

How to Get the Most Accurate Results for Your Data Using Ensembles for Numeric, Classification, Logistic and Time Series Data

Russ Conte, 2025 INFORMS Conference, Atlanta, Georgia

The vision: *As easy to use as an LLM*, but it's for data.

Intro: The “Hello, world!” of ensembles



How much time would it take to build from scratch:

- A set of 18 individual models and 14 ensembles of models
- Automatically optimize all models which can be optimized
- Randomly resample the data as many times as the user requests
- Automatically produce all EDA, summary plots and reports
- Automatically get results that beat the best Kaggle results for 20 years
- Automatically run without any errors or warnings
- Be fully reproducible

Data

Randomize the rows

Split data into train/test/validation

Fit training data to each of the individual models

Make predictions and measure RMSE/accuracy on the holdout set

Use predictions to make an ensemble

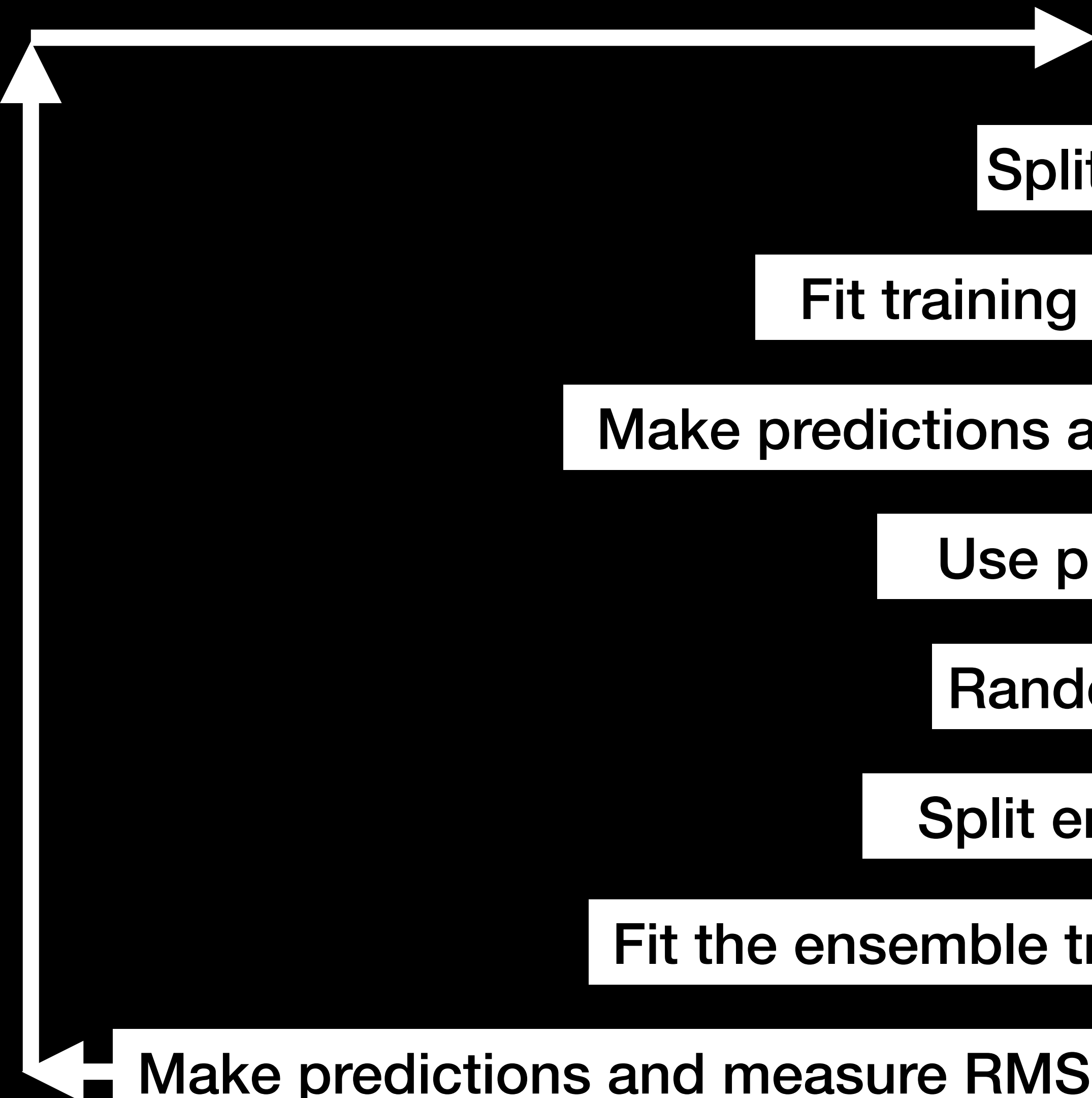
Randomize the rows in the ensemble

Split ensemble into train/test/validation

Fit the ensemble training data to each of the ensemble models

Make predictions and measure RMSE/accuracy using the models on ensemble holdout data

