

# Gemeinsames Mathematisches Kolloquium der Universitäten Marburg und Gießen



Universität  
Marburg

## 17. Juni 2026

### Prof. Dr. Tilmann Gneiting

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## Assessing Monotone Dependence: Area Under the Curve Meets Rank Correlation

The assessment of monotone dependence between random variables is a classical problem in statistics and a gamut of application domains. Consequently, researchers have sought measures of association that are invariant under strictly increasing transformations of the margins, with the extant literature being splintered. For continuous variables, symmetric rank correlation coefficients, such as Spearman's Rho and Kendall's Tau, have been studied at great length in the statistical literature. For dichotomous outcomes, the asymmetric area under the curve (AUC) measure is used to assess monotone dependence. We unify and complete thus far disconnected strands of literature, by establishing common population level theory, common estimators, and common tests that bridge continuous and dichotomous settings and apply to all linearly ordered outcomes.

Originating in the biomedical literature, the C index provides a bridge between AUC, to which it reduces for a dichotomous outcome, and Kendall's Tau, to which it relates linearly under continuity. To establish the same kind of bridge between AUC and Spearman's Rho, we introduce asymmetric grade correlation,  $AGC(X,Y)$ , as the covariance of the mid distribution function transforms, or grades, of  $X$  and  $Y$ , divided by the variance of the grade of  $Y$ . The coefficient of monotone association then is  $CMA(X,Y) = 1/2 (AGC(X,Y) + 1)$ . The CMA measure has range  $[0,1]$ , and the perfect monotone predictor property holds:  $CMA(X,Y) = 1$  if, and only if, there is a nondecreasing function  $m$  such that  $Y = m(X)$  almost surely. Crucially, CMA provides a bridge between AUC, to which it reduces for a dichotomous outcome, and Spearman's Rho, to which it relates linearly under continuity. We establish central limit theorems for the sample versions of these measures, and we develop tests for their equality with a shared outcome. In case studies, we assess progress in data-driven weather prediction.

Joint work with Eva-Maria Walz and Andreas Eberl.

**16:30 Uhr: Tee und Kaffee im Seminarraum VII  
(Ebene 5, Raum 05 D 01)**

**17:00 Uhr: Vortrag im Hörsaal IV  
(Ebene 4, Raum 04 A 30)**

Im Anschluss ist eine Nachsitzung geplant.

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