

April 20, 2026
2:00pm-3:00pm
KAP 414

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AICO: Feature Significance Tests for Supervised Learning

Abstract: Machine learning is central to modern science, industry, and policy, yet its predictive power often comes at the cost of transparency: we rarely know which input features truly drive a model's predictions. Without such understanding, researchers cannot draw reliable conclusions, practitioners cannot ensure fairness or accountability, and policymakers cannot trust or govern model-based decisions.

Existing tools for assessing feature influence are limited: most lack statistical guarantees, and many require costly retraining or surrogate modeling, making them impractical for modern, large-scale models. We introduce AICO, a broadly applicable hypothesis testing framework that turns model interpretability into an efficient statistical exercise. AICO tests whether each feature genuinely improves predictive performance by masking its information and measuring the resulting change.

AICO delivers exact, finite-sample p -values and confidence intervals for feature importance through a simple, non-asymptotic procedure. It requires no retraining, no surrogate modeling, and no distributional assumptions, making it suitable for large-scale algorithms. Across controlled experiments and real-world applications—from credit scoring to mortgage behavior prediction—AICO identifies the variables that drive model behavior, providing a scalable and statistically principled foundation for transparent and trustworthy machine learning. AICO has been deployed at leading institutions, demonstrating its practical viability at scale.

This is joint work with Enguerrand Horel (Upstart, Inc.) and Chartsiri Jirachotkulthorn (Stanford).

Zoom Link: USC Math Finance Colloquium

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