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Predictive journalism

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Predictive journalism: The case of Greek sports and betting websites

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Abstract

Predictive journalism is an emerging genre in data journalism that incorporates predictive information such as estimates, forecasts, etc. It helps the audience to speculate about possible future events and outcomes. In recent years, there has been a fusion of predictive journalism with sports, as sports allow journalists to make predictions about the outcome of a match, how a team will line up on the field, and so on. The present study examines the application of predictive journalism in Greek sports and betting websites. It aims to analyze the volume and the content of articles, as well as where journalists base their predictions, concluding that, although Greek sports websites publish approximately 100 football-related articles per day, the percentage of predictive journalism articles are rather small to non-existent in some of them.

Keywords: data, sports, predictive journalism.

Introduction

The emergence of computational methods and the abundance of data have been used by journalists as they appear to help them to anticipate future developments (Pentzold & Fechner, 2021). Journalists, using new tools and resources, can analyze trends, patterns, and probabilities and make more informed predictions about upcoming events.

Predictive journalism is a type of data journalism. It incorporates predictive information such as forecasts or other estimates into news production processes using computational modeling techniques like machine learning and simulation. It often features interactivity and includes some form of data visualization (Diakopoulos, 2022). Based on probabilities, it leads to various future scenarios, some of which may occur while others may not (Pentzold & Fechner, 2021). It is applied in various fields such as politics, medicine, sports, etc.

The continual growth of data information underscores the increasing importance of tracking, collecting, and effectively utilizing data. The emergence of data journalism has led to significant transformations in the sports journalism industry, shifting the focus from merely reporting news to adopting new writing methods that leverage data-driven insights (Gao, Tang & Lu, 2023). This condition forms a deeper integration of quantitative analysis and storytelling in sports reporting, enhancing the depth and quality of coverage for audiences. As information and

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communication technology advances rapidly, the integration of big data in the sports industry extends beyond the playing field, intertwining closely with various aspects of sports management and administration (Gao, Tang & Lu, 2023).

Until recently, the use of data and statistics to measure and analyze sports performance primarily focused on basic events such as wins, losses, points, and assists. However, over the last 10-15 years, richer and more complex statistical methods and models have emerged. The availability of larger datasets and computational analysis of that data leads to the development of these so-called analytics (Fu & Stasko, 2022). Data and modern analytical methods have allowed researchers and coaches to gain a much better understanding of athletic performance and make analytical predictions. Data visualization in sports serves two roles: analytical (or exploratory) purposes and narrative (or communicative) purposes, as sportswriters both analyze games and communicate insights to audiences (Fu & Stasko, 2022).

In this context, this study examines whether and to what extent predictive journalism is used by sports journalists in Greece. Specifically, it conducts content analysis on three sports and three betting websites, and records the topics, the number of articles related to predictive journalism, and the predictions made by the journalist.

Data Journalism – Definition and characteristics

Data journalism can be defined as the process of extracting valuable information from data, crafting articles based on this information, and integrating visualizations (interactive in some cases) into the articles, which help readers understand the significance of the story or allow them to find data relevant to them (Veglis & Bratsas, 2017). In data journalism traditional journalistic methods intersect with data analysis, programming, and visualization techniques (Appelgren, Huttenrauch & Nygren, 2012).

Data journalism projects use (large) sets of (digital) quantitative data as their "raw material," which undergo some form of (statistical) analysis to uncover and tell stories (Coddington, 2015; Royal & Blasingame, 2015). They often use open data and open-source code, promoting transparency (Borges-Rey, 2017). Also, the results are frequently visualized (Gray, Bounegru & Chamber, 2012), and in some cases try to enable users to collect, analyze, and interpret the data (Borges-Rey, 2017). Data journalism “tells” a compelling story, like traditional journalism, however, the difference lies in the fact that now the story comes from the data itself (Kalaitzi, Veglis & Bratsas, 2018).

Visualizations are a basic characteristic of data journalism articles and convey a large volume of data with substantive information (Veglis & Bratsas, 2017). Classic data visualizations include charts, maps, and timelines, either individually or in combination. A visualization can be static or dynamic/interactive. In a static visualization, there is only one view of the data, and often multiple “readings” by the user are required for a complete understanding of the available information. In a dynamic visualization, users explore the data themselves. An interactive

visualization should initially provide an overview of the data but also include tools for discovering details. Additionally, it may incorporate animated transitions and well-designed interfaces to engage the audience (Murray, 2013).

