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A review paper on the emerging trends in sports analytics in India

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Abstract

Sports analytics is the field which deals with application of data analysis techniques to improve the performance and decision-making of sports teams, players, coaches, and managers. It is one of the rapidly growing fields and it has attracted significant attention from the sports industry, academia, and the media. In this paper, we have reviewed the current state of sports analytics in India. Our country has a large and diverse sports culture. We have also identified and analyzed the emerging trends in sports analytics in India. These include the use of artificial intelligence, machine learning, computer vision, natural language processing, and cloud computing. We have also discussed the challenges and opportunities for sports analytics in India, such as the availability and quality of data, the adoption and acceptance of analytics by stakeholders, the ethical and legal implications of data collection and analysis, and the potential for social impact and innovation.

Keywords: Sports analytics; Predictive; Prescriptive; Descriptive; Trends; Data analytics

1. Introduction

Sports analytics is defined as “the management of structured historical data, the application of predictive analytic models that utilize that data, and the use of information systems to inform decision-makers and enable them to act”. Sports analytics can be applied to various aspects of sports. These aspects include player performance, team performance, coaching strategies, scouting and recruitment, injury prevention and rehabilitation, fan engagement, media coverage, and business operations. Sports analytics can provide competitive advantages for sports organizations, as well as enhance the experience and enjoyment of sports fans. Sports analytics is known to be a multidisciplinary field. It draws knowledge from various domains. These domains range from mathematics, computer science, engineering, psychology, sociology, economics, to management.

Sports analytics has gained prominence in recent years due to several factors. These factors are as follows: Increasing availability and accessibility of data sources, the advancement and affordability of technologies and tools for data collection and analysis, the growing demand and awareness for evidence-based decision-making in sports, and the emergence and popularity of new sports leagues and formats. Sports analytics is a global phenomenon that has been adopted by various countries and regions with different levels of development and maturity. One such country is India. India has a rich and diverse sports culture that encompasses both traditional and modern sports.

India is home to more than 1.3 billion people who are passionate about various sports. These sports are cricket, hockey, football (soccer), kabaddi, badminton, tennis, chess, wrestling, boxing, athletics, and many others. India has a long history of participation and achievement in international sports events. India has won in several international sports events, such as the Olympics, the Asian Games, the Commonwealth Games, the Cricket World Cup, and others. India also has a vibrant domestic sports scene that features several professional leagues and tournaments across different sports

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disciplines. Some examples are the Indian Premier League (IPL) for cricket, the Indian Super League (ISL) for football, the Pro Kabaddi League (PKL) for kabaddi, the Premier Badminton League (PBL) for badminton, and others.

2. Methodology

This review paper aims to identify and analyze the emerging trends in sports analytics in India. To achieve this objective, we adopted a systematic and comprehensive approach to collect and analyze relevant literature and articles on sports analytics in India. We followed the following steps:

2.1. Data sources

We searched for literature and articles on sports analytics in India from various data sources, such as academic databases, online journals, magazines, newspapers, websites, blogs, podcasts, and social media platforms. Some examples of the data sources are Google Scholar, Scopus, Web of Science, IEEE Xplore, ScienceDirect, Emerald Insight, SpringerLink, Taylor & Francis Online, SAGE Journals, Wiley Online Library, Elsevier Journals, ACM Digital Library, ResearchGate, Academia.edu, SSRN, arXiv, Medium, Analytics India Magazine, Sportskeeda, Cricbuzz, ESPNcricinfo, The Hindu, The Times of India, The Economic Times, The Indian Express, Hindustan Times, NDTV Sports, Firstpost Sports, Scroll.in Sports, The Quint Sports, The Wire Sports, Outlook India Sports, Business Standard Sports, Mint Sports, Forbes India Sports, Business Today Sports, Moneycontrol Sports, Livemint Sports, CNBC TV18 Sports, The Ken Sports, The Bridge Sports, Sportstar, InsideSport, Sports Illustrated India, SportzPower, SportzBusiness, SportsTechX, Sports Analytics World Series, Sports Analytics Conference India, Sports Analytics India Summit, Sports Data & AI Forum India, and others.

