



sanofi

The Sanofi logo is centered on a light gray background. It features the word "sanofi" in a bold, black, sans-serif font. The first dot of the "s" and the dot above the "i" are replaced by small purple circles. Two thick, vibrant purple curved lines sweep across the background, one from the top left and another from the bottom left, framing the logo.

CI/CD In R Packages Development With Risk Management

*Building Automated Workflows and Risk-Managed
Sustainable Development Paradigms*

Zhenhuan YANG

*The views and opinions expressed in this presentation
are those of the author(s) and do not necessarily reflect
the official policy or position of PhUSE Beijing SDE 2025*

sanofi

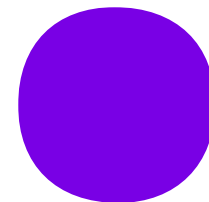
Contents

- 01 Introduction
- 02 CI/CD
- 03 Risk-Managed Paradigms
- 04 Q&A



01 Introduction

CI/CD/ R PACKAGE/ CRAN



The Whole Game



Install Helper Packages



Create Package Structure



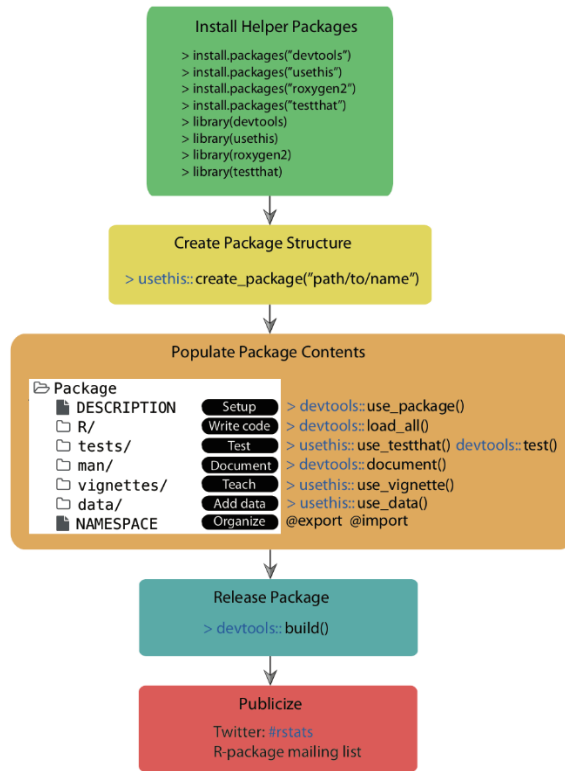
Populate Package Contents



Release Package

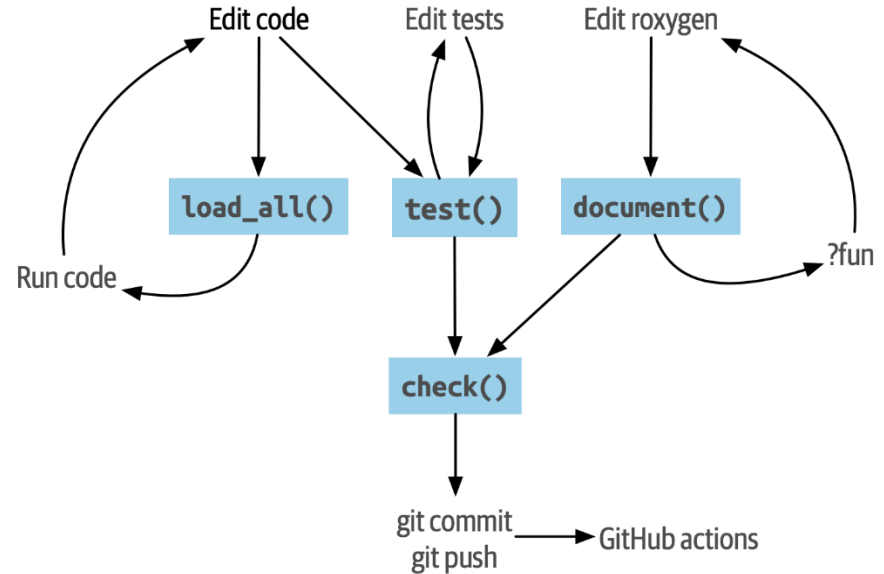


Publicize



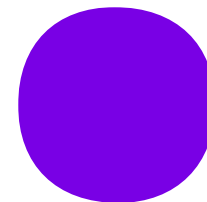
Pain Point Of Traditional Manual Methods

- Efficiency Bottlenecks In The Development Process
- Collaboration And Quality Control Challenges
- Delivery And Maintenance Risks