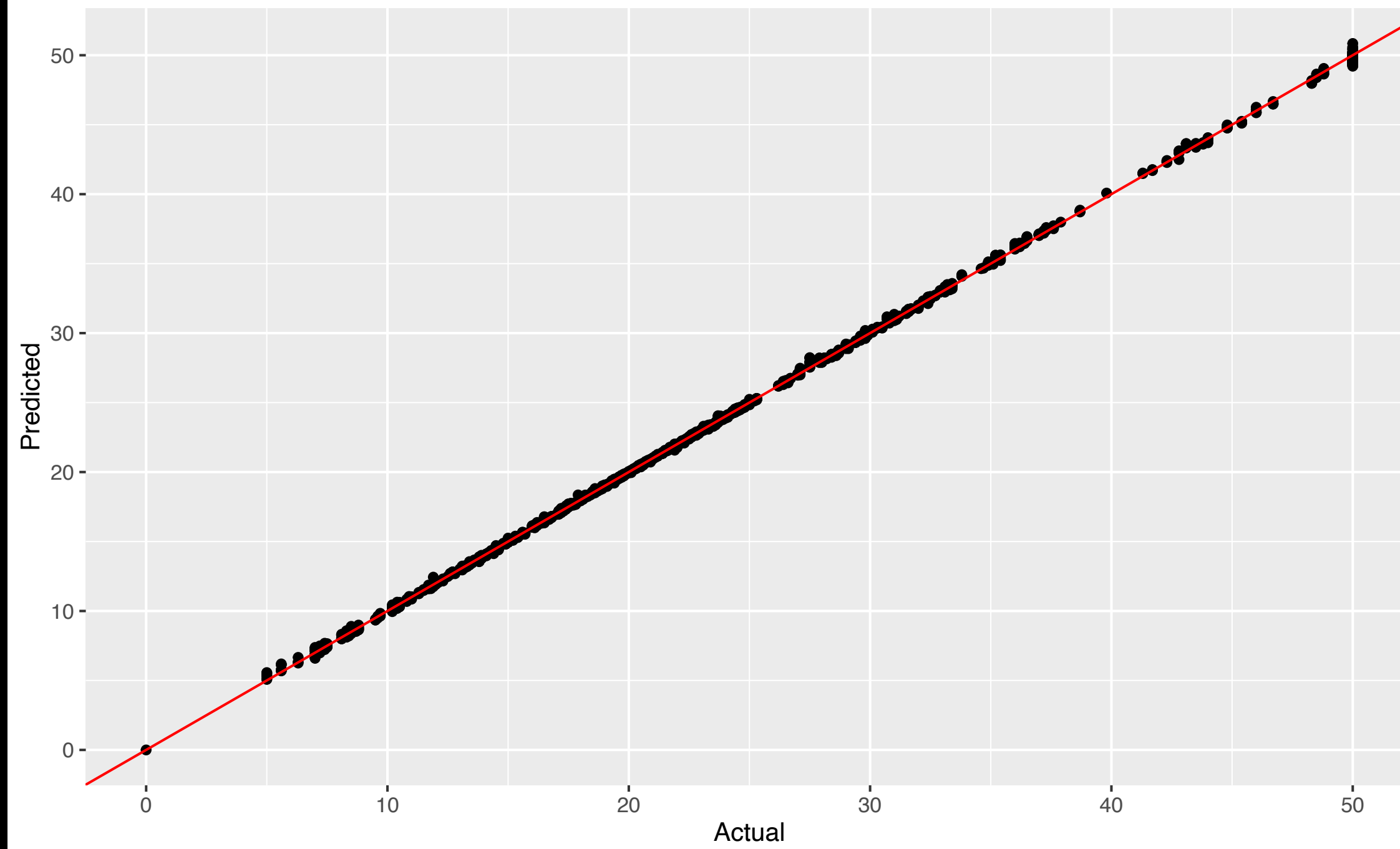
Automatically create many summary reports and plots