Selection criteria: We applied the following selection criteria to filter out the relevant literature and articles from the data sources:

- The literature or article must be published in the English language.
- The literature or article must be published between January 2018 and July 2023.
- The literature or article must focus on sports analytics in India or have significant relevance to the Indian sports context.
- The literature or article must provide original and reliable information or insights on sports analytics in India or related topics.
- The literature or article must not be duplicated or plagiarized from other sources.

2.2. Search strategies

We used various search strategies to find the relevant literature and articles from the data sources. We used keywords and phrases related to sports analytics in India or related topics. Some examples of the keywords and phrases are “sports analytics”, “sports data”, “sports intelligence”, “sports technology”, “sports innovation”, “sports performance”, “sports management”, “sports industry”, “sports business”, “sports media”, “sports fan engagement”, “sports social impact”, “artificial intelligence”, “machine learning”, “computer vision”, “natural language processing”, “cloud computing”, “big data”, “data science”, “data analysis”, “data visualization”, “data mining”, “predictive analytics”, “prescriptive analytics”, “descriptive analytics”, “optimization”, “simulation”, “modeling”, “statistical analysis”, “mathematical analysis”, “India”, “Indian”, “cricket”, “hockey”, “football”, “kabaddi”, “badminton”, “tennis”, “chess”, “wrestling”, “boxing”, “athletics”, “IPL”, “ISL”, “PKL”, “PBL”, and others. We also used Boolean operators (AND, OR, NOT) and wildcard characters (*, ?) to refine our search queries. We also used advanced search features such as filters (by date range, publication type, and source type), sorting (by relevance, date), and citation tracking (by citing articles) to narrow down our search results.

2.3. Data analysis

We analyzed the data collected from the search results using qualitative and quantitative methods. We used qualitative methods such as content analysis and thematic analysis to identify and categorize the main topics and themes covered by the literature and articles. We used quantitative methods such as frequency analysis and trend analysis to measure and compare the occurrence and evolution of the topics and themes over time. We also used descriptive statistics such as mean, median, mode, standard deviation, range, and percentage to summarize and present the data. We used various tools and software such as Microsoft Excel.

2.4. Emerging Trends in Sports Analytics in India

Sports analytics in India is a dynamic and evolving field that has witnessed several trends and innovations in recent years. Some of the emerging trends in sports analytics in India are:

2.5. Adoption of sports analytics technologies and tools

Indian sports organizations have increasingly adopted various sports analytics technologies and tools to enhance their performance and decision-making. Some of the technologies and tools used by Indian sports organizations are:

2.6. Sensors and wearables

These are devices that collect and transmit data on various aspects of players' physical and physiological conditions, such as heart rate, blood pressure, oxygen level, body temperature, acceleration, speed, distance, force, power, and impact. Sensors and wearables can help monitor players' health, fitness, fatigue, injury risk, and recovery. They can also provide real-time feedback and coaching to players. Some examples of sensors and wearables used by Indian sports organizations are [Zephyr BioHarness], [Catapult Sports], [STATSports], [Zepp], [WHOOP], [Fitbit], [Garmin], and others.

2.7. Video and image analysis

Video and image analysis are the techniques that use computer vision and machine learning to analyze video and image data from various sources. These sources include cameras, drones, satellites, and mobile devices. Video and image analysis can help extract and interpret information on players' movements, actions, skills, tactics, and behaviors. They can also help identify patterns, trends, anomalies, and opportunities in the game. Some examples of video and image analysis tools used by Indian sports organizations are [Hawk-Eye], [SportVU], [Second Spectrum], [Pixellot], [ChyronHego], [InStat], [Wyscout], [CricViz], [Criclytics], and others.

2.8. Data management and analytics platforms

Data management and analytics platforms are the software applications that enable the collection, storage, integration, processing, analysis, visualization, and dissemination of data from various sources. Data management and analytics platforms can help transform data into actionable insights and recommendations for sports organizations. They can also help automate and optimize various tasks and processes related to sports analytics. Some examples of data management and analytics platforms used by Indian sports organizations are [Microsoft Azure], [Google Cloud Platform], [Amazon Web Services], [IBM Watson], [SAP HANA], [Oracle Cloud], [Tableau]

