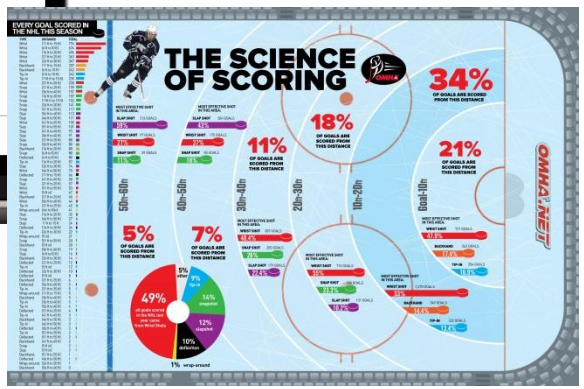
Sports Analytics

https://www.ida.liu.se/~TDDE64/

Sports Analytics@IDA/ADIT

Problems

- ***Team and player performance***
- Training
- Strategies
- Injuries



Techniques

- ***Machine learning and data mining***
- ***Knowledge representation and databases***
- ***Visualization and UI***
- Image recognition

http://www.ida.liu.se/research/sportsanalytics

Sports Analytics

“Sports analytics are a collection of relevant, historical, statistics that when properly applied can provide a competitive advantage to a team or individual. Through the collection and analyzation of these data, sports analytics inform players, coaches and other staff in order to facilitate decision making both during and prior to sporting events.” [wikipedia]

Sports Analytics

- On-field analytics: improving the on-field performance of teams and players. (e.g., game tactics, player performance, player fitness.)
- Off-field analytics: business side of sports. (e.g., ticket and merchandise sales, fan engagement, game attendance)

Sports Analytics – Example applications

Scouting, Coaching and Performance Improvement

- Identifying young talent
- Identifying players that are undervalued by the market
- Understanding how athletes can improve skills, physical preparedness and mental conditioning
- Understanding team/player strengths and weaknesses, to help develop strategy and tactics

Sports Analytics – Example applications

Broadcasting and fans' viewing experience

- Index content fast, tools for editors and producers to quickly create content for fans
- Fans decide how to view a game
- Tracking of attendees' emotions in real time to understand how much they enjoyed an event
- Wearables to track player activity. Fans can access corresponding mobile apps.

Sports Analytics - History

- Henry Chadwick, (New York sportswriter), developed the box score in 1858.

Boston	r.	b.	1b.	p.o.	a.	e.
G. Wright, s.s	6	4	4	1	5	2
Leonard, 2 b.	6	3	3	4	4	3
O'Rourke, 1b	6	2	3	9	0	1
Murnan, l. f.	6	1	0	3	1	0
Schafer, 3d b	6	3	3	3	1	2
McGinley, c. f	6	0	0	0	0	1
Manning, r. f.	6	0	2	2	0	0
Morrill, c.	6	2	2	4	1	2
Josephs, p.	5	4	4	1	1	2
Totals	53	19	21	27	13	13

Athletic	r.	b.	1b.	p.o.	a.	e.
Force, s. s.	5	1	2	1	3	2
Eggler, c. f.	5	3	3	0	0	0
Fisler, r. f.	5	0	1	2	0	0
Meyerle, 3d b	5	1	2	2	3	3
Sutton, 1st b.	5	1	2	10	0	0
Coons, c.	5	1	0	1	1	3
Hall, l. f.	5	1	3	5	0	0
Fowser, 2d b.	6	1	2	2	1	3
Knight, p.	5	2	2	0	1	1
Totals	46	11	17	27	15	15

Boston	9	1	3	3	4	1	0	2	5—19
Athletic	1	0	0	0	3	5	2	2	0—11

Runs earned—Boston, 4; Athletic, 5. Home-run—Hall, 1. Total bases on hits—Boston, 22; Athletic, 20. First base by errors—Boston, 8; Athletic, 5. Umpire, George White of Lowell, Mass. Time 2h. 47m.

