

**University of California, Irvine
Statistics Seminar**

**Fusion learning: *Combine inferences from diverse data sources
of heterogenous data***

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Advanced data collection technology nowadays often makes inferences from diverse data sources easily accessible. Fusion learning refers to combining inferences from multiple sources or studies to make more effective inference than from any individual source or study alone. We focus on the tasks: 1) *Whether/When to combine inferences?* 2) *How to combine inferences efficiently if you need to?*

We present a general framework for nonparametric and efficient fusion learning for inference on multi-parameters, which may be correlated. The main tool underlying this framework is the new notion of *depth confidence distribution* (depth-CD), which is developed by combining data depth, bootstrap and confidence distributions. We show that a depth-CD is an omnibus form of confidence regions, whose contours of level sets shrink toward the true parameter value, and thus an all-encompassing inferential tool. The approach is shown to be efficient, general and robust. Specifically, it achieves high-order accuracy and Bahadur efficiency under suitably chosen combining elements. It readily applies to heterogeneous studies with a broad range of complex and irregular settings. This property also enables the approach to utilize indirect evidence from incomplete studies to gain efficiency for the overall inference.

This is joint work with Dungan Liu of University of Cincinnati and Minge Xie of Rutgers University.