Dynamic visualizations, according to the interactivity can be categorized as follows: *Transmissional*: Projects that use simple interactive visualizations. They allow the user to view the visualization and provide some additional explanations for various elements in the form of information displayed in a window. *Consultational*: Projects that offer multiple views of the same data, as well as projects that include interactive visualizations allowing the user to focus on specific areas (such as maps, timelines, etc.). *Conversational*: Projects that allow user input of data that can change the visualization (Jensen, 1998).

In data journalism, quantitative evidence and computational techniques convert into story formats. This is essential for making them meaningful, communicable, and relevant to audiences (Pentzold & Fechner, 2021). So, data journalists follow a specific workflow, which includes the detection of the information, the interpretation of the findings, and the configuration of narratives that are related to their audience's interests and understanding. The translation of complex data and computational analyses into compelling stories allows data journalists to bridge the gap between raw data and audience comprehension, thereby making the information accessible and impactful.

Predictive Journalism

According to Pentzold & Fechner (2021), the mere availability of digital information and algorithmic calculations has not inherently revolutionized journalistic efforts to anticipate, outline, and communicate forthcoming trends and events. Although these technological resources offer valuable tools for data analysis and prediction, their impact depends on how journalists utilize them within the broader context of their reporting practices. Digital information and algorithms should be integrated by journalists into their workflows, interpret the insights derived from them, and effectively communicate their findings to their audiences.

Predictive journalism, as a subset of data journalism, specializes in producing forecasts and predictions based on evidence and data analysis. By using the resources referred, it aims to cover the audience's demand for informed insights and forecasts in various domains, including sports. So, audiences can be provided with valuable foresight and understanding of future events, contributing to a deeper engagement and comprehension of complex topics.

Predictive journalism involves integrating predictive information like forecasts, nowcasts, hindcasts, or other estimates into various stages of news production, including reporting, publication, and distribution. This integration typically relies on computational modeling techniques, such as machine learning and simulation to generate these predictions. Also, it often adopts an interactive approach and typically incorporates various forms of data visualization. Through interactive features and visual representations, predictive journalism engages

audiences more effectively, enabling them to explore and understand complex predictions. A common objective of predictive journalism is to communicate the associated probability with a prediction, aiming for transparency and clarity. The impact of predictive journalism extends beyond audience perception to its reception, utilization, and influence on media production processes themselves (Diakopoulos 2022).

Thus, predictive data journalism represents a relatively new frontier in news production. It serves as a lens through which to explore the broader landscape of data-driven journalism and its potential for innovation (Pentzold & Fechner, 2021). By delving into predictive analytics and forecasting techniques, journalists can unlock new dimensions of storytelling and analysis. This emerging field offers exciting opportunities to anticipate and address future events, trends, and developments, thereby enriching the practice of journalism and enhancing its relevance in an increasingly data-driven world. As predictive data journalism continues to evolve, it will likely play a pivotal role in shaping the future of news production and consumption.

The role of data in sports journalism

Which is the relationship between data and sports journalism? What role do the data have in sports news journalism? Nowadays, big data is used to draw up results predictions. So, probability models in sports coverage are aimed at extracting readings and new interpretations from a set of datificated information that already exists. This set of ordered data is already used by the media, leagues and sports institutions specialized in the storage and processing of sports statistics, such as the American Stats LLC or the British Opta Sports (Rojas-Torrijos & Garcia-Cepero, 2020).

Specifically, sports results prediction models have already been used by the media (for example the Financial Times or the website Five ThirtyEight) which have made data their trademark (Arias-Robles, 2017). These publications have developed them to diversify their sports coverage and to provide new angles and perspectives rather than just seeking to broadcast facts.

Therefore, models based on advanced statistics, such as those created by El País for the 2018 Football World Cup, measure probabilities and make future projections from already existing data. So, rather than making mere predictions, they determine which scenarios are more probable within a competition according to a general trend and how to tell the reader about these predictions, following a methodology which characterizes data journalism (Rojas-Torrijos & Garcia-Cepero, 2020).

Predictive journalism in sports: The beginning

Sports data mining tools as derivatives of the data mining technique appeared in large numbers, allowing players, coaches, and opponents to better understand their competitive level. Thus, a new industry has emerged that uses the application of data mining in sports for commercial purposes (Herbinet, 2018).

Below there are some popular sports data mining tools:

Advanced Scout: IBM developed Advanced Scout in the mid-1990s as a data mining tool used to analyze NBA data. The application was specially designed for NBA coaches and statistic analysts to discover hidden patterns or features in basketball data, which provided a new insight using business intelligence and data mining technique (virtualscoutschool.com, 2019). There were two sources of data for this tool, one of which came from a court event collection system that included time-stamped event data such as shots, rebounds, etc. The other source was the game tape, which included frames of the game. This resource could be maintained by coaches to prepare for upcoming opponents as well as to control their players' mistakes and in turn improve them effectively (Schumaker, Solieman & Chen, 2010).