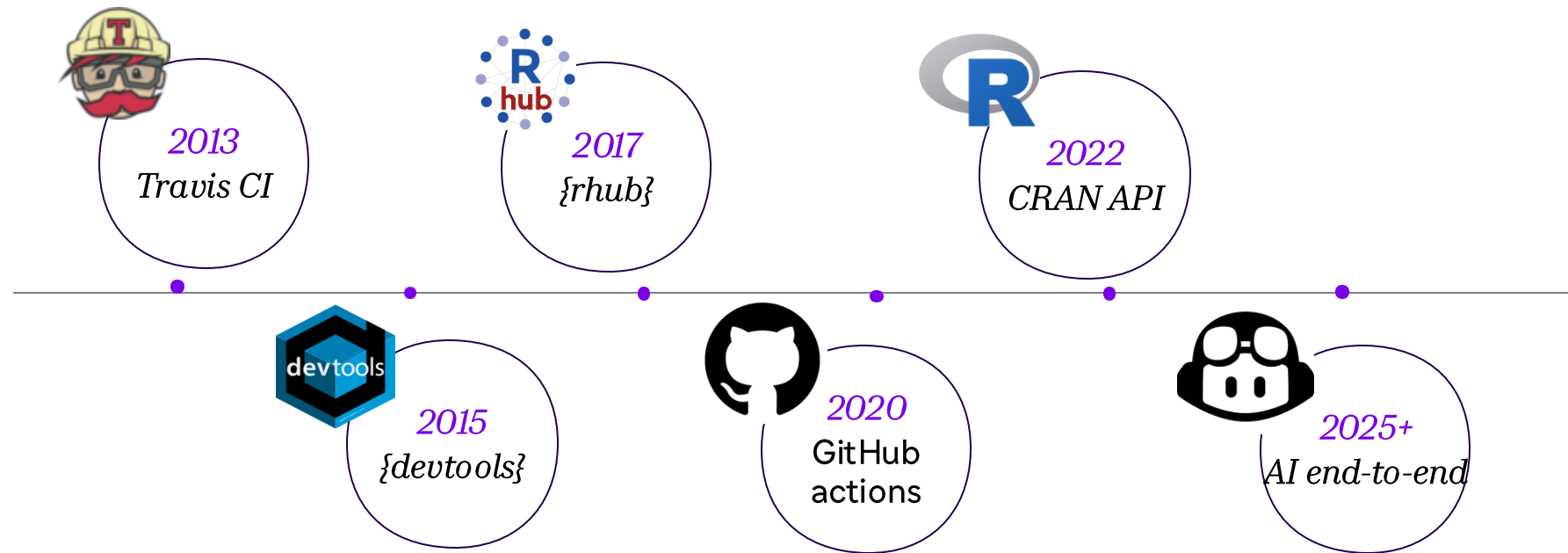
02 CI/CD

CONTINUOUS INTERROGATION/DELIVERY



Millstones

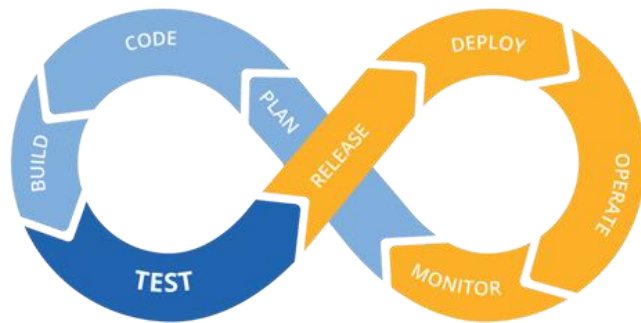
R package development has evolved from **craftsmanship** to **AI-driven industrial production**



What is CI/CD?

Definition

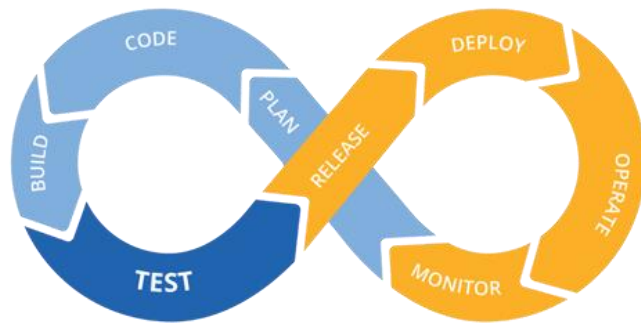
- CI/CD stands for **Continuous Integration, Continuous Delivery** (or Continuous Deployment), which represents a culture and process around constantly integrating **new code**.
- Long ago, we had Waterfall, then it was Agile, and now it's **DevOps**. DevOps is how modern developers are building great products.



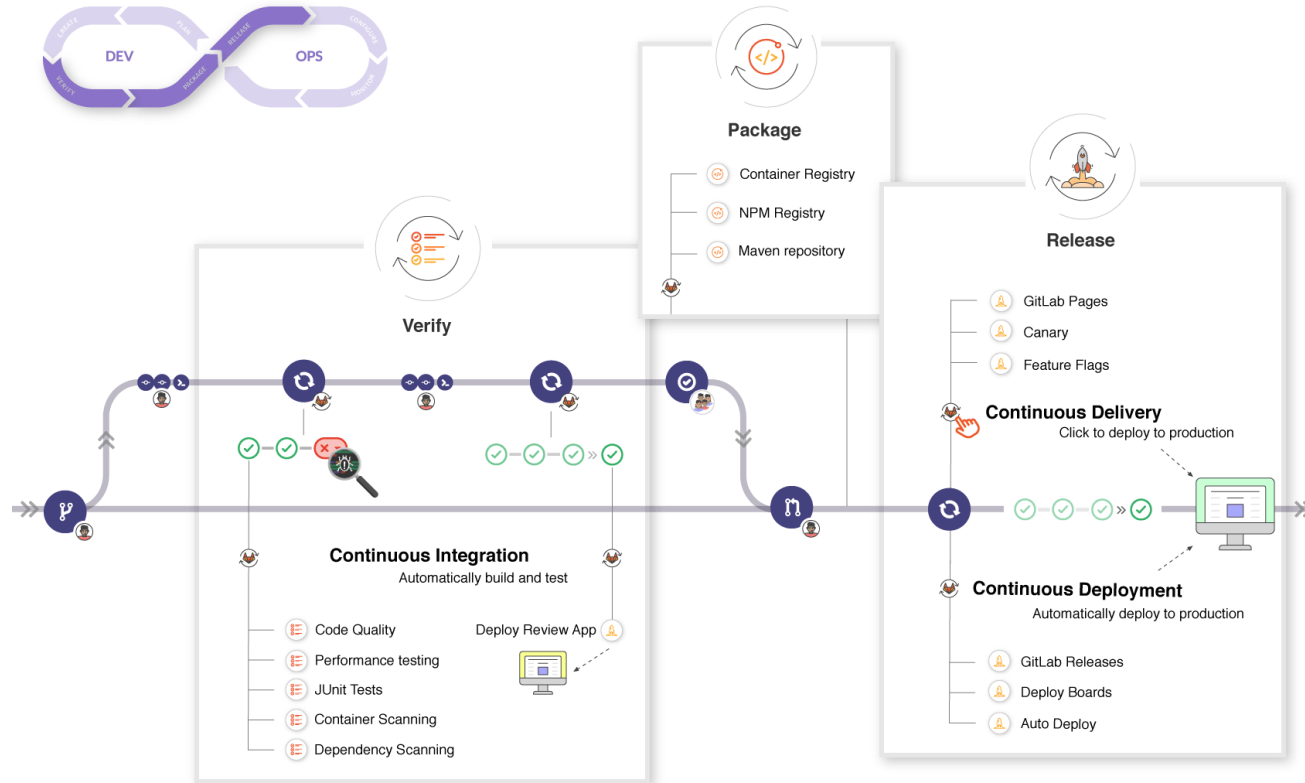
Why CI/CD?

