

- Welcome!
- Thank you!
- Introductions: Shankar and Oliver
- Housekeeping
 - will share documents with everyone
 - Not too much mechanics (not an Excel lesson), but will go over some details
 - Question periods between sections



Setting the Stage

It's Friday night...

- Time for your pick list – how do you prepare?
- Right information \leftarrow right spreadsheet \leftarrow right scouting sheet
- “To find the answer, you must know the answer”
 - **Hypothesise** how the game plays out
 - What do you need to know to make the right pick
- Generally, the sheet governs the spreadsheet
- Sheet design leads \rightarrow to spreadsheet design
- Good sheet \rightarrow good spreadsheet \rightarrow good decision \rightarrow **good results**
- 3 examples of sheets and corresponding spreadsheets
- 3 case studies demonstrating how data is used to make decisions



Overview

- Track every point-scoring action by every team
 - Measure a robot's actual ability to make point-scoring actions
 - Make **data-driven decisions** based on proven abilities

2056 Scouting Sheet 2016: FIRST Stronghold

Match: 22
Team: 1690
Scout Initials: KK

Autonomous Period

Reached (but NOT Crossed)? Y ☐ N ☒

Crossed? ☐ Y ☒ N

Scored high goal? ☐ Y ☒ N

Scored low goal? Y ☐ N ☒

Teleoperated Period

Low Goals Scored	High Goals Scored	Crosses
	8	1

Crossing Ability 1 2 3 ☒ 4 5

Endgame

Challenge (5) Scale (15)

N/A

Comments

Scouting Sheet, Version 1 : Every Point-Scoring Action

Tracked information

- Establishes robot archetypes
- Individual scout tracking – accountability and commendation
- Qualitative comments

2056 Scouting Sheet 2016: FIRST Stronghold

Match: 22 Team: 1690 Scout Initials: KK

Autonomous Period

Reached (but NOT Crossed)? Y ☐ N ☒

Crossed? ☒ Y ☐ N

Scored high goal? ☒ Y ☐ N

Scored low goal? Y ☐ N ☒

Teleoperated Period

Low Goals Scored	High Goals Scored	Crosses
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<div></div>	<div>8</div>	<div>1</div>

Crossing Ability 1 2 3 ☒ 4 5

Endgame

Challenge (5) Scale (15)

N/A

Comments

Raw Data

- Transfer data
- Vital to get right
- Key role for **on-the-fly** learning

Match	Colour	Team	A-RC	A-CR	A-HG	A-LG	T-HG	T-LG	T-CR	T-RC	E-P
1	Red	5114	0	1	0	0	6	0	5	0.8	5
1	Red	1099	0	1	0	0	0	1	4	3.4	15
1	Red	66	0	1	0	0	1	1	2	2.5	5
1	Blue	5053	0	1	0	0	0	5	4	2.3	0

Calculations

- Calculate performance
- As many dimensions **as reasonable**
- Line-by-line calculations here
- Average/look up elsewhere

Match	Colour	Team	A-CP	A-GP	C-AP	T-GP	T-CP	C-TP
1	Red	5114	10	0	10	30	25	55
1	Red	1099	10	0	10	2	20	22
1	Red	66	10	0	10	7	10	17
1	Blue	5053	10	0	10	10	20	30

Lookup values

- Unique identifiers
- Pull data to summarise match data

Match	Colour	Team	Lookup	Team Rank	Match Ref
1	Red	5114	5114-0	0	1
1	Red	1099	1099-0	0	2
1	Red	66	66-0	0	3
1	Blue	5053	5053-0	0	4

Scouting Sheet, Version 1: The Spreadsheet

Calcs Tab

Team	Matches	A-CrsPt	A-GlPt	A-Total	T-HiPt	T-LoPt	T-GlPts	T-CrPt	T-CrRt	T-CrPt	T-Total	E-Pt	TotPt
Code	Team	A-CP	A-GP	C-AP	T-HG	T-LG	C-BP	T-CR	T-RC	C-CP	C-TP	C-EP	C-Tot
33	10	10.00	4.00	14.00	4.80	-	24.00	3.40	2.62	17.00	41.00	12.50	67.50
66	10	9.00	-	9.00	0.60	1.40	5.80	1.80	1.86	9.00	14.80	4.00	27.80
74	10	9.20	-	9.20	-	5.00	10.00	3.70	1.96	18.50	28.50	13.00	50.70
111	10	-	7.00	7.00	3.40	0.30	17.60	4.10	1.33	20.00	37.60	4.00	48.60
177	10	7.20	4.00	11.20	3.30	-	16.50	3.20	1.97	16.00	32.50	7.50	51.20

Calcs

- Averages all collected data for each team
- Can be live if data entry is done on the fly
- Keep this as untouched data and play with/sort on the Picks – Sortable tab
- Headers used as lookup for Picks – Sortable

