Means Rotation (MR1)

MR1 represents the maximum difference between two group means [1]. But researchers often investigate multiple variables at a time. There is no current way to define an ENA space to show the independent impact of multiple variables.

Formula Rotation (F1)

First, we generalize MR1 using a regression framework to model the direction of the effect of an arbitrary variable of interest through the high dimensional ENA space. MR1 is just a binary case of F1. In both, the y-axis is an orthogonal SVD of the x-axis. We are currently exploring uses of the F1 rotation to model continuous variables and to control for hierarchically nested data.

Nested Axes

Second, to model the independent impact of multiple variables, we choose a second direction of interest in the same manner as the first. We then reject that direction from the x-axis and use the result as the y-axis. In this way, the y-axis models the effect of a second variable of interest independent of the effect modeled on the x-axis.

Example

In the RescueShell Virtual Internship data packaged with rENA [2] there are two grouping variables, Condition and GameHalf. Using an MR1, the SVD (y-axis) cleanly separates the First and Second halves of the game, but only for those in the Second Game, even though there were qualitative differences. Using an F1, we can: tease out a second dimension of interest (GameHalf); control the x-axis for the effect modeled on the y-axis (slight differences along x-axis); and see what appears to be a small interaction effect between GameHalf and Condition.
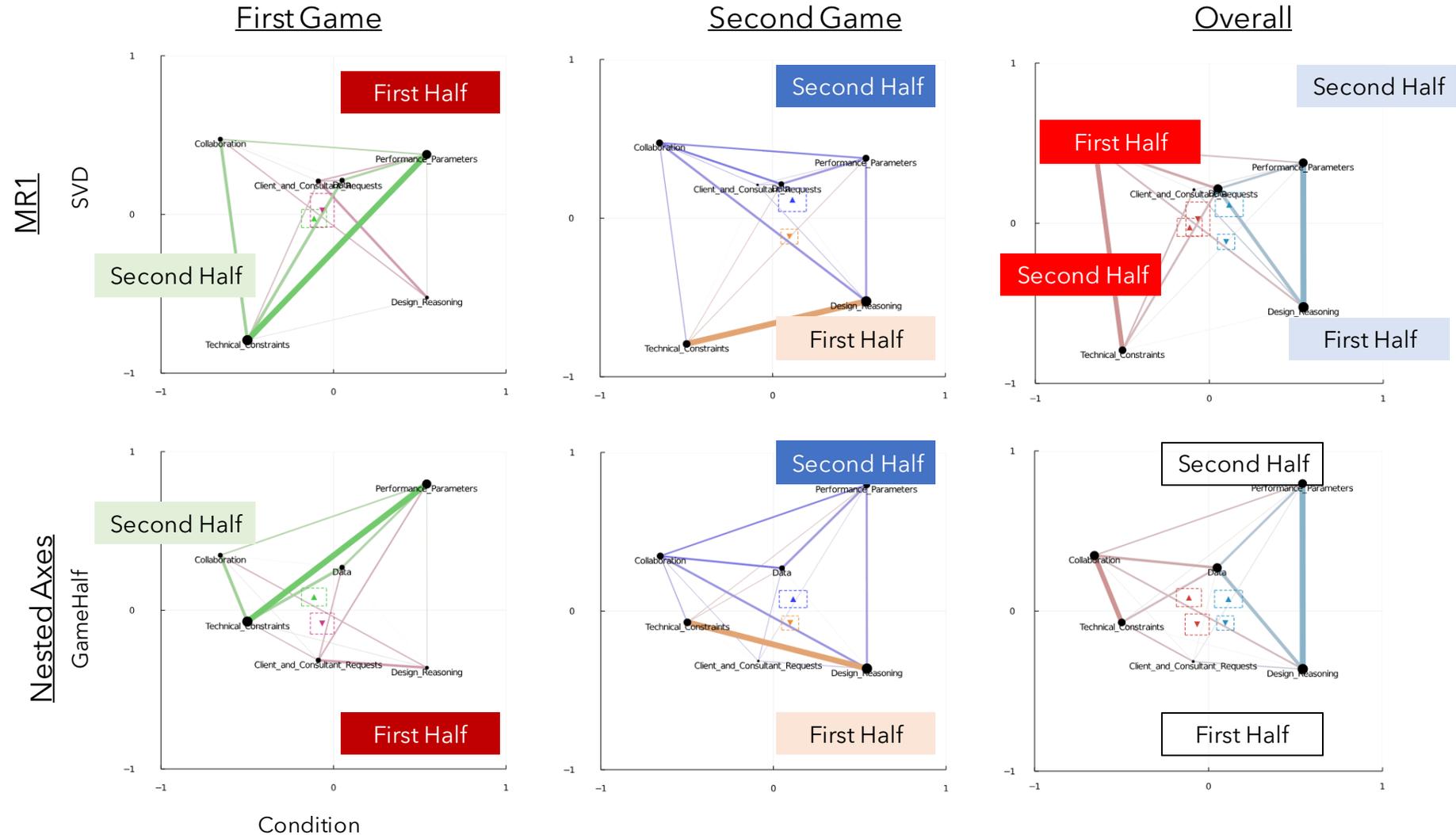
References [1] Shaffer, D.: Quantitative Ethnography. Cathcart, Madison WI (2017). [2] Chesler, N. et al: A novel paradigm for engineering education. Journal of Biomechanical Engineering 137(2) (2015)