

First Side Out Analysis

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Outline

- Questions of interest
- Data
- Analysis 1
- Results 1
- Analysis 2
- Results 2
- Conclusion

Questions of interest

First Side Out (FSO)

- The team that receives the serve returns the serve in such a way that the serving team is unable to continue the rally

Same Passer and Hitter (SPH)

- The player that receives the serve also hits

Questions of interest

1 - Does FSO differ by area the serve lands in?

2 - Does FSO differ with SPH and not SPH?

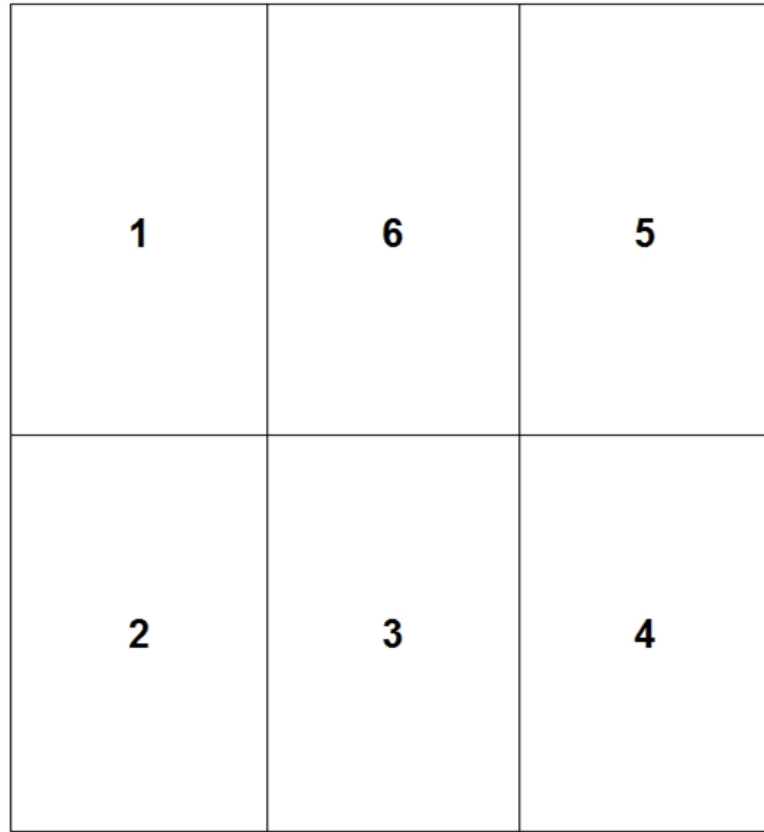
Data

- Collected by VolleyMetrics
- Men's 2015 season
- Information about each touch
- Duration of each rally
- Result of each rally
- 375,017 observations with 79 variables
- 68,221 serves

Data

Divide Court into 6 areas

Example Court



Net

Data

Original Data

wonlost	sk	x3	y3	Play_In_Rally	Prg_Rally_Data_ID	pos
1	1	4.6	15.45	1	1	3
0	2	0.29	10.36	2	1	4
0	3	0.27	11.18	2	1	5
0	4	0.51	8.87	2	1	1
1	5	0.76	10.27	3	1	3

Data

Final Data

First Side Out	SPH	Area ₁	Area ₂	Area ₃	Area ₄	Area ₅	Area ₆
1	0	1	0	0	0	0	0
1	1	0	0	0	0	1	0
0	1	0	0	1	0	0	0
1	0	0	0	0	0	0	1
0	0	0	0	0	0	0	1

Analysis 1

Null Hypothesis:

- Probability of FSO is the same for all areas on the court

Alternative Hypothesis:

- Probability of FSO differs by area

Analysis 1

Dependent variable

- First Side Out

Independent variable

- Location the serve landed in

Analysis 1

Model Formation - FSO by area

Likelihood

$$y_j \sim \text{Bern}(\Theta_i) \quad , j = 1, \dots, 68,221 \quad , i = 1, 2, \dots, 6$$

