Carnegie Mellon University

SCORE NETWORK

SCORE with Data: Sports Content for Outreach, Research, and Education

Rebecca Nugent (on behalf of SCORE)

Stephen E. & Joyce Fienberg Professor of Statistics & Data Science
Head, Department of Statistics & Data Science
PI, NSF SCORE with Data, NSF Award #2142705

DATA SCIENCE & AI

The Good News:

Students have never been more excited about working with data; opportunities are everywhere.

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Students hear about the importance of AI, but also how it's going to take their jobs.

EXAMPLE CMU STUDENT EMAIL ABOUT THEIR BACKGROUND

Mildly inappropriate greeting because students don't know how to write emails anymore,

I am interested in studying data science, machine learning, and/or AI at your university/as part of your research group. Ever since I was a young child, I have loved advanced machine learning and written Python/C++/R/flavor of the month code to build AI models and am confident that I could contribute to your program/courses/research. For example, I have built machine learning models and used AI to predict <fill-in-the-blank> and <fill-in-the-blank>.

I believe that I have the background knowledge and skills necessary to skip into <advanced models/machine learning course> and can assure you that I will make up any deficits on my own through online material.

Thank you,
Well-meaning student

EXAMPLE CMU STUDENT EMAIL ABOUT THEIR BACKGROUND: TRANSLATION

Mildly inappropriate greeting because students don't know how to write emails anymore,

I do not yet understand mathematics and statistics.

While I have done quite a bit of work downloading, reading, and running code from the internet, I have little to no exposure to the ideas of randomness and variance, and as such, it is difficult for me to understand why or when my models work. I often mistake "the code ran without crashing" with "the results are right".

I really should take more foundational mathematics and statistics classes, not fewer.

Thank you,
Well-meaning student

Note: CMU has added pre-calculus courses this year to help with lack of preparedness/pipeline

And then there is the pipeline problem…..

Real FaceTime conversation in January with two grumpy children of CMU Statistics & Data Science faculty:

I don't want to go to school. School sucks. Math sucks.

Math is used in everything you do and like. It's the best.
You know, I'm in DC for the Joint Math Meetings with thousands of people who like math.

Oh god, who would want to go to that meeting? (many eye-rolls)

Hey Mom, tell them that when you do math, you should wear your glasses because it helps with "da vision"!

This is what we're dealing with.

The World of Data Science & AI

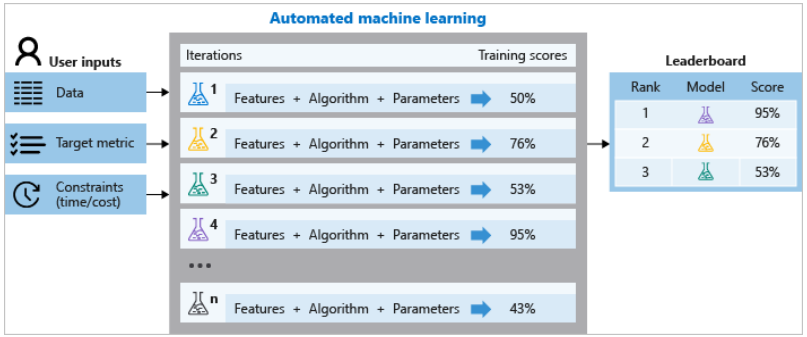
The Matrix

Iron Man

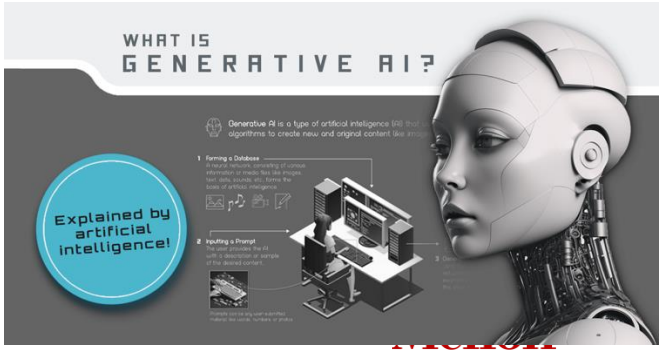
Data science (and AI): a way to collect information and make decisions about the world around us through complex technology

Extract value from data to solve real world problems

While "data technology" advances, it is crucial for everyone to gain skills in interpretation and communication



Microsoft Azure



Visual Capitalist

It's All About Communicating the Data

"After analyzing all your data, I think we can safely say that none of it is useful."

"After careful consideration of all 437 charts, graphs, and metrics, I've decided to throw up my hands, hit the liquor store, and get snockered. Who's with me?!"