Why use CI/CD for a R package

- Multiple Contributors On Your R Package
- User Base On Multiple Uses And Multiple R Versions
- Faster Turnaround On Pull Requests
- Catch Issues(bugs) Early
- Enforce Style Conventions And Preferences
- Measure Test Coverage For New Code
- ...



CI/CD Workflows



CI/CD Usage

CI

1. Automated Testing
2. Code Quality Checking
3. Dependency Management Validation
4. Build And Pre-cran-checking

CD

1. Dynamic Documentation
2. Binary Package Building And Distribution
3. Risk Scoring And Compliance Checks
4. Trigger Deployment Preparation

```
# GitHub Actions example
name: R package CI

on:
  push:
    branches: [ main ]
  pull_request:
    branches: [ main ]

jobs:
  build:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v2
      - name: Set up R
        uses: r-lib/actions/setup-r@v1
      - name: Install dependencies
        run: |
          install.packages(c("testthat", "devtools"))
          devtools::install_deps(dependencies = TRUE)
      - name: Run tests
        run: |
          library(testthat)
          test_package(".")
```

[Workflow runs · tidyverse/forcats](#)

tidyverse / forcats Public

Notifications Fork 127 Star 554

- Code Issues 31 Pull requests 8 Actions Security Insights

main 3 Branches 9 Tags Go to file Code

davidchall Fix typo (#354) 6a9bd65 · 2 years ago 366 Commits		
.github	Upkeep 2023-10 (#357)	2 years ago
R	Allow fct_lump_n() to accept infinite values	2 years ago
data-raw	Restyle with styler	3 years ago
data	Add some continuous vars too	9 years ago
man	Upkeep 2023-10 (#357)	2 years ago
pkgdown/favicon	Upkeep 2023-10 (#357)	2 years ago
revdep	Re-run revdeps and update cran comments	2 years ago

About

🐼🐼🐼🐼: tools for working with categorical variables (factors)

forcats.tidyverse.org/

r tidyverse factor

Readme

Unknown, MIT licenses found

Code of conduct

Activity

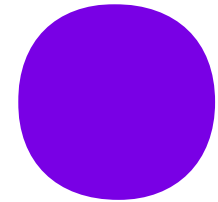
Custom properties

554 stars

21 watching

03 Risk-Manage Paradigms

RISK INTRO/ SOLUTIONS/ INTEGRATION

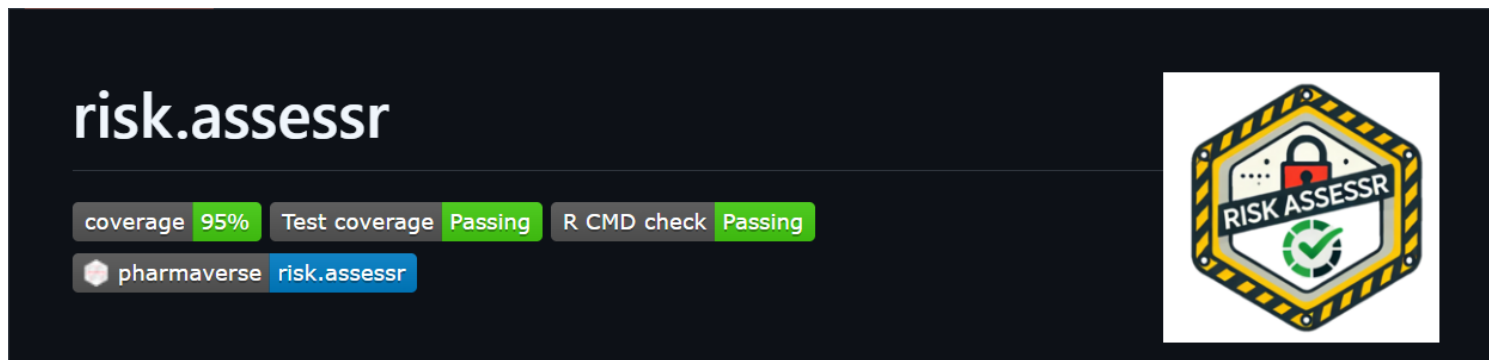


Risk In R Package Life Cycle

Phase	Risk ID	Risk Name	Description	Severity
Development Phase	1.1	Code Quality Defects	Maintenance difficulties from redundant code/logical flaws	High
	1.2	Dependency Conflicts	Build failures caused by third-party library version inconsistencies	Medium
	1.3	Security Vulnerabilities	Exploitable unpatched vulnerabilities	Critical
Operational Phase	2.1	Compatibility Issues	System/device adaptation problems (e.g., interface protocol/data format mismatches)	High
	2.2	Legal Compliance Risks	Data privacy, intellectual property, and regulatory compliance concerns	Critical
	2.3	User Activity Decline	Operational disruptions caused by reduced user engagement	Medium

