Monte Carlo Dependency Estimation

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▼ What did the authors try to accomplish?

- Propose Monte Carlo Dependency Estimation (MCDE), a framework to estimate multivariate dependency.
- Present a novel dependency estimator: Mann-Whitney P (MWP)

▼ What were the key elements of the approach?

- MCDE:
  - Measuring Dependency via Contrast
  - Estimating Conditional Distributions
  - Estimating Discrepancy
  - Monte Carlo Approximation
- Instantiation as MWP

r_i: Interval

c_i: Slice

Our approach, *MWP*, is the instantiation of $\hat{C}$ using a two-sided U test as the statistical test $\mathcal{T}$. The letter P emphasises that the test returns a p^c-value, as required by *MCDE*, i.e., whenever the evidence against independence increases, the values of the U test approach 1. *MWP* is the average of this test over M iterations:

DEFINITION 10 (MANN-WHITNEY P (*MWP*)).

$$MWP = \frac{1}{M} \sum_{m=1}^{M} U\left(B_{[c_i|r_i]_m}, B_{[\bar{c}_i|r_i]_m}\right)$$

where $[c_i|r_i]_m$ *means that we draw* i, c_i *and* r_i *randomly at iteration* m, *i.e.,* $i \leftarrow \{1, \ldots, |S|\}$ *and* $\{c_i, r_i\} \leftarrow \mathcal{P}^{c \times r}$.

▼ What can you use yourself?

- Mann-Whitney P (MWP)

▼ What other references do you want to follow?

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- William J. McGill. 1954. Multivariate information transmission. Trans. of the IRE Professional Group on Information Theory (TIT) 4 (1954), 93–111. https://doi.org/10.1109/TIT.1954.1057469