So how do we get people to use and communicate about data?

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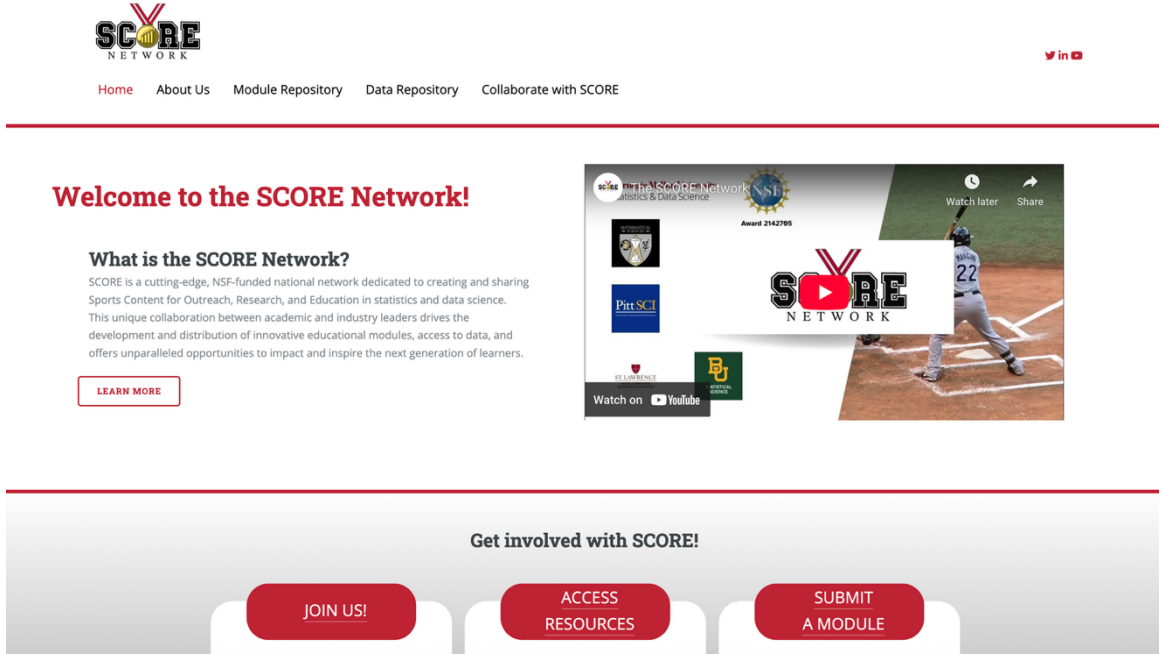
SCORE with Data

Building a sustainable national network for developing and disseminating Sports Content for Outreach, Research, Education in data science



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SCORE with Data

- Unique NSF-funded project combining academia, professional sports, and media to build a repository of educational materials for statistics & data science that use sports applications/analytics

- National network with initial hubs at
  - *Pittsburgh*: Carnegie Mellon Univ, Univ of Pittsburgh
  - *New York*: St Lawrence Univ, West Point Academy, Yale Univ
  - *Texas*: Baylor University, Asuza Pacific Univ
  - New primary hubs at UNC Charlotte and St Thomas Univ (MN)

- Publicly accessible materials that have been reviewed/vetted by experts
  Citations supported; use metrics available for educators/creators

- Pedagogical resources and collaborator network available for support

- Strong emphasis on outreach and building pipelines/community

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SCORE with Data: The Roster

Rebecca Nugent (PI, Pittsburgh Hub)
Meet the team captain , Rebecca Nugent. A
Statistics & Data Science, she brings a game
Academies of Science, Engineering, and Me
Meritorious Teaching and the ASA's Waller

Nicholas Clark (co-PI, Minnesota Hub)
Nick Clark is a powerhouse with a stat-heav
Professor at the University of St Thomas in
education and training, and outside of the

Michael Schuckers (co-PI, New York Hub)
Schuckers is our analytics all-rounder. A Prof
academia. A recipient of the ASA's Section or
also a prolific author.

Rodney X. Sturdivant (co-PI, Baylor Hub)
Rodney Sturdivant is our sports stats coach.
training drills and resources for statistical ed
authored a highly cited text on logistic regres

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SCORE with Data: The Roster

Samantha Nielsen (Pittsburgh Hub)
Take a moment to meet Samantha Nielsen, the powerhouse Assc
constantly driving forward with innovative plays in the academic
Psychology and Family Studies, Sam brings a diverse playbook to
management and tech implementation, she's always had her eye
project's goals.