Digital Scout: Digital Scout is a software used to collect and analyze game-based statistics and tools for baseball, basketball, and football etc. (Solieman, 2006).

Synergy Online: This system is similar in functionality to Advanced Scout and is dedicated to basketball-based media. It contains an index of live video broadcasts, where coaches, players and fans are able to query games in real time and receive continuously updated player statistics using this software (Schumaker et al., 2010).

NHL-ICE: In recent years, hockey has experienced a data-centric renaissance. The National Hockey League (NHL) has formed a technology joint venture with IBM to develop a data mining application, NHL-ICE. This is similar to Digital Scout, which is an online real-time game scoring and statistics' system. Coaches, broadcasters, reporters, and fans can look up statistical data through in this app when visiting the NHL website. Also, fans can use this system to watch the match repeatedly and meanwhile broadcasters and journalists can dig up these data and try to find out the backstages to add them to their reports (Knorr & Ng, 1998).

Sports, predictive journalism, and betting

In the world of professional sports, predictive analytics is used more and more as teams look to gain a competitive edge. Predictive analytics is the process of using data and statistical models to make predictions about future events or outcomes. By utilizing predictive analytics, teams gain an understanding of how different strategies will affect their performance in the future. On the spectator side, this technology has helped in the analysis of statistics such as NBA picks and various odds to help fans in making informed betting decisions.

Teams have also begun using predictive analytics to identify potential new players who may be more successful than those currently on their roster. For example, by analyzing player stats from past seasons, teams can identify which players are most likely to perform well in certain areas and use that information when making draft picks or signing free agents. The use of predictive analytics is likely to continue in the future as technology continues to advance, and data becomes easier to access (dailypress.net, 2023).

Nowadays, the prediction of sports results is very popular among fans all over the world, which greatly contributes to the expansion of sports betting. This is especially evident in the most popular sports, such as football and basketball. Many people have developed various systems with the aim to provide the best possible prediction of the winners of sporting events. The main problems with these systems are that users are often influenced by emotions or that these systems do not work with the right data set (Miljković, Gajić, Kovačević & Konjović, 2010).

There are several research that have dealt with the topic of predicting the results of sports events: For example, Byongho, Jinhyuck, Chonghyoun, Hyeonsang, and McKay (2008) presented an approach for predicting the results of football matches called FRES (Football Result Expert System). It uses a combination of Bayesian inference and rule-based reasoning. Each game is represented as a series of streams. The probabilities of certain events, such as a possible player change or formation change, are calculated based on previous data in each stream and are used to trigger certain rules to determine decisions for the next stream. The system was applied to the 2002 FIFA World Cup matches and correctly predicted the champion and the second runner-up, as well as the six out of the eight teams in the quarterfinals.

Regarding basketball over the past decades, different statistical principles have been applied by researchers, considering the technical characteristics of previous games to predict the probability of the home team winning in future games (Zak, Huang & Siegfried, 1979). The range of available data resulted in low prediction accuracy (Kuhn & Johnson, 2013).

Furthermore, artificial neural networks (ANNs) are among the most used approaches in machine learning for sports outcome predictions (Markoski, Pecev, Ratgeber, Ivkovic & Ivankovic, 2011). Connection systems (as they are also called) are computational systems inspired by, but not necessarily identical to, the biological neural networks that make up animal brains (Loeffelholz, Bednar & Bauer, 2009). Such systems learn to perform tasks by examining examples, generally without being programmed with task-specific rules. Their power comes from the nonlinearity of the hidden neurons that adjust the weights to achieve a high level of prediction accuracy, all while avoiding overfitting (Santos, Pazos & Sierra, 2011).

One of the first studies that used an ANN model to predict results for the National Football League (NFL) was conducted by Purucker (1996). Data from the first eight league matches and five characteristics of each match were selected and then they used clustering techniques. Puruker's system had 61% accuracy.

Also, Artificial Intelligence has affected journalism and sports. The algorithms of AI analyze the betting history, preferences, and behavior of a user, adjust suggestions, bets, and promotions for each user, improving their experience. Furthermore, AI processes numbers from a wide range of sources, including player statistics, team performance, weather conditions, and even sentiment on social media (Van Isacker, 2024). So, increased accuracy of predictions, faster decision-making, reduction of human errors in betting strategies are offered (Dooley, 2024).

