

Chi-Square Goodness-of-Fit Test

Verified Python analysis transcript

Test: Chi-Square Goodness-of-Fit Test

Design: One categorical variable compared with an equal four-category reference distribution.

Variables: reason

Null hypothesis: The four school-choice reasons occur in equal population proportions.

Primary formula: $\chi^2 = \sum_j (O_j - E_j)^2 / E_j$, $df = k - 1$

Valid source rows: 649

Verified results:

statistic: 146.43297380585514

p_value: 1.5494561192342533e-31

degrees_of_freedom: 3

maximum_absolute_signed_root: 9.6367179485405

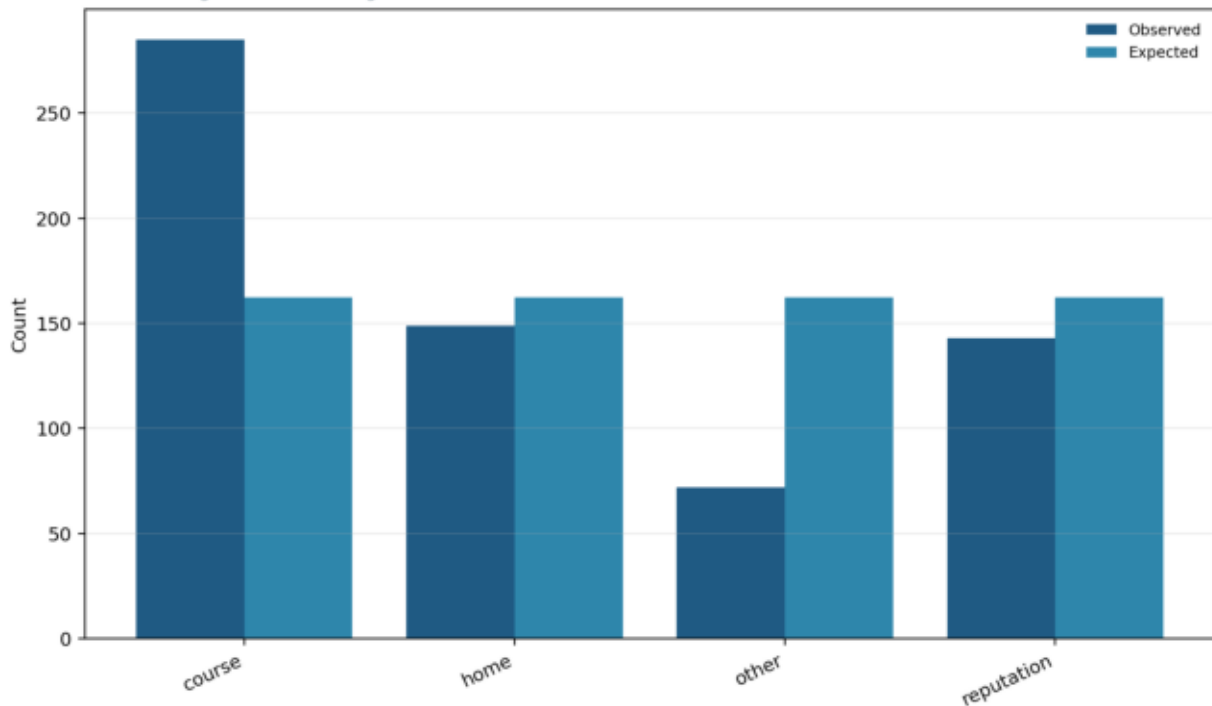
Interpretation:

The goodness-of-fit statistic is 146.432974 on 3 degrees of freedom ($p = 1.54946e-31$).

Category-level signed contributions identify whether each observed count is above or below its equal-share expectation.