Scouting Sheet, Version 1: The Spreadsheet

Summary Tab

Team	2451													
Name	PWNAGE													
Location	Saint Charles, IL USA													
Rookie Year	2008													
		Contribution						Bouldering		Auto				End
Index	Match	Total Points	Auto Points	Crossing Points	Cross Rating	Boulder Points	End Points	High Scores	Low Scores	Reached	Crossed	High	Low	Points
Average	10 played	54.9	7.4	18.5	2.2	21.5	7.5	4.3	-	0.2	0.6	0.1	-	7.5
38	7	42.0	2.0	15.0	2.5	20.0	5.0	4.0	-	1.0	-	-	-	5.0
116	20	60.0	10.0	20.0	2.9	25.0	5.0	5.0	-	-	1.0	-	-	5.0
202	34	60.0	10.0	15.0	3.3	30.0	5.0	6.0	-	-	1.0	-	-	5.0
268	45	45.0	-	20.0	3.9	20.0	5.0	4.0	-	-	-	-	-	5.0
329	55	65.0	10.0	20.0	1.9	20.0	15.0	4.0	-	-	1.0	-	-	15.0
390	65	47.0	2.0	25.0	2.4	20.0	-	4.0	-	1.0	-	-	-	-
462	77	60.0	10.0	5.0	4.0	30.0	15.0	6.0	-	-	1.0	-	-	15.0
599	100	25.0	-	20.0	3.3	-	5.0	-	-	-	-	-	-	5.0
658	110	75.0	20.0	25.0	2.4	25.0	5.0	5.0	-	-	1.0	1.0	-	5.0
750	125	70.0	10.0	20.0	2.6	25.0	15.0	5.0	-	-	1.0	-	-	15.0
					-									
					-									
					-									

Summary

- Use raw data to evaluate team's **consistency** (can graph to simplify further)
 - Relatively consistent scoring (3 40s, 4 60s, 2 70s, 1 25)
 - Inconsistent auto crossing, almost no auto scoring

Scouting Sheet, Version 1: The Spreadsheet

Picks - Sortable

Team	A-CP	A-GP	C-AP	T-HG	T-LG	C-BP	T-CR	T-RC	C-CP	C-TP	C-EP	C-Tot
2056	10.0	8.0	18.0	5.3	0.3	27.1	4.8	2.1	24.0	51.1	13.0	82.1
1690	9.2	7.0	16.2	6.5	-	32.5	3.9	1.0	19.5	52.0	4.5	72.7
33	10.0	4.0	14.0	4.8	-	24.0	3.4	2.6	17.0	41.0	12.5	67.5
1806	7.0	5.0	12.0	5.9	-	29.5	3.8	1.8	19.0	48.5	4.5	65.0
3130	10.0	8.0	18.0	5.0	0.2	25.4	2.5	2.3	12.5	37.9	6.5	62.4
2834	8.4	2.0	10.4	4.1	0.3	21.1	4.3	1.6	21.5	42.6	4.5	57.5
548	10.0	1.0	11.0	4.3	0.1	21.7	2.8	2.2	14.0	35.7	8.5	55.2

Team	A-CP	A-GP	C-AP	T-HG	T-LG	C-BP	T-CR	T-RC	C-CP	C-TP	C-EP	C-Tot
1690	9.2	7.0	16.2	6.5	-	32.5	3.9	1.0	19.5	52.0	4.5	72.7
1806	7.0	5.0	12.0	5.9	-	29.5	3.8	1.8	19.0	48.5	4.5	65.0
2056	10.0	8.0	18.0	5.3	0.3	27.1	4.8	2.1	24.0	51.1	13.0	82.1
3130	10.0	8.0	18.0	5.0	0.2	25.4	2.5	2.3	12.5	37.9	6.5	62.4
5114	10.0	-	10.0	5.0	-	25.0	3.0	2.3	15.0	40.0	3.5	53.5
33	10.0	4.0	14.0	4.8	-	24.0	3.4	2.6	17.0	41.0	12.5	67.5
2054	6.4	1.0	7.4	4.5	-	22.5	2.1	1.5	10.5	33.0	2.5	42.9

Picks - Sortable

- Run our pick list off this tab by filtering for and sorting for data that we want
- Surprises?
 - Only 5 teams averaged more than 60 points/match
 - Only 5 teams averaged more than 5 high goals/match

Scouting Sheet, Version 1: The Spreadsheet

Picks - Sortable Tab, Pick List

Rank	Team		Team #	TotPt	AutoPt	BoulderPt	TeleCrPt	EndPt	TeleHigh	TeleLow	AutoGoalPt	AutoCrossPt	TeleCrS	TeleCrRt
1	2056		2056	82.1	18.0	27.1	24.0	13.0	5.3	0.3	8.0	10.0	4.8	2.1
2	33/1690		33	67.5	14.0	24.0	17.0	12.5	4.8	-	4.0	10.0	3.4	2.6
3	1690/33		1690	72.7	16.2	32.5	19.5	4.5	6.5	-	7.0	9.2	3.9	1.0

Rank	Team		Team #	TotPt	AutoPt	BoulderPt	TeleCrPt	EndPt	TeleHigh	TeleLow	AutoGoalPt	AutoCrossPt	TeleCrS	TeleCrRt
1	2056		2451	54.9	7.4	21.5	18.5	7.5	4.3	-	1.0	6.4	3.7	2.9
2	1690		5114	53.5	10.0	25.0	15.0	3.5	5.0	-	-	10.0	3.0	2.3
3	33		177	51.2	11.2	16.5	16.0	7.5	3.3	-	4.0	7.2	3.2	2.0
4	1806		74	50.7	9.2	10.0	18.5	13.0	-	5.0	-	9.2	3.7	2.0
5	3130		3238	50.5	10.0	19.5	16.5	4.5	3.9	-	-	10.0	3.3	2.7
6	2834		2415	50.1	7.2	21.9	17.0	4.0	4.3	0.2	-	7.2	3.4	2.4

Picks – Sortable (Pick List)

- Compare specific characteristics of teams against each other
 - Can combine absolute data with trend from summary
- Break teams down into tiers for further sorting
 - What matters: auto? boulder? endgame? crossing? high goals?