1876

wikipedia

Sports Analytics - History

- Baseball box score usually includes a line score and player performance measures

Team	1	2	3	4	5	6	7	8	9	R	H	E
Brooklyn	1	0	0	0	0	0	0	3	0	**4**	**8**	**0**
New York	0	0	0	0	1	0	0	0	4	**5**	**8**	**0**
WP: Larry Jansen **LP:** Ralph Branca												

wikipedia

Sports Analytics - History

- SABR (Society for American Baseball Research) (1971)

  Sabermetrics

- Annual Baseball Abstracts by Bill James (1977)

- Moneyball

Sports Analytics - History

- **Some early academic work**

G. R. Lindsey, Statistical Data Useful for the Operation of a Baseball Team, *Operations Research* 7(2):197-207, 1959

- **Specialized journal**

Journal of Quantitative Analysis in Sports (2005)

Sports Analytics - Enablers

- Availability of lots of data
  - Improved reporting (media, coaches, medical staff,…)
  - Innovations in sports (training, nutrition, …)
  - Leveraging historical data
  - Motion capture
- More advanced algorithms
  - Descriptive analytics
  - Visualization
  - Predictive analytics

Sports Analytics - Enablers

- Students and researchers applying advanced methods to sports
  - SABR 1971
  - Available data allows fans to work to analyze the data
  - Successful analyses may lead to jobs at teams
- Teams start using sports analytics
  - 'Moneyball' 2002, Oakland Athletics (MLB), Billy Bean
  - Started in MLB; NBA and NHL follow; some in NFL

Sports Analytics – Adoption barriers

- Most decision-makers have little to no experience or training in analytics
- Strongly held beliefs about the sport and its workings based on personal experience
- Lack of talented sports analytics professionals
- Communication barrier between analysts and professionals in sports
- Many sports organizations view data summaries and analytic results as another type of information; need for integration

Sports Analytics in MLB 2015

- ALL-IN: Boston Red Sox *+, Chicago Cubs +, Cleveland Indians, Houston Astros +, New York Yankees, Oakland A's, Pittsburgh Pirates, St. Louis Cardinals *, Tampa Bay Rays
- BELIEVERS: Baltimore Orioles, Kansas City Royals *, Los Angeles Dodgers +, New York Mets, San Diego Padres, Toronto Blue Jays, Washington Nationals +
- ONE FOOT IN: Chicago White Sox, Los Angeles Angels, Milwaukee Brewers, San Francisco Giants ***, Seattle Mariners, Texas Rangers
- SKEPTICS: Arizona Diamondbacks, Atlanta Braves +, Cincinnati Reds, Colorado Rockies, Detroit Tigers, Minnesota Twins
- NONBELIEVERS: Miami Marlins, Philadelphia Phillies

*: champions 2010-2015; +: champions 2016-2021

http://www.espn.com/espn/feature/story/_/id/12331388/the-great-analytics-rankings

Sports Analytics in NBA 2015

- ALL-IN: Dallas Mavericks *, Houston Rockets, Philadelphia 76ers, San Antonio Spurs **
- BELIEVERS: Atlanta Hawks, Boston Celtics, Cleveland Cavaliers, Detroit Pistons, Golden State Warriors *+++, Memphis Grizzlies, Oklahoma City Thunder *, Portland Trail Blazers
- ONE FOOT IN
- Charlotte Hornets, Indiana Pacers, Miami Heat, Milwaukee Bucks +, Orlando Magic, Phoenix Suns, Sacramento Kings, Toronto Raptors +, Utah Jazz
- SKEPTICS: Chicago Bulls, Denver Nuggets, Los Angeles Clippers, Minnesota Timberwolves, New Orleans Pelicans, Washington Wizards
- NONBELIEVERS: Brooklyn Nets, Los Angeles Lakers *+, New York Knicks

*: champions 2010-2015; +: champions 2016-2021

http://www.espn.com/espn/feature/story/_/id/12331388/the-great-analytics-rankings

Sports Analytics in NHL 2015

- ALL-IN: Chicago Blackhawks ***
- BELIEVERS: Boston Bruins *, Buffalo Sabres, Columbus Blue Jackets, Edmonton Oilers, Los Angeles Kings **, Minnesota Wild, New York Islanders, Pittsburgh Penguins ++, St. Louis Blues +, Tampa Bay Lightning ++, Toronto Maple Leafs, Washington Capitals +, Winnipeg Jets
- ONE FOOT IN: Arizona Coyotes, Calgary Flames, Carolina Hurricanes, Dallas Stars, Detroit Red Wings, Florida Panthers, Montreal Canadiens, Nashville Predators, New Jersey Devils,Philadelphia Flyers, San Jose Sharks, Vancouver Canucks
- SKEPTICS: Anaheim Ducks, New York Rangers, Ottawa Senators
- NONBELIEVERS: Colorado Avalanche

