

Kendall's Tau Correlation Analysis

Primary variables: G1 and G3
H0: Kendall's tau-b = 0; no monotonic association.
H1: Kendall's tau-b is not 0; monotonic association exists.

Primary Kendall result:

n_complete_pairs	total_observation_pairs	concordant_pairs	discordant_pairs	x_ties_only	y_ties_only	ties_on_both_variables	kendalls_tau_b_manual	x_variable	y_variable	kendalls_tau_b	p_value_two_tailed	alpha	direction	practical_strength_label	decision	method_note
649	210276	158466	13791	16516	16614	4889	0.766198	G1	G3	0.766198	2.108694e-155	0.05	positive	strong	Reject H0: significant monotonic association	scipy.stats.kendalltau; tau-b with tie handling

Top pairwise Kendall relationships:

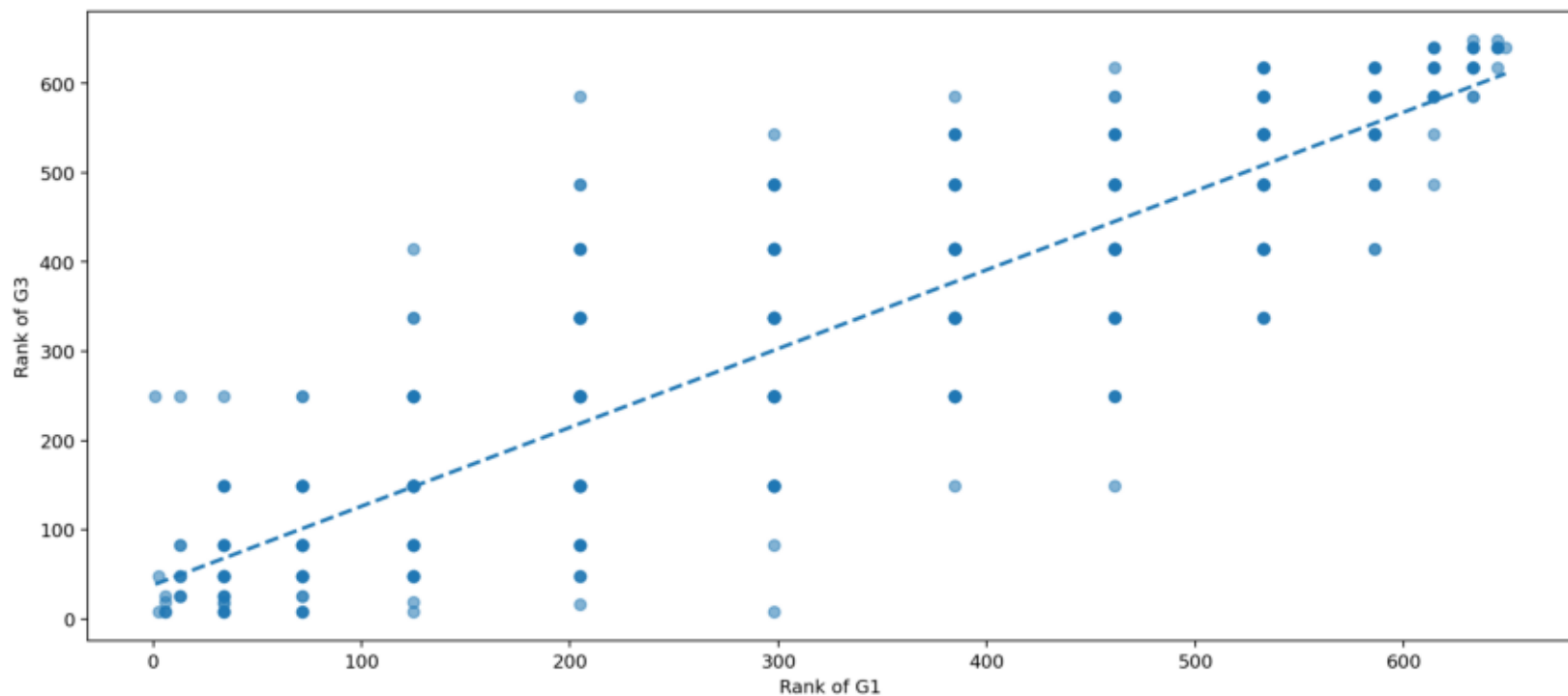
variable_1	variable_2	n_complete_pairs	kendalls_tau_b	p_value_two_tailed	abs_tau
G2	G3	649	0.869595	2.113285e-199	0.869595
G1	G2	649	0.780639	4.403489e-161	0.780639
G1	G3	649	0.766198	2.108694e-155	0.766198
Fedu	Medu	649	0.569954	5.622318e-68	0.569954
Dalc	Walc	649	0.555407	4.096093e-59	0.555407
G3	failures	649	-0.378883	2.182742e-30	0.378883
G2	failures	649	-0.367969	9.916502e-29	0.367969
G1	failures	649	-0.365780	1.963360e-28	0.365780
Walc	goout	649	0.314907	1.732229e-22	0.314907
freetime	goout	649	0.303904	6.841912e-21	0.303904
age	failures	649	0.258367	1.259734e-13	0.258367
Medu	traveltime	649	-0.230626	2.076133e-11	0.230626