Risk Manage by: {risk.assessr}

Introduction



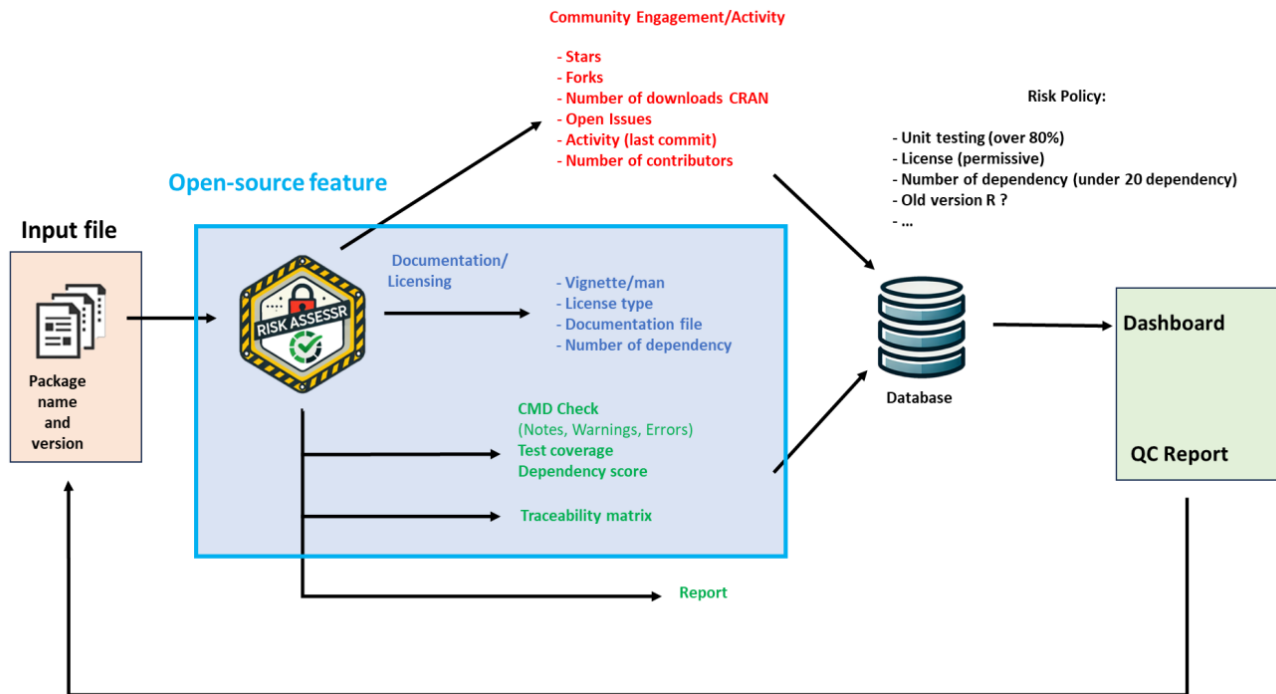
Gillian, E., Bottois, H., Charliquart, P., & Couturier, A. (2025). sanofi.risk.assessr: Assessing package risk metrics (Version 2.0.0) [R package].

Sanofi Public Repository. GNU General Public v2.0 Licensed

Retrieved from [Sanofi-Public/risk.assessr: Define quality variables for evaluating the risk associated with R packages.](#)

Risk Manage By: {risk.assessr}

Package Validation Workflow





Risk Manage By: {risk.assessor}

Data Extraction From The Source Code On CRAN

term: Create Common TLOs Used In Clinical Trials

Table, Listings, and Graphs (TLO) library for common outputs used in clinical trials.

Version: 0.9.5
Depends: R (≥ 3.6), graphics (≥ 0.6.3)
Imports: base (≥ 0.5-4), cli (≥ 3.0-1), checkmate (≥ 2.1.0), corrrplot (≥ 1.0.0), dplyr (≥ 1.0.0), munsell (≥ 1.4.0), flextable (≥ 1.0.0), formatR (≥ 0.5.8), ggplot2 (≥ 3.4.1), R6 (≥ 2.4.0), dplyr (≥ 1.1.0), scales (≥ 1.2.0), vtable (≥ 2.0.0), wklib (≥ 0.8.3), wklib (≥ 1.4.2), wklib (≥ 0.18-4), wklib (≥ 1.7.9), wklib (≥ 0.1.1), wklib (≥ 2.1.9), wklib (≥ 1.4.1), wklib (≥ 2.1.2), wklib (≥ 3.1.9), wklib (≥ 2024-06-21)
Published: 2024-06-21
DOI: 10.32614/CRAN.package.term
Author: Joe Zhu [aut, cre], Daniel Sabanes Bove [aut], Jana Stoolova [aut], Davide Garocci [aut], Emily de la Rue [aut], Abhinav Yoganekar [aut], Hong Wan Hoffmann-La Roche AG [ph, fnd]
Maintainer: Joe Zhu <joe.zhu@roche.com>
BugReports: <https://github.com/sanofi/riskmanagement/issues>
License: Apache License 2.0
URL: <https://sanofiengineering.github.io/term/>, <https://github.com/sanofiengineering/term/>
NeedsCompilation: no
Language: en-US
Materials: README NEWS
CRAN checks: [term results](#)