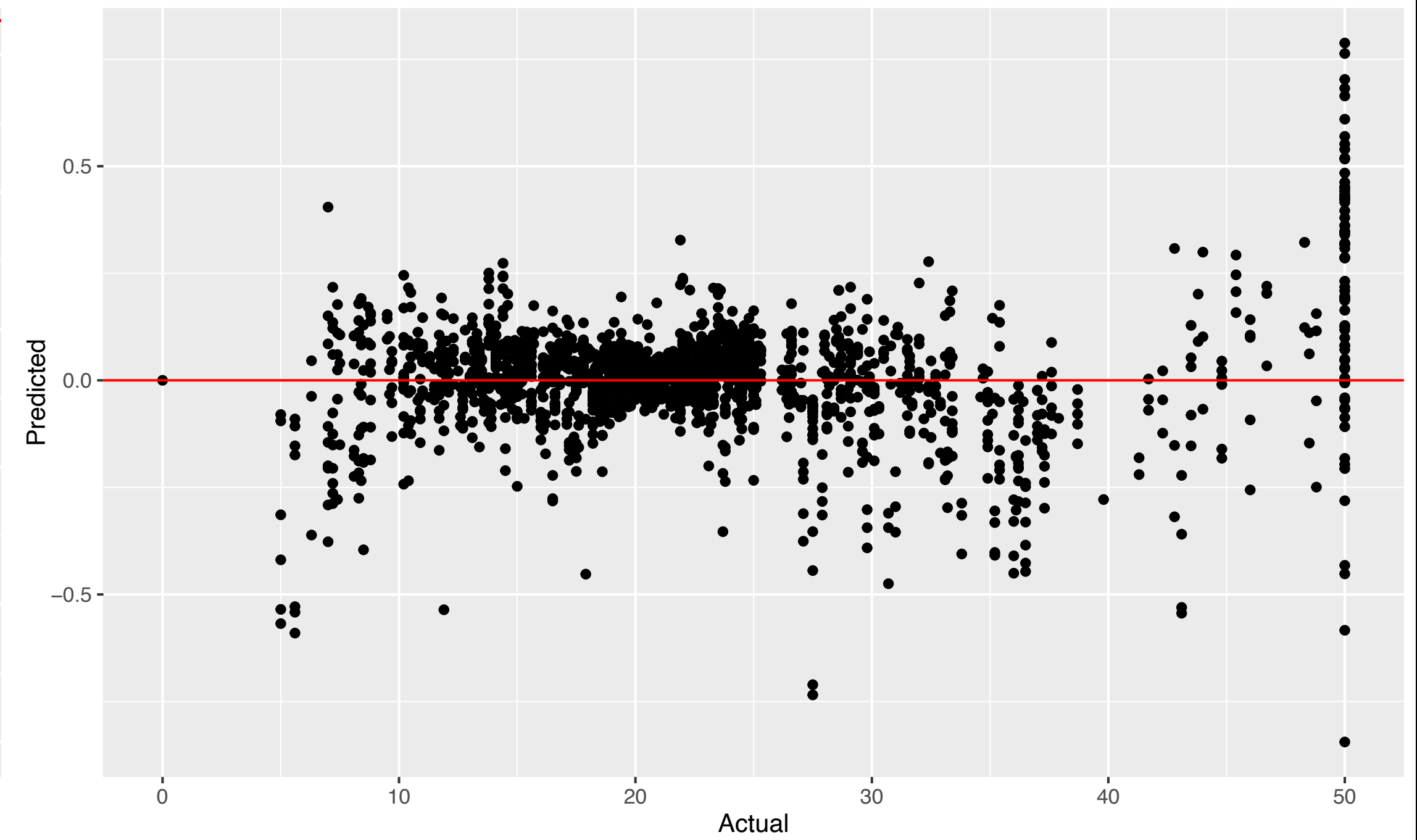
Best results with NumericEnsembles package beats best results on
Kaggle data science competitions for Boston Housing data

Kaggle Contest Name	Best Score (lowest RMSE)	# of teams	# of entries
Reitaku University	0.80946	12	32
Veronica	1.78911	41	328
UOU G03784	2.41242	49	699
SC201 June 2004	2.56893	17	402
SC201 Oct 2024	3.05221	10	220
Dupanya	3.09643	18	63
Total		147	1744
NumericEnsembles	Live demo right now	1	1