Assumption/reporting context:

check	requirement	status	why_it_matters
Variable scale	Two ordinal, interval, or ratio variables	Use numeric/ordinal columns only	Kendall's Tau is rank-based and is suitable for ordinal data.
Observation independence	Each row should represent a different independent case	Confirm from study design	Repeated or clustered rows can make the p-value too optimistic.
Monotonic pattern	Relationship should be monotonic, not necessarily linear	Review rank scatterplot	Tau measures ordered agreement between paired ranks.
Ties	Ties are allowed but should be reported	Tau-b tie correction used	The student-grade dataset has many tied values; tau-b is the correct version to report.
Missing values	Use complete pairs for each variable pair	Pairwise complete observations used	Different variable pairs may have different usable sample sizes.

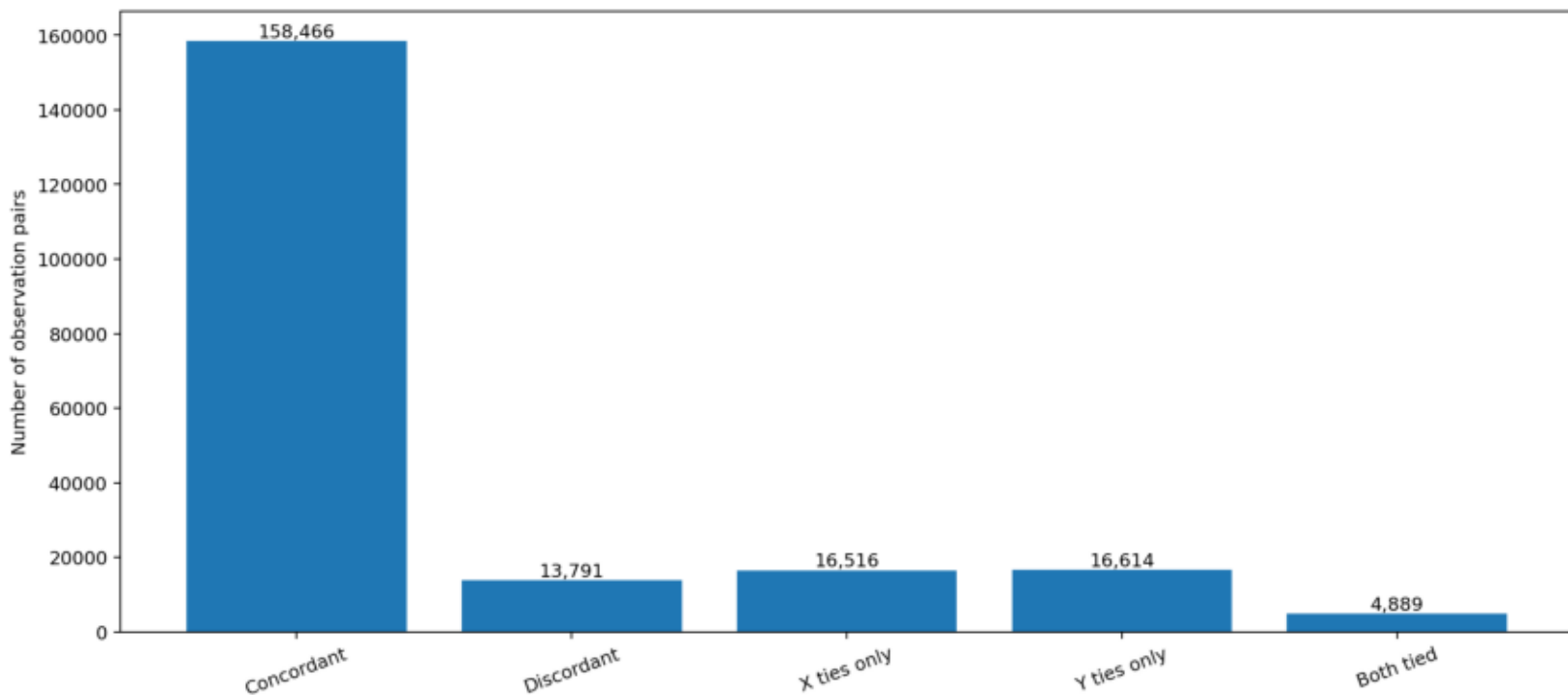
Kendall's Tau: Rank Scatterplot

Primary pair: G1 vs G3; tau-b = 0.7662, two-tailed p = 2.109e-155



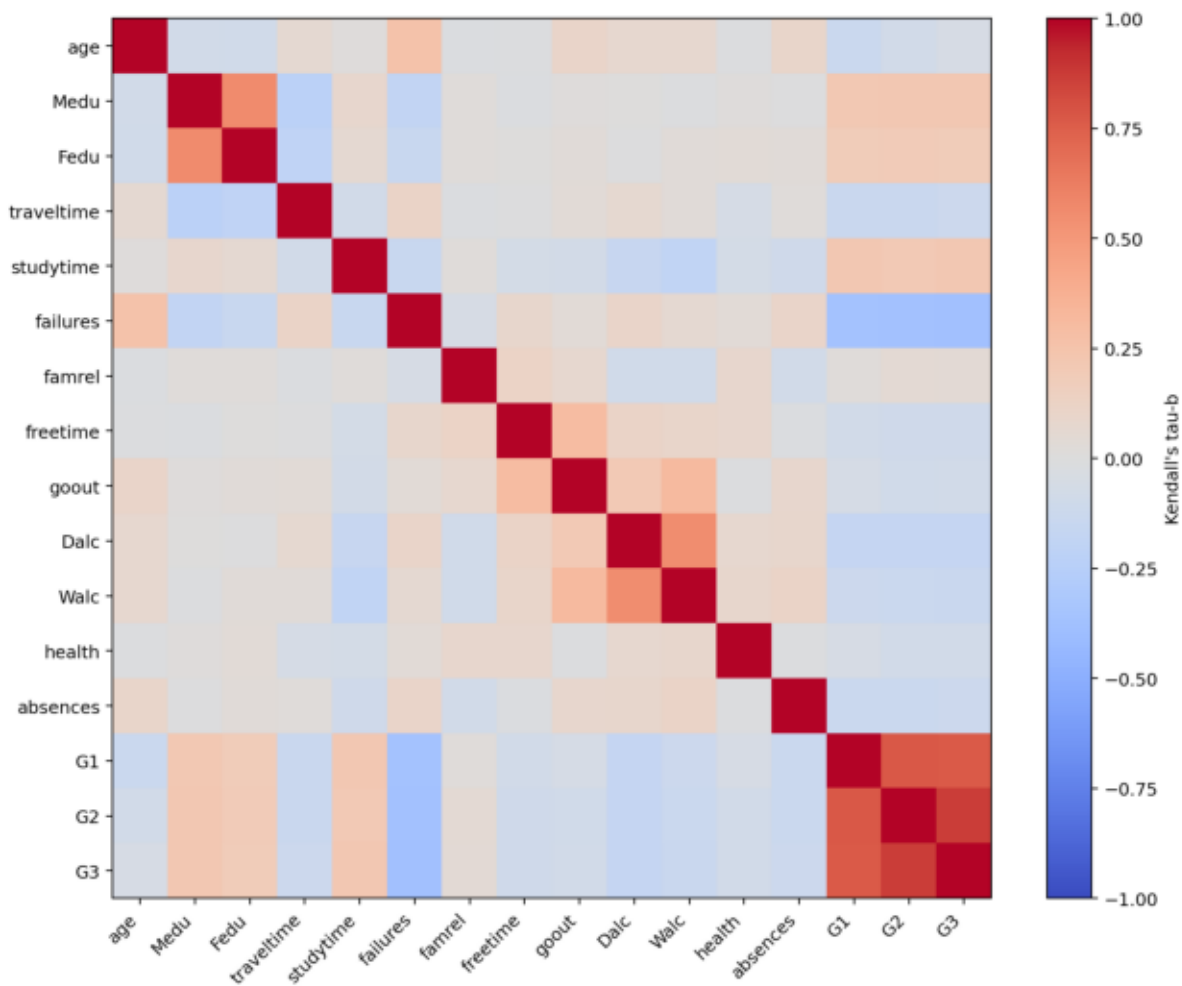
Kendall's Tau: Concordant, Discordant, and Tied Pairs