Prior

$$\Theta_i = \gamma_{\text{area}_i} \quad , i = 1, 2, \dots, 6$$

$$\gamma_{\text{area}_i} \sim \text{Beta}(1, 1) \quad , i = 1, 2, \dots, 6$$

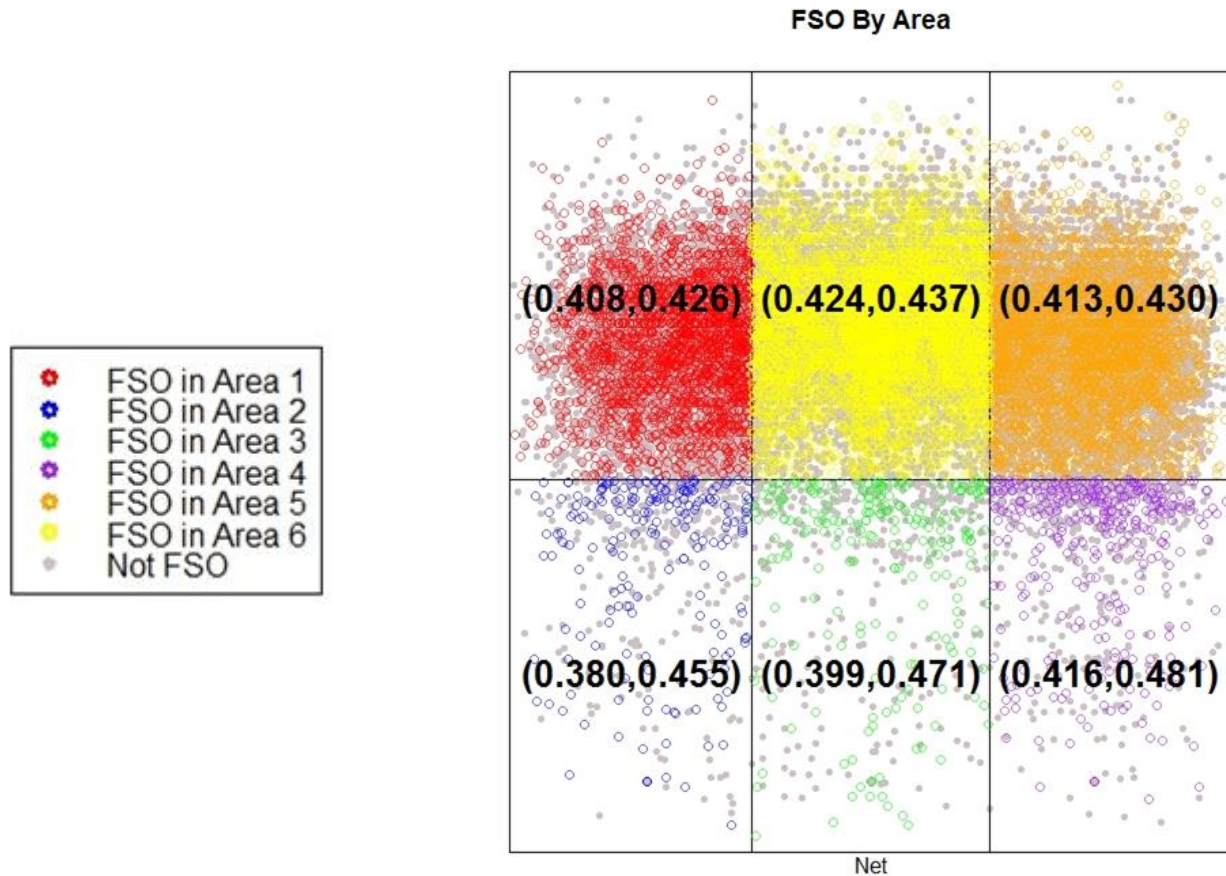
Results 1

Alternative Hypothesis:

Probability of FSO in Area_i > Probability of FSO in Area_j, $i \neq j$

- $\Pr(\text{Prob FSO Area}_6 > \text{Prob FSO Area}_1) = 0.993$
- $\Pr(\text{Prob FSO Area}_6 > \text{Prob FSO Area}_5) = 0.95$

Results 1



Analysis 2

Null Hypothesis:

- Probability of FSO with not SPH is the same as probability of FSO with SPH

Alternative Hypothesis:

- Probability of FSO with not SPH differs from probability of FSO with SPH

Analysis 2

Dependent variable

- First Side Out

Independent variable

- Location the serve landed in
- If there was SPH

Analysis 2

Model Formation Logistic - FSO by same hitter

Likelihood

$$y_j \sim \text{Bern}(\Theta_i) \quad , j = 1, \dots, 68,221 \quad , i = 1, 2, \dots, 6$$