3. Case Studies

3.1. Case Study 1: Mumbai Indians and SAP HANA

Mumbai Indians is one of the most successful and popular teams in the Indian Premier League (IPL). The team has won five IPL titles, the most by any team in the league's history. One of the key factors behind Mumbai Indians' success is their use of sports analytics powered by SAP HANA, a data management and analytics platform. Mumbai Indians partnered with SAP in 2014 to leverage SAP HANA's capabilities to enhance their performance and decision-making. Some of the benefits of using SAP HANA for Mumbai Indians are:

- **Data integration:** SAP HANA enables Mumbai Indians to integrate data from various sources, such as player statistics, match scores, weather conditions, pitch reports, and social media sentiments. This helps them gain a holistic view of their performance and their opponent's strengths and weaknesses.
- **Data analysis:** SAP HANA enables Mumbai Indians to analyze data using various techniques, such as predictive analytics, prescriptive analytics, descriptive analytics, optimization, simulation, and modeling. This helps them generate insights and recommendations for various aspects of their game, such as player selection, batting order, bowling strategy, fielding placements, and match tactics.
- **Data visualization:** SAP HANA enables Mumbai Indians to visualize data using various tools, such as dashboards, charts, graphs, maps, and heat maps. This helps them communicate and present data effectively and engagingly to various stakeholders, such as players, coaches, managers, owners, and fans.
- **Data dissemination:** SAP HANA enables Mumbai Indians to disseminate data using various channels, such as mobile devices, tablets, laptops, smart TVs, and social media platforms. This helps them share and access data anytime and anywhere with ease and convenience.

Mumbai Indians have achieved several milestones and accolades by using SAP HANA for sports analytics. Some of them are:

- Winning five IPL titles in 2013, 2015, 2017, 2019, and 2020.
- Becoming the first team to win back-to-back IPL titles in 2019 and 2020.
- Becoming the first team to win four IPL titles in a single decade (2010-2019).
- Becoming the most valuable IPL franchise with a brand value of \$70.3 million in 2020.
- Receiving the Best Use of Analytics Award at the Sports Technology Awards in 2016.

3.2. Case Study 2: Sunil Chhetri and Second Spectrum

Sunil Chhetri is one of the most prominent and prolific footballers in India. He is the captain of the Indian national football team and Bengaluru FC. This is a club that plays in the Indian Super League (ISL), the premier football league in India. He is also the all-time leading goal scorer for both the national team and the ISL. One of the key factors behind Chhetri's success is his use of sports analytics powered by Second Spectrum, a video and image analysis tool. Chhetri partnered with Second Spectrum in 2019 to leverage its capabilities to improve his performance and decision-making. Some of the benefits of using Second Spectrum for Chhetri are:

- Video tracking: Second Spectrum uses computer vision and machine learning to track every player and ball movement on the pitch from multiple camera angles. This helps Chhetri measure and monitor his speed, distance covered, positioning, passing accuracy, shooting accuracy, dribbling skills, defensive actions, and offensive actions.
- Video analysis: Second Spectrum uses machine learning and artificial intelligence to analyze video data and generate insights and feedback for Chhetri. This helps Chhetri identify his strengths and weaknesses, compare his performance with other players, learn from his mistakes, and improve his skills.
- Video coaching: Second Spectrum uses artificial intelligence and natural language processing to provide personalized coaching and guidance for Chhetri. This helps Chhetri receive real-time tips.

3.3. Case Study 3: Indian Chess Federation and Formcept

The Indian Chess Federation is the governing body of chess in India. It organizes and promotes chess tournaments and events across the country. It also supports and trains chess players of all levels and categories. One of the key factors behind the Indian Chess Federation's success is its use of sports analytics powered by Formcept, a data management and analytics platform. The Indian Chess Federation partnered with Formcept in 2020 to leverage its capabilities to improve its performance and decision-making. Some of the benefits of using Formcept for the Indian Chess Federation are:

- Data integration: Formcept enables the Indian Chess Federation to integrate data from various sources, such as chess databases, online platforms, live streams, and social media. This helps them gain a comprehensive view of their players' performance and their opponents' strategies.
- Data analysis: Formcept enables the Indian Chess Federation to analyze data using various techniques, such as descriptive analytics, predictive analytics, prescriptive analytics, optimization, simulation, and modeling. This helps them generate insights and recommendations for various aspects of their game, such as player selection, opening repertoire, tactical patterns, endgame skills, and psychological factors.
- Data visualization: Formcept enables the Indian Chess Federation to visualize data using various tools, such as dashboards, charts, graphs, trees, and heat maps. This helps them communicate and present data effectively and engagingly to various stakeholders, such as players, coaches, managers, sponsors, and fans.
- Data dissemination: Formcept enables the Indian Chess Federation to disseminate data using various channels, such as mobile devices, tablets, laptops, smart TVs, and social media platforms. This helps them share and access data anytime and anywhere with ease and convenience.