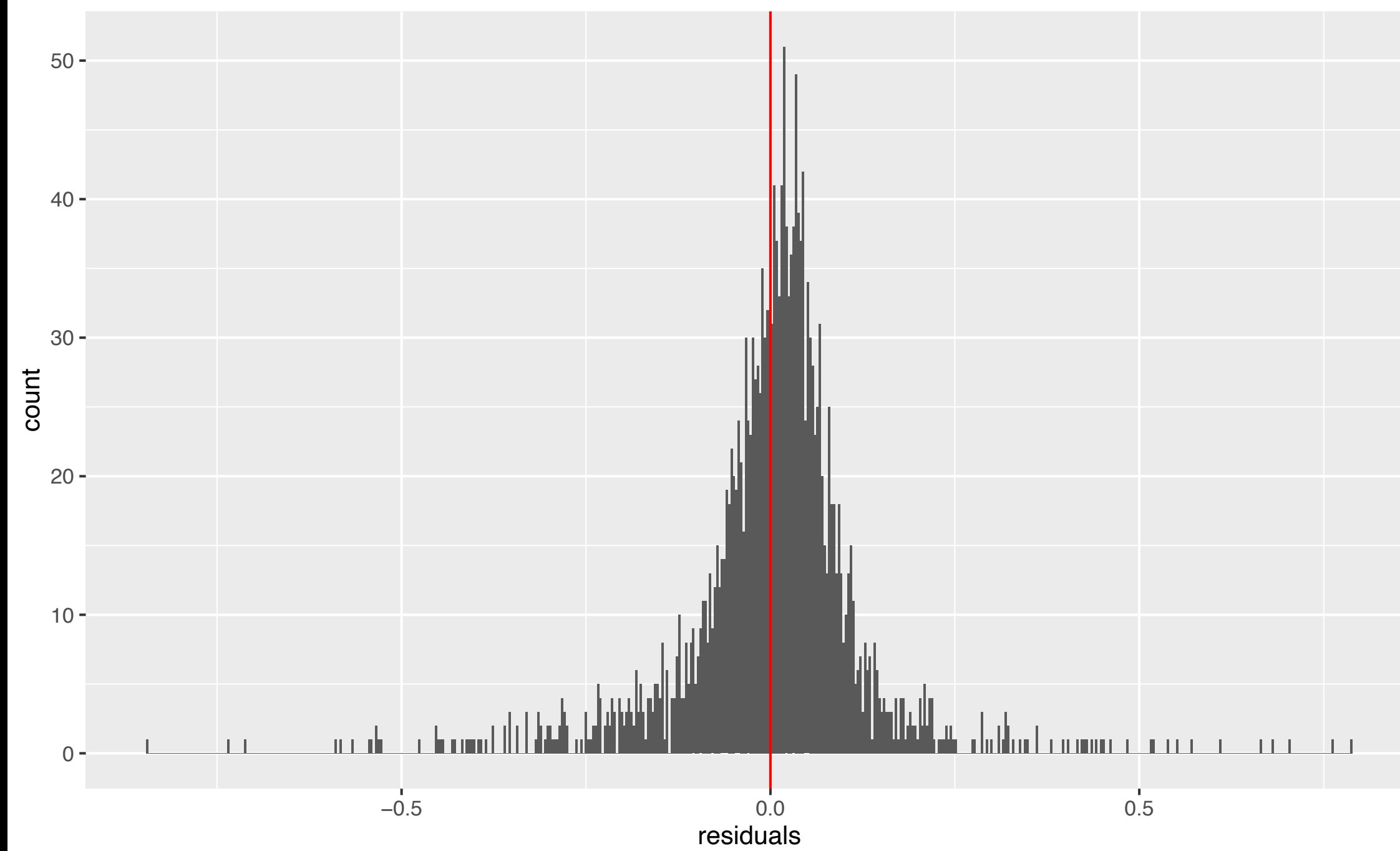
Ensemble Earth model: Predicted vs actual