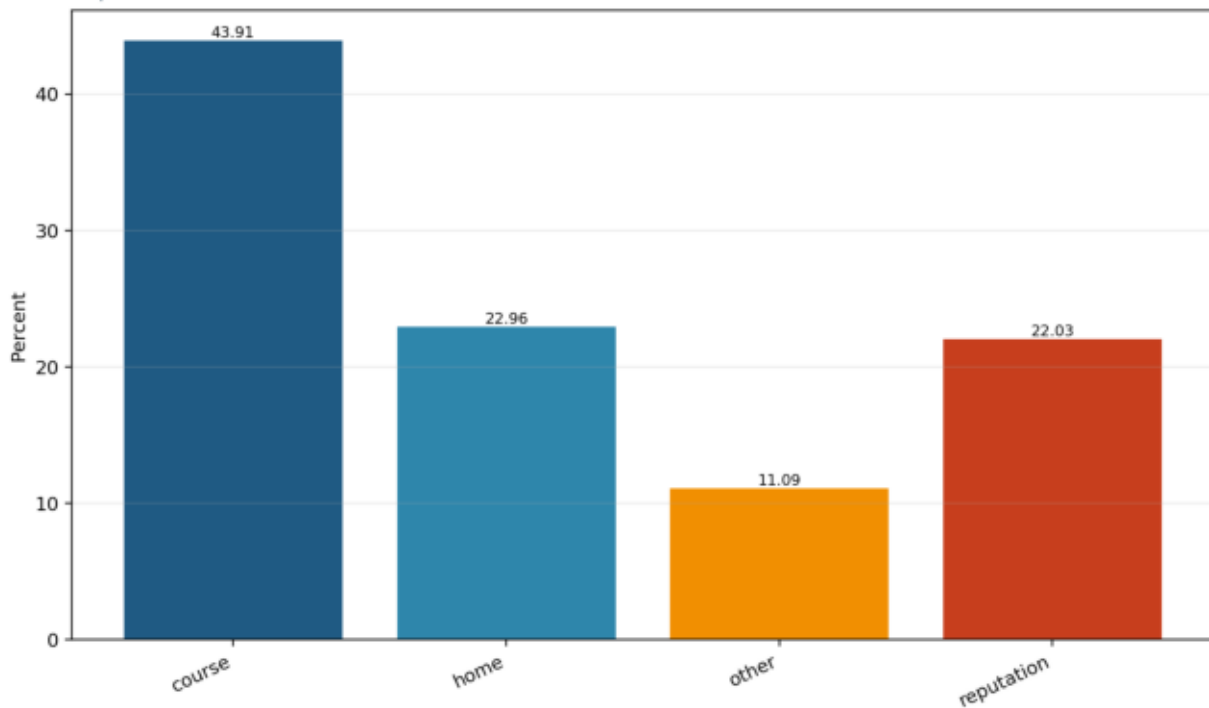
Observed and null-expected category counts