Prior

$$\text{logit}(\Theta_i) = \beta_{0_{\text{area}_i}} + \beta_1 \times I_{SPH} \quad , i = 1, 2, \dots, 6$$

$$\beta_{0_i} \sim \text{Norm}(0, 1) \quad , i = 1, 2, \dots, 6$$

$$\beta_1 \sim \text{Norm}(0, 1)$$

Results 2

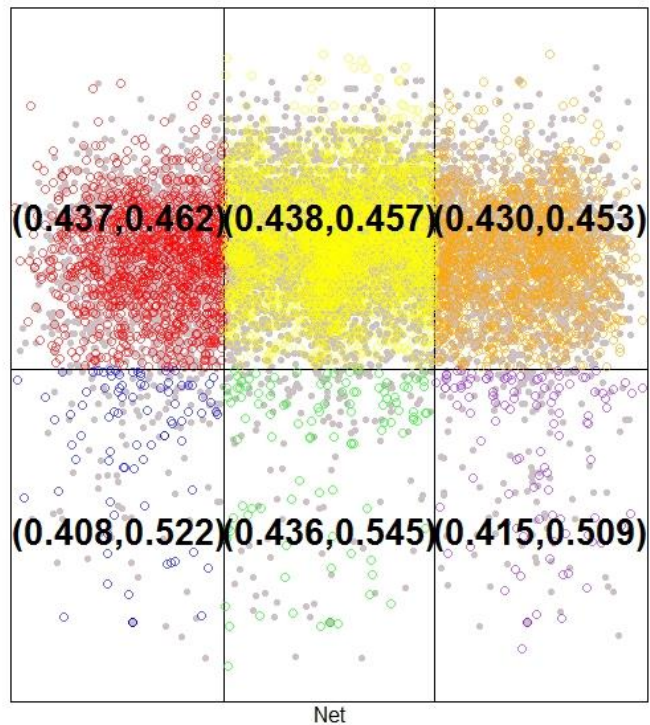
Alternative Hypothesis:

Probability of FSO in Area_i not SPH is greater than probability of FSO in Area_i with SPH

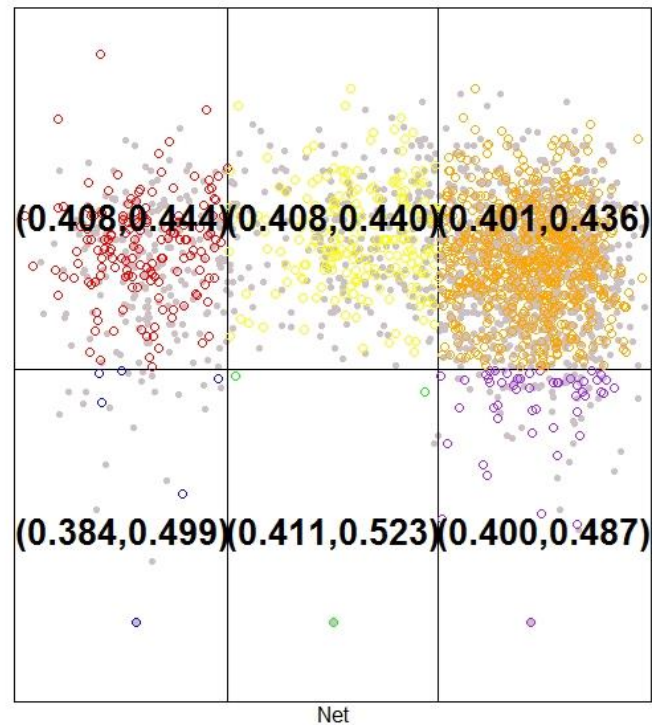
- $\Pr(\text{Prob FSO Area}_1 \text{ Not SPH} > \text{Prob FSO Area}_1 \text{ SPH}) = 0.984$
- $\Pr(\text{Prob FSO Area}_5 \text{ Not SPH} > \text{Prob FSO Area}_5 \text{ SPH}) = 0.985$
- $\Pr(\text{Prob FSO Area}_6 \text{ Not SPH} > \text{Prob FSO Area}_6 \text{ SPH}) = 0.994$

Results 2

FSO with no SPH by Area



FSO with SPH by Area



Conclusion

1 - Probability of FSO is greater in Area₆ than in Area₁ and Area₅

2 - Probability of FSO is higher when it is not SPH in Area₁ , Area₅ , and Area₆

Conclusion

Application

- Serve it to the back sides
- Serve it to the best hitter