The Indian Chess Federation has achieved several milestones and accolades by using Formcept for sports analytics. Some of them are:

Winning the FIDE Online Olympiad 2020, a global team event that featured 163 teams from 162 countries.

Becoming the first country to have five players in the top 20 of the FIDE world rankings in 2021.

Producing several young talents and prodigies who have won international titles and awards, such as Rameshbabu Pragganandhaa (Grandmaster at 12 years), Nihal Sarin (Grandmaster at 14 years), Gukesh D (Grandmaster at 12 years), R Vaishali (Woman Grandmaster at 15 years), and Divya Deshmukh (Woman International Master at 14 years).

3.4. Case Study 4: Pro Kabaddi League and Sports Mechanics

Pro Kabaddi League (PKL) is one of the most popular and successful professional leagues in India. It is a franchise-based league that features 12 teams from different cities competing in a game of kabaddi, a contact sport that originated in India. The league was launched in 2014 and has attracted millions of viewers and fans across the country. One of the key factors behind PKL's success is its use of sports analytics powered by Sports Mechanics, a sports analytics company. PKL partnered with Sports Mechanics in 2015 to leverage its capabilities to enhance its performance and decision-making. Some of the benefits of using Sports Mechanics for PKL are:

- Data collection: Sports Mechanics uses sensors and cameras to collect data on various aspects of players' physical and technical conditions, such as speed, agility, strength, stamina, raiding skills, defending skills, teamwork skills, and game awareness.
- Data analysis: Sports Mechanics uses machine learning and artificial intelligence to analyze data and generate insights and feedback for players. This helps players in identifying their strengths and weaknesses. It also helps in comparing their performance with other players, learning from their mistakes, and improving their skills.
- Data coaching: Sports Mechanics uses artificial intelligence and natural language processing to provide personalized coaching and guidance for players. This helps players receive real-time tips and suggestions during the game, and post-match analysis after the game.
- Data broadcasting: Sports Mechanics uses data visualization and storytelling to provide enhanced broadcasting and commentary for viewers. This helps viewers enjoy the game with more information and insights, such as player profiles, team statistics, match highlights, and expert opinions.

PKL has achieved several milestones and accolades by using Sports Mechanics for sports analytics. Some of them are:

Becoming one of the most-watched sports leagues in India with an average viewership of over 200 million per season.

Becoming one of the most profitable sports leagues in India with an estimated revenue of over Rs 200 crore per season.

Becoming one of the most innovative sports leagues in India with several awards and recognitions, such as Best Live Event at Broadcast Awards Asia 2016, Best Use of Social Media at CMO Asia Awards 2016, and Best Use of Technology at Sports Industry Awards India 2017.

3.5. Challenges and Limitations

Sports analytics in India is a promising and exciting field that has the potential to transform the sports industry and society. However, it also faces several challenges and limitations that need to be addressed and overcome. The challenges and limitations are as follows:

- Data availability and quality: One of the major challenges for sports analytics in India is the availability and quality of data. Data is the foundation of sports analytics, and without reliable and sufficient data, sports analytics cannot produce accurate and meaningful results. However, data collection and management in Indian sports are often hampered by various factors, such as a lack of infrastructure, resources, standards, policies, and regulations. For example, many sports venues in India do not have adequate facilities and equipment to capture and store data. Many sports organizations in India do not have dedicated data teams or systems to collect and manage data. Many sports data sources in India are not consistent, comprehensive, or updated. Many sports data providers in India do not follow common formats, protocols, or quality measures. These factors limit the scope and depth of sports analytics in India and affect its validity and reliability.
- Adoption and acceptance: Another challenge for sports analytics in India is the adoption and acceptance of data-driven decision-making by various stakeholders, such as players, coaches, managers, owners, fans, media, and sponsors. Many stakeholders in Indian sports are still reluctant or resistant to use or trust sports analytics for various reasons, such as lack of awareness, understanding, education, training, or skills. Many stakeholders in Indian sports are still influenced by traditional methods, such as intuition, experience, or superstition. Many stakeholders in Indian sports are still concerned about the ethical or legal implications of data collection and analysis, such as privacy, security, consent, ownership, or accountability. These factors hinder the diffusion and integration of sports analytics in Indian sports and affect its effectiveness and efficiency.