Peter Freeman (Senior Personnel, Pittsburgh Hub)
Peter Freeman is our playbook strategist. An Associate Teaching
and Director of the Undergraduate Program, he's a pro at scopin
proven to be a game-changer in statistical learning workshops an

Michael P. B. Gallaugher (Baylor Hub)
Mike Gallaugher is our classification and clustering quarterback.
brings a unique interest in complex data types like higher order d
Classification Society, keeping us in line with the best practices.

Andrew Lee (Senior Personnel, New York Hub)
Andrew Lee is our operations research and transportation model
innovative educator with a unique flair for pedagogy. His expertis

Robin Lock (Senior Personnel, New York Hub)
Robin Lock is our stats education learning goal-tender. A distingu
education. He's a fellow of the ASA and the inaugural winner of th
interesting data and applications for teaching statistics, and his c

Brian Macdonald (Yale Hub)
Brian Macdonald is our industry scout. A Senior Lecturer a
previously been on the front lines in the sports industry wi
industry experience and a unique understanding of sports

Joshua Patrick (Baylor Hub)
Joshua Patrick is our data analyst outfielder. A Lecturer at
temporal modeling and statistics education to our team. H
that he knows how to hit analytical home runs.

Ivan Ramler (Senior Personnel, New York Hub)
Ivan Ramler is our e-sports analyst and digital games strat
Computer Science, and Statistics, he has made waves in th
Legends. Beyond his remarkable skills on the Rift (having r
underrepresented and/or economically challenged studen

Ron Yurko (Senior Personnel, Pittsburgh Hub)
Say hello to Ron Yurko. He's an Assistant Teaching Profess
field of statistics & data science. His game plan involves de
Whether it's statistical genetics or sports analytics, he's alw

Gordon Weinberg (Pittsburgh Hub)
Meet Gordon Weinberg, our skilled team trainer. Currently
University, Gordon's been a natural teacher since his elem
Council and Panhellenic Council Award for his leadership a

SCORE with Data: The Roster

ASSOCIATE EDITORS

- **Brian Macdonald**, Yale
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- **Kostas Pelechrinis**, University of Pittsburgh
- **Rodney Sturdivant**, Baylor University
- **Robin Lock**, University of St. Lawrence
- **Ron Yurko**, Carnegie Mellon
- **Andrew Lee**, West Point
- **Josh Patrick**, Baylor University
- **Peter Freeman**, Carnegie Mellon
- **Rachel Gidaro**, West Point
- **Eric Gerber**, Northwestern University
- **Michael Gallaugher**, Baylor University
- **Scott Nestler**, University of Florida
- **Scott Powers**, Rice University
- **John Draper**, The Ohio State University
- **Ryan Elmore**, University of Denver

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- **Mike Powell**, United States Military Academy
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- **Rachel Gidaro**, United States Military Academy
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- **Brad Hartlaub**, Kenyon College
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- **Pratham Lakhani**, CMU
- **Ryan Varghese**, CMU
- **Benjamin Kriger**, N/A (current high school student)
- **Anthony Zheng**, Carnegie Mellon University
- **Thomas Jin**, CMU Pre-College Summer Session
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- **Alyssa Bigness**, St. Lawrence University
- **Hope Donoghue**, St. Lawrence University
- **Taylor Lum**, St. Lawrence University
- **Abby Hustler**, St. Lawrence
- **Kristen Varin**, St. Lawrence University
- **Ryan Juricic**, Belmont University
- **Drew Clement**, West Point
- **Christian Lee**, United States Military Academy at West Point
- **Ryan Sellew**, United States Military Academy
- **Gavin Cassidy**, St. Lawrence University
- **Zhenzhu Nelson**, United States Military Academy
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- **Aoran Zhang**, Carnegie Mellon University
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- **Sam Volokh**, Rice University
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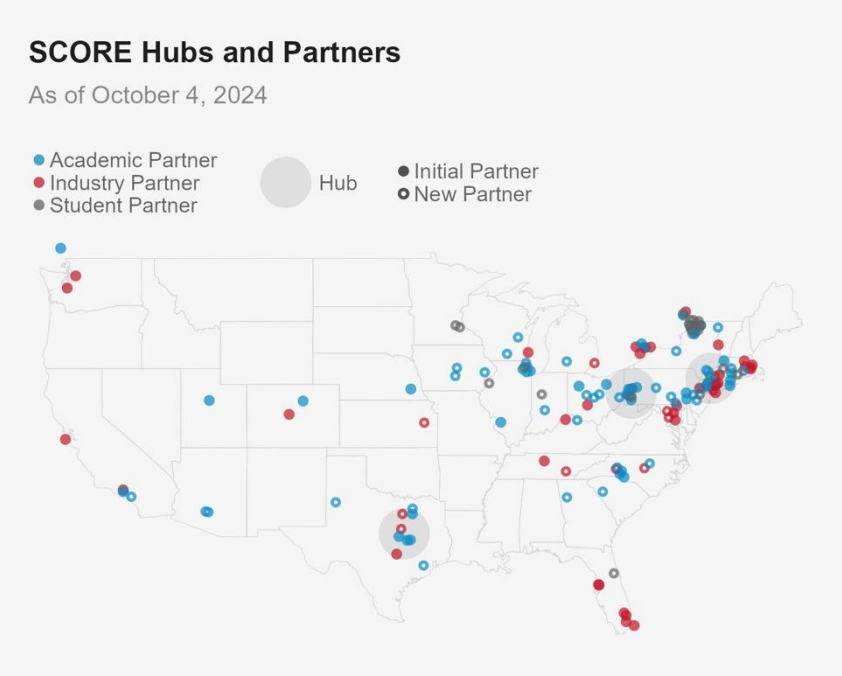
SCORE with Data: Collaborators



