Extracting, Computing and Exploring the Parameters of Statistical Models using R

21 March 2021

Summary

The `performance` package provides utilities for computing measures to assess model quality, which are not directly provided by R's `base` or `stats` packages. These include e.g. measures like R^2, intraclass correlation coefficient, root mean squared error, or functions to check models for overdispersion, singularity or zero-inflation and more. Functions apply to a large variety of regression models, including generalized linear models, mixed effects models, and Bayesian models.

Aims of the Package

performance is part of the *easystats* ecosystem, a collaborative project created to facilitate the usage of R for statistical analyses.

Comparison to other Packages

Examples of Features

Assessing Model Quality

The `model_performance()` function is the workhorse of this package and allows you to extract a comprehensive set of model fit indices from various models in a consistent way. Depending on the regression model object, the list of computed indices might include R^2, AIC, BIC, RMSE, ICC, LOOIC, etc.

Example with linear model

```
m1 <- lm(mpg ~ wt + cyl, data = mtcars)
model_performance(m1)
#> # Indices of model performance
#>
#> AIC     |     BIC |    R2 | R2 (adj.) |  RMSE | Sigma
#> ----------------------------------------------------------
#> 156.010 | 161.873 | 0.830 |     0.819 | 2.444 | 2.568
```

Example with logistic regression

```
m2 <- glm(vs ~ wt + mpg, data = mtcars, family = "binomial")
model_performance(m2)
#> # Indices of model performance
#>
#> AIC    |    BIC | Tjur's R2 |  RMSE | Sigma | Log_loss | Score_log | Score_spherical |   PCP
```

```
#> ---------------------------------------------------------------------------------------------
#> 31.298 | 35.695 |     0.478 | 0.359 | 0.934 |    0.395 |   -14.903 |           0.095 | 0.743
```

Example with linear mixed model:

```
library(lme4)
m3 <- lmer(Reaction ~ Days + (1 + Days | Subject), data = sleepstudy)
model_performance(m3)
#> # Indices of model performance
#>
#> AIC      |      BIC | R2 (cond.) | R2 (marg.) |   ICC |   RMSE |  Sigma
#> ---------------------------------------------------------------------
#> 1755.628 | 1774.786 |      0.799 |      0.279 | 0.722 | 23.438 | 25.592
```

Visualisation

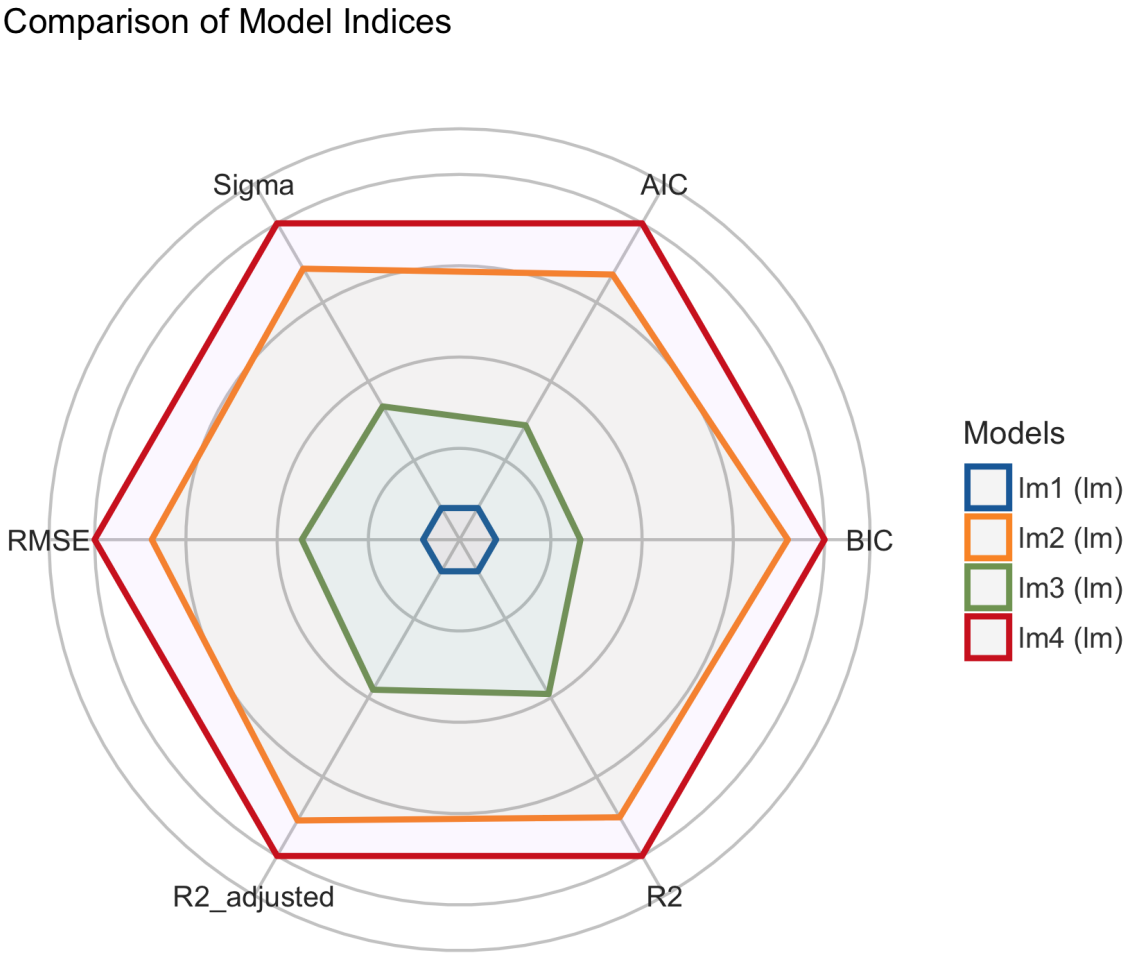
performance functions also include plotting capabilities via the **see** package (Lüdecke, Ben-Shachar, Waggoner, & Makowski, 2020). A complete overview of plotting functions is available at the *see* website (https://easystats.github.io/see/articles/performance.html).

Visual Check of Model Assumptions

```
library(see)
library(lme4)
data(sleepstudy)

model <- lmer(Reaction ~ Days + (Days | Subject), sleepstudy)
check_model(model)
```

Visual Comparison of Model Fits

```
library(see)
data(iris)

lm1 <- lm(Sepal.Length ~ Species, data = iris)
lm2 <- lm(Sepal.Length ~ Species + Petal.Length, data = iris)
lm3 <- lm(Sepal.Length ~ Species * Sepal.Width, data = iris)
lm4 <- lm(Sepal.Length ~ Species * Sepal.Width + Petal.Length + Petal.Width, data = iris)

plot(compare_performance(lm1, lm2, lm3, lm4))
```



Licensing and Availability

performance is licensed under the GNU General Public License (v3.0), with all source code stored at GitHub (https://github.com/easystats/performance), and with a corresponding issue tracker for bug reporting and feature enhancements. In the spirit of honest and open science, we encourage requests/tips for fixes, feature updates, as well as general questions and concerns via direct interaction with contributors and developers.

Acknowledgments

performance is part of the collaborative *easystats* ecosystem. Thus, we would like to thank the members of easystats as well as the users.

References

Lüdecke, D., Ben-Shachar, M. S., Waggoner, P., & Makowski, D. (2020). see: Visualisation toolbox for 'easystats' and extra geoms, themes and color palettes for 'ggplot2'. *CRAN*. https://doi.org/10.5281/zenodo.3952153