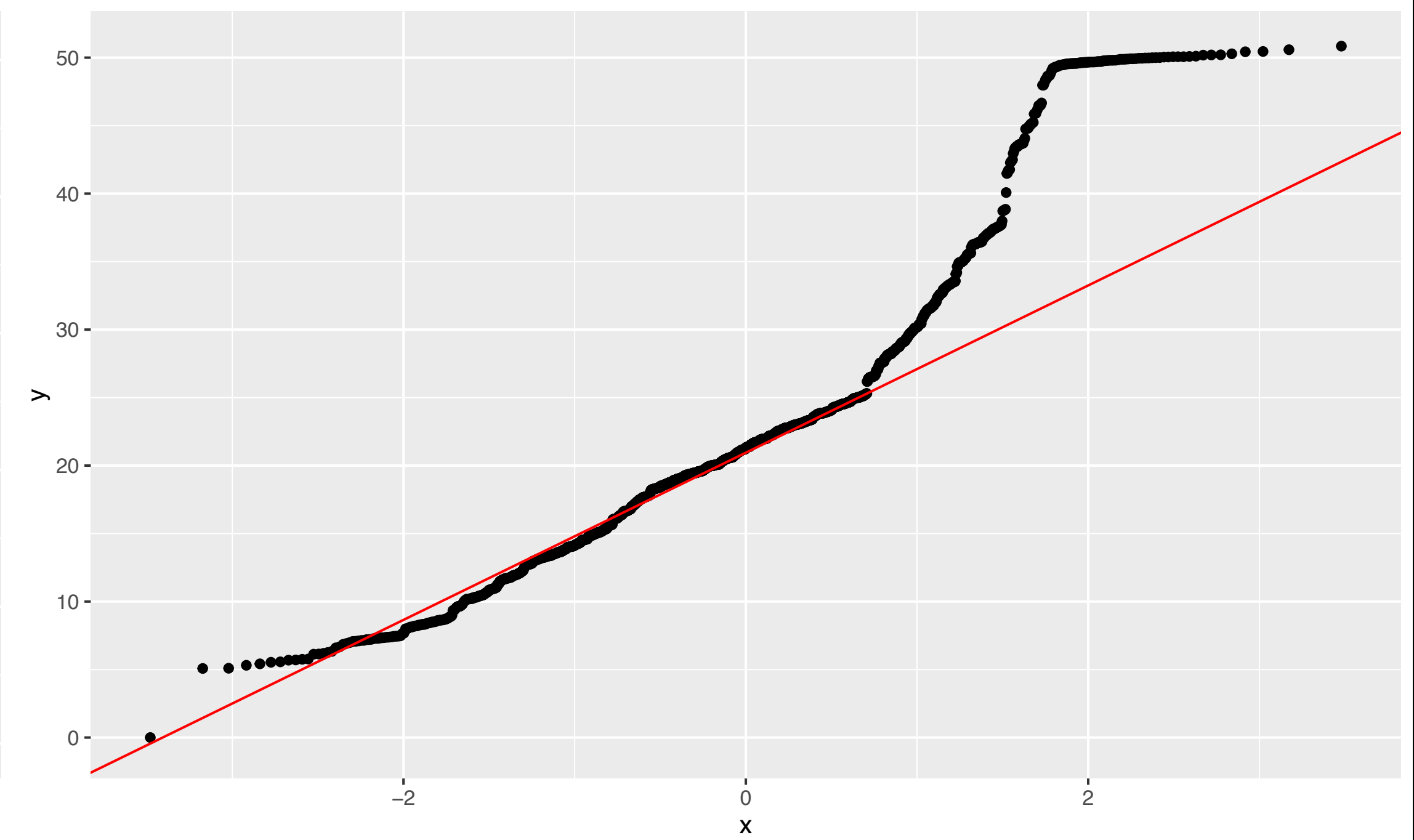
Ensemble Earth model: Residuals



Ensemble Earth model: Histogram of residuals



Ensemble Earth model: Q-Q plot



First (of many) pro features: How the package helps you write a professional paper using the NumericEnsembles package and helps you tell the story in your data.

Addressing the most difficult (and important) problem in data science today using the NumericEnsembles package.

Replication crisis

Article [Talk](#)

From Wikipedia, the free encyclopedia

The **replication crisis**, also known as the **reproducibility** or **replicability crisis**, is the growing number of published scientific results that other researchers have been unable to reproduce. Because the reproducibility of empirical results is a cornerstone of the [scientific method](#),^[2] such failures undermine the credibility of theories that build on them and can call into question substantial parts of scientific knowledge.

