MSAM 2020 – @MWSprtAnalytics
ABSTRACTS – POSTER PRESENTATIONS

(BREAKOUT ROOM 2) Throw Deep to the Slot: Integrating Quarterback and Receiver Influence on Catch Rates

Hailen Ackerman, Minnesota State University - Moorhead

Abstract: To move the football closer to the end zone, offenses must be able to complete passes downfield. Completing deep passes is a weakness for some teams in the National Football League (NFL). This study was conducted to see if quarterback influence on catch rate (QBICR) and receiver influence on catch rate (RICR) were effective predictors of air yards. Air yards are the number of yards a football is thrown past the line of scrimmage to the point of reception. This study also looked at where teams should throw passes when they struggle throwing the football downfield. The interaction between QBICR and RICR was found to be an effective predictor of air yards. When a quarterback had a low QBICR, the highest RICR ratings came from slot receivers. These results suggest that teams struggling to complete deep passes should throw to the middle of the field. By using these findings, struggling offenses can move the football closer to the end zone. This will allow teams to score more points, increasing the chances of winning a game.

(BREAKOUT ROOM 3) The Implementation and Application of Statistics in the Martial Arts World

Olivia DiDonato and Ryan Savitz, Neumann University

Abstract: This poster proposes a model that may be used to predict the outcome of Shotokan Karate matches using various skills that are performed by the competitors. Data were collected from 30 matches on a large set of karate skills. Stepwise logistic regression was used to determine the subset of these variables that best predicted the matches' outcomes. The final model predicted match outcomes with nearly 92% accuracy, using only the skills of punches and counterattacks (both of which were statistically significant). One area for future research involves developing a single metric from these skills that will succinctly measure a participant's skill level.

(BREAKOUT ROOM 4) Linear Algebra in Volleyball Analytics

Patrick Hollander, Loras College

Abstract: I used Markov chains and transition matrices to improve scoring efficiency. I transformed rallies into probabilities and with the statistics I have gathered, I put the probabilities into a matrix to yield scoring for the designated state (touch of the ball within the rally). I created a matrix that places a percentage on each touch of the ball. This is based on what percentage of time each state transitions to one of the next possible states. I then began to see the side-out efficiency of a certain team broken down to every touch of the ball, thus revealing the significance of every touch a player has in the rally. This can be used within games and practices to help teams better

understand where they need to improve to get better as a whole. I think one of the interesting parts of this presentation is the actual application of these newly-drawn statistics. We always want to see an increase in side-out potential when we are getting close to a swinging attempt. Usually the team with the higher termination percentage at the kill state wins the match.

(BREAKOUT ROOM 5) A Poisson Betting Model with a Kelly Criterion Element for European Soccer

James Hyman, Dominic Samangy, and Kushal Shah, Syracuse University

Abstract: Sport betting has experienced a meteoric rise in popularity as accessibility and commercialization of daily fantasy and live betting has increased. As sport betting is legalized in different countries and states, we are presented with a new opportunity to create statistical models that we can utilize to predict outcomes of different sporting events. In this paper, we attempt to create a model for European Soccer and measure its performance against betting markets to understand if this model can be used to generate profits. The paper shows how we assigned teams an attacking and defensive rating based on their production against their league counterparts which we then utilized to create a Poisson distribution that determined the probability of each event (Win, Lose, Draw). To add another dimension to our model, we used an optimization technique known as Kelly Criterion to determine the optimal amount of money that should be bet on each match. This technique generates bet amounts while also creating a value (KCO Value) that acts as an accurate estimator of the risk associated with each match. By exploring the characteristics of this value, we were able to maximize the success of the model. Our results based on the 2018 and 2019 seasons across the five major European soccer leagues indicate that our model was not only successful in predicting outcomes, but also in generating significant profit yields for a user.

(BREAKOUT ROOM 6) Comparing Free-Throw Forms Among NBA Players Through 3D Similarity Measures

Paul Ibrahim, Cary Academy

Abstract: In this paper, we propose a method to compare free-throw forms of various NBA players. Using publicly available SportVU tracking data from the 2015-16 NBA season, we identify instances of free-throw attempts and track the ball's motion while it's in the player's hands in order to isolate the given player's shot form from the data. To characterize each player's form, we apply a multivariate kernel density estimation to the sample of the player's free throw attempts. Furthermore, using a divisive clustering algorithm, we attempt to categorize the multivariate kernel density estimates across the sample of players, characterizing each cluster by the cluster mean. We then proceed to apply a variety of three-dimensional similarity measures to the clustered kernel density estimates, therein providing a variety of metrics by which we can assess free-throw form similarity among NBA players.

