

Principal Component Analysis

Standalone verified Python analysis

Test: Principal Component Analysis

Design: Orthogonal variance-maximizing decomposition of the six standardized variables.

Variables: G1, G2, G3, famrel, freetime, goout

Null hypothesis: The retained components explain no more variance than individual standardized variables.

Formula: $PC_j = X v_j$ with $R v_j = \lambda_j v_j$; explained proportion = λ_j / p .

Source rows: 649

Calculated metrics:

first_eigenvalue: 2.7828698961540006

second_eigenvalue: 1.3848036796677767

first_component_variance: 0.4638116493590001

first_two_cumulative_variance: 0.694612262636963

components: 2

Independent reference values:

first_eigenvalue: 2.7828698961540006

second_eigenvalue: 1.3848036796677767

first_component_variance: 0.4638116493590001

first_two_cumulative_variance: 0.694612262636963

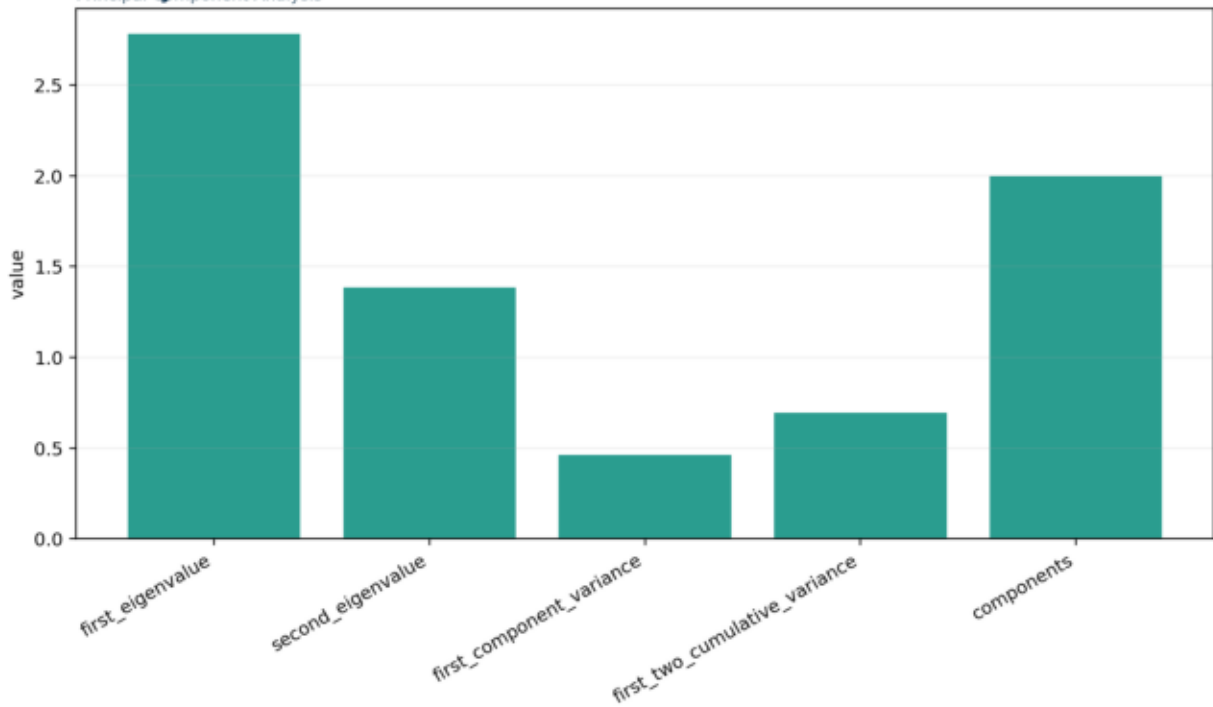
components: 2

Interpretation:

