

Response Optimization

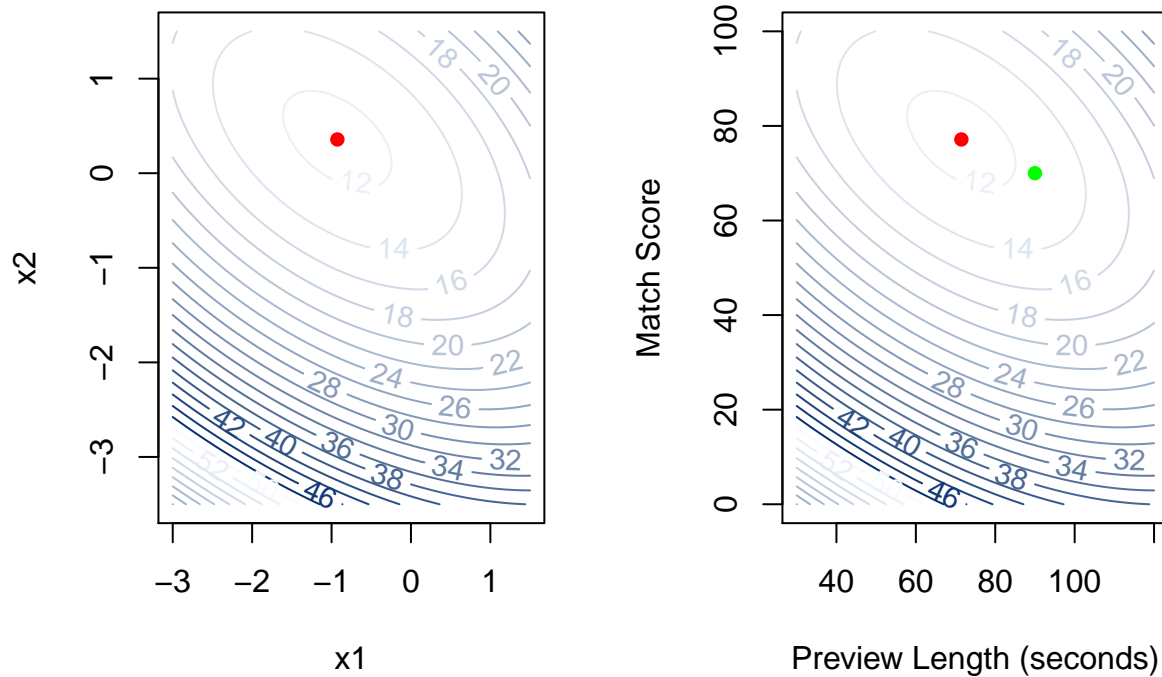
I decided to follow up my results with a response surface experiment so that a full second order model could be fit and the optimum identified. I have already identified the significant factors through factor screening, and found a rough idea of where the optimum lies through the method of steepest descent.

The response surface experiment that I decided to use was the central composite design. A central composite design facilitates estimation of the full second order response surface model, and hence identification of the optimum.

I chose the high and low levels of the factors based on the center point being my estimate of the optimum from steepest descent in phase 2. I also chose the high and low levels based on my selection of a spherical design in order to ensure the estimate of the response surface at each condition is equally precise.

Condition.Num	Prev.Length	Match.Score	Browse.Time
1	70	50	15.72111
2	70	90	15.82121
3	110	50	15.90275
4	110	90	15.93098
5	90	70	15.91739
6	120	70	15.73697
7	60	70	15.95454
8	90	100	15.91128
9	90	40	15.84565

I intended to perform axial conditions with $a = \sqrt{2}$, but the corresponding preview times and match scores were messy. Thus, in the interest of defining experimental conditions with more convenient levels, I let $a = 1.5$, yielding the preview lengths and match scores in the table above. I then generated data simulating 100 users randomized into each of these 9 conditions, and recorded their browsing time.



I then fit the full second order response surface by fitting the second order regression model.

From the coefficients in the output, I plotted the contour plot in coded units and found that the stationary point was located at $x_1 = -0.9266421$ and $x_2 = 0.3571865$.

I then converted the contour plot to natural units. The corresponding stationary point is when preview length is 71.47 (70) seconds and match score is 77.14% (77%), represented by the red point. The green point is my rough estimate of the optimal conditions from using the method of steepest descent in phase 2. It suggested a preview length of 90 seconds and a match score of 70%. As can be seen, it is somewhat close to the true optimum.

The estimated browsing time at the optimum is 11.53 seconds and a 95% confidence interval is given by (11.3855, 11.675).

Thus, Netflix should utilize preview lengths of 70 seconds and match scores of 77% in order to minimize the browsing time by users.