*: champions 2010-2015; +: champions 2016-2021

http://www.espn.com/espn/feature/story/_/id/12331388/the-great-analytics-rankings

Sports Analytics in NFL 2015

ALL-IN: -

BELIEVERS: Atlanta Falcons, Baltimore Ravens *, Cleveland Browns, Dallas Cowboys, Jacksonville Jaguars, Kansas City Chiefs +, New England Patriots *++, Philadelphia Eagles +, San Francisco 49ers

ONE FOOT IN: Buffalo Bills, Chicago Bears, Green Bay Packers *, Miami Dolphins, Oakland Raiders, Seattle Seahawks *, Tampa Bay Buccaneers +

SKEPTICS: Arizona Cardinals, Carolina Panthers, Cincinnati Bengals, Denver Broncos +, Detroit Lions, Houston Texans, Indianapolis Colts, Minnesota Vikings, New Orleans Saints *, New York Giants *, Pittsburgh Steelers, St. Louis/LA Rams +

NONBELIEVERS: , New York Jets, San Diego Chargers, Tennessee Titans, Washington Redskins

*: champions 2010-2015; +: champions 2016-2022

http://www.espn.com/espn/feature/story/_/id/12331388/the-great-analytics-rankings

Sports analytics good use Top 10 MLB/NBA/NHL/NFL 2015

1. PHILADELPHIA 76ERS (NBA): 5 staff, mining player health, theories on roster construction

2. HOUSTON ASTROS (MLB): 9 staff, including a medical risk manager and a mathematical modeler

3. HOUSTON ROCKETS (NBA): multiple analysts

4. TAMPA BAY RAYS (MLB): 8 staff, find numerical advantages in defensive shifts and roster moves

5. BOSTON RED SOX (MLB): recruitment, valuing action impacts

http://www.espn.com/espn/feature/story/_/id/12331388/the-great-analytics-rankings

Sports analytics good use Top 10 MLB/NBA/NHL/NFL 2015

6. NEW YORK YANKEES (MLB): 15 staff

7. SAN ANTONIO SPURS (NBA): original subscriber to SportVU cameras, which track player location at a rate of 25 times per second