Documentation:

Reference manual: [term.pdf](#)
Vignettes: [Managing Values in Term Tables](#), [Introduction to term Formatting Functions](#)

Downloads:

[term_0.9.5.tar.gz](#)

Latest version .tar file

Package source: [term_0.9.5.tar.gz](#), r-release: [term_0.9.5.zip](#), r-oldrel: [term_0.9.5.zip](#)
Windows binaries: [r-devel: term_0.9.5.zip](#), r-release: [term_0.9.5.zip](#), r-oldrel: [term_0.9.5.zip](#)
macOS binaries: [r-release \(arm64\): term_0.9.5.zip](#), r-oldrel (arm64): [term_0.9.5.zip](#), r-release (x86_64): [term_0.9.5.zip](#), r-oldrel (x86_64): [term_0.9.5.zip](#)

Old sources: [term_0.9.5.tar.gz](#)

Reverse dependencies:

Reverse depends: [term.modules.clinical](#), [term.modules.general](#), [term.modules.general](#)

Reverse imports: [checkmate](#), [term.modules.general](#)

Linking:

Please use the canonical form <https://CRAN.R-project.org/package=term> to link to this page.

Archived
version package

Index of /src/contrib/Archive/term

Name	Last modified	Size	Description
Parent Directory			
term_0.8.3.tar.gz	2023-06-19 17:20 2.2M		
term_0.8.4.tar.gz	2023-06-27 13:00 2.2M		
term_0.9.0.tar.gz	2023-09-01 11:20 2.3M		
term_0.9.3.tar.gz	2023-12-08 17:20 2.3M		
term_0.9.4.tar.gz	2024-04-17 08:50 4.2M		

Apache Server at cran.r-project.org Port 443

term / DESCRIPTION

Meiliades and github-actions[bot] [skip actions] Bump version to 0.9.5.003

```
1 Package: term
2 Title: Create Common TLOs Used In Clinical Trials
3 Version: 0.9.5.003
4 Date: 2024-07-01
5 Author-Maintainer: Joe Zhu
6
7 person("Joe", "Zhu", "joe.zhu@roche.com", role = c("aut", "cre")),
8 person("Daniel", "Sabanes Bove", "daniel.sabanes_bove@roche.com", role = "aut"),
9 person("Jana", "Stoolova", "jana.stoolova@roche.com", role = "aut"),
10 person("Davide", "Garocci", "davide.garocci@roche.com", role = "aut"),
11 person("Emily", "de la Rue", "emily.de_la_rue@contractors-roche.com", role = "aut"),
12 person("Abhinav", "Yoganekar", "abhinav.yoganekar@contractors-roche.com", role = "aut"),
13 person("Hong", "Wan", "hong.wan@roche.com", role = "aut"),
14 person("Francis", "Gallagher", "francis.gallagher@roche.com", role = "aut"),
15 person("Hoffmann-La Roche AG", "Hoffmann-La Roche AG", "hla-roche@roche.com", role = "aut"),
16 person("Hoffmann-La Roche AG", "Hoffmann-La Roche AG", "hla-roche@roche.com", role = "aut"),
17 person("Hoffmann-La Roche AG", "Hoffmann-La Roche AG", "hla-roche@roche.com", role = "aut"),
18 person("Hoffmann-La Roche AG", "Hoffmann-La Roche AG", "hla-roche@roche.com", role = "aut"),
19
20 Description: Table, Listings, and Graphs (TLO) library for common outputs
21 used in clinical trials.
22 License: Apache License 2.0
23 URL: https://sanofiengineering.github.io/term/, https://github.com/sanofiengineering/term/
24 BugReports: https://github.com/sanofiengineering/term/issues
25
26 Depends:
27   R (>= 3.6),
28   graphics (>= 0.6.3)
29
30 Imports:
31   base (>= 0.5-4),
32   cli (>= 3.0-1),
33   checkmate (>= 2.1.0),
34   corrrplot (>= 1.0.0),
35   dplyr (>= 1.0.0),
36   flextable (>= 1.0.0),
37   formatR (>= 0.5.8),
38   ggplot2 (>= 3.4.1),
39   munsell (>= 1.4.0),
40   wklib (>= 0.8.3),
41   wklib (>= 1.4.2),
42   wklib (>= 0.18-4),
43   wklib (>= 1.7.9),
44   wklib (>= 0.1.1),
45   wklib (>= 2.1.9),
46   wklib (>= 1.4.1),
47   wklib (>= 2.1.2),
48   wklib (>= 3.1.9),
49   wklib (>= 2024-06-21)
```

term / LICENSE

edelarua Check all URLs (#909)

Code Blame 13 lines (10 loc) - 565 Bytes

```
1 Copyright 2022 F. Hoffmann-La Roche AG
2
3 Licensed under the Apache License, Version 2.0 (the "License");
4 you may not use this file except in compliance with the License.
5 You may obtain a copy of the License at
```

- Data extraction from .tar package source code

Risk Manage By: {risk.assessor}



Data Extraction From GitHub

- Data extraction from github repository and CRAN download:

- Stars
- Forks
- Last commit
- Number of downloads (Last month, Total)

Risk Manage By:



{risk.assessor}

results\$results

```
$pkg_name
[1] "here"

$pkg_version
[1] "1.0.1"

$pkg_source_path
C:/Users/I0555262/AppData/Local/Temp/RtmpOc7a0z/temp_file_5a3
"C:/Users/I0555262/AppData/Local/Temp/RtmpOc7a0z/temp_file_5a30

$date_time
[1] "2024-10-29 12:08:35"

$executor
[1] ""

$sysname
[1] "Windows"

$version
[1] "build 19045"

$release
[1] "10 x64"

$machine
[1] "x86-64"

$comments
[1] " "

$has_bug_reports_url
[1] 1
```