Tau-b is based on the balance of concordant and discordant paired orderings with tie correction.



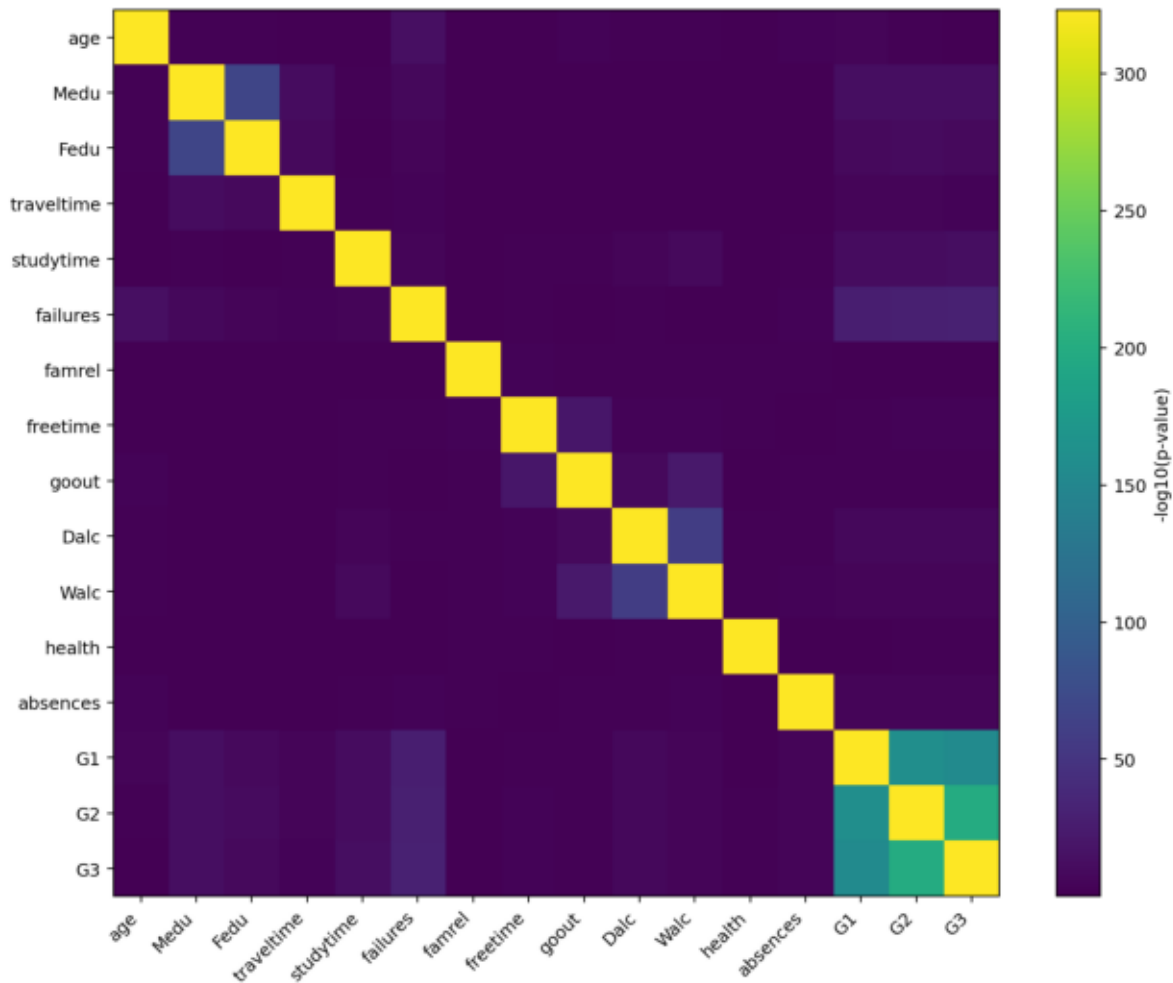
Kendall's Tau Matrix

Blue indicates negative ordered association; red indicates positive ordered association.