- Over 100 confirmed partners/collaborators across universities, professional sports, media, etc
- Some partners are writing educational materials; others providing videos and sports-related feedback
- We welcome people using SCORE materials and encourage participation in the network
- Around 10,000 active users in just the last year!

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SCORE with Data: Modules

- Introductory motivation videos/content from sports professionals (athletes, analysts, management)
  Network can help make these connections
- Learning Objectives
- Data sets
- Lecture notes, handouts, activities, slides
- Multiple formats, languages: interactive/no code (ISLE, Excel, Minitab), Rstudio, Python, etc
- Modules could be downloaded and used in educator's typical classroom format
  Modules can also be directly accessed through the SCORE website (e.g., can do data analysis online)

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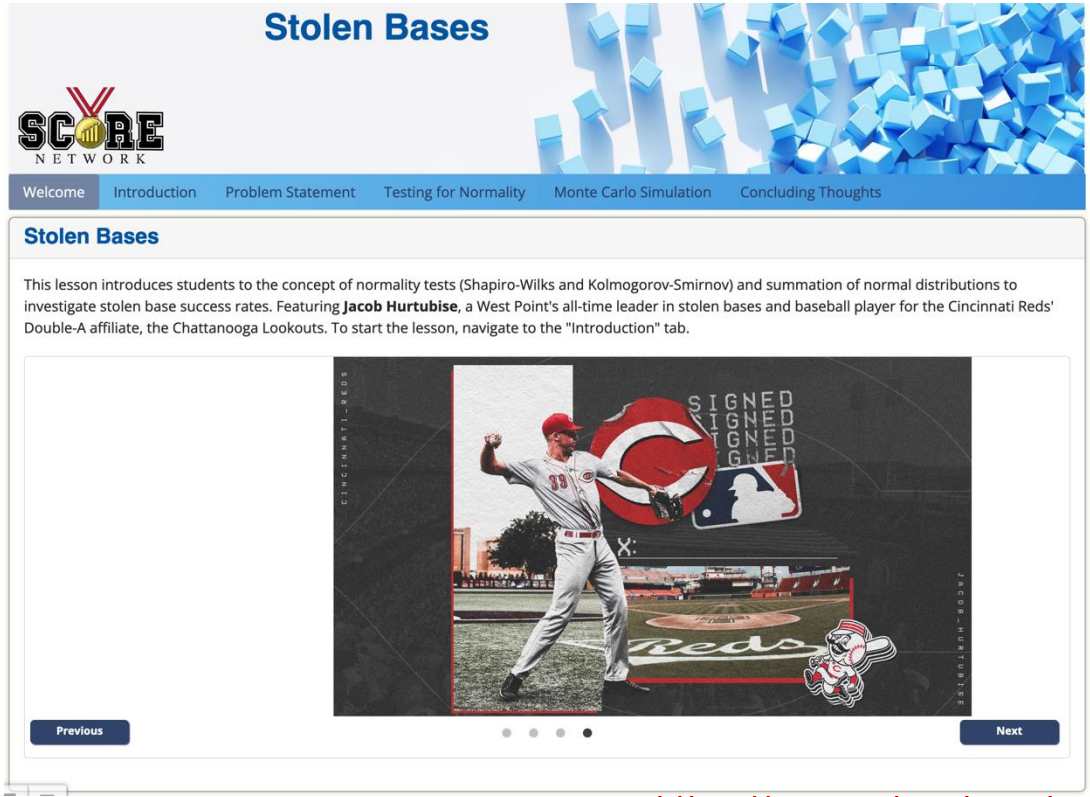
SCORE with Data: Modules



- Formats vary slightly but overall info similar
- Welcome/Intro/Problem Statement
- Learning Objectives
- Statistics & Data Science material
- Activities
- Wrap-up/Next Steps

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SCORE with Data: Modules

Pickleball: Estimating the proportion o dependable DUPR ratings

CONFIDENCE INTERVALS | PROPORTIONS

Estimate the proportion of collegiate pickleball players who have a dependable reliability score (of 60% or higher).