Scouting Sheet, Version 2 : Everything you want to know

Overview

- Every piece of information realistically needed to understand a robot
- All the information you need to make an **informed decision** on who would be the best alliance partners
- Predict what they can do on your alliance
- Predict what they would do on an opposing alliance
 - Allows you to prepare strategies against them

2056 Scouting Sheet 2016: FIRST Stronghold

Match: _____ Team: _____ Scout Initials: _____

Autonomous Period

Crosses

Portcullis	Moat	D-bridge	Rock W	Low B
Cheval d F	Ramparts	Sally P	Rough T	

Reached (but NOT Crossed)? Y N

Spybot? Y N

Start with Ball? Y N

Balls picked up	High goal scores
Drops/missed shots	Low goal scores

Crossed: X

Teleoperated Period

Pickups

SHOTS

From Outer Works	Batter
Mid-Courtyard	Low Goal

Misses/Drops

Defences Crossed

Portcullis			Cheval d F
Moat			Ramparts
D-bridge			Sally P
Rock W			Rough T
Low Bar			Low Bar

Endgame

Challenge? N/A Attempted Success

Scaled? N/A Attempted Success

Comments

- Plan for defence placement
 - Important for autonomous
- Acquisitions
 - Analogue for ability to manipulate balls
- Missed shots
 - Balls are scarce; misses are costly
- Shot location
 - Ability to shoot from outer works was going to be key
- Endgame attempts vs. actualizations

2056 Scouting Sheet 2016: FIRST Stronghold

Match: _____ Team: _____ Scout Initials: _____

Autonomous Period

Crosses

Portcullis	Moat	D-bridge	Rock W	Low B
Cheval d F	Ramparts	Sally P	Rough T	

Crossed: ☒

Reached (but NOT Crossed)?

Y

N

Spybot?

Y

N

Start with Ball?

Y

N

Balls picked up	High goal scores
<div></div>	<div></div>
Drops/missed shots	Low goal scores
<div></div>	<div></div>

Teleoperated Period

Pickups

SHOTS

From Outer Works	Batter
<div></div>	<div></div>
Mid-Courtyard	Low Goal
<div></div>	<div></div>

Misses/Drops

Defences Crossed

Portcullis	<div></div>	<div></div>	Cheval d F
Moat	<div></div>	<div></div>	Ramparts
D-bridge	<div></div>	<div></div>	Sally P
Rock W	<div></div>	<div></div>	Rough T
Low Bar	<div></div>	<div></div>	Low Bar

Endgame

Challenge?

N/A

Attempted

Success

Scaled?

N/A

Attempted

Success

Comments

Raw Data

- More data = more insights

Match	Colour	Team	A-PC	A-CF	A-RP	A-MO	A-RT	A-RW	A-DB	A-SP	A-LB	A-RE
1	Red	5114	0	0	0	0	0	0	0	0	1	0
1	Red	1099	0	0	0	0	1	0	0	0	0	0
1	Red	66	0	0	0	1	0	0	0	0	0	0
1	Blue	5053	0	0	0	0	0	0	0	0	1	0

Match	Colour	Team	B-MI	T-PC	T-CF	T-MO	T-RP	T-DB	T-SP	T-RW	T-RT	T-LB	E-CA	E-CS	E-SA	E-SS
1	Red	5114	0	0	0	0	0	0	0	0	3	2	1	1	0	0
1	Red	1099	3	0	2	0	0	0	1	0	1	0	1	1	1	1
1	Red	66	2	0	0	2	0	0	0	0	0	0	1	1	0	0
1	Blue	5053	1	0	2	0	0	0	0	0	0	2	0	0	0	0

Calculations

- Where are balls being shot from
- True crossing points
- Proportion of balls acquired that get scored

Match	Colour	Team	A-C%	A-CR	A-CP	A-GP	C-AP	B-HS	B-C%	C-BP	C-CP	C-CC	E-CP	E-SP	C-EP	C-TP
1	Red	5114	0.0%	1.00	10.00	0.00	10.00	6	100%	30	20	5	5	0	5	65.00
1	Red	1099	0.0%	1.00	10.00	0.00	10.00	0	25%	2	20	4	5	15	15	47.00
1	Red	66	0.0%	1.00	10.00	0.00	10.00	1	50%	7	10	2	5	0	5	32.00
1	Blue	5053	0.0%	1.00	10.00	0.00	10.00	0	83%	10	20	4	0	0	0	40.00