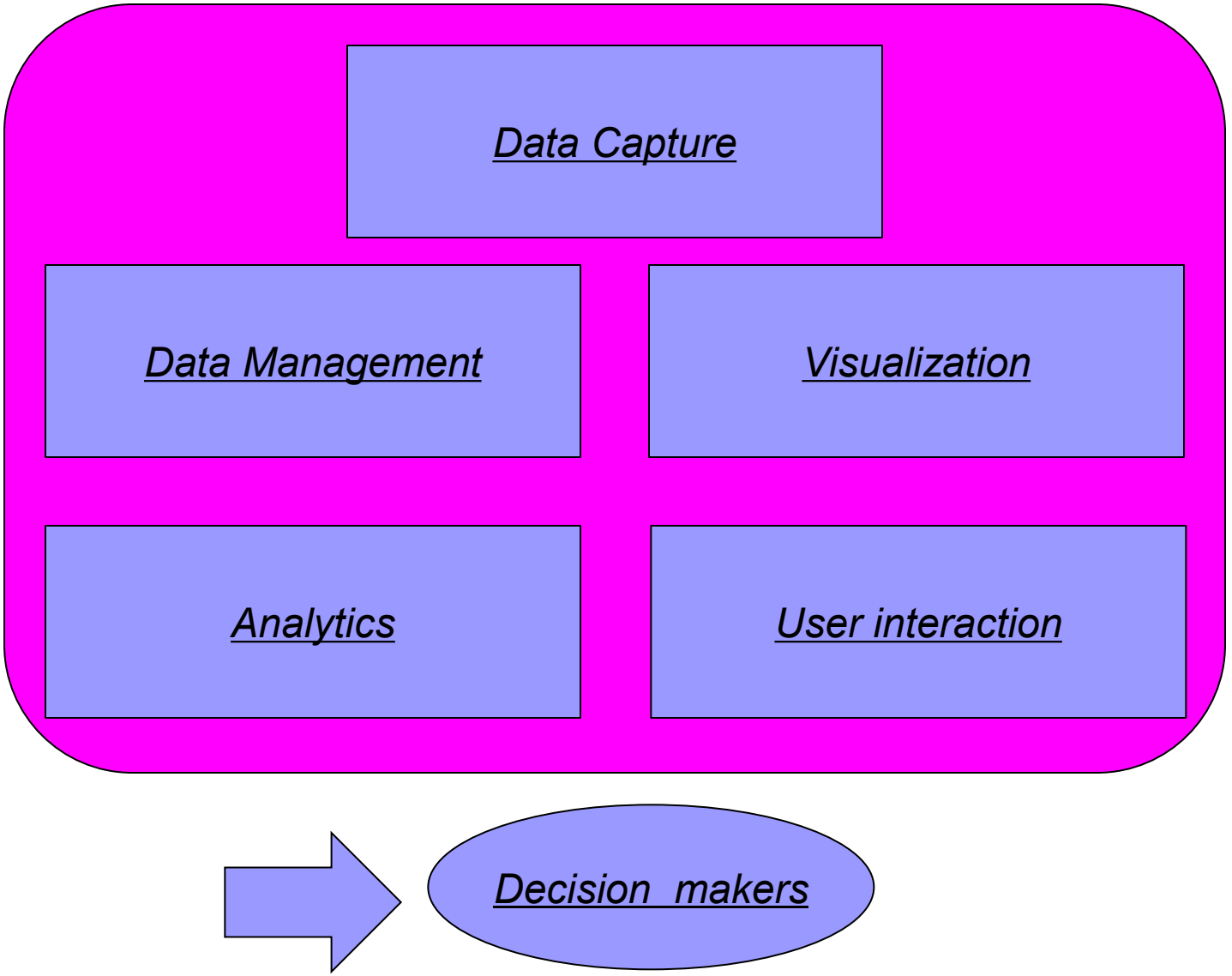
8. DALLAS MAVERICKS (NBA): player workload to keep players healthy

9. OAKLAND ATHLETICS (MLB) 'Moneyball'

10. CHICAGO BLACKHAWKS (NHL): pioneers in Corsi and Fenwick ratings, which value players by possessions instead of points

http://www.espn.com/espn/feature/story/_/id/12331388/the-great-analytics-rankings

Tools


Data Capture
Data Management
Visualization
Analytics
User interaction
Decision makers

Tools (some examples)

- Multi
  - Catapult Sports (performance tracking, wearable technology, video analysis, athlete management)
  - SportLogiq /Teamworks (e.g., SHL) (image recognition from TV broadcasts, visualization)
  - SportVU (tracking, player-location data at a rate of 25 times per second)
  - KINEXON/Dartfish (image recognition, performance)
  - Spiideo (image recognition)
  - Hudl (image recognition, performance)

Tools (some examples)

- Football
  - SciSports (image recognition from video data, visualization, player performance)
  - Football Analytics Sweden /Playmaker AI (TV4; interactive pass maps,visualization)

Tools (some examples)

- Ice Hockey
  - 49ing (image recognition, LLMs, performance)
  - Stretch (data integration)
- Basketball
  - ShotTracker (real-time tracking)
- Tennis
  - IBM SlamTracker (dash-board for statistics)
- Many teams build their own systems

Sports Analytics - Recent trends

- Tracking from video/TV broadcasts
- Wearable devices (heart rate, speed, acceleration)

- New performance and strategy models

- Future: Mental abilities (e.g., Capacio)

Sports Analytics - Material

- Proprietary material in the clubs
- Blogs

Sports Analytics – Material - Academia

- Journals
  - Journal of Quantitative Analysis in Sports
  - Journal of Sports Analytics
  - Special issues: Data Mining and Knowledge Discovery, Big Data, Machine Learning
- Conferences
  - MIT Sloan Sports Analytics Conference
  - MathSport International
- Workshops (currently running)
  - Machine Learning and Data Mining for Sports Analytics