All of the above, in combination with the development of technology, resulted in the prevalence of betting and consequently "betting journalism": It is characteristic that on September 9, 2021, the first day of the 2021-22 NFL season, Arizona became the 23rd US state which legalized sports gambling, allowing its residents to bet either in physical locations or online. The mass legalization of sports gambling has already had significant effects on the sports business in America, with everyone - from state governments to major professional sports leagues, media companies to Native American casinos in all over the country - wanted to get in to action. The "why" is easy to be understandable: A 2017 study by the American Gaming Association pegged the expected economic return of a mass sports betting legalization movement at $41.2 billion (Green, 2021). Also, Bloomberg reported that players bet more than $7 billion on sports in October 2021 – an increase of more than 2,000% since June 2018, when the United States Supreme Court struck down a federal law that banned sports gambling in every State except Nevada (Moritz, 2022).

The betting market has grown very rapidly in the last decade, thanks to the increased coverage of live football matches as well as the higher accessibility of betting websites and the development of mobile devices and tablets (Herbinet, 2018). In 2013 the value of the betting industry, which included both illegal and legal markets, was estimated at $700 billion to $1 trillion (£435 billion to £625 billion) per year. Around 70% of this trade was estimated to come from football trading (Keogh & Rose, 2013). In 2021, the market size of the UK sports betting sector reached a value of $5.4 billion, which represented the 5% of the global market size and making football the market leader. Earlier in 2020, the COVID-19 outbreak affected the sector as most outdoor sports facilities were stopped and people were forced to spend most of their time at home. This resulted in little to no sports taking place during the year, which meant that there were no betting activities. As a result, in the year 2020 the market value of sports betting in the UK showed a decrease of 10% (globaldata.com, 2021). As it is understood, football and gambling have now become so intertwined that it is difficult to imagine a match day experience without the influence of betting (Rackham, 2023).

Research questions

The main question to which the present research is asked to answer is whether predictive journalism applies to Greek sports websites, especially during periods of intense sporting activities. We recognize that this type of journalism is gaining more and more ground, as the widespread adoption of data journalism has been playing a key role in this direction.

The main research question is framed by a series of sub-questions, which are the following:

RQ1: What is the volume of predictive journalism articles related to football published on the Greek sports and betting websites?

RQ2: What are the subjects covered?

RQ3: Which data do journalists base their predictions on regarding these articles?

Research methodology

A quantitative content analysis has been chosen for this: According to Berelson (1952), this is a research technique with the aim of objective, systematic and quantitative description of the manifest content of communication. As Bryman (2017) claims, content analysis is about uncovering the obvious content of each element.

Many studies applying quantitative content analysis do not develop their own coding protocols but rely on pre-existing ones by other researchers (White & Marsh, 2006). In the present research, the researchers developed their own coding protocols given that similar research does not exist.

Research material and sample

To answer the above questions, the research focused on the articles related to football which were published on three sports websites (sport24.gr, gazzetta.gr, sdna.gr) and three sports betting websites (betarades.gr, kingbet.net, bethome.gr). As one of the most popular sports on the planet, football is always followed very closely by many people. In recent years, new types of data have been collected for many games in different countries, such as play-by-play data including information about every shot or pass in a match (Herbinet, 2018). The data concerns the period from November 4th to November 19th, 2023. Totally, the sample consists of 4.379 articles published on the six websites that were mentioned above and more specifically of 917 articles posted on sport24.gr, 1.439 posted on gazzetta.gr, 1.689 posted on sdna.gr, 115 posted on betarades.gr, 113 posted on kingbet.net and 106 posted on bethome.gr (Table 1).

Table 1. The number of articles that were published from November 4th to November 19th, 2023

Website's name	Number of articles	Number of articles of predictive journalism
sport24.gr	917	3
gazzetta.gr	1.439	2
sdna.gr	1.689	0
betarades.gr	115	5
kingbet.net	113	9
bethome.gr	106	12

Results

Analytics have been very impactful for teams, as the use of them helps teams to gain insights into their players' strengths and weaknesses, as well as the overall performance of the team. This allows them to make more informed decisions about how to best utilize their resources and optimize their strategies. Analytics also provides teams with data-driven insights into game

situations, allowing them to better anticipate opponents' moves and adjust their own strategies accordingly. Analytics can help teams identify areas for improvement in terms of player development or team chemistry. It can also be used to track progress over time and measure the effectiveness of different strategies or tactics. All in all, analytics has revolutionized the way teams approach performance and strategy, giving them an edge over their competition (dailypress.net, 2023).

But as it concerns the application of analytics in sports journalism, it was found that the volume of predictive journalism articles published by the sports and betting websites during the study period was very low, especially for sports websites. It is characteristic that although a total of 1,689 articles were published on the sdna.gr website, none of them were related to predictive journalism. This means that it is not particularly widespread on Greek sports websites. Moreover, the subjects covered by these predictive journalism articles were related to match predictions for the Greek League (Super League and Super League 2) and European Cups such as Champions League, Europa League, and Europa Conference League.

