

Measuring the Performance of Disc Golf Holes

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The award for best performance by a disc golf hole in 2019 goes to Hole 10 at Codorus State Park - Red – CSR, during the 2019 PDGA Amateur Disc Golf World Championships- Powered by Prodigy.

Performance?

The job of a disc golf hole is to help sort players by their performance during a tournament.

“Help” because no single hole can provide enough information to tell us much about who is performing well that day. They only give out a few scores. On a typical disc golf hole, the lowest score could go to anybody in the top 85% of the field, and the worst score could go to any player in the bottom 85% of the field.

“Sort players” because what really matters is finding out who played better than who. Winning with a high score on a windy, rainy, cold day on a very long course is the same as winning with a low score under ideal conditions on an easy course.

Sure, disc golf holes can also do other things like provide fun and evoke emotions, but those are avocations. Their job is to rank players.

Sorting

From information theory, the amount of information in a set of scores is measured by entropy. Simply, the more different scores, the more you know about how well each player did against all the other players. Raising 2 to the negative entropy gives Scoring Spread Width. If, say 16 players all have different scores, the entropy will be -4 and the Scoring Spread Width will be 16. Tie scores reduce the amount of information and also the Scoring Spread Width.

The Scoring Spread Width of the scores of all players on a single hole is not enough to make a judgement about how well the hole is doing its job. The Scoring Spread Width of the total scores of all the players is the measure of the amount of information the whole course generated. Each hole contributes something to the Scoring Spread Width of total scores. A good hole will increase the spread, increasing the amount of information. A bad hole can decrease the spread - actually destroying information by creating more tied scores.

The measure of how well a hole is performing is how much it contributes to increasing the Scoring Spread Width of total scores.

Dealing with Confounding Factors

The performance of a hole depends on the mix of players. It is easier to sort out players that represent a large range of skill levels. For fair comparisons, we look at what happens when both holes are sorting the same set of players.

It is also easier for a hole to contribute to scoring spread when the other holes are doing a poor job. For fair comparisons, we look at what happens when both holes are part of the same set of holes. This is done by combining the scores from two different events.

Doing hole to hole comparisons this way gives a fair measure, but not all events share enough players with all other events to get a fair comparison across all events. To accomplish that, we use an ELO like method to give each hole a power rating. Each hole is compared to as many holes as possible and each hole's winning percentage is calculated. Then, each hole is given a power rating. Power ratings are higher for holes that have good winning percentages against other holes that have high winning percentages. The hole's power rating is the measure of how well it contributes to the Scoring Spread width of total scores for the players who played that hole.

For each hole, the expected winning percentage based on power ratings equals the actual winning percentage. The probability of a win is $1/(1+10^{(O-S)})$. O is the power rating of the Opponent hole, and S is the power rating of the Subject hole.

Limits

Holes were only included if the player by player scores were in the database. Only comparisons with at least 10 player-rounds in common were included. Only holes that could be compared to more than 36 other holes were included.

Best Performance at each Event

2019 PDGA Amateur Disc Golf World Championships- Powered by Prodigy:
Hole 10 on the 7223 ft layout of the Codorus State Park - Red - CSR course.
Rating = 1.21

Dynamic Discs Tyyni sponsored by Latitude 64 2019:
Hole 18 on the Sibbe Tyyni 2019; 18 holes; Par 59; 2,154 m layout of the Joensuun Tiilan Frisbeegolfrata course.
Rating = 1.13

2019 PDGA Professional Masters Disc Golf World Championships Driven By Innova:
Hole 12 on the GOLD 9345 ft layout of the Fox course.
Rating = 1.03

2019 United States Women's Disc Golf Championships - presented by Spotsy Disc Golf Club and Driven by Innova Discs:
Hole 9 on the USWDGC - Pool A; 18 holes; Par 65; 7,999 ft. layout of the Hawk Hollow course.
Rating = 0.93

Mid America Open sponsored by Discraft:
Hole 13 on the Gold; 18 holes; Par 68 layout of the Harmony Bends Disc Golf at Strawn Park course.
Rating = 0.92

Huk Central - Pro 2019:
Hole 9 on the Locomotive; 6965 Feet layout of the Grand Central Station course.
Rating = 0.91

The 37th Annual Kansas City Wide Open Presented by Discraft 2019:
Hole 1 on the Water Works 2019; 18 holes; Par 56; 6,390 ft layout of the Water Works Park course.
Rating = 0.87

2019 PDGA Professional Disc Golf World Championships:
Hole 2 on the 9647 ft layout of the Lake Eureka course.
Rating = 0.84

DGPT - Discraft's Portland Open presented by Bevel Craft Brewing:
Hole 16 on the 10,220 ft layout of the Blue Lake course.
Rating = 0.82

Utah Open Presented by Lucky Disc Golf 2019:
Hole 18 on the Mulligans course.
Rating = 0.82