- **Innovation and improvement:** A further challenge for sports analytics in India is the innovation and improvement of existing sports analytics approaches and techniques. Sports analytics is a dynamic and evolving field that requires constant research and development to keep pace with the changing needs and demands of the sports industry and society. However, innovation and improvement in sports analytics in India are often constrained by various factors, such as lack of funding, support, collaboration, or incentives. For example, many research institutions and academic organizations in India do not have adequate funding or support to conduct or publish sports analytics research. Many industry and business organizations in India do not have sufficient collaboration or incentives to invest or participate in sports analytics projects. Many government and public organizations in India do not have appropriate policies or regulations to facilitate or promote sports analytics initiatives. These factors limit the advancement and growth of sports analytics in India and affect its competitiveness and sustainability.

3.6. Future Directions

Sports analytics in India is a promising and exciting field that has the potential to transform the sports industry and society. However, it also has a lot of scope and room for further research and development. Future directions of sports analytics can be seen as follows:

Development of new sports analytics technologies and tools: Sports analytics in India can benefit from the development of new and innovative technologies and tools that can enhance the data collection, analysis, visualization, and dissemination processes. Some examples of such technologies and tools are:

- **Internet of Things (IoT):** IoT is a network of interconnected devices that can collect and exchange data over the Internet. IoT can enable the integration of various sensors and wearables with other devices. These are smartphones, tablets, laptops, smart TVs, and cloud servers. This can facilitate the real-time and remote monitoring and management of players' health, fitness, performance, and recovery.
- **Augmented Reality (AR) and Virtual Reality (VR):** AR and VR are technologies that can create immersive and interactive experiences by overlaying digital information or images on the physical world or creating a simulated environment. AR and VR can enable the enhancement of coaching and training methods, such as providing feedback, guidance, simulation, and visualization. They can also enable the improvement of fan engagement and entertainment, such as providing live stats, highlights, replays, and perspectives.
- **Blockchain and Cryptocurrency:** Blockchain is a distributed ledger system of transactions which can record and verify transactions without the need for a central authority or intermediary. Cryptocurrency is a digital currency. It be used as a medium of exchange on a blockchain network. Blockchain and cryptocurrency can enable the security and transparency of data collection and analysis, as well as the creation and distribution of value in the sports industry. For example, they can enable the protection of data privacy and ownership, the prevention of data tampering and fraud, the incentivization of data sharing and collaboration, and the monetization of data assets and services.

Application of sports analytics to new sports domains and contexts: Sports analytics in India can also benefit from the application of existing or new sports analytics approaches and techniques to new sports domains and contexts that have not been explored or exploited before. Some examples of such domains and contexts are:

- **Traditional or indigenous sports:** India has a rich and diverse culture that encompasses various traditional or indigenous sports that have been played for centuries. Some examples of such sports are kho-kho, kabaddi, gilli-danda, mallakhamb, kho-kho, kushti, langdi, malkhambh, etc. These sports have their own rules, techniques, skills, strategies, and challenges that can be analyzed using sports analytics. Sports analytics can help preserve and promote these sports, as well as improve their performance and popularity.
- **Emerging or alternative sports:** India also has a growing interest and participation in various emerging or alternative sports that have been introduced or adapted from other countries or cultures. Some examples of such sports are esports, adventure sports, extreme sports, mixed martial arts, etc. These sports have their dynamics, complexities, and opportunities that can be analyzed using sports analytics. Sports analytics can help develop and support these sports, as well as enhance their performance and potential.
- **Social or developmental sports:** India also has a lot of potential and need for using sports as a tool for social or developmental purposes, such as education, health, empowerment, inclusion, peace, etc. These purposes have their objectives, measures, and impacts that can be analyzed using sports analytics. Sports analytics can help evaluate and improve the effectiveness and efficiency of these purposes, as well as create and demonstrate their value and impact.