AUTHORS
Faith Rhinehart
Ivan Ramler
Jessica Chapman

AFFILIATION
St. Lawrence University
St. Lawrence University
St. Lawrence University

PUBLISHED
December 4, 2025

Background to Pickleball Video

If you are unfamiliar with Pickleball, please watch this video:

Introduction to Module

Pickleball is a fast-paced sport blending tennis, badminton, and ping-pong, played with paddles and a plastic ball on a small court. College tournaments feature singles, doubles, and mixed doubles in a best-of-three format, emphasizing strategy, teamwork, and precision. Player performance is often tracked using the DUPR (Dynamic Universal Pickleball Rating) system, which rates skill from 2.000 to 8.000 based on match results, opponent strength, and recent play. A Reliability Score (1–100%) reflects how accurate a rating is, with 60%+ considered dependable.

The pickleBall dataset features data from the NCPA (National Collegiate Pickleball Association) of male and female players in 2024. Variables include characteristics such as name and sex. Other variables included the overall, singles, doubles, and mixed rating and the overall, singles, doubles, and mixed reliability score. The relevant variables for this specific module are doubles reliability and singles reliability.

- Activity Length
- Learning Objectives
- Methods

Learning Objectives

Data

This module used the `pickleBall` data from the SCORE Data Repository

However, students do not need access to the data to complete the module as it is summarized in the provided worksheet.

Materials

- Class handout (MS Word)
- Class handout - with solutions

Conclusion

How to Cite

If you use this module in your work, please cite it as follows:

Rhinehart, F., Ramler, I., & Chapman, J. (2025, December 4). Pi dependable DUPR ratings. "The SCORE Network." https://doi.

You can include this citation directly in your references or bib

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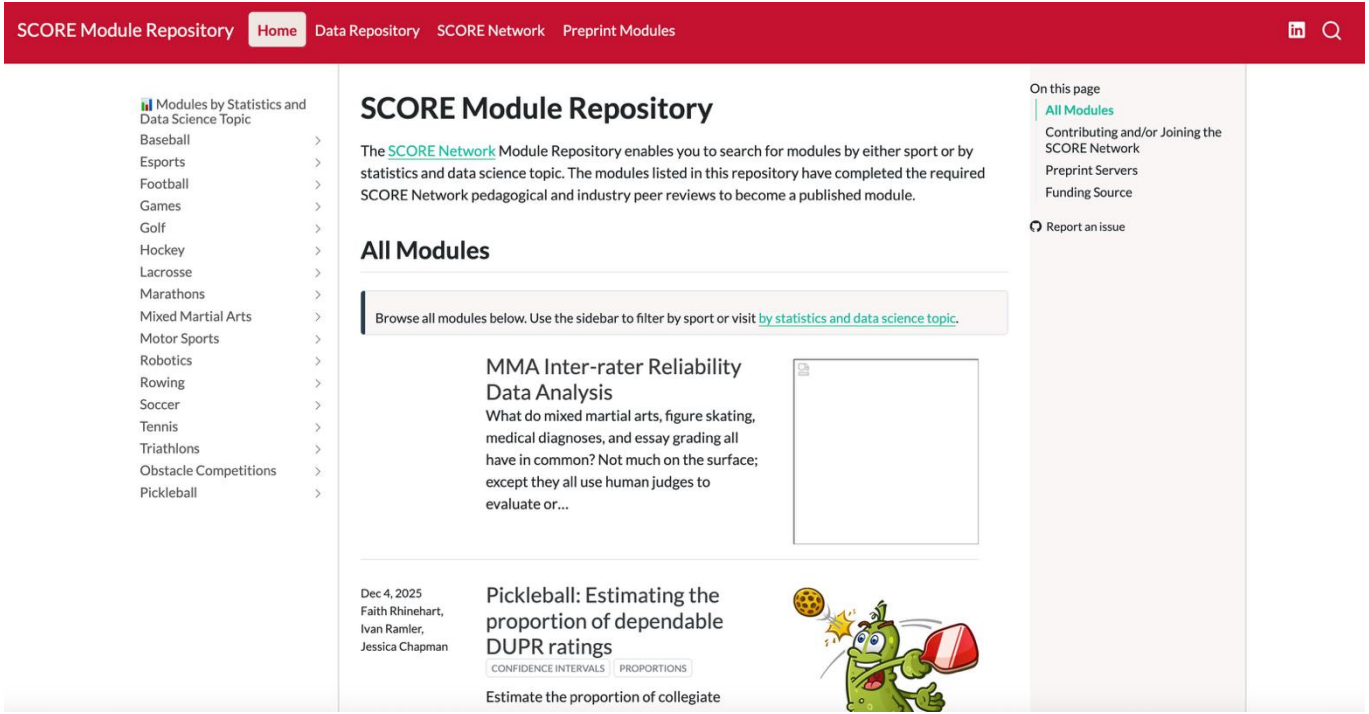
SCORE with Data: Modules



