0003-0645-5666), Jonathan McPherson [aut], Javier Luraschi [aut], Kevin Ushey [aut], Aron Atkins [aut], Hadley Wickham [aut], Joe Cheng [aut], Winston Chang [aut], Richard Iannone [aut] (https://orcid.org/0000-0003-3925-190X), Jeff Allen [ctb], Barret Schloerke [ctb], Roy Storey [ctb], Rob Hyndman [ctb], Ruben Arslan [ctb], Frederik Aust [ctb] (https://orcid.org/0000-0003-4900-788X), Christophe Dervieux [ctb], RStudio, Inc. [cph], jQuery Foundation [cph] (jQuery library), jQuery contributors [ctb, cph] (jQuery library; authors listed in inst/rmd/h/jquery-AUTHORS.txt), jQuery UI contributors [ctb, cph] (jQuery UI library; authors listed in inst/rmd/h/jqueryui-AUTHORS.txt), Mark Otto [ctb] (Bootstrap library), Jacob Thornton [ctb] (Bootstrap library), Bootstrap contributors [ctb] (Bootstrap library), Twitter, Inc [cph] (Bootstrap library), Alexander Farkas [ctb, cph] (html5shiv library), Scott Jehl [ctb, cph] (Respond.js library), Ivan Sagalaev [ctb, cph] (highlight.js library), Greg Franko [ctb, cph] (tocify library), John MacFarlane [ctb, cph] (Pandoc templates), Google, Inc. [ctb, cph] (ioslides library), Dave Raggett [ctb] (slidy library), W3C [cph] (slidy library), Dave Gandy [ctb, cph] (Font-Awesome), Ben Sperry [ctb] (Ionicons), Drifty [cph]	https://rmarkdown.rstudio.com	GPL-3	1.11

	(Ionicons), Aidan Lister [ctb, cph] (jQuery StickyTabs)			
knitr	<p>Yihui Xie [aut, cre] (https://orcid.org/0000-0003-0645-5666), Adam Vogt [ctb], Alastair Andrew [ctb], Alex Zvoleff [ctb], Andre Simon [ctb] (the CSS files under inst/themes/ were derived from the Highlight package http://www.andre-simon.de), Aron Atkins [ctb], Aaron Wolen [ctb], Ashley Manton [ctb], Ben Baumer [ctb], Brian Diggs [ctb], Brian Zhang [ctb], Cassio Pereira [ctb], Christophe Dervieux [ctb], David Hugh-Jones [ctb], David Robinson [ctb], Donald Arseneau [ctb, cph] (the framed package at inst/misc/framed.sty), Doug Hemken [ctb], Duncan Murdoch [ctb], Elio Campitelli [ctb], Fabian Hirschmann [ctb], Fitch Simeon [ctb], Forest Fang [ctb], Frank E Harrell Jr [ctb] (the Sweavel package at inst/misc/Sweavel.sty), Garrick Aden-Buie [ctb], Gregoire Detrez [ctb], Hadley Wickham [ctb], Hao Zhu [ctb], Heewon Jeon [ctb], Henrik Bengtsson [ctb], Hiroaki Yutani [ctb], Ian Lyttle [ctb], Hodges Daniel [ctb], Jake Burkhead [ctb], James Manton [ctb], Jared Lander [ctb], Jason Punyon [ctb], Javier Luraschi [ctb], Jeff Arnold [ctb], Jenny Bryan [ctb], Jeremy Ashkenas [ctb, cph] (the CSS file at inst/misc/docco-classic.css), Jeremy Stephens [ctb], Jim Hester [ctb], Joe Cheng [ctb], Johannes Ranke [ctb], John Honaker [ctb], John Muschelli [ctb], Jonathan Keane [ctb], JJ Allaire [ctb], Johan Toloe [ctb], Jonathan Sidi [ctb], Joseph Larmarange [ctb], Julien Barnier [ctb], Kaiyin Zhong [ctb], Kamil Slowikowski [ctb], Karl Forner [ctb], Kevin K. Smith [ctb], Kirill Mueller [ctb], Kohske Takahashi [ctb], Lorenz Walthert [ctb], Lucas Gallindo [ctb], Martin Modrák [ctb], Michael Chirico [ctb], Michael Friendly [ctb], Michal Bojanowski [ctb], Michel Kuhlmann [ctb], Nacho Caballero [ctb], Nick Salkowski [ctb], Noam Ross [ctb], Obada Mahdi [ctb], Qiang Li [ctb], Ramnath Vaidyanathan [ctb], Richard Cotton [ctb], Robert Krzyzanowski [ctb], Romain Francois [ctb], Ruairidh Williamson [ctb], Scott Kostyshak [ctb], Sebastian Meyer [ctb], Sietse Brouwer [ctb], Simon de Bernard [ctb], Sylvain Rousseau [ctb], Taiyun Wei [ctb], Thibaut Assus [ctb], Thibaut Lamadon [ctb], Thomas Leeper [ctb], Tim Mastny [ctb], Tom Torsney-Weir [ctb], Trevor Davis [ctb], Viktoras Veitas [ctb], Weicheng Zhu [ctb], Wush Wu [ctb], Zachary Foster [ctb]</p>	https://yihui.name/knitr/	GPL	1.21
stringi	Marek Gagolewski [aut, cre], Bartek Tartanus [ctb], and other contributors (stringi source code); IBM and other contributors (ICU4C source code); Unicode, Inc. (Unicode Character Database)	http://www.gagolewski.com/software/stringi/ http://site.icu-project.org/ http://www.unicode.org/	file LICENSE	1.2.4
	Yihui Xie [aut, cre], Joe Cheng [aut], Xianying Tan [aut], JJ Allaire [ctb], Maximilian Gillich [ctb], Greg Freedman Ellis [ctb], Johannes Rauh [ctb], jQuery contributors [ctb, cph] (jQuery in			

