

Carnegie Mellon University



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

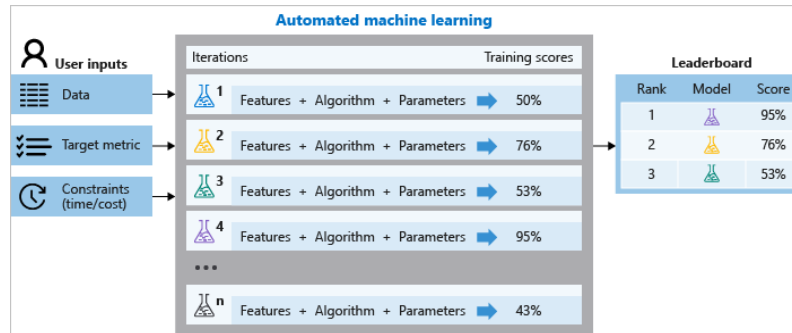


Iron Man

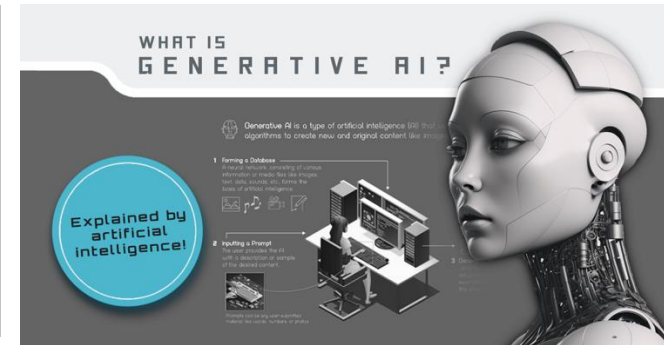
Data science (and AI): a way to collect information and make decisions about the world around us through complex technology

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

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"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 snocked. Who's with me?!"

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

SCORE with Data



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



[Home](#) [About Us](#) [Module Repository](#) [Data Repository](#) [Collaborate with SCORE](#)

Welcome to the SCORE Network!

What is the SCORE Network?

SCORE is a cutting-edge, NSF-funded national network dedicated to creating and sharing Sports Content for Outreach, Research, and Education in statistics and data science. This unique collaboration between academic and industry leaders drives the development and distribution of innovative educational modules, access to data, and offers unparalleled opportunities to impact and inspire the next generation of learners.

[LEARN MORE](#)



Get involved with SCORE!

[JOIN US!](#)

[ACCESS
RESOURCES](#)

[SUBMIT
A MODULE](#)

<https://scorenetwork.org/>

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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

<https://scorenetwork.org/>

SCORE with Data: The Roster



Rebecca Nugent (PI, Pittsburgh Hub)

Meet the team captain, Rebecca Nugent. A Professor of Statistics & Data Science, she brings a game-changing perspective to the Academies of Science, Engineering, and Meritorious Teaching and the ASA's Waller Institute.



Nicholas Clark (co-PI, Minnesota Hub)

Nick Clark is a powerhouse with a state-of-the-art background in statistics. A Professor at the University of St Thomas in Minnesota, he focuses on education and training, and outside of the classroom, he is a avid runner.



Michael Schuckers (co-PI, New York Hub)

Schuckers is our analytics all-rounder. A Professor at the University of Pennsylvania, he is a recipient of the ASA's Section on Statistics in Education and also a prolific author.



Rodney X. Sturdivant (co-PI, Baylor Hub)

Rodney Sturdivant is our sports stats coach. He has developed a variety of training drills and resources for statistical education. He has also authored a highly cited text on logistic regression.

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SCORE with Data: The Roster



Samantha Nielsen (Pittsburgh Hub)

Take a moment to meet Samantha Nielsen, the powerhouse Assoc 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 scoping proven to be a game-changer in statistical learning workshops an



Michael P. B. Gallagher (Baylor Hub)

Mike Gallagher is our classification and clustering quarterback. brings a unique interest in complex data types like higher order 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 disting 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 t 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 strate 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. Currentl University, Gordon's been a natural teacher since his elem Council and Panhellenic Council Award for his leadership a