Scouting Sheet, Version 2: The Spreadsheet

Summary Tab

Contribution					Bouldering							Autonomous								Endgame				Crosses	Pickup
Total Points	Auto Points	Crossing Points	Boulder Points	Challenge Points	High Scores	Outerworks	Mid-range	Batter	Low Scores	Drops + Misses	Conversion %	Spybot	Reached	Crossed	What Was Crossed?	High	Low	Ball Conversion %	Balls	Challenge Attempt	Challenge Success	Scale Attempt	Scale Success	Total Crosses	Total
O-TP	O-AP	O-CP	O-BP	O-EP	B-HS	B-OW	B-MC	B-BA	B-LG	B-MI	B-CX	A-SY	A-RE	A-CR	A-CT	A-HS	A-LS	A-CX	A-BA	E-CA	E-CS	E-SA	E-SS	O-CO	P-TO
51.9	7.4	15.5	21.5	7.5	4.3	0.9	3.4	-	-	1.2	72.3%	-	0.2	0.6	-	0.1	-	10.0%	-	1.0	0.9	0.5	0.3	3.7	5.3
9	59	11	10	12	8	5	7	28	61	17	40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	13	15	12	7	9
37.0	2.0	10.0	20.0	5.0	4.0	-	4.0	-	-	3.0	57.1%	-	1.0	-	None	-	-	0.0%	-	1.0	1.0	1.0	-	3.0	7.0
55.0	10.0	15.0	25.0	5.0	5.0	1.0	4.0	-	-	-	100.0%	-	-	1.0	A-CF	-	-	0.0%	-	1.0	1.0	-	-	4.0	5.0
60.0	10.0	15.0	30.0	5.0	6.0	-	6.0	-	-	2.0	75.0%	-	-	1.0	A-RW	-	-	0.0%	-	1.0	1.0	-	-	3.0	7.0
45.0	-	20.0	20.0	5.0	4.0	-	4.0	-	-	-	100.0%	-	-	-	None	-	-	0.0%	-	1.0	1.0	1.0	-	4.0	3.0
60.0	10.0	15.0	20.0	15.0	4.0	-	4.0	-	-	3.0	57.1%	-	-	1.0	A-MO	-	-	0.0%	-	1.0	1.0	1.0	1.0	4.0	7.0
47.0	2.0	25.0	20.0	-	4.0	4.0	-	-	-	2.0	66.7%	-	1.0	-	None	-	-	0.0%	-	1.0	-	-	-	5.0	5.0
60.0	10.0	5.0	30.0	15.0	6.0	3.0	3.0	-	-	-	100.0%	-	-	1.0	A-CF	-	-	0.0%	-	1.0	1.0	1.0	1.0	1.0	7.0
25.0	-	20.0	-	5.0	-	-	-	-	-	-	0.0%	-	-	-	None	-	-	0.0%	-	1.0	1.0	-	-	4.0	1.0
65.0	20.0	15.0	25.0	5.0	5.0	1.0	4.0	-	-	1.0	83.3%	-	-	1.0	A-CF	1.0	-	100.0%	-	1.0	1.0	-	-	5.0	6.0
65.0	10.0	15.0	25.0	15.0	5.0	-	5.0	-	-	1.0	83.3%	-	-	1.0	A-SP	-	-	0.0%	-	1.0	1.0	1.0	1.0	4.0	5.0

Summary

- Same sheet, much more to draw from the sheet:
 - Some crossing of the same defense (3.7 crosses vs. 15 cross points)
 - Mid-range shooter, but can shoot deep; doesn't go to the batter
 - Relatively low ball conversion (1/3 balls do not get scored)
 - Diverse auto crossing ability (including sally port once)

Scouting Sheet, Version 2: The Spreadsheet

Picks - Sortable Tab

Team	A-GlPt	A-Total	T-Picks	T-HiPt	T-LoPt	T-Ow	T-Md	T-Ba	T-GlPt	T-Miss	T-Conv%	C-Cross	C-CrPt	E-ChAtt	E-ChSu	E-ScAtt	E-ScSu	E-Pt	TotPt
2056	8.0	18.0	6.5	5.3	0.3	1.0	4.0	0.3	27.1	1.2	0.8	4.8	19.5	1.0	1.0	0.8	0.8	13.0	77.6
33	4.0	14.0	5.9	4.8	-	0.3	-	4.5	24.0	0.9	0.8	3.4	14.5	0.9	0.9	0.8	0.8	12.5	65.0
1690	7.0	16.2	7.3	6.5	-	0.6	5.9	-	32.5	0.8	0.9	3.9	11.5	0.9	0.9	-	-	4.5	64.7
1806	5.0	12.0	6.6	5.9	-	0.9	3.5	1.5	29.5	1.1	0.8	3.8	15.5	1.0	0.9	-	-	4.5	61.5
3130	8.0	18.0	7.4	5.0	0.2	0.4	4.4	0.2	25.4	2.1	0.7	2.5	11.5	1.0	0.9	0.5	0.2	6.5	61.4

Team	T-HG	T-LG	C-BP	T-CR	C-CP	C-TP	C-Tot
2056	5.3	0.3	27.1	4.8	24.0	51.1	82.1
1690	6.5	-	32.5	3.9	19.5	52.0	72.7
33	4.8	-	24.0	3.4	17.0	41.0	67.5
1806	5.9	-	29.5	3.8	19.0	48.5	65.0
3130	5.0	0.2	25.4	2.5	12.5	37.9	62.4