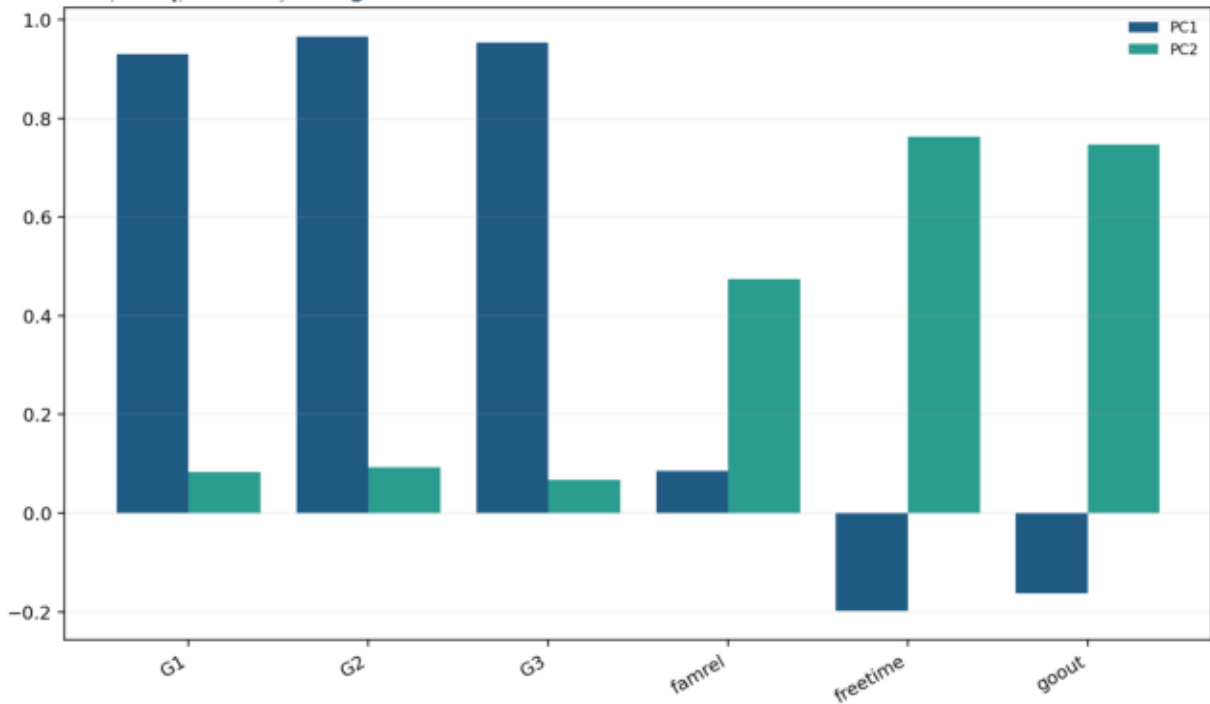
PCA decomposes total standardized variance and does not estimate uniqueness.

First two cumulative variance=0.694612.