Quality metrics

```
$license
[1] 1

$has_examples
[1] 1

$has_maintainer
[1] 1

$size_codebase
[1] 0.4680851

$has_news
[1] 1

$has_source_control
[1] 1

$has_vignettes
[1] 1

$has_website
[1] 1

$news_current
[1] 1

$export_help
[1] 1

$export_calc
[1] 0.6791787

$check
[1] 0

$cover
[1] 0.9867
```

Dependencies

```
$dependencies
$dependencies$imports
$dependencies$imports$rprojroot
[1] "2.0.4"

$dependencies$suggests
$dependencies$suggests$conflicted
[1] "None"

$dependencies$suggests$cover
[1] "3.6.4"

$dependencies$suggests$fs
[1] "1.6.3"

$dependencies$suggests$knitr
[1] "None"

$dependencies$suggests$palmerpenguins
[1] "None"

$dependencies$suggests$plyr
[1] "None"

$dependencies$suggests$readr
[1] "None"

$dependencies$suggests$rlang
[1] "1.1.3"

$dependencies$suggests$rmarkdown
[1] "None"

$dependencies$suggests$testthat
[1] "3.2.1.1"

$dependencies$suggests$uuid
[1] "None"
```

\$dep_score
[1] 0.04742587

Reverse Dependencies

```
$rev_deps
[1] "adepro" "APcalign" "archetype"
[4] "ARUtools" "AzureAppInsights" "bdc"
[7] "BeeDO" "blastula" "boxr"
[10] "bscu" "cache" "case"
[13] "cbtools" "clockify" "clockify"
[16] "cohortcharacteristics" "cohortconstructor" "cohortsymmetry"
[19] "cpsvote" "cricketdata" "crosstalk"
[22] "denguedatahub" "DescrTab2" "designit"
[25] "did" "diffenrich" "DrugUtilisation"
[28] "dtrackr" "dyn.log" "EElentropy"
[31] "elaborator" "emayili" "EpiNow2"
[34] "fileacher" "flourishcharts" "flow"
[37] "folders" "formods" "funspotr"
[40] "fusen" "ggplot2" "ggseg"
[43] "ghclass" "GOWEQUAR" "gssse"
[46] "gitignore" "golem" "graphicalHCP"
[49] "gtfsrouter" "guerry" "heddlr"
[52] "heplots" "hkdassets" "IncidencePrevalence"
[55] "isotracer" "ixplorer" "justifier"
[58] "ks" "kindisperse" "logitr"
[61] "logrx" "longsurv" "lterdatasampler"
[64] "mailmerge" "maraca" "marginaleffects"
[67] "metabolic" "metr" "midfielder"
[70] "misotetabar" "nlr3spatiotempcv" "morphemeplece"
[73] "naniar" "nascalc_data" "nascalc_data"
[76] "nestedlogit" "nettskjenar" "olinkanalyze"
[79] "omopgenerics" "OmopSketch" "Omopviewer"
```

\$revdep_score
[1] 0.9721276

\$overall_risk_score
[1] 0.2963372

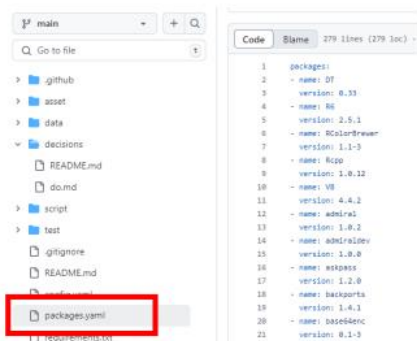
\$risk_profile
[1] "Medium"