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SCORE with Data: Modules

Preprint Servers

You can also access *preprint* repositories maintained by members of the SCORE Network. These preprint repositories are created and maintained by faculty and students from the respective institutions. Please note that these materials have not yet completed the required pedagogical and industry peer reviews to become a published module on the SCORE Network. However, instructors are still welcome to use these materials if they are so inclined.

- Carnegie Mellon University
- St. Lawrence University
- Baylor University + Azusa Pacific University
- West Point

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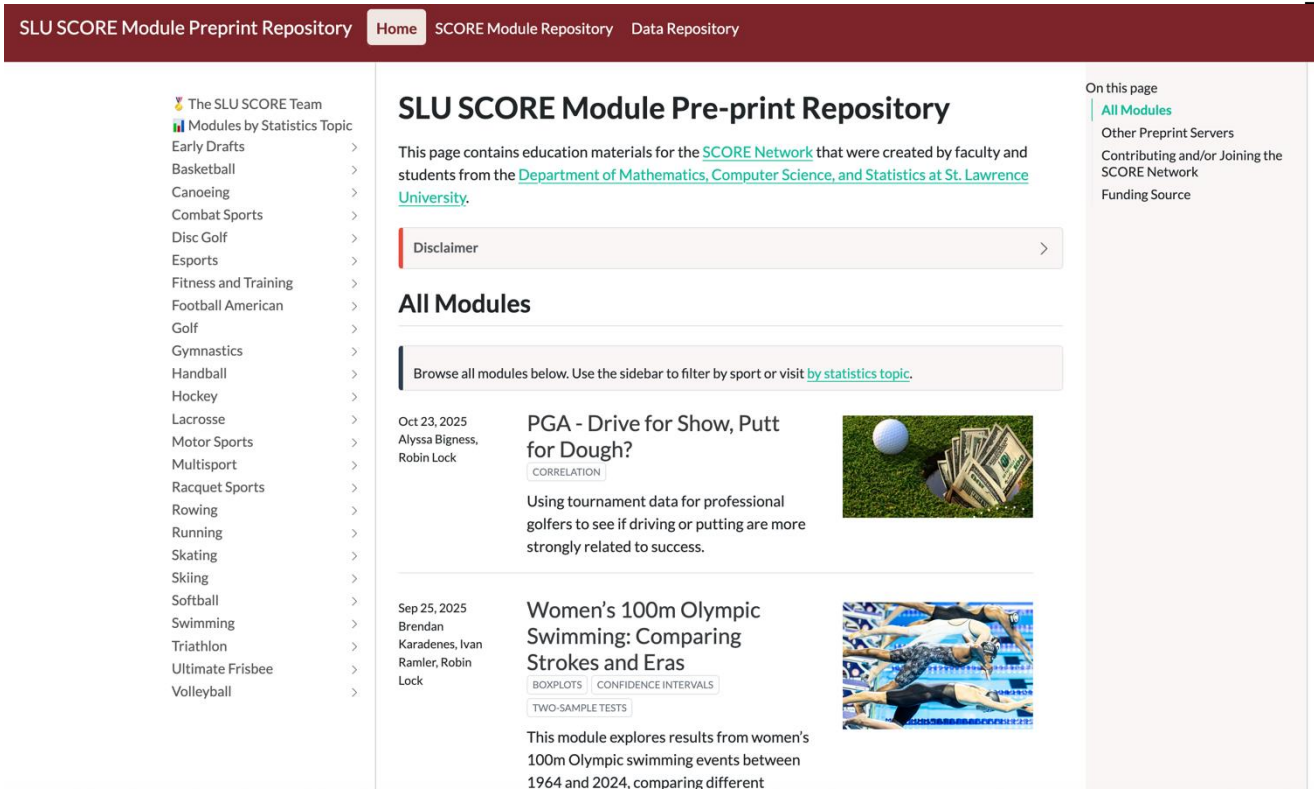
SCORE with Data: Modules