Team	T-Picks	T-HiPt	T-LoPt	T-Ow	T-Md	T-Ba	T-GlPt	T-Miss	T-Conv%	C-Cross	C-CrPt	TotPt
2056	6.5	5.3	0.3	1.0	4.0	0.3	27.1	1.2	0.8	4.8	19.5	77.6
33	5.9	4.8	-	0.3	-	4.5	24.0	0.9	0.8	3.4	14.5	65.0
1690	7.3	6.5	-	0.6	5.9	-	32.5	0.8	0.9	3.9	11.5	64.7
1806	6.6	5.9	-	0.9	3.5	1.5	29.5	1.1	0.8	3.8	15.5	61.5
3130	7.4	5.0	0.2	0.4	4.4	0.2	25.4	2.1	0.7	2.5	11.5	61.4

Picks Sortable

- With more information available, the picture changes
- Boulder scoring data doesn't change
- Total points/game drops because of the cross point calculation adjustments
 - Not so easy to decide who 2nd and 3rd (or even 4th and 5th) are now, is it?

Scouting Sheet, Version 2: The Spreadsheet

Picks - Sortable Tab, Pick List

Rank	Team		Team #	Total	AutoTotal	AutoGoalPts	BoulderPts	HighGoals	OwGoals	MdGoals	BaGoals	LowGoals	TelopPicks	TeleConv%	Crosses	CrossPts	EndPts
1	2056		2056	77.6	18.0	8.0	27.1	5.3	1.0	4.0	0.3	0.3	6.5	82%	4.8	19.5	13.0
2	33/1690		33	65.0	14.0	4.0	24.0	4.8	0.3	-	4.5	-	5.9	84%	3.4	14.5	12.5
3	1690/33		1690	64.7	16.2	7.0	32.5	6.5	0.6	5.9	-	-	7.3	89%	3.9	11.5	4.5

Rank	Team		Team #	Total	AutoTotal	AutoGoalPts	BoulderPts	HighGoals	OwGoals	MdGoals	BaGoals	LowGoals	TelopPicks	TeleConv%	Crosses	CrossPts	EndPts
1	2056		3238	49.5	10.0	-	19.5	3.9	-	1.4	2.5	-	4.1	78%	3.3	15.5	4.5
2	33/1690		2415	49.1	7.2	-	21.9	4.3	1.6	2.7	-	0.2	5.3	73%	3.4	16.0	4.0
3	1690/33		177	48.2	11.2	4.0	16.5	3.3	0.6	2.7	-	-	3.9	80%	3.2	13.0	7.5
4	1806/3130		74	47.2	9.2	-	10.0	-	-	-	-	5.0	4.4	93%	3.7	15.0	13.0
5	3130/1806		3044	46.7	12.0	3.0	15.2	3.0	2.1	0.9	-	0.1	4.4	66%	3.1	14.5	5.0
6	5144		1099	46.6	10.0	-	7.6	-	-	-	-	3.8	4.2	83%	3.7	17.0	12.0
7	2834		461	46.2	9.2	1.0	17.5	3.5	2.3	1.1	0.1	-	3.8	88%	3.1	14.5	5.0
8	2451		1306	45.1	13.0	3.0	15.1	2.9	0.1	2.3	0.5	0.3	4.2	76%	2.8	13.0	4.0
9			3015	44.2	15.0	5.0	13.2	2.6	-	2.4	0.2	0.1	3.9	63%	2.8	10.0	6.0
10			1405	27.6	10.0	-	3.6	-	-	-	-	1.8	1.9	75%	1.6	8.0	6.0

Picks Sortable (Pick List)

- Some visible tiering from the points/match sort
 - Almost always the first sorting criteria (particularly for first pick)
- New information to consider when choosing between teams:
 - Balls acquired
 - Balls converted
 - Locations of high goal scores

Scouting Sheet, Version 3 : Everything You Might Want to Know

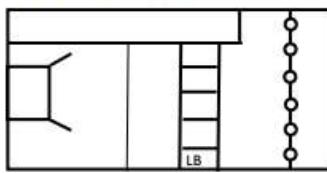
Overview

- Ultimately capture every difference between every robot
- Answers infrequent but important questions
- Credit or discredit certain statistics based on other information

2056 Scouting Sheet 2016: FIRST Stronghold

Match: _____ Team: _____ Scout Initials: _____

Autonomous Period



Spybot?: Y / N
Started with ball?: Y / N

Crosses:

X = crossed
/ = reached

Portcullis	Ramparts	Rough T	D-Bridge	Low Bar
CDF	Moat	Rock W	Sally P	

Balls picked up	High Goals	Drops/Misses	Low Goals

Teleoperated Period

Pickups

Courtyard	Opposing Secret Passage (STEAL)	Neutral Zone	Own Secret Passage	Opposing Courtyard (STEAL)

SHOTS

From Outer Works
Mid-Courtyard
Batter
Low Goal

Errors

Misses/Drops
Beached Bots
Challenges
Comm issues
Fouls

Defences Crossed

Portcullis			Cheval F
Moat			Ramparts
D-Bridge	Only One Direction	Also only One Direction	Sally P
Rock W			Rough T
Low Bar			Low Bar

Endgame

Time at batter: _____

Challenge? N/A Attempted Success

Scaled? N/A Attempted Success

Time after scale: _____

Comments

Scouting Sheet, Version 3 : Everything You Might Want to Know

Tracked Information

- Autonomous period map
- Pickup location
 - Credit or discredit drivers that perform actions based on predicted elimination round strategies
 - Know what you can expect in elimination rounds
- More errors; Measures reliability
- Endgame times