DT	htmlwidgets/lib), SpryMedia Limited [ctb, cph] (DataTables in htmlwidgets/lib), Brian Reavis [ctb, cph] (selectize.js in htmlwidgets/lib), Leon Gersen [ctb, cph] (noUiSlider in htmlwidgets/lib), Bartek Szopka [ctb, cph] (jquery.highlight.js in htmlwidgets/lib), RStudio Inc [cph]	https://rstudio.github.io/DT	GPL-3 ; file LICENSE	0.5
corrplot	Taiyun Wei [cre, aut], Viliam Simko [aut], Michael Levy [ctb], Yihui Xie [ctb], Yan Jin [ctb], Jeff Zemla [ctb]	https://github.com/taiyun/corrplot	GPL	0.84
gridExtra	Baptiste Auguie [aut, cre], Anton Antonov [ctb]		GPL (>= 2)	2.3
ggplot2	Hadley Wickham [aut, cre], Winston Chang [aut], Lionel Henry [aut], Thomas Lin Pedersen [aut], Kohske Takahashi [aut], Claus Wilke [aut], Kara Woo [aut], RStudio [cph]	http://ggplot2.tidyverse.org , https://github.com/tidyverse/ggplot2	GPL-2 ; file LICENSE	3.1.0
shinyFiles	Thomas Lin Pedersen [cre, aut], Vincent Nijs [aut], Thomas Schaffner [aut], Eric Nantz [aut]	https://github.com/thomasp85/shinyFiles	GPL (>= 2)	0.7.2
shinyjs	Dean Attali [aut, cre]	https://deanattali.com/shinyjs	AGPL-3	1.0
shinyBS	Eric Bailey	https://ebailey78.github.io/shinyBS	GPL-3	0.61
shiny	Winston Chang [aut, cre], Joe Cheng [aut], JJ Allaire [aut], Yihui Xie [aut], Jonathan McPherson [aut], RStudio [cph], jQuery Foundation [cph] (jQuery library and jQuery UI library), jQuery contributors [ctb, cph] (jQuery library; authors listed in inst/www/shared/jquery-AUTHORS.txt), jQuery UI contributors [ctb, cph] (jQuery UI library; authors listed in inst/www/shared/jqueryui/AUTHORS.txt), Mark Otto [ctb] (Bootstrap library), Jacob Thornton [ctb] (Bootstrap library), Bootstrap contributors [ctb] (Bootstrap library), Twitter, Inc [cph] (Bootstrap library), Alexander Farkas [ctb, cph] (html5shiv library), Scott Jehl [ctb, cph] (Respond.js library), Stefan Petre [ctb, cph] (Bootstrap-datepicker library), Andrew Rowls [ctb, cph] (Bootstrap-datepicker library), Dave Gandy [ctb, cph] (Font-Awesome font), Brian Reavis [ctb, cph] (selectize.js library), Kristopher Michael Kowal [ctb, cph] (es5-shim library), es5-shim contributors [ctb, cph] (es5-shim library), Denis Ineshin [ctb, cph] (ion.rangeSlider library), Sami Samhuri [ctb, cph] (Javascript strptime library), SpryMedia Limited [ctb, cph] (DataTables library), John Fraser [ctb, cph] (showdown.js library), John Gruber [ctb, cph] (showdown.js library), Ivan Sagalaev [ctb, cph] (highlight.js library), R Core Team [ctb, cph] (tar implementation from R)	http://shiny.rstudio.com	GPL-3 ; file LICENSE	1.2.0

We provide the source code of each package with ASAQ Visualizer You can find their sources and licenses in `ACAQ_Shiny/packrat/src`.

Updating this README file

This README file is autogenerated using RMarkdown. Please don't forget to run ACAQ Visualizer once before rebuilding this README.

Note: You cannot use RStudio as RStudio's RMarkdown builder runs in a separate environment!

```
# Run ACAQ Visualizer once
shiny::runApp()
# Cancel with Ctrl + C
```

```
# Build the README file
rmarkdown::render("README.Rmd")
```