The Majestic 2019:

Hole 6 on the BRP Pro 27 holes; 10,160 ft layout of the Blue Ribbon Pines Disc Golf Course.
Rating = 0.80

2019 Dynamic Discs Glass Blown Open - National Tour:

Hole 17 on the MPO layout of the Emporia Country Club course.
Rating = 0.80

2019 United States Disc Golf Championship:

Hole 5 on the Gold A layout of the Winthrop University course.
Rating = 0.79

DGPT - Discraft Ledgestone Insurance Open 2019:

Hole 18 on the 9,647 ft, MPO layout of the Lake Eureka course.
Rating = 0.79

DGPT - Idlewild Open driven by Innova Discs & The Nati:

Hole 16 on the DGPT MPO; 18 holes; Par 68 layout of the Idlewild course.
Rating = 0.78

Beaver State Fling presented by KEEN - National Tour:

Hole 1 on the 8681 ft layout of the Milo West course.
Rating = 0.78

Santa Cruz Masters Cup presented by Innova - National Tour:

Hole 7 on the 8713 ft layout of the Delaveaga Golf Course.
Rating = 0.77

The Challenge at Goat Hill Park - Driven by Innova - 2019:

Hole 15 on the MPO layout of the Goat Hill Park course.
Rating = 0.74

2019 Delaware Disc Golf Challenge - National Tour:

Hole 8 on the Gold (MPO); 18 holes; Par 69; 10,240 ft. layout of the Iron Hill course.
Rating = 0.73

Prodigy Disc Pro Tour 2019 - Helsinki:

Hole 1 on the 2180m layout of the Tali Disc Golf Park course.
Rating = 0.73

2019 PDGA United States Amateur Disc Golf Championship:

Hole 14 on the Amateur 9013 feet layout of The Toboggan course.
Rating = 0.73

DGPT - AbsoluteXtracts presents the San Francisco Open driven by Innova at Gleneagles DGC:
Hole 6 on the MPO layout of the Gleneagles DGC course.
Rating = 0.73

Discraft's CCR Open 2019:
Hole 10 on the MPO layout; 18 holes; Par 66; 9,154 ft. layout of the Burchfield Park - Devil's Den -
Renegades Trail course.
Rating = 0.70

The Rumble 2019 presented by Discraft and Clint's Draft House:
Hole 4 on the Long layout of the West Lake course.
Rating = 0.66

2019 Canadian National Disc Golf Championships Powered By Innova Champion Discs:
Hole 8 on the Huck It Longs - Hurricane Dorian Baker's Dozen; 13 holes; Par 44; 5,062 ft. layout of the
Huck It Middleton Disc Golf Course.
Rating = 0.66

Southwest Funding presents the Nick Hyde Memorial powered by Hyzerbomb driven by Innova - Pro
Weekend:
Hole 10 on the Gold layout of the Harry Myers Park course.
Rating = 0.65

European Open 2019:
Hole 4 on the European Open 2019; 18 holes; Par 64; 2,738 m layout of The Beast course.
Rating = 0.64

DGPT - 2019 Great Lakes Open presented by DISCRAFT:
Hole 9 on the Long; 18 holes; Par 62; 9,461 ft. layout of the Toboggan course.
Rating = 0.63

2019 Texas State Disc Golf Championships Presented by Discraft:
Hole 9 on the Gold layout of the Spring Valley Golf & Disc Golf course.
Rating = 0.63

2019 DGPT - MVP Open at Maple Hill:
Hole 11 on the Golds; 18 holes; Par 60; 8,500 ft layout of the Maple Hill course.
Rating = 0.62

The Ed Headrick Disc Golf Hall of Fame Classic presented by REC TEC Grills - National Tour Finale:
Hole 9 on the Jackson Long - MPO ; 18 holes; Par 68; 10,485 ft. layout of the WR Jackson Memorial Disc
Golf Course.
Rating = 0.62

Worst Performances at each Event

2019 PDGA United States Amateur Disc Golf Championship:

Hole 16 on the Amateur 9013 feet layout of the Toboggan course.

Rating = -0.18

2019 PDGA Amateur Disc Golf World Championships- Powered by Prodigy:

Hole 17 on the 7223 ft layout of the Codorus State Park - Red - CSR course.

Rating = -0.10

2019 PDGA Professional Masters Disc Golf World Championships Driven By Innova:

Hole 2 on the GOLD 9345 ft layout of the Fox course.

Rating = -0.03

Huk Central - Pro 2019:

Hole 13 on the Locomotive; 6965 Feet layout of the Grand Central Station course.

Rating = -0.01

2019 United States Women's Disc Golf Championships - presented by Spotsy Disc Golf Club and Driven by Innova Discs:

Hole 17 on the USWDGC - Pool A; 18 holes; Par 63; 7,189 ft. layout of the Loriella Park course.