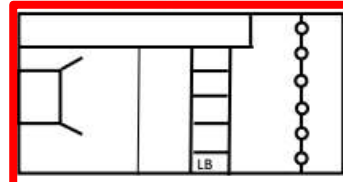
2056 Scouting Sheet 2016: FIRST Stronghold

Match: _____

Team: _____

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Portcullis	Ramparts	Rough T	D-Bridge	Low Bar
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Teleoperated Period

Pickups

Courtyard	Opposing Secret Passage (STEAL)	Neutral Zone	Own Secret Passage	Opposing Courtyard (STEAL)

SHOTS

From Outer Works
Mid-Courtyard
Batter
Low Goal

Errors

Misses/Drops
Beached Bots
Chances
Comm issues
Fouls

Defences Crossed

Portcullis			Cheval F
Moat			Ramparts
D-bridge	Only One Direction	Also only One Direction	Sally P
Rock W			Rough T
Low Bar			Low Bar

Endgame

Time at batter: _____

Challenge? N/A Attempted Success

Scaled? N/A Attempted Success

Time after scale: _____

Comments

Scouting Sheet, Version 3: The Spreadsheet

Summary Tab

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Summary

- Same sheet, more to draw from the sheet:
 - Arrive early at batter (11.3s), 3/5 successful scales avg 10s/climb
 - Did not beach or die in matches (so what happened in match 8?)
 - Where are the balls coming from?
 - Clean matchplay with no fouls taken
 - Pit scouting information (do they have weight to adjust something?)

Data-driven decision-making

Case study #1: 33 or 1690

- Be honest about your abilities, needs, and limitations
 - Crossing is simple;
 - Autonomous is tricky;
 - Triple hanging is impossible



VS



Data-driven decision-making

Case study #1: 33 or 1690

- Be honest about your abilities, needs, and limitations
 - Crossing is simple;
 - Autonomous is tricky;
 - Triple hanging is impossible

Team #	Total	AutoTotal	AutoGoalPts	AutoCrossPts	BoulderPts	HighGoals	OuterGoals	MidGoals	BatterGoals	LowGoals	TelopPicks	TeleConv%
33	65.0	14.0	4.0	10.0	24.0	4.8	0.3	-	4.5	-	5.9	84%
1690	64.7	16.2	7.0	9.2	32.5	6.5	0.6	5.9	-	-	7.3	89%

Team #	Total	CrossPts	Crosses	TimesBeached	TimesDied	ChallengeSt	ScaleSucc	ScaleTime	Fouls
33	65.0	14.5	3.4	-	0.1	0.9	0.8	5.1	-
1690	64.7	11.5	3.9	0.1	-	0.9	-	(1.0)	-

Data-driven decision-making

Case study #1: 33 or 1690

- 1690 is better in auto, high goals, outer works shots, boulder acquisitions
- 33 can hang, and shoot from the batter
 - There were 14 other teams that could consistently hang
 - Slightly devalues their hanging ability
- 1690 gives us more options and a higher ceiling

Team #	Total	AutoTotal	AutoGoalPts	AutoCrossPts	BoulderPts	HighGoals	OuterGoals	MidGoals	BatterGoals	LowGoals	TelopPicks	TeleConv%
33	65.0	14.0	4.0	10.0	24.0	4.8	0.3	-	4.5	-	5.9	84%
1690	64.7	16.2	7.0	9.2	32.5	6.5	0.6	5.9	-	-	7.3	89%

Team #	Total	CrossPts	Crosses	TimesBeached	TimesDied	ChallengeS	ScaleSucc	ScaleTime	Fouls
33	65.0	14.5	3.4	-	0.1	0.9	0.8	5.1	-
1690	64.7	11.5	3.9	0.1	-	0.9	-	(1.0)	-

Data-driven decision-making

Case study #1: 33 or 1690

- Points = auto + boulder + cross + end
- Can't have 3 climbers
 - After run on scorers enough climbers to get one with pick 2
- Primary considerations then becomes **auto + boulder**

Team	A-Total	T-Picks	T-GIPt	T-Miss	T-Conv%	C-Beach	C-Died	C-CrPt	E-ChSu	E-ScSu	E-ScTm	E-Pt	F-Nor	TotPt	Count
74	9.2	4.4	10.0	0.4	93%	0.0	0.0	15.0	1.0	0.8	7.7	13.0	0.0	47.2	1
2056	18.0	6.5	27.1	1.2	82%	0.0	0.0	19.5	1.0	0.8	5.9	13.0	0.0	77.6	Scorer
33	14.0	5.9	24.0	0.9	84%	0.0	0.1	14.5	0.9	0.8	5.1	12.5	0.0	65.0	Scorer
1099	10.0	4.2	7.6	0.8	83%	0.0	0.0	17.0	1.0	0.7	11.6	12.0	0.0	46.6	2
1250	9.0	3.7	6.2	0.9	78%	0.0	0.0	12.0	0.9	0.7	7.3	11.5	0.3	38.7	3
4930	8	4	7	1.4	71%	0	0	13	1	1	11	12	0	38.8	4
5854	9	2	9	0.4	83%	0	0	10	1	1	14	10	0	38.2	5
548	11.0	5.0	21.7	0.8	85%	0.0	0.0	13.0	0.9	0.4	6.1	8.5	0.0	54.2	Scorer
2194	10	3	9	0.7	77%	0	0	12	1	0	5	9	0	39.0	6
2363	8.0	3.1	8.8	1.2	71%	0.2	0.0	13.0	0.9	0.4	6.4	8.5	0.0	38.3	7
433	9.2	1.6	2.8	0.5	74%	0.1	0.1	8.0	0.8	0.4	11.6	8.0	0.0	28.0	8
177	11.2	3.9	16.5	0.8	80%	0.0	0.2	13.0	0.9	0.3	9.8	7.5	0.0	48.2	9
2451	7.4	5.3	21.5	1.2	78%	0.0	0.0	15.5	0.9	0.3	6.0	7.5	0.0	51.9	Scorer
4391	13.2	3.6	9.4	1.0	72%	0.0	0.0	9.0	0.9	0.3	10.2	7.5	0.0	39.1	10