References

Web:

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- http://analytics-magazine.org/the-emergence-of-sport-analytics/
- http://analytics-magazine.org/beyond-moneyball-the-rapidly-evolving-world-of-sports-analytics-part-i/, http://analytics-magazine.org/sports-analytics-part-2/, http://analytics-magazine.org/analytics-a-sports-part-iii-improving-resource-allocation-with-portfolio-decision-analysis/
- https://www.cbinsights.com/research/future-sports-stadium-technology-market-map/

- https://en.wikipedia.org/wiki/Sports_analytics

References

- Lewis M, *Moneyball - The Art of Winning an Unfair Game*, WW Norton & Co, 2004 .
- Swartz T, Where Should I Publish My Sports Paper?, *The American Statistician*, 2018.

COURSE ORGANIZATION

Lectures

- Introduction (Patrick)
- Research @ IDA in ice hockey, football, basketball (Patrick)
- Guest lectures
  - Ola Lidmark Eriksson (Playmaker AI)
  - Marcus Bendtsen (LiU)
- Student presentations

Credit requirements - 1

- **Presentation of research paper**.
  - Alone or in group
  - Presentation 15 minutes per student
  - Select your paper(s) and get them approved by Patrick latest April 17, 2026.
  - Send slides latest 1 week before presentation time to Patrick.

Credit requirements - 2

- **Project.**
  - Alone or in group
  - Participate in LINHAC student competition. Deadline April 24, 2026.
  - https://www.ida.liu.se/research/sportsanalytics/LINHAC/LINHAC26/studentcompetition.html

  OR
  - Define your own project and get it approved by Patrick latest May 9, 2026.
  - Ca 100 hours per person

Credit requirements – 2

Topics:

- LINHAC
- Drafts in NBA
- Expected goals in football
- Passing strategies in football
- Comparing key performance indicators in football
- Visualizing passing reception in football
- Predicting tournament outcome in football
- Predicting biathlon shooting outcomes
- Predicting ball-by-ball outcomes in cricket
- Golf Performance Analysis and Prediction
- Prediction lap times in Formula 1
- Visualization of ice hockey data for goalkeepers
- Importance of top players in SHL
- …

Linköping Hockey Analytics Conference - LINHAC

Linköping, Sweden

Home | Calls | Program | Registration | Student Competition | Travel | Venue | Organization | Industry packages | Press

Registration for 2026 will open later

For enquiries send mail to:
LINHAC@groups.liu.se

Tweets by linhacevent

LINHAC is Europe's only conference on ice hockey analytics. It is also the only 3-day event on this topic world-wide.

LINHAC aims to bring together professionals and academics with an interest in hockey analytics. LINHAC features the latest research in hockey analytics in academia and companies, panel discussions with analysts, coaches, GMs and players, industry sessions with the latest hockey analytics products, and an analytics competition for students.

LINHAC is organized by Linköping University. Previous editions have been held in cooperation with Linköping Hockey Club, the Alliance of European Hockey Clubs and the City of Linköping. Support has been provided by the Swedish Research Council for Sport Science.

Current LINHAC

All tabs in this page point to the LINHAC 2026. (Not all tabs are activated yet.)

LINHAC 2026 will be the fifth edition of LINHAC and take place June 2-4, 2026, in Linköping, Sweden, as a hybrid conference. The conference is planned to start on June 2 with lunch and end in the evening on June 4 (Linköping time).

Previous conferences

- LINHAC 2025
- LINHAC 2024
- LINHAC 2023
- LINHAC 2022

Organized by

LINKÖPING UNIVERSITY

In cooperation with

ALLIANCE OF EHC EUROPEAN HOCKEY CLUBS

With support from

CENTRUM FÖR IDROTTSFORSKNING

https://www.ida.liu.se/research/sportsanalytics/LINHAC/

LINHAC student competition – open for all students

- **Data set**

Data produced by Sportlogiq provided with permission of SHL, the Swedish Hockey League, representing event data from an SHL season.

- **Task:**

Given the event data, generate findings/patterns related to sequences of events leading up to a particular outcome. You can choose the kind of outcome. For instance, find characteristics of sequences of events leading to, e.g., a goal or a successful zone entry.