(BREAKOUT ROOM 7) Spatial Value in Target Sports: Using Cornhole as a Paradigm

Paul Ibrahim, Cary Academy

Abstract: The game of cornhole is structured quite simply: hierarchically from round to game, a game is won by scoring or exceeding 21 points before your opponent. Because each game's score is the sum of the point differential in each round, to optimize the probability of winning a given game the objective should be to create as large a favorable point differential as possible in each round. With no obvious method of defense, the game has an inherently offensive-centric nature. To score points, players primarily aim to make the bag into the hole on the board, yielding three points, whilst preserving a point if the bag misses the hole but remains on the board. However, this single faceted approach is too narrow. Because both players throw to the same board alternatingly, bags situated in front of the hole can act as barricades to the opponent's subsequent throws, affording players the opportunity to establish defensive positioning. In this paper, we propose a new strategy to the game, examining the defensive potentiality of each given throw. Through the use of OpenCV, the spatial coordinates of each bag's position on the board can be retrieved, and, in conjunction with a play-by-play log, we use this data to transform the cornhole board into a probabilistic grid in order to assess the value of a given throw with consideration given to the bag's defensive impact. Applying a simulation accounting for human error in throws, we show that abiding by the deduced strategy creates a significantly larger point differential (in favor of the player abiding by the strategy) and accordingly increases a given player's win probability.

(BREAKOUT ROOM 8) An Analysis of the Division III Learfield Cup Landscape

Davis Pasco and Simon Schuler, Loras College

Abstract: Awarded annually to the top collegiate athletic institutions in America since 1993, the Learfield IMG College Director's Cup showcases the success, talents and athletic prowess of student-athletes at the national level. The overall standings published each year offer a brief, yet simple, understanding of the level of achievement for all NCAA athletic institutions. In our research, we studied the point totals in-depth, aiming to develop a complicated spreadsheet, full of several new data categories, for all Division III athletic teams from years ranging 2010-2019 to find successful trends that were relevant to Loras College, the American Rivers Conference a. After compiling point totals for all teams, we examined, analyzed and constructed numerous trends and categories relative to not only Loras, but Division III athletics as a whole. We will discuss the challenges and value that the corresponding data and research presents to the sports analytics industry. By using analytical skills and tools, our research resulted in finding useful and meaningful data for all Division III athletic institutions and may be used to highlight program strengths and avenues of growth for all athletic teams.

(BREAKOUT ROOM 9) Exploring Equity in the Golf Skins Game

Olivia Strasburg and Matt Kretchmar, Denison University

Abstract: In this work we assess the fairness of applying handicaps to the golf skins game. In the skins game, each hole is a stand-alone competition; players attempt to win the maximum number of holes. Unlike in match play, a handicap is divided into whole strokes applied to the hardest holes on the course. When assessing the equity of handicaps in skins, we find a number of interesting dynamics that arise that affect players' chances of winning skins. We suggest alternative methods for making the game equitable between players of different abilities.

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ADDITIONAL POSTERS: THE CENTRAL COLLEGE SOCCER ANALYTICS HONORS SEMINAR

(BREAKOUT ROOM 10) Weight Training in Soccer, 1

Abby Alberti, Central College

Abstract: In this work we looked at the relationship between weight training and soccer skills for the Central College division III women's soccer team. Limited data was collected over a two week period and we were not able to find any notable correlation. In the future, though we would like to collect more data and look further for significant results.

(BREAKOUT ROOM 11) Reload and Hang Loose: Analyzing Mentality and Work Rate in Women's Division III Soccer

Logan Huinker, Central College

Abstract: In this research, we analyzed the short amount of time after a goal was scored in a scrimmage during practices. The purpose was to see if a team would perform better after a goal was allowed, tying this into mentality and working hard. We observed that a scrimmage team is more likely to allow more shots and goals than actually scoring goals in that short period of time. Future work on this would extend into a full season with actual games.

(BREAKOUT ROOM 12) What Impacts and Accelerations Do NCAA Division III Women's Soccer Goalkeepers Experience?

Gage Linahon, Central College

Abstract: In this work, we studied the number of impacts and accelerations experienced by Central Colleges Women Soccer Goalkeepers. From this study, we found that during a limited number of practices, goalkeepers experienced fewer impacts and high speed accelerations compared to their teammates.

(BREAKOUT ROOM 13) The Effects of Impacts on NCAA Women's Soccer Goalkeepers

Thomas Spoehr, Central College

Abstract: In this work we assessed the relation between the number of impacts and reported physical exertion for women's goalkeepers at Central College. We found in limited data that there was little to no apparent relation between impacts and self reported physical exertion. We hope to continue this work by gathering more data, including game statistics.

(BREAKOUT ROOM 14) GPS Analysis: Field Domination in Soccer

Shawn Spurrier, Central College

Abstract: In this work we analyzed which third of the field is most valuable to dominate in soccer during a match to have the best chance of creating shots and scoring goals. In this project we studied training matches from the Division III Central College's women's soccer team and the limited data indicated that dominating the middle third slightly tended to lead to more goals scored. However, more data will need to be collected in the future throughout the course of a full season with official games to form stronger conclusions.

(BREAKOUT ROOM 15) Weight Training in Soccer, 2

Madison Van Vors, Central College

Abstract: In this work, we compared weight lifting exercises to variables collected through the Catapult PlayerTek+ pods via the Division III Central College Women's Soccer team. The results did not show much if any correlation in the data but we are interested in the future to see if additional data would indicate a notable correlation.

(BREAKOUT ROOM 16) Energy Expenditure vs. RPE in Division III Soccer Goalkeepers

Joseph Weber, Central College

Abstract: In this work, we observed the relationship between energy expenditure in kilocalories to rate of perceived exertion in Division III women's soccer goalkeepers during training sessions. It was discovered that there is little to no correlation between these two variables with limited data. Future work should include more participants and more training sessions as well as comparing these two variables during match play.