Data-driven decision-making

Case study #2: 3rd scorer or D first?

Type	Team #	Total	AutoTotal	AutoCrossPts	BoulderPts	CrossPts	TimesBeached	TimesDied	Fouls	EndPts	ChallengeSuc	ScaleSucc
Scorer	4468	42.1	9.0	9.0	11.6	17.0	-	-	-	4.5	0.9	-
Scorer	111	43.6	7.0	-	17.6	15.0	-	0.2	-	4.0	0.8	-
D	2337	36.0	10.0	10.0	11.5	11.0	-	-	-	3.5	0.7	-
Scaler	2363	38.3	8.0	8.0	8.8	13.0	0.2	-	-	8.5	0.9	0.4
Scorer	3042	28.0	10.2	9.2	3.3	10.5	-	0.1	0.1	4.0	0.8	-
Scorer	1756	40.1	11.4	8.4	12.2	12.5	-	0.1	-	4.0	0.8	-
Scaler	2194	39.0	10.0	10.0	8.5	12.0	-	0.1	0.1	8.5	0.9	0.4
Scorer	3015	44.2	15.0	10.0	13.2	10.0	0.1	0.2	0.1	6.0	0.8	0.2
Scorer	1306	45.1	13.0	10.0	15.1	13.0	-	-	0.1	4.0	0.8	-
D	1405	27.6	10.0	10.0	3.6	8.0	-	-	-	6.0	1.0	0.1
Scaler	1250	38.7	9.0	9.0	6.2	12.0	-	-	0.3	11.5	0.9	0.7
Scaler	5854	38.2	9.0	3.0	9.2	10.0	-	-	0.2	10.0	1.0	0.5

- Who do we take first with the 2nd pick?
 - Have two very good scorers
 - Stopping 10 points = scoring 10 points – value in D
 - Consistency a must: ≥10 auto points, ≥90% challenge success
- average of 38.7 points by teams taken in round 2
 - D robot is 27.6/19.6 points → stop 11.1-19.7 points (2-4 balls)
 - Scarcity mind-set: 1-2 D vs. many teams in same tier of scoring
 - Scoring < blocks + mess

Data-driven decision-making

Case study #2: 3rd scorer or D first?

- Almost...



Data-driven decision-making

Case study #3: High ceilings

- 3944 was the 14th highest scoring team at the event
- They were the 26th team to join an alliance (4th robot on #2 alliance)
 - They were as good as 4th !! (caveat: can burglars)

Team #	Points	Stack Points	Stack + Coo HP-P Throw	Stacks	Stack Height	Floor T	Feed T	A-Step	Ca	Can	Time
2056	134.2	85.0	109.0	2.4	2.4	5.5	13.7	0.0	0.0	0.0	
525	101.9	102.4	102.4	-4.0	2.8	5.7	0.0	16.4	0.0	0.0	
1619	90.1	85.2	88.2	0.0	2.6	5.5	1.0	13.0	1.2	0.7	
2836	81.3	78.8	78.8	-4.0	2.1	5.4	0.0	11.5	0.0	0.0	
1690	78.2	75.4	75.4	0.8	2.2	5.8	0.1	13.4	0.0	0.0	
876	66.8	74.8	74.8	0.0	2.1	5.5	0.1	12.0	0.0	0.0	
330	66.6	65.0	65.0	-1.5	2.3	5.0	0.0	11.9	0.6	0.6	
384	65.4	64.8	64.8	0.0	2.1	5.4	0.0	12.5	0.0	0.0	
2502	63.6	62.8	62.8	0.4	2.0	5.4	0.0	13.2	0.0	0.0	
494	61.9	47.2	47.2	0.0	1.9	4.7	3.2	6.5	0.0	0.0	
2067	60.1	45.2	50.2	2.1	1.6	4.8	7.1	1.3	0.8	1.0	
1189	58.4	38.2	50.4	2.6	2.0	3.6	0.3	8.0	0.0	0.0	
967	58.4	59.0	59.0	-4.0	2.2	5.2	0.2	12.1	0.0	0.0	
3944	58.0	58.6	58.6	-1.2	2.0	5.5	0.0	13.0	0.0	0.0	
2052	57.2	56.0	56.0	0.9	1.9	5.8	0.0	11.2	0.0	0.0	
492	55.7	53.4	53.4	0.6	1.9	5.7	0.0	11.7	0.0	0.0	
111	53.3	39.4	48.4	2.6	1.5	4.5	0.0	9.1	1.1	0.7	
1	53.2	52.0	52.0	1.7	1.9	5.2	0.0	11.8	0.0	0.0	