One-variable goodness-of-fit design



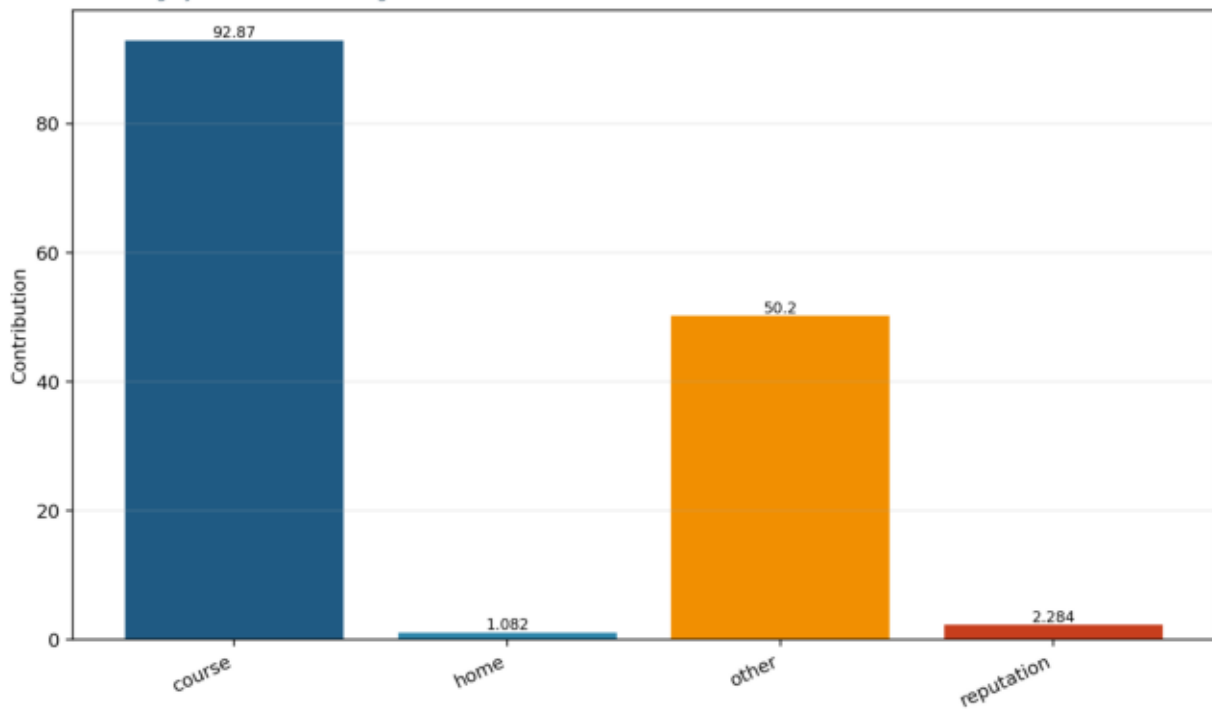
Observed category proportions

Empirical distribution



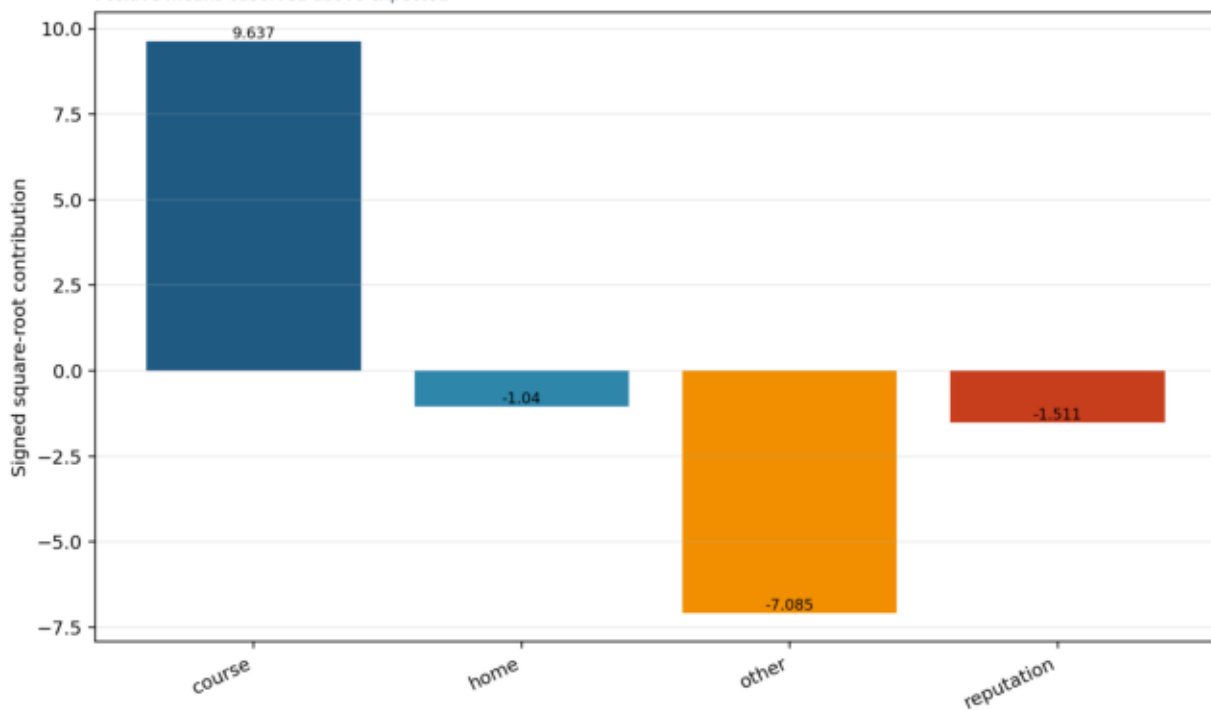
Pearson contributions

Each category's contribution to the global statistic



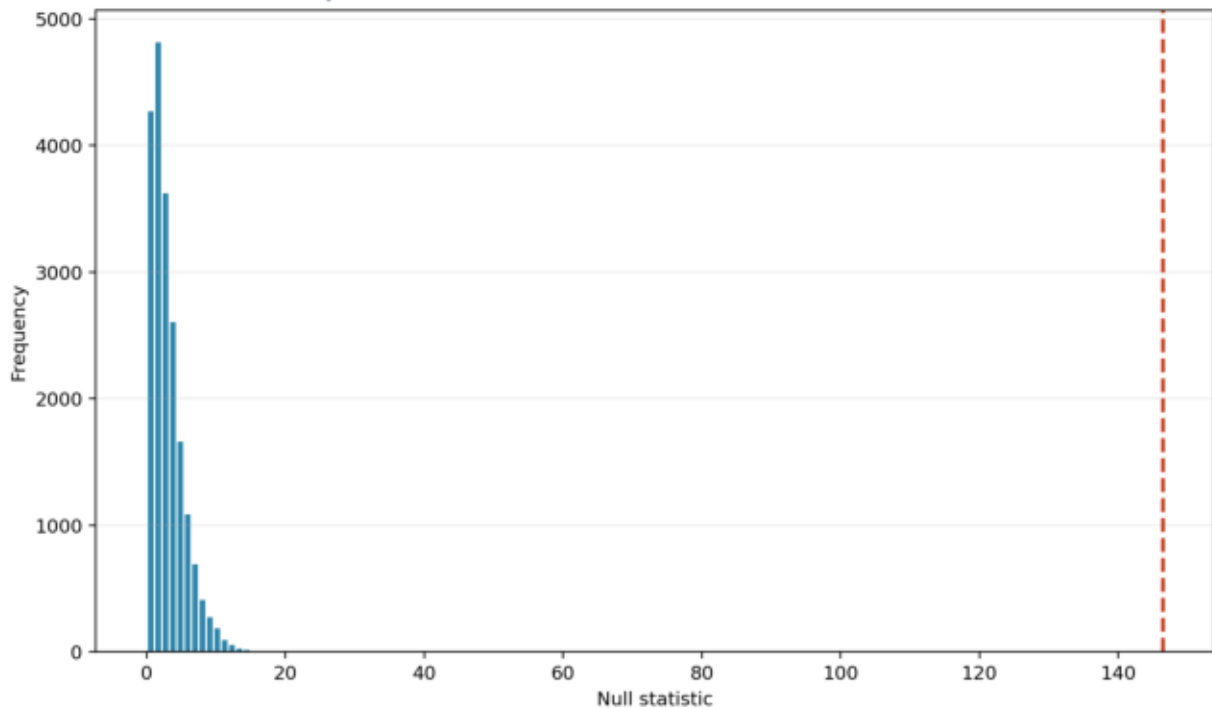
Signed contribution direction

Positive means observed above expected



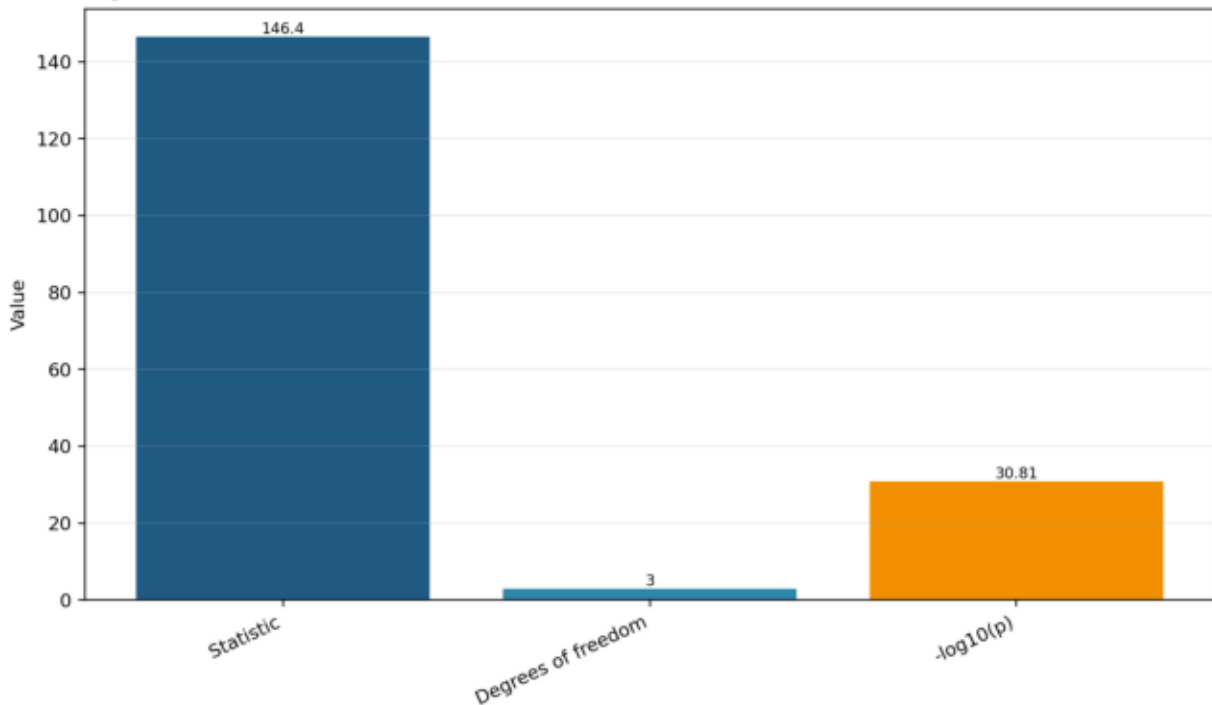
Asymptotic chi-square reference distribution

Observed statistic shown by the red line



Goodness-of-fit result summary

Magnitude and evidence



Observed Expected

Observed	Expected	Contribution	Signed_root
285	162.25	92.8663	9.63672
149	162.25	1.08205	-1.04022
72	162.25	50.2007	-7.08524
143	162.25	2.2839	-1.51126

Category Contributions

Contribution	Signed_root
92.8663	9.63672
1.08205	-1.04022
50.2007	-7.08524
2.2839	-1.51126