SCORE with Data: The Roster



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SCORE with Data: The Roster



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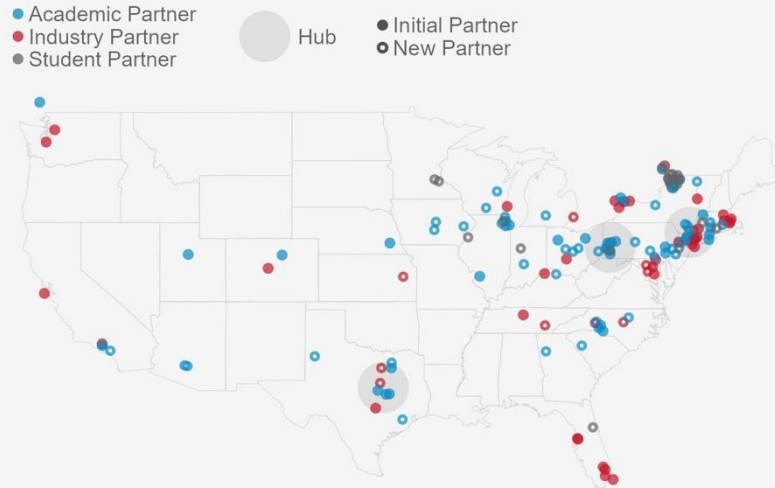
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- Anthony Zheng, Carnegie Mellon University
- Thomas Jin, CMU Pre-College Summer Session
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- Keerthana Komma, Carnegie Mellon University

SCORE with Data: Collaborators



SCORE Hubs and Partners

As of October 4, 2024



- 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!

<https://scorenetwork.org/>



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)

<https://scorenetwork.org/>

SCORE with Data: Modules



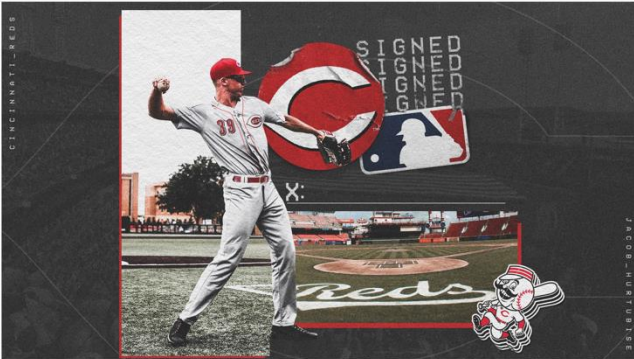
Stolen Bases



Welcome
Introduction
Problem Statement
Testing for Normality
Monte Carlo Simulation
Concluding Thoughts

Stolen Bases

This lesson introduces students to the concept of normality tests (Shapiro-Wilks and Kolmogorov-Smirnov) and summation of normal distributions to investigate stolen base success rates. Featuring **Jacob Hurtubise**, a West Point's all-time leader in stolen bases and baseball player for the Cincinnati Reds' Double-A affiliate, the Chattanooga Lookouts. To start the lesson, navigate to the "Introduction" tab.



Previous
Next

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

<https://scorenetwork.org/>

SCORE with Data: Modules



Pickleball: Estimating the proportion of 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.org/10.21203/rs.3.rs-5911111/v1>

You can include this citation directly in your references or bibliography.

SCORE with Data: Modules



SCORE Module Repository
Home
Data Repository
SCORE Network
Preprint Modules
in
Q

Modules by Statistics and Data Science Topic

- Baseball >
- Esports >
- Football >
- Games >
- Golf >
- Hockey >
- Lacrosse >
- Marathons >
- Mixed Martial Arts >
- Motor Sports >
- Robotics >
- Rowing >
- Soccer >
- Tennis >
- Triathlons >
- Obstacle Competitions >
- Pickleball >

SCORE Module Repository

The [SCORE Network](#) Module Repository enables you to search for modules by either sport or by statistics and data science topic. The modules listed in this repository have completed the required SCORE Network pedagogical and industry peer reviews to become a published module.

All Modules

Browse all modules below. Use the sidebar to filter by sport or visit [by statistics and data science topic](#).

MMA Inter-rater Reliability Data Analysis


What do mixed martial arts, figure skating, medical diagnoses, and essay grading all have in common? Not much on the surface; except they all use human judges to evaluate or...