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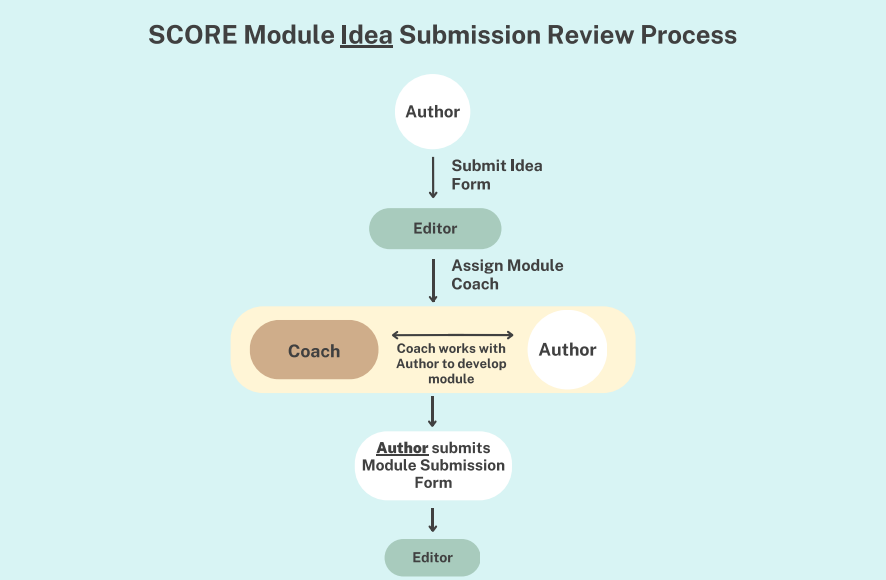
SCORE with Data: Developing Module Ideas



- Can start with just contributing an idea
  Might have sport and data in mind (e.g.)
- Submit idea on the website; SCORE will connect you with a ”coach” to help develop the idea
- Coach is there to provide support; author retains responsibility for material development
- (Almost) complete module can then be submitted for review; video not necessary at this point

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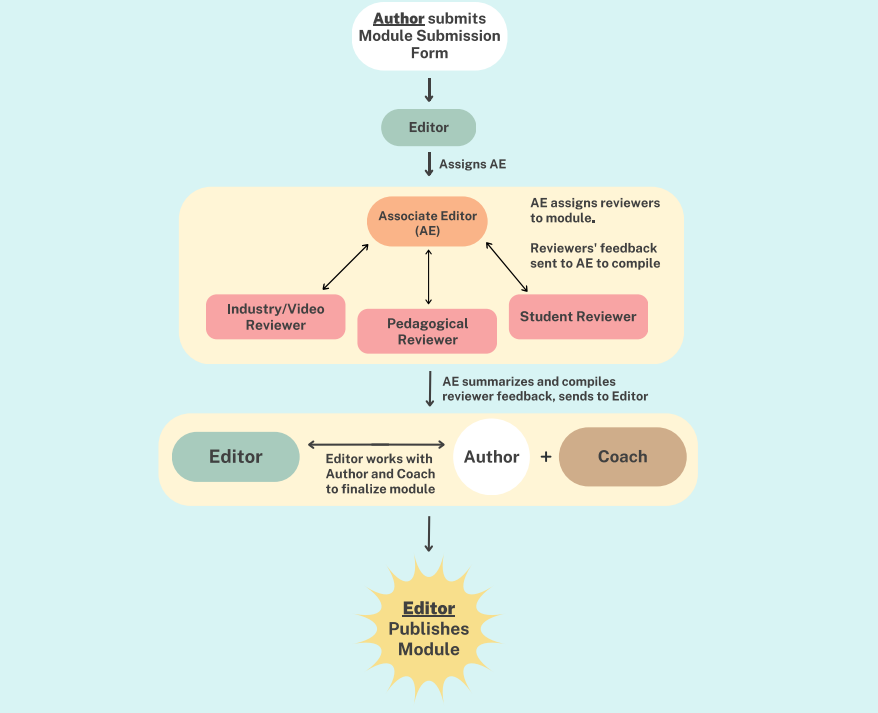
SCORE with Data: Submitting Modules



- Module author submits module to website
- SCORE sends out module for review to get feedback from educators, sports professionals, students
- SCORE iterates with authors to finalize module
- Module will be published and advertised with attribution; use metrics available
- Goal is to publish/complete accessible modules (aka “friendly review process”)
- Peer-vetted
- Unique DOI for citations and to track analytics

