

**University of California, Irvine
Statistics Seminar**

***Elastic Priors to Dynamically Borrow Information from
Historical Data in Clinical Trials***

**Ying Yuan
Bettyann Asche Murray Distinguished Professor
Department of Biostatistics
The University of Texas MD Anderson Cancer Center**

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Use of historical data and real-world evidence holds great potential to improve the efficiency of clinical trials. One major challenge is to effectively borrow information from historical data while maintaining a reasonable type I error and minimal bias. We propose the elastic prior approach to address this challenge. Unlike existing approaches, this approach proactively controls the behavior of information borrowing and type I errors by incorporating a well-known concept of clinically significant difference through an elastic function, defined as a monotonic function of a congruence measure between historical data and trial data. The elastic function is constructed to satisfy a set of prespecified criteria such that the resulting prior will strongly borrow information when historical and trial data are congruent, but refrain from information borrowing when historical and trial data are incongruent. The elastic prior approach has a desirable property of being information borrowing consistent, i.e. asymptotically controls type I error at the nominal value, no matter that historical data are congruent or not to the trial data. Our simulation study that evaluates the finite sample characteristic confirms that, compared to existing methods, the elastic prior has better type I error control and yields competitive or higher power. The proposed approach is applicable to binary, continuous and survival endpoints.