



Scouting

In Theory

Scouting | In Theory



Why do we scout? What is the objective?

- Statistical rating for robots exist. Some are better than others.
 - OPR, ELO, CCWM, DPR, cOPR, etc.
 - Some years' games are better than others for statistical methods.
- None are totally accurate.
 - OPR is <80%
- Scouting allows you to accurately rate the on-field performance of each team



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Why do we scout? What is the objective?

- Pick the strongest alliance (if you're expecting to be a captain)
- Supplement your alliance captain's data (if you're expecting to be a 1st round pick)
- Make the smartest game plan for each match. (Matches are ~\$500/ea. Don't waste them.)
 - Estimated score?
 - Try to win, try to win with bonus RP, or anticipate a loss and only target the bonus RP?
 - Where to send a defender?



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Word of Warning

- Scouting data is never 100% correct either
- Wrong data is worse than no data
- Lots of ways to improve data quality
- Don't collect more data than you can use





Scouting

In Practice

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Understand your resources

- How much technical work can you do before competition?
- How many people will be scouting?
- How well trained are your scouts?
- How motivated are your scouts?



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Maximize your resources – scouting system

	Paper	Spreadsheet	Database
Technical Difficulty	Easy	Over easy	Hard
Benefits	<ul style="list-style-type: none">• Easiest setup• No internet required	<ul style="list-style-type: none">• Quick• Flexible	<ul style="list-style-type: none">• Most flexible (cOPR & Deep Learning)
Drawbacks	<ul style="list-style-type: none">• Time consuming• Hard to organize• Calculations are manual	<ul style="list-style-type: none">• Limited to gSheet's / Excel functions• Might require internet	<ul style="list-style-type: none">• High initial investment• Requires internet



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Maximize your resources – people


- 6 is the magic number
 - 6 scouts means one person watching each robot each match
 - Each scout records actual scoring capability of each robot
- Scouts are people too
 - Scouting for 8 hours is exhausting.
 - Give generous breaks to your scouts
 - Having some scouts on and some off means you need *more* than 6 people



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Maximize your resources – <6 people

- You won't be able to accurately track all 6 robots. Don't try.
 - Prioritizing robots to scout?
 - Ignore the top-tier. Everyone knows that 254 outscores 2102.
 - Focus on the wildcards and middle-of-the-pack
 - Alternatively: focus on subjective info.
 - OPR is a pretty good metric. Use it.
 - DPR is a *terrible* metric. Make your scout(s) look for defenders and helpers.
 - Alternatively: partner with another team.
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Maximize your resources – 6+ people

- 1 Person per robot
- Limit your data collection to *only what actually matters*.
 - Do you care about level 2 vs. 3 scoring, or just high vs low?
 - Do you care about left vs. right rocket scoring?
 - Do you care about rocket level 1 vs. cargo ship?
- Rotate your scouts. Do it on a schedule.
 - Happy scouts give better data.



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Maximize your resources – 12+ people

- 2+ people per robot
- Averaging multiple scouts gives more accurate data overall
- With 3+ scouts per robot, you can assign accuracy ratings to the scouts themselves.
 - **chiefdelphi** [Citrus Circuits 2019 Scouting System Whitepaper](#)



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Maximize your resources – Training

- Untrained scouts give bad data.
 - Bad data is *worse* than no data
- Train your scouts about what to look for.
- Scout an event using the livestream.



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Maximize your resources – Motivation

- Forcing scouts to sit down, record information, and then leave, results in bad data.
 - Bad data is *worse* than no data
- Make sure your scouts *really* understand the importance of scouting
- Thank your scouts for their work
- Rewards for scouting!
 - Comfy seats?
 - Team gets pizza, scouts get burritos?



Recommended Reading (or viewing)



[Karthik \(1114\): Effective FIRST Strategies 2019](#)

[1241: FRC Strategic Design \(2019\)](#)

[1678: Scouting System Development \(2018\)](#)

[1678: Strategic Design \(2018\)](#)

[1678: Field Strategy \(2019\)](#)

[1678: Picklist Formation and Alliance Selection \(2019\)](#)

[1986: Key Questions for Kickoff \(2018\)](#)

[2056: Keys to Success \(2019\)](#)

[2056: Strategy \(2019\)](#)





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Thanks!

Questions?

Appendix | OPR

- Rating metric used to calculate a team's average points *scored or facilitated* per match.
- Usually capable of estimating ~75% of matches correctly.
- Invented in 2004 by Karthik (1114)
- Similar to adjusted plus/minus in basketball

Appendix | DPR

- Same metric as OPR, but using the opponent's score instead of yours
- Used to measure how much you *reduce* your opponents score
- Totally useless as a metric
- Don't use DPR

Appendix | ELO

- Used in esports to rank players
- FRC ELO is “Winning margin ELO”
- Based on how much you’re expected to win or lose by.