Dec 4, 2025
Faith Rhinehart,
Ivan Ramler,
Jessica Chapman

Pickleball: Estimating the proportion of dependable DUPR ratings

CONFIDENCE INTERVALS | PROPORTIONS

Estimate the proportion of collegiate



On this page

- [All Modules](#)
- Contributing and/or Joining the SCORE Network
- Preprint Servers
- Funding Source
- Report an issue

<https://scorenetwork.org/>

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](#)

<https://scorenetwork.org/>

SCORE with Data: Modules



SLU SCORE Module Preprint Repository

Home

SCORE Module Repository

Data Repository

- The SLU SCORE Team
- Modules by Statistics Topic
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- Basketball >
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- Fitness and Training >
- Football American >
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- Gymnastics >
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- Lacrosse >
- Motor Sports >
- Multisport >
- Racquet Sports >
- Rowing >
- Running >
- Skating >
- Skiing >
- Softball >
- Swimming >
- Triathlon >
- Ultimate Frisbee >
- Volleyball >

SLU SCORE Module Pre-print Repository

This page contains education materials for the [SCORE Network](#) that were created by faculty and students from the [Department of Mathematics, Computer Science, and Statistics at St. Lawrence University](#).

Disclaimer >

All Modules

Browse all modules below. Use the sidebar to filter by sport or visit [by statistics topic](#).

Oct 23, 2025
Alyssa Bigness,
Robin Lock

PGA - Drive for Show, Putt for Dough?

CORRELATION

Using tournament data for professional golfers to see if driving or putting are more strongly related to success.



Sep 25, 2025
Brendan
Karadenes, Ivan
Ramler, Robin
Lock

Women's 100m Olympic Swimming: Comparing Strokes and Eras

BOXPLOTS CONFIDENCE INTERVALS

TWO-SAMPLE TESTS

This module explores results from women's 100m Olympic swimming events between 1964 and 2024, comparing different



On this page

[All Modules](#)

[Other Preprint Servers](#)

[Contributing and/or Joining the SCORE Network](#)

[Funding Source](#)

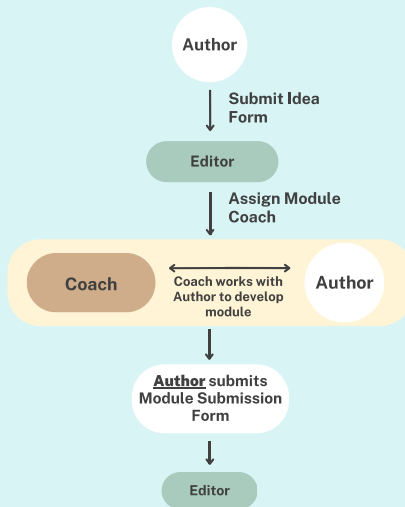
<https://scorenetwork.org/>

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SCORE with Data: Developing Module Ideas