Risk score

Risk Manage By: {risk.assessor}

Package Validation Workflow: DB Rpackage

Packages.yaml



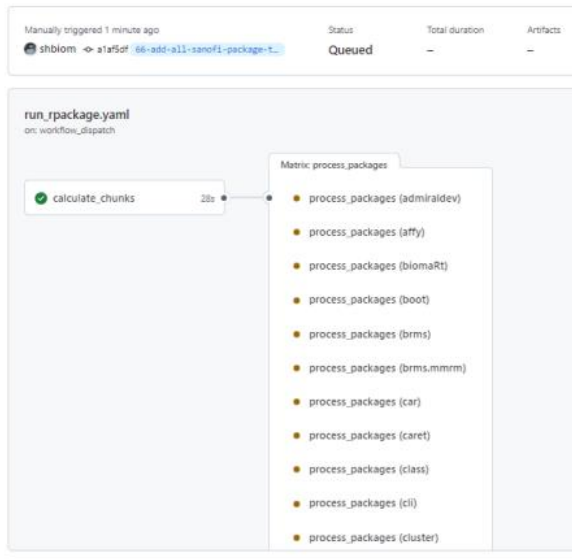
Github Action



← run r package
● run r package #172

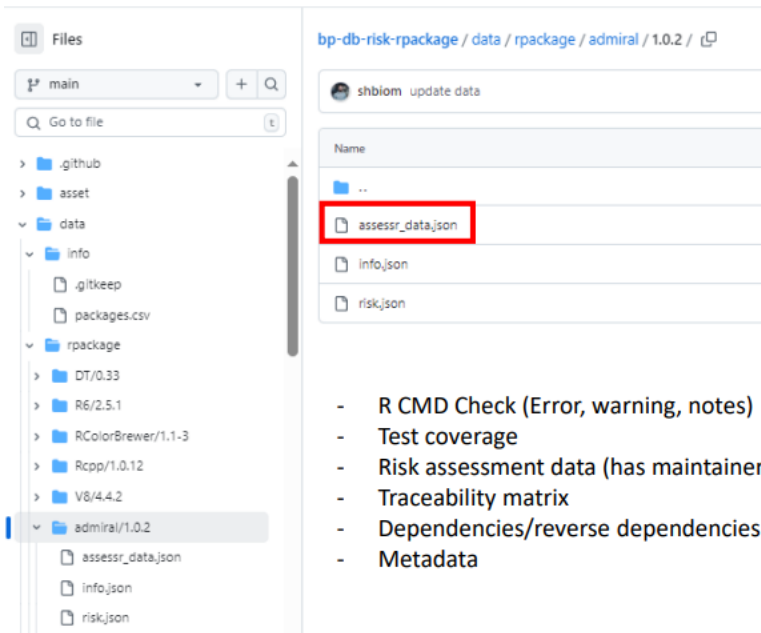
Summary

- Jobs
- calculate_chunks
 - process_packages (admiraldev)
 - process_packages (affy)
 - process_packages (biomaRt)
 - process_packages (boot)
 - process_packages (brms)
 - process_packages (brms.mmm)
 - process_packages (car)
 - process_packages (caret)
 - process_packages (class)
 - process_packages (cli)
 - process_packages (cluster)
 - process_packages (clusterGeneration)
 - process_packages (cmdstanr)
 - process_packages (codetools)
 - process_packages (compiler)
 - process_packages (cowplot)
 - process_packages (crew)
 - process_packages (crew.cluster)
 - process_packages (cubature)
 - process_packages (datasets)



Risk Manage By: {risk.assessr}

DB R Package: assessr_data.json



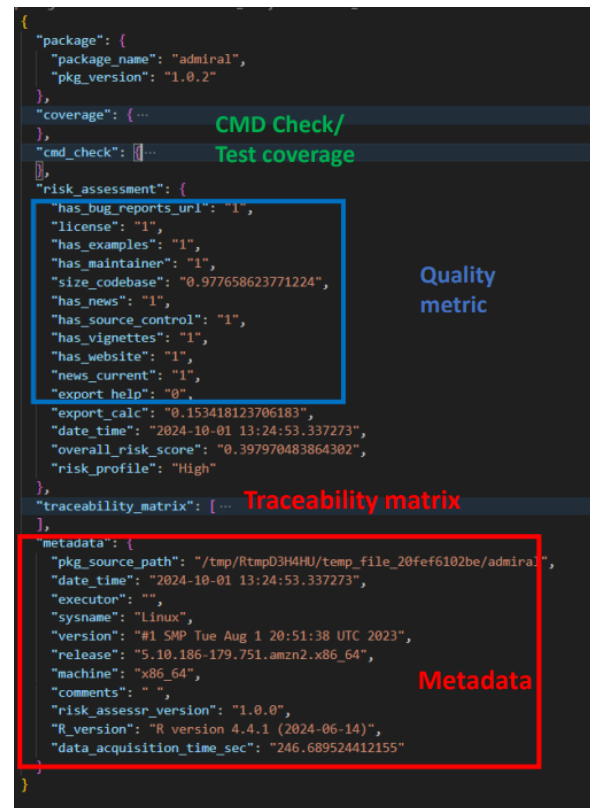
bp-db-risk-rpackage / data / rpackage / admiral / 1.0.2 /

shbiom update data

Name

- ..
- assessr_data.json
- info.json
- risk.json

- R CMD Check (Error, warning, notes)
- Test coverage
- Risk assessment data (has maintainer, has website)
- Traceability matrix
- Dependencies/reverse dependencies
- Metadata



```
{
  "package": {
    "package_name": "admiral",
    "pkg_version": "1.0.2"
  },
  "coverage": { ... },
  "cmd_check": { ... },
  "risk_assessment": {
    "has_bug_reports_url": "1",
    "license": "1",
    "has_examples": "1",
    "has_maintainer": "1",
    "size_codebase": "0.977658623771224",
    "has_news": "1",
    "has_source_control": "1",
    "has_vignettes": "1",
    "has_website": "1",
    "news_current": "1",
    "export_help": "0",
    "export_calc": "0.153418123706183",
    "date_time": "2024-10-01 13:24:53.337273",
    "overall_risk_score": "0.397970483864302",
    "risk_profile": "High"
  },
  "traceability_matrix": { ... },
  "metadata": {
    "pkg_source_path": "/tmp/RtmpD3H4HU/temp_file_20fef6102be/admiral",
    "date_time": "2024-10-01 13:24:53.337273",
    "executor": "",
    "sysname": "Linux",
    "version": "#1 SMP Tue Aug 1 20:51:38 UTC 2023",
    "release": "5.10.186-179.751.amzn2.x86_64",
    "machine": "x86_64",
    "comments": " ",
    "risk_assessr_version": "1.0.0",
    "R_version": "R version 4.4.1 (2024-06-14)",
    "data_acquisition_time_sec": "246.689524412155"
  }
}
```

Risk Manage By: {risk.assessr}

Validation Policy Rules (Ongoing)

Low Risk:

A package is low risk if all these criteria are met:

- **R CMD check** - The package passes a R CMD check without ERRORS
- **RCMD check** - Passes CRAN feasibility check (extra checks run to assess CRAN submission)
- **Test coverage** over 80%
- Each exported function has at least one unit test (excluding re-exported from other packages functions)
- **Number of dependencies** ≤ 20
- **Documentation** - (Package has examples, vignettes, website, maintainer ...)
- **License**(type of permissive): MIT, Apache 2, Artistic-2