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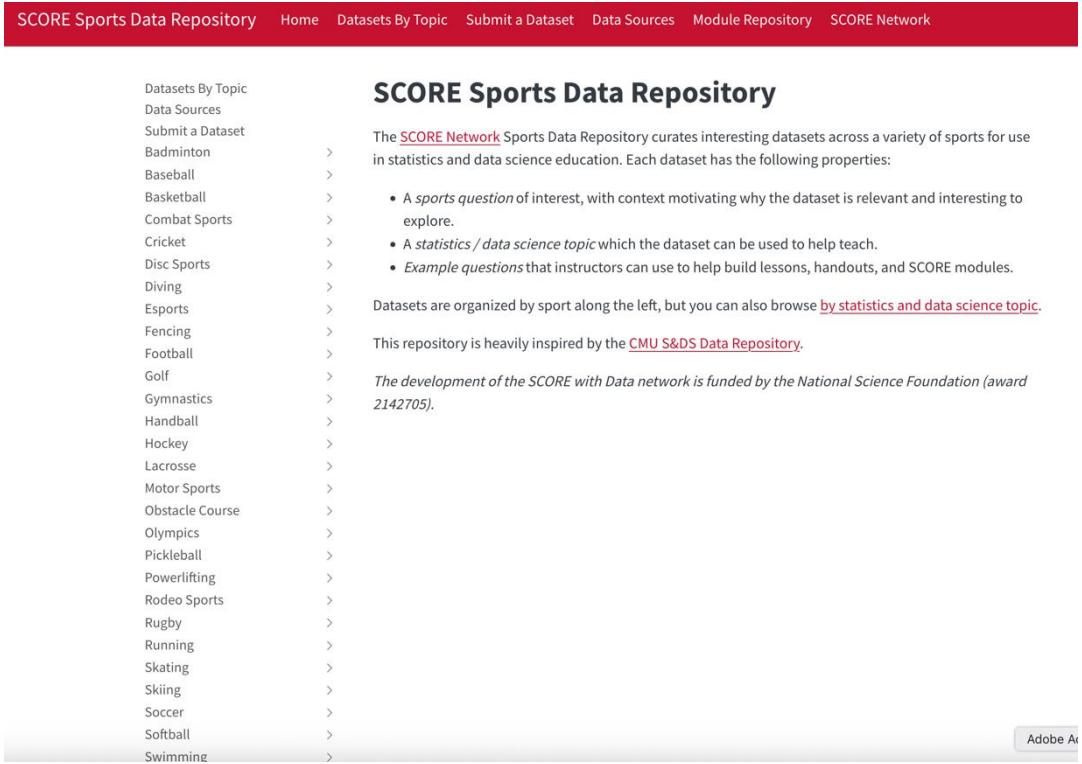
SCORE with Data: Data Repository



- SCORE also provides a public data repo
- Not just a list of sports data sets
- Tagged with searchable information about statistics & data science topics that could be taught
- Some data sets go with modules; others just available
- Also available for contributions; set up to easily submit files with minimal documentation

https://data.scorenetwork.org/

So how are things going?

- Been very happy about growth and use; early metrics far exceeded our expectations. Tend to see expected behavior (e.g. spikes near beginning of semesters)

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So how are things going?

Challenges/Opportunities:

- Not surprisingly, videos are difficult
  - Mostly just from a bandwidth perspective; also getting permission to film/post
  - Have experimented with interviewing experts at conferences, events, etc
  - Also using more general videos not specific to SCORE
- Review process, while friendly, still relies on the age-old problem of bandwidth
- Interesting questions about consistency of educational material standards
- On the plus side, building networks of educators very much a positive experience
- In general, sports analytics programs/courses are growing; how can SCORE be of help?

SCORE 2.0 Thoughts and Goals

Now also focusing on the impact on math/stat education as a field/workforce

- Building out vetting/review and citation system for educational materials.
  Getting good support and buzz for that work. People starting to cite use metrics.

  Ties into the growing movement to support work beyond traditional journals as well as support teaching track faculty professional development.

- Discussing having a synthesis "capstone" communication project.
  Requiring students to be able to build math/stat/DS educational content and explain/teach concepts to other students.

  Arguably as important as being able to do a capstone/applied research project.

- Can SCORE move beyond just educational modules? One-stop sports analytics education shop?

Thanks!

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SCORE with Data

Building a sustainable national network for developing and disseminating Sports Content for Outreach, Research, Education in data science

- Email scorenetworkorg@gmail.com to join d-list, get more info, etc
- Workshops, trainings, network events for educators
- Data sets and educational materials available
- Connecting students with statistics & data science through sports and sports analytics
- Researching how students engage with data science

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