Rating = 0.10

Dynamic Discs Tyyni sponsored by Latitude 64 2019:

Hole 9 on the Tyyni 2019; 18 holes; Par 61; 2,409 m layout of the Ford DiscGolfPark course.

Rating = 0.12

2019 Canadian National Disc Golf Championships Powered By Innova Champion Discs:

Hole 2 on the Huck It Longs - Hurricane Dorian Baker's Dozen; 13 holes; Par 44; 5,062 ft. layout of the Huck It Middleton Disc Golf Course.

Rating = 0.15

2019 Delaware Disc Golf Challenge - National Tour:

Hole 4 on the Gold (MPO); 18 holes; Par 69; 10,240 ft. layout of the Iron Hill course.

Rating = 0.19

The 37th Annual Kansas City Wide Open Presented by Discraft 2019:

Hole 18 on the WyCo Gold 2019; 18 holes; Par 62; 8,447 ft layout of the Wyandotte County Park course.

Rating = 0.20

Discraft's CCR Open 2019:

Hole 6 on the MPO; 18 holes; Par 66; 9,154 ft. layout of the Burchfield Park - Devil's Den - Renegades Trail course.

Rating = 0.20

The Majestic 2019:

Hole 7 on the BRP Pro 27 holes, 10,160 ft layout of the Blue Ribbon Pines Disc Golf Course.

Rating = 0.22

The Rumble 2019 presented by Discraft and Clint's Draft House:

Hole 8 on the Long layout of the West Lake course.

Rating = 0.23

DGPT - Idlewild Open driven by Innova Discs & The Nati:

Hole 4 on the DGPT MPO; 18 holes; Par 68 layout of the Idlewild course.

Rating = 0.24

Prodigy Disc Pro Tour 2019 - Helsinki:

Hole 4 on the 2180m layout of the Tali Disc Golf Park course.

Rating = 0.24

Southwest Funding presents the Nick Hyde Memorial powered by Hyzerbomb driven by Innova - Pro Weekend:

Hole 8 on the Gold layout of the Harry Myers Park course.

Rating = 0.24

DGPT - 2019 Great Lakes Open presented by DISCRAFT:

Hole 10 on the Long; 18 holes; Par 62; 9,461 ft. layout of the Toboggan course.

Rating = 0.26

DGPT - AbsoluteXtracts presents the San Francisco Open driven by Innova at Gleneagles DGC:

Hole 3 on the MPO layout of the Gleneagles DGC course.

Rating = 0.26

The Ed Headrick Disc Golf Hall of Fame Classic presented by REC TEC Grills - National Tour Finale:

Hole 3 on the Jackson Long - MPO; 18 holes; Par 68; 10,485 ft. layout of the WR Jackson Memorial Disc Golf Course.

Rating = 0.26

2019 Texas State Disc Golf Championships Presented by Discraft:

Hole 12 on the Gold layout of the Spring Valley Golf & Disc Golf course.

Rating = 0.26

Mid America Open sponsored by Discraft:

Hole 17 on the Gold Layout; 18 holes; Par 68 layout of the Harmony Bends Disc Golf at Strawn Park course.

Rating = 0.27

Utah Open Presented by Lucky Disc Golf 2019:

Hole 12 on the Fort course.

Rating = 0.28

The Challenge at Goat Hill Park - Driven by Innova - 2019:

Hole 8 on the MPO layout of the Goat Hill Park course.

Rating = 0.28

2019 United States Disc Golf Championship:

Hole 1 on the Gold A layout of the Winthrop University course.

Rating = 0.30

Beaver State Fling presented by KEEN - National Tour:

Hole 12 on the 8596 ft layout of the Milo East course.

Rating = 0.30

DGPT - Discraft Ledgestone Insurance Open 2019:

Hole 10 on the 9,647 ft, MPO layout of the Lake Eureka course.

Rating = 0.30

Santa Cruz Masters Cup presented by Innova - National Tour:

Hole #17 on the 8209 ft layout of the Delaveaga Disc Golf Course.

Rating = 0.31

European Open 2019:

Hole 6 on the European Open 2019; 18 holes; Par 64; 2,738 m layout of the Beast course.

Rating = 0.31

2019 DGPT - MVP Open at Maple Hill:

Hole 3 on the Golds; 18 holes; Par 60; 8,500 ft layout of the Maple Hill course.

Rating = 0.33

DGPT - Discraft's Portland Open presented by Bevel Craft Brewing:

Hole 4 on the 10,220 ft layout of the Blue Lake course.

Rating = 0.34

2019 PDGA Professional Disc Golf World Championships:

Hole 10 on the 9647 layout of the Lake Eureka course.

Rating = 0.35

2019 Dynamic Discs Glass Blown Open - National Tour:

Hole 1 on the MPO layout of the Emporia Country Club course.

Rating = 0.44