Medium Risk:

A package is Medium risk if one or more of these criteria fails:

- **R CMD check** passed with WARNINGS and/or NOTES
- **Test coverage** between 60% - 80%
- Some exported functions do not have a unit test and/or function test coverage $< 60\%$ (exclude re-exported functions)
- **Number of dependencies** between 20 - 40
- Influence - **reverse dependencies** (< 5 reverse dependencies)
- **License** GPL or LGPL or unclear licenses OR GPL/LGPL in dependencies
- 5 versions behind the latest one

High Risk:

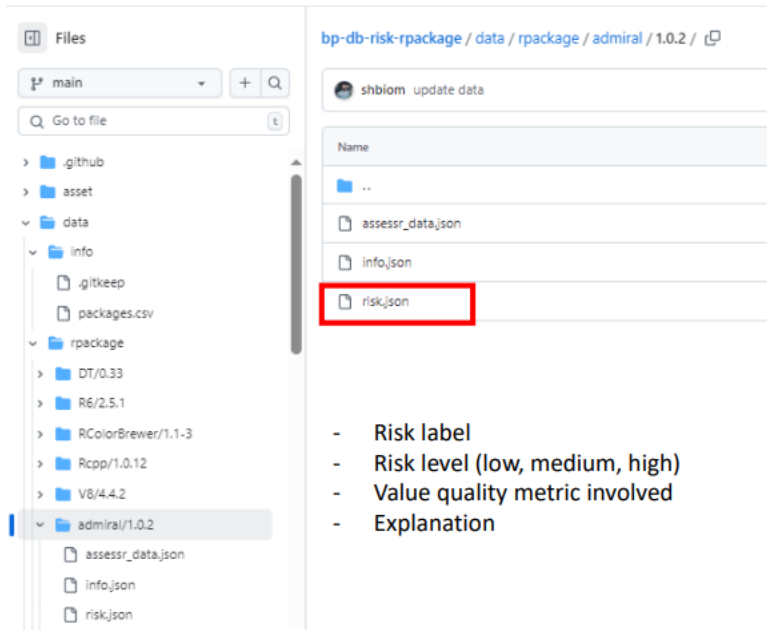
A package is High Risk if one or more of these criteria fail:

Fail one or more of the following criteria:

- **R CMD basic check**
- **Test coverage** over 60%
- **Number of dependencies** > 40
- **License**: GNU Affero GPL(AGPL) 3.0, CeCILL v2.1, Open Software Licence 3.0, Server Side Public License(SSPL) 1.0 or other "non-SAAS-friendly" license

Risk Manage By: {risk.assessr}

DB R package Rules: risk.json



bp-db-risk-rpackage / data / rpackage / admiral / 1.0.2 /

shbiom update data

Name
..
assessr_data.json
info.json
risk.json

- Risk label
- Risk level (low, medium, high)
- Value quality metric involved
- Explanation

```
{
  "package_name": "admiral",
  "package_version": "1.0.2",
  "risks": [
    {
      "risk_label": "Licence",
      "risk_level": "Low",
      "value": "Apache-2.0",
      "operator": "",
      "threshold": "",
      "explanation": "License is permissive (e.g., MIT, Apache) and favored for use."
    },
    {
      "risk_label": "Unit test",
      "risk_level": "High",
      "value": "nan",
      "operator": "<=",
      "threshold": 60,
      "explanation": "Code coverage is below the acceptable threshold set at 60."
    },
    {
      "risk_label": "Dependency count",
      "risk_level": "medium",
      "value": "22",
      "operator": ">",
      "threshold": 20,
      "explanation": "Number of dependencies exceeds the acceptable between 20 and 40."
    },
    {
      "risk_label": "Deprecated version",
      "risk_level": "low",
      "value": "2",
      "operator": "<=",
      "threshold": "5",
      "explanation": "Less than 5 packages versions behind the latest version"
    },
    {
      "risk_label": "ODI check",
      "risk_level": "High",
      "value": "Notes, Warnings, Errors",
      "operator": ">",
      "threshold": null,
      "explanation": "The package contains notes during ODI check.\nWarnings found during ODI check.\nErrors found during ODI check."
    }
  ]
}
```

[decision_report_dplyr_1.1.4.html](#)

Package Decision Document for dplyr version 1.1.4



Package Details

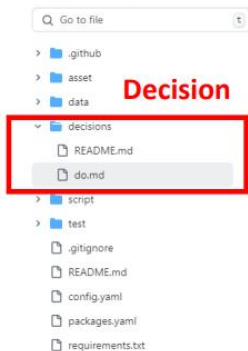
Type	Values
Package	dplyr
Version	1.1.4
Package Description	
CRAN link	https://cran.r-project.org/src/contrib/dplyr_1.1.4.tar.gz
GitHub repository	https://github.com/tidyverse/dplyr
Bioconductor Link	No Bioconductor link found
Intent of Use	
Requestor	

Activity Summary

Risk Manage By: {risk.assessr}

Documentation Approval Decision

DB Rpackage



Preview Code Blame 31 lines (15 loc) · 584 Bytes

do

Information

- Package description: Flexibly convert data between long and wide format using just two functions: `reshape_toLong()` and `reshape_toWide()`.
- CRAN link: <https://cran.r-project.org/package=do>
- Github repository: <https://github.com/yikeshu0611/do>
- Intent of use: for data preparation and adam creation
- Requestor: Fan.Zhang2@sanofi.com

Review

No unit test, too old. Lots of dependencies. Several functions already covered by tidyR package.

Decision

Rejected.

Date

02Jul2024

Approvers

- Paulin Charliquart

Next step: text generation

Thank
you

sanofi