- 3944 was the 14th highest scoring team at the event
- They were the 26th team to join an alliance (4th robot on #2 alliance)
 - They were as good as 4th !! (caveat: can burglars)

Alliances

Alliance	Captain	Pick 1	Pick 2	Pick 3
Alliance 1	2836	2067	2168	1
Alliance 2	2056	330	492	3944
Alliance 3	525	1595	2052	2990
Alliance 4	3618	1619	967	3026
Alliance 5	876	111	2451	3674
Alliance 6	27	1690	384	3146
Alliance 7	365	494	1477	245
Alliance 8	4961	744	2502	1189

2836

Contribution				Stacking								Pickup		
Points	Stack Points	A-Points	HP-Points	S1	S2	S3	S4	S5	S6	Total Totes	Coop Totes	Totes: Feeder	Totes: Floor	Litter
81.3	78.8	2.9	-0.40							11.30	-	11.5	0.0	1.9
84.0	84	0.0	0	6CL	6CL	0	0	0	0	12	0	12	0	2
85.3	84	1.3	0	6CL	6CL	0	0	0	0	12	0	12	0	2
84.0	84	4.0	-4	6CL	6CL	0	0	0	0	12	0	12	0	2
76.0	72	4.0	0	6CL	4CL	0	0	0	0	10	0	10	0	2
82.0	78	4.0	0	6CL	5CL	0	0	0	0	11	0	11	0	2
84.0	84	0.0	0	6CL	6CL	0	0	0	0	12	0	12	0	2
64.0	60	4.0	0	6CL	3C	0	0	0	0	9	0	9	0	1
88.0	84	4.0	0	6CL	6CL	0	0	0	0	12	0	12	0	2
76.0	72	4.0	0	6CL	4CL	0	0	0	0	10	0	12	0	2
90.0	86	4.0	0	6CL	6CL	1	0	0	0	13	0	13	0	2

3944

Contribution				Stacking							Errors		
Points	Stack Points	A-Points	HP-Points	S1	S2	S3	S4	S5	S6	Total Totes	Dropped Totes	Stacks Smashed	Fouls
58.0	58.6	0.0	-0.60							10.90	0.4	0.1	0.0
84.0	84	0.0	0	6CL	6CL	0	0	0	0	12	0	0	0
78.0	78	0.0	0	6C	6CL	0	0	0	0	12	0	0	0
30.0	30	0.0	0	4CL	0	0	0	0	0	4	0	0	0
38.0	42	0.0	-4	6	4CL	0	0	0	0	10	0	0	0
54.0	54	0.0	0	6CL	6	0	0	0	0	12	0	0	0
42.0	42	0.0	0	6CL	0	0	0	0	0	6	0	1	0
18.0	16	0.0	2	4	4	0	0	0	0	8	3	0	0
86.0	90	0.0	-4	6CL	6CL	3	0	0	0	15	0	0	0
96.0	96	0.0	0	6CL	6CL	6	0	0	0	18	1	0	0
54.0	54	0.0	0	6CL	6	0	0	0	0	12	0	0	0

3944

Contribution				Stacking							Errors		
Points	Stack Points	A-Points	HP-Points	S1	S2	S3	S4	S5	S6	Total Totes	Dropped Totes	Stacks Smashed	Fouls
58.0	58.6	0.0	-0.60							10.90	0.4	0.1	0.0
84.0	84	0.0	0	6CL	6CL	0	0	0	0	12	0	0	0
78.0	78	0.0	0	6C	6CL	0	0	0	0	12	0	0	0
30.0	30	0.0	0	4CL	0	0	0	0	0	4	0	0	0
38.0	42	0.0	-4	6	4CL	0	0	0	0	10	0	0	0
54.0	54	0.0	0	6CL	6	0	0	0	0	12	0	0	0
42.0	42	0.0	0	6CL	0	0	0	0	0	6	0	1	0
18.0	16	0.0	2	4	4	0	0	0	0	8	3	0	0
86.0	90	0.0	-4	6CL	6CL	3	0	0	0	15	0	0	0
96.0	96	0.0	0	6CL	6CL	6	0	0	0	18	1	0	0
54.0	54	0.0	0	6CL	6	0	0	0	0	12	0	0	0

- 3944 was capable of scoring 6CL/6CL/3 or 6CL/6CL/6 (**3 6-stacks**)
- Inconsistent, leading to low average
- **Improvement** over the course of the event
- Fairly error-free
- More likely for an inconsistent team to perform at their best than for a consistent team to perform at their worst
- 2015 was the ideal year for “Best Case Scenario” picks
- Cost-benefit analysis between consistency and high ceiling
 - Depends on your goal and your capabilities

- “To find the answer, you must know the answer”
- Good sheet → good spreadsheet → good decision → **good results**
- Data-driven decisions; informed decisions
- Be honest about your abilities and limitations
- Cost-benefit analysis; consistency or high ceiling

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Questions?

Thank You!