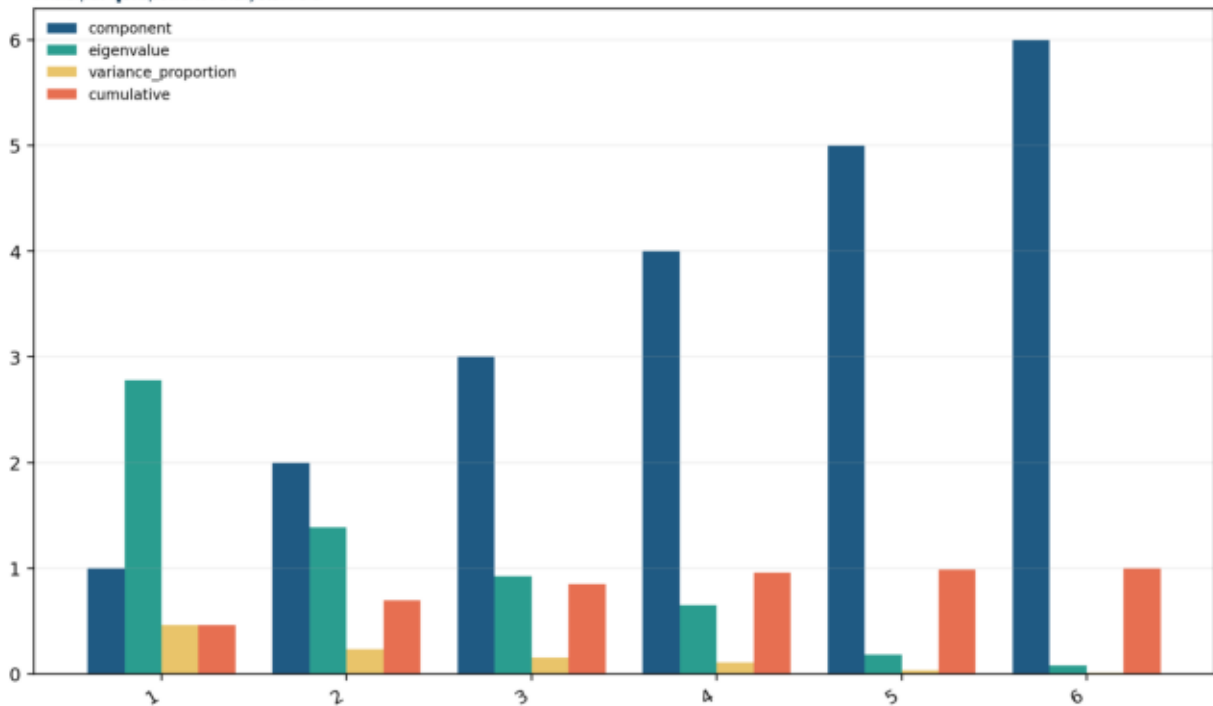
Primary Metrics



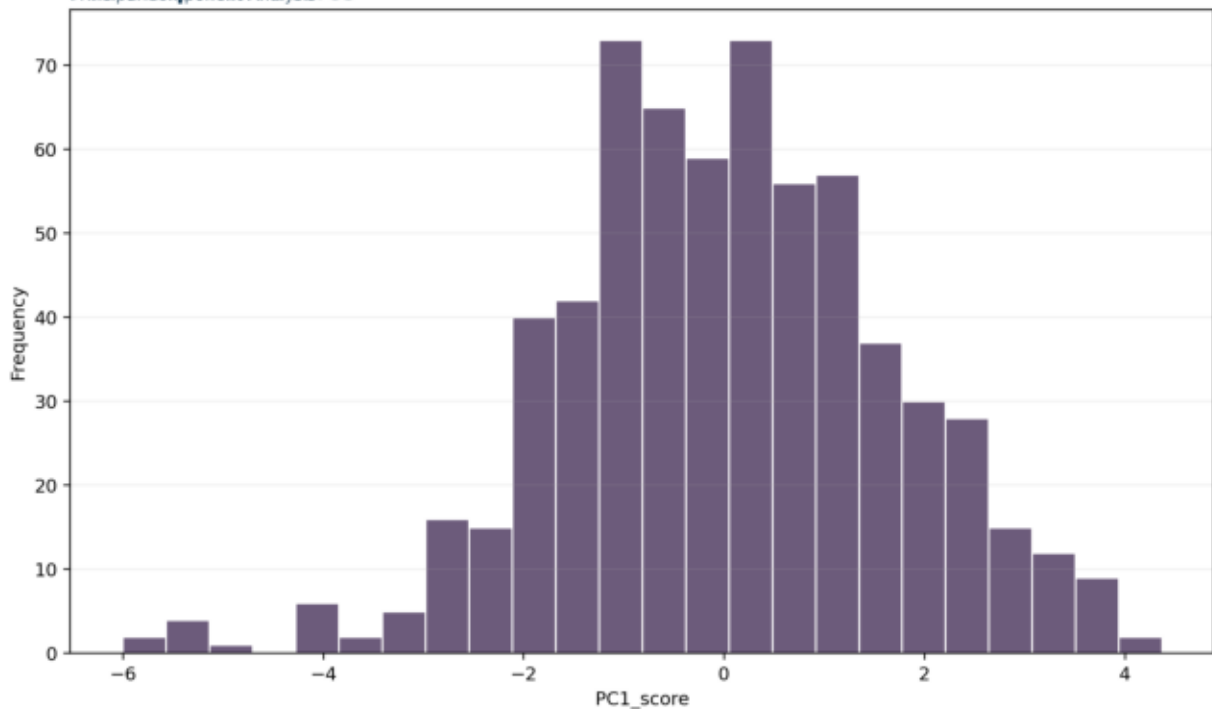
Pca Component Loadings



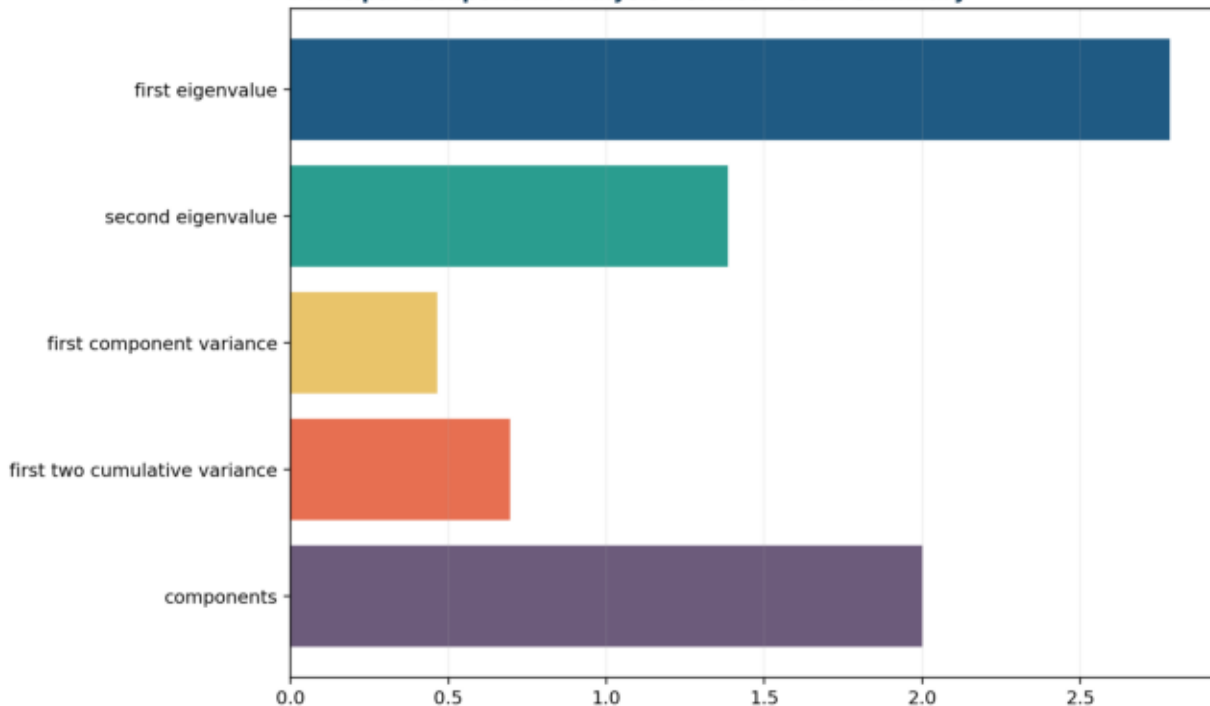
Pca Explained Variance



Pca Component Scores



Principal Component Analysis verified result summary



Primary Metrics

metric	value
first_eigenvalue	2.78287
second_eigenvalue	1.3848
first_component_variance	0.463812
first_two_cumulative_variance	0.694612
components	2

Pca Component Loadings

item	PC1	PC2
G1	0.930593	0.083687
G2	0.966354	0.093445
G3	0.953899	0.067366
famrel	0.0853669	0.473814
freetime	-0.198243	0.763226
goout	-0.162834	0.746671

Pca Explained Variance

component	eigenvalue	variance_proportion	cumulative
1	2.78287	0.463812	0.463812
2	1.3848	0.230801	0.694612
3	0.924099	0.154016	0.848629
4	0.650103	0.108351	0.956979
5	0.182299	0.0303832	0.987362
6	0.0758252	0.0126375	1

Pca Component Scores

PC1_score	PC2_score
-2.6336	0.0309603
-0.668216	0.145744
0.545497	-0.66526
1.56423	-1.5891
0.519291	-0.673445
0.46416	0.363546
0.44778	1.04746
0.376171	-0.854138
2.7496	-1.03423
0.434119	0.44094
1.36815	-0.432398
0.283877	-0.922357
0.462478	-0.125607
0.381141	0.903198
1.45559	0.701056
2.96266	1.35823
1.07919	-1.1026
1.35505	-0.155369
-2.56802	2.2806
0.436237	-1.80825
0.869449	-0.552426
0.0839612	0.319922
0.756389	0.0646205
-1.03691	1.28337
-0.612536	-0.807016
-0.306115	-2.6525