SCORE Module Idea Submission Review Process

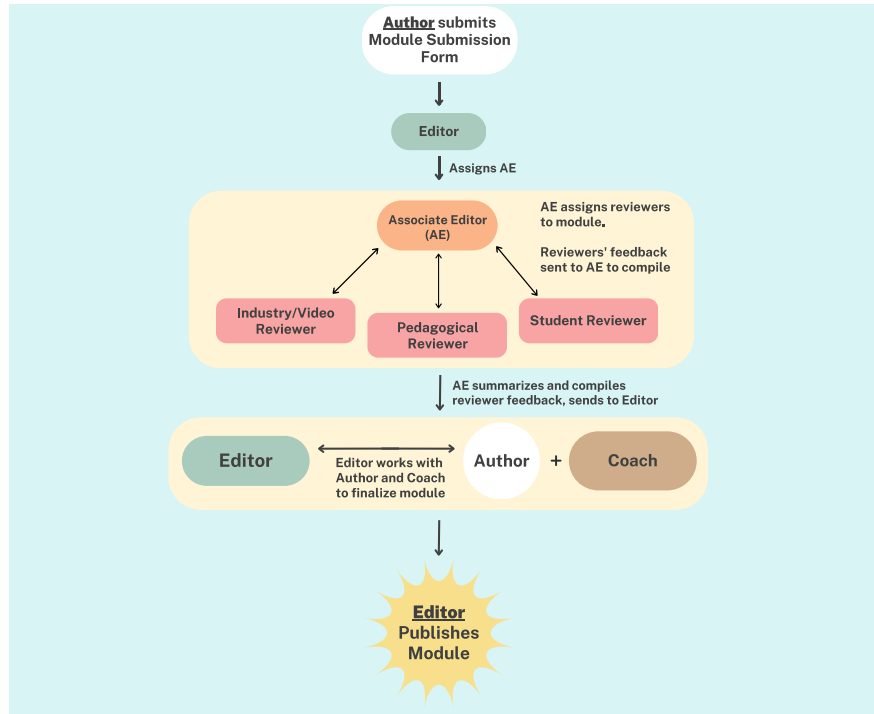


- Can start with just contributing an idea
Might have sport and data in mind (e.g.)
- Submit idea on the website; SCORE will connect you with a “coach” to help develop the idea
- Coach is there to provide support; author retains responsibility for material development
- (Almost) complete module can then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

<https://scorenetwork.org/>



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

<https://scorenetwork.org/>

SCORE with Data: Data Repository



SCORE Sports Data Repository Home Datasets By Topic Submit a Dataset Data Sources Module Repository SCORE Network

Datasets By Topic
 Data Sources
 Submit a Dataset
 Badminton >
 Baseball >
 Basketball >
 Combat Sports >
 Cricket >
 Disc Sports >
 Diving >
 Esports >
 Fencing >
 Football >
 Golf >
 Gymnastics >
 Handball >
 Hockey >
 Lacrosse >
 Motor Sports >
 Obstacle Course >
 Olympics >
 Pickleball >
 Powerlifting >
 Rodeo Sports >
 Rugby >
 Running >
 Skating >
 Skiing >
 Soccer >
 Softball >
 Swimming >

SCORE Sports Data Repository

The [SCORE Network](#) Sports Data Repository curates interesting datasets across a variety of sports for use in statistics and data science education. Each dataset has the following properties:

- A *sports question* of interest, with context motivating why the dataset is relevant and interesting to explore.
- A *statistics / data science topic* which the dataset can be used to help teach.
- *Example questions* that instructors can use to help build lessons, handouts, and SCORE modules.

Datasets are organized by sport along the left, but you can also browse [by statistics and data science topic](#).

This repository is heavily inspired by the [CMU S&DS Data Repository](#).

The development of the SCORE with Data network is funded by the National Science Foundation (award 2142705).

Adobe Ai

- SCORE also provides a public data repository
- 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

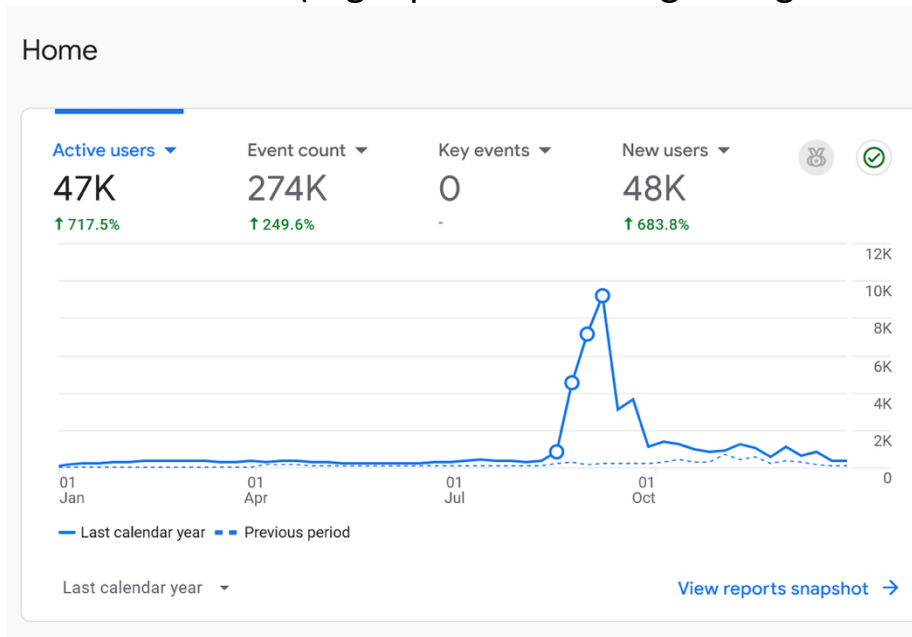
<https://data.scorenetwork.org/>

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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)



<https://scorenetwork.org>



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?

<https://scorenetwork.org>



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!

<https://scorenetwork.org>



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

<https://scorenetwork.org/>