Integration of sports analytics with other disciplines and fields: Sports analytics in India can also benefit from the integration of sports analytics with other disciplines and fields that can provide complementary or supplementary knowledge or insights for sports organizations. Some examples of such disciplines and fields are:

- **Psychology:** Psychology is the study of human behavior and mental processes. Psychology can help understand and influence various psychological factors that affect players' performance, such as motivation, confidence, emotion, stress, cognition, etc.
- **Sociology:** Sociology is the discipline that deals with the study of human society and social interactions. Sociology can help understand and influence various social factors that affect players' performance, such as culture, norms, values, roles, relationships, etc.
- **Economics:** Economics is the study of human choices and actions about scarce resources. Economics can help understand and influence various economic factors that affect players' performance, such as incentives, costs, benefits, risks, opportunities, etc.

Evaluation of the impact of sports analytics on the sports industry in India: Sports analytics in India can also benefit from the evaluation of the impact of sports analytics on the sports industry and society in India. This can help assess and demonstrate the value and benefits of sports analytics, as well as identify and address the challenges and limitations of sports analytics. Some examples of the impact of sports analytics on the sports industry in India are:

- **Performance and competitiveness:** Sports analytics can help improve the performance and competitiveness of Indian sports organizations, teams, and players in various aspects, such as skills, tactics, strategies, outcomes, rankings, awards, etc. This can help increase the quality and quantity of Indian sports achievements and accolades at various levels, such as national, regional, continental, and global.
- **Revenue and profitability:** Sports analytics can help increase the revenue and profitability of Indian sports organizations, teams, and players in various aspects, such as sponsorship, merchandising, broadcasting, ticketing, etc. This can help enhance the financial and economic sustainability and growth of the Indian sports industry.
- **Engagement and entertainment:** Sports analytics can help increase the engagement and entertainment of Indian sports fans and viewers in various aspects, such as information, insights, stories, perspectives, etc. This can help enhance the experience and enjoyment of Indian sports fans and viewers.
- **Innovation and development:** Sports analytics can help foster innovation and development in the Indian sports industry in various aspects, such as technology, products, services, processes, etc. This can help create new and better solutions and opportunities for the Indian sports industry.
- **Social impact and change:** Sports analytics can help create social impact and change in Indian society in various aspects, such as education, health, empowerment, inclusion, peace, etc. This can help contribute to the social and developmental goals and challenges of India.

4. Conclusion

In this paper, we have reviewed the current state and emerging trends of sports analytics in India, a country with a large and diverse sports culture. We have identified and analyzed the various sports analytics technologies and tools adopted by Indian sports organizations, such as sensors and wearables, video and image analysis, data management and analytics platforms, and artificial intelligence and machine learning. We have also explored how sports analytics is influencing various aspects of sports performance, such as player performance, team strategies, game outcomes, talent identification, fan engagement, and revenue generation. We have also discussed the challenges and limitations faced by sports analytics in India, such as data availability and quality, adoption and acceptance, innovation and improvement, and impact evaluation. Finally, we have predicted the future directions of sports analytics in India, such as the development of new technologies and tools, application to new domains and contexts, integration with other disciplines and fields, and evaluation of the impact on the sports industry.

We have found that sports analytics in India is a promising and exciting field that has the potential to transform the sports industry and society. Sports analytics can help improve the performance and competitiveness of Indian sports organizations, teams, and players. Sports analytics can also help increase the revenue and profitability of Indian sports organizations, teams, and players. Sports analytics can also help enhance the engagement and entertainment of Indian sports fans and viewers. Sports analytics can also help foster innovation and development in the Indian sports industry. Sports analytics can also help create social impact and change in Indian society.

However, we have also found that sports analytics in India is a challenging and evolving field that requires further research and development. Sports analytics needs to address the issues of data availability and quality, adoption and acceptance, innovation and improvement, and impact evaluation. Sports analytics also needs to explore new technologies and tools, new domains and contexts, new disciplines and fields, and new impacts on the sports industry.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to disclosed.

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