The replication crisis is frequently discussed in relation to [psychology](#) and [medicine](#), wherein considerable efforts have been undertaken to reinvestigate the results of classic studies to determine whether they are reliable, and if they turn out not to be, the reasons for the failure.^{[3][4]} Data strongly indicate that other [natural](#) and [social sciences](#) are also affected.^[5]

The phrase "replication crisis" was coined in the early 2010s as part of a growing awareness of the problem.^[6] Considerations of causes and remedies have given rise to a new scientific discipline known as [metascience](#),^[7] which uses methods of [empirical research](#) to examine empirical research practice.^[8]

Considerations about reproducibility can be placed into two categories. *Reproducibility* in a narrow sense refers to reexamining and validating the analysis of a given set of data. The second category, *replication*, involves repeating an existing experiment or study with new, independent data to verify the original conclusions.

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Essay

Why Most Published Research Findings Are False

John P.A. Ioannidis

Summary

There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio of true to no relationships among the relationships posited in each scientific field. In this framework a research finding is less likely to be true when the studies conducted in a field are unallow, when effect sizes are smaller when there is a greater number and lower proportion of tested relationships, where there is greater flexibility in designs, definitions, outcomes, and analytical approaches, where there is greater financial and other interest, and where more negative results are excluded in a scientific field. In cases of statistical significance, simulations show that for many study designs and settings, it is more likely for a research claim to be false than true. Moreover, for many current scientific fields, claimed research findings may often be simply accurate measures of the prevailing bias. In this view, I discuss the implications of these problems for the conduct and interpretation of research.

It can be proven that most claimed research findings are false.

should be interpreted based only on p-values. Research findings are defined here as any relationship reaching formal statistical significance, e.g., effective interventions, informative predictors, risk factors, or associations. "Negative" research is also very useful. "Negative" is actually a misnomer, and the misinterpretation is widespread. However, here we will target relationships that investigators claim exist, rather than null findings. As has been shown previously, the probability that a research finding is indeed true depends on the prior probability of it being true (before doing the study), the statistical power of the study, and the level of statistical significance [10,11]. Consider a 2 × 2 table in which research findings are compared against the gold standard of true relationships in a scientific field. In a research field both true and false hypotheses can be made about the presence of relationships. Let *R* be the ratio of the number of "true relationships" to "no relationships" among those tested in the field. *R*

is characteristic of the field and can vary a lot depending on whether the field targets highly likely relationships or searches for only one or a few true relationships among thousands and millions of hypotheses that may be postulated. Let us also consider, for computational simplicity, circumscribed fields where either there is only one true relationship (among many that can be hypothesized) or the power is similar to find any of the several existing true relationships. The pre-study probability of a relationship being true is *R*/(*R* + 1). The probability of a study finding a true relationship reflects the power 1 – β (one minus the Type II error rate). The probability of claiming a relationship when none truly exists reflects the Type I error rate, α. Assuming that relationships are being probed in the field, the expected values of the 2 × 2 table are given in Table 1. After a research finding has been claimed based on achieving formal statistical significance, the post-study probability that it is true is the positive predictive value, PPV. The PPV is also the complementary probability of what Wacholder et al. have called the false-positive report probability [10]. According to the 2 × 2 table, one gets PPV = (1 – β)R/(*R* + βR + α). A research finding is thus

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Abbreviations: PPV: positive predictive value

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Ioannidis (2005): "[Why Most Published Research Findings Are False](#)".^[1] 

The vision: As easy to use as an LLM, but it's for data.

The packages are designed to be:

Accurate

Fast

Easy to use

The goal is to make ensembles available to everyone.

No trackers, no cache, no saved data, no shared data, no LLMs, no agents, no coding assistants, no calls to any other systems.

Everything is done by the package on your local machine.

**‘All truths are easy to understand, once they are discovered;
the point is, to discover them.’**

Galileo Galilei

Dialogue Concerning the two Chief World Systems (1632) ‘The Second Day’ tr. Stillman Drake

**Solve real problems and/or make great opportunities with Ensembles
for Everyone:**

NumericEnsembles

ClassificationEnsembles

LogisticEnsembles

ForecastingEnsembles

All packages published on CRAN

Message me/feedback/collaborate, etc:

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Github (including slides) : InfiniteCuriosity



Russ Conte, October 28, 2025 for INFORMS Annual Meeting in Atlanta, Georgia, USA