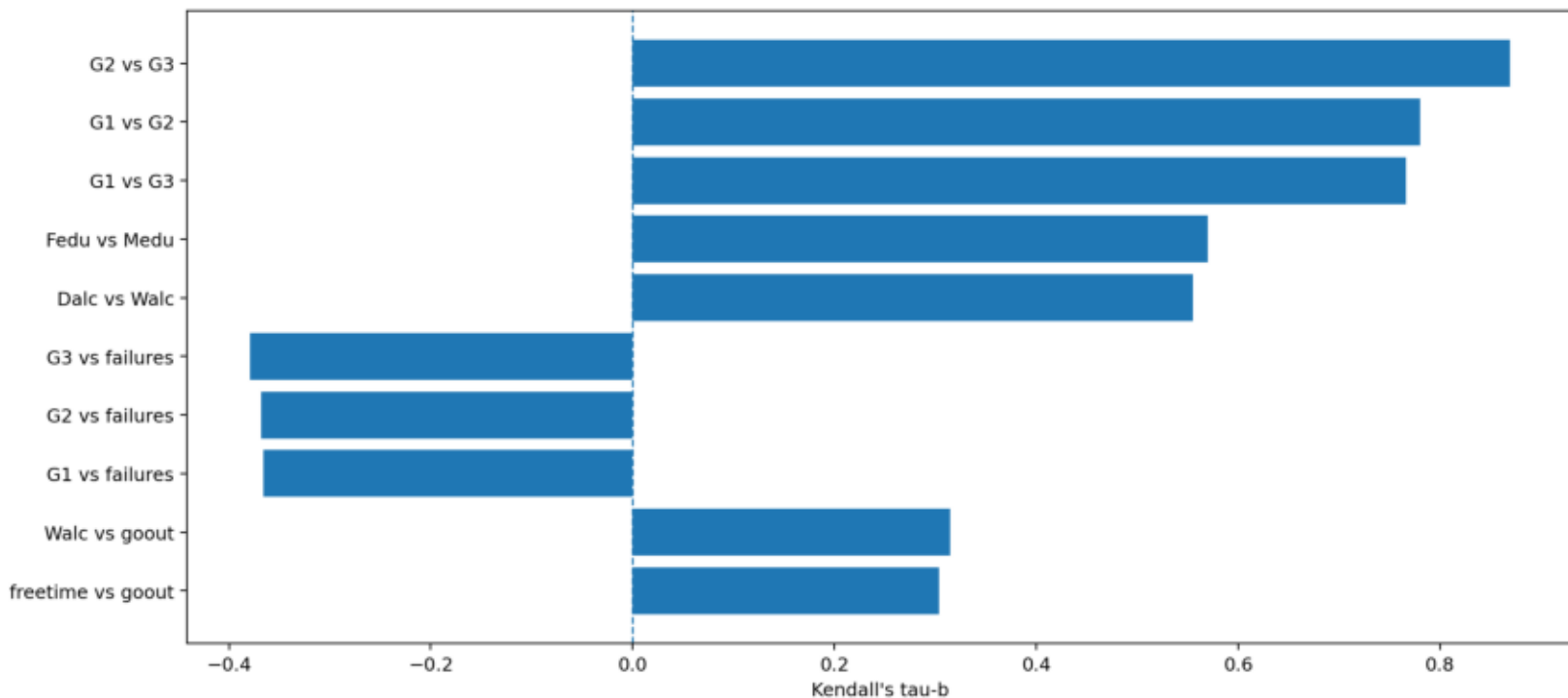
Kendall's Tau Significance Map

Larger values indicate smaller p-values for the pairwise Kendall tests.



Top Kendall's Tau Relationships

Pairs are ranked by the absolute size of tau-b.



Kendall's Tau Inputs: Primary Variable Distributions

Many tied values are expected in grade variables, so tau-b is used.

