Feature Interaction Analysis

Pairwise Interaction Strength Matrix

H-Statistic Interaction Matrix

	Age	Income	Credit	Debt	Employ	Educ	Savings	Region
Age	0	0.65	0.23	0.18	0.31	0.12	0.15	0.08
Income	0.65	0	0.58	0.72	0.41	0.26	0.49	0.16
Credit	0.23	0.58	0	0.52	0.34	0.19	0.28	0.11
Debt	0.18	0.72	0.52	0	0.27	0.21	0.38	0.09
Employ	0.31	0.41	0.34	0.27	0	0.29	0.17	0.13
Educ	0.12	0.26	0.19	0.21	0.29	0	0.16	0.10
Savings	0.15	0.49	0.28	0.38	0.17	0.16	0	0.07
Region	0.08	0.16	0.11	0.09	0.13	0.10	0.07	0

Weak ————————————————— Strong
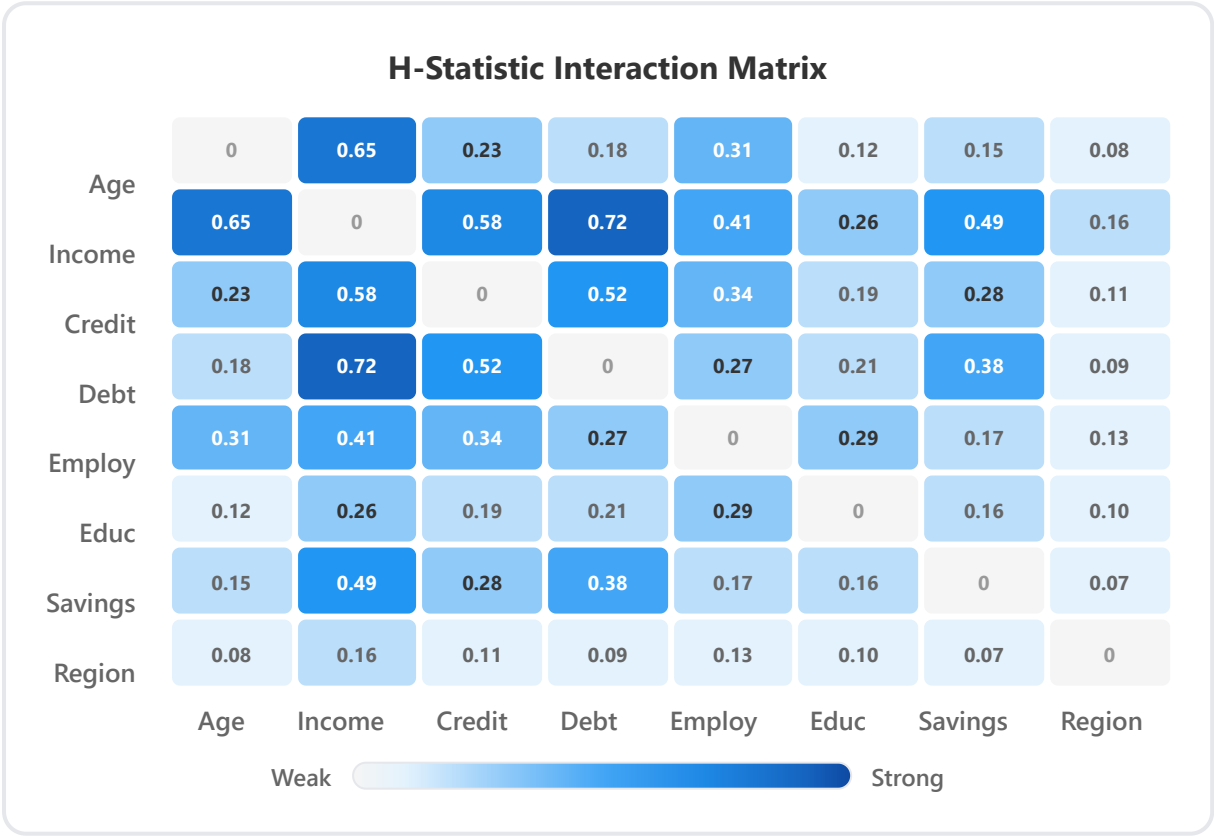
Methods

Interaction Detection

- **H-statistic:** Quantify strength
- **2D PDP:** Visual effects
- **SHAP:** Pairwise values
- **PD-based:** Joint vs separate

Non-additive
Features work together synergistically

Understanding
Model behavior & debugging

Engineering
Guide interaction term creation

Complexity
$O(n^2)$ - quadratic with features

Interpretation Guide

- 0.0-0.3: Weak interaction
- 0.3-0.6: Moderate interaction
- 0.6-1.0: Strong interaction