Finally, as it concerns where the columnists base their predictions on, it was found that they are based on the following:

- The strategy, the tactics and the analysis of the match
- Determining the playing style of team players and opponents (using statistics)
- The teams' results so far
- The dynamics of opponents
- What the teams have done in the past in the same institution/in a similar situation.

The result confirms the literature, as the collection of data has placed Data Science at the forefront of the football industry and many potential uses and applications presented below:

• Strategy, tactics, and match analysis

• Identifying the players' playing style

• Player acquisition, player valuation and team's budget

• Training regimens

• Predict and prevent injuries using test results

• Performance management and forecasting

• Match results

• Tournament planning and scheduling

• Calculation of betting odds

A particularly important element of Data Science in football is the ability to evaluate a team's performance in matches and use that information to try to predict the outcome of future matches based on that data. The results of sporting events can be difficult to predict, as surprises often occurs. Football is an interesting example, as a) the matches have a fixed duration (unlike, for example, tennis or volleyball) and b) it has a unique type of scoring matches, namely, goals.

The possible outcomes for a team participating in a football match are win, lose, or draw. Therefore, it may seem quite simple to predict the outcome of a match. Traditional prediction methods simply use match results to evaluate team performance and build statistical models to predict future match results. However, due to the low scoring in matches (for example, less than 3 goals per game on average in the English Premier League over the past 15 years), there is a random element associated with the number of goals scored during a match. For example, a team which has many chances to score could be unlucky and not convert any of its scoring chances to goal, while a team with only one scoring chance could score a goal. This makes match results an imperfect measure of a team's performance and thus an incomplete metric against which to predict future results (Herbinet, 2018).

A possible solution to this problem can be provided by using in-game statistics: In recent years, detailed match statistics have become available, which create the opportunity to look further than the match result itself. This allowed the development of metrics such as "expected goals" which calculate the number of goals a team would be expected to score in a match, removing the random element of scoring. The emergence of new Machine Learning techniques in recent years also allows for better predictive performance in a wide range of classification and regression problems. Exploring these different methods and algorithms allowed the development of better models in both predicting the outcome of a match and the actual ranking (Herbinet, 2018).

Conclusions

Data journalism is applied in the field of sports, as evidenced by the many examples that exist in the field of sports journalism. In recent years, new technologies have made it possible to collect and analyze more data in this area. The above contributed to the formation of sports analysis, a type that is found especially in specific periods of time, such as for example before and/or after a football match. This development helped to connect predictive journalism with sports, allowing journalists to make predictions based on data.

Also, the sports industry has grown considerably, thanks to more people understanding the power of predictive analytics. Now, broadcasts and social media teams are starting to realize the benefits of providing these metrics to fans. Based on a recent Nielsen report that 51% of people are checking live stats while watching sports, fans are seeking more than just an opinion (Hensley, 2022).

In the context of this work, the following were observed: Each sports website publishes an average of 100 football-related articles per day. The subjects varied from interviews, opinion articles, republishing of Press releases, announcements etc. to analysis articles and data journalism articles. Despite hosting these kind of articles (such as articles with numbers, tables, and visualizations), the percentage of predictive journalism articles was rather small to non-existent in some cases. This creates a big concern, as predictive journalism has invaded many fields, and one would expect that the field of sports journalism would be one of the first to be applied.

Future research

In the future, our goal is to study more sports and betting websites both in Greece and abroad, in order to establish whether the results of this research are different or remain the same in a wider range of websites and in a different period of time. Besides, the study period of this work is short and indicative, not representative. In addition, the goal is to extend the study of predictive journalism to other sports, such as basketball, tennis, volleyball, etc. The reference to these sports is based on the fact that there are daily reports on the websites for them.

However, research on the application of predictive journalism in sports will be more complete if we ask sports journalists themselves. The latter will be asked to answer questions related to the way they work in the case of forecasts and predictions. In other words, they will be asked where they base their predictions on, if the way of predictions has changed due to artificial intelligence, if they notice more general differences in recent years, how their predictions can be made more effective, etc. It should also be investigated whether predictions based on computational methods are absolutely certain, and if not, how the possibility of error can be reduced.

Finally, it is important to investigate the public's attitudes towards predictive journalism articles with the use of a questionnaire in the future. In other words, it is appropriate to study whether the public can read and understand the content of such articles, if they encounter any difficulty and at what point, what they like and what they don't like to read, etc.

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