



CSCI 370 Final Report

Engineering Champions

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Table of Contents

I. Introduction.....	3
II. Functional Requirements.....	3
III. Non-Functional Requirements.....	3
IV. Risks.....	4
V. Definition of Done.....	4
VI. System Architecture.....	4
VII. Software Test and Quality.....	5
VIII. Project Ethical Considerations.....	7
IX. Project Completion Status.....	8
X. Future Work.....	9
XI. Lessons Learned.....	9
XII. Acknowledgments.....	10

I. Introduction

The goal of the project is to automate the analysis of a prospective collegiate athlete's performance. The final project will be able to take in information about a high school or transfer student, such as physical measurements, skill metrics, and training results, and output a detailed evaluation of their performance in a readable PDF to be shared with potential coaches.

Our team began this project with an existing system in place that collected athlete data through spreadsheets and didn't compile any type of report. While it was functional, it was slow and prone to user error. Our task was to build a more automated and user-friendly platform for all coaches to be able to use.

Our main goal was focused on the implementation of creating these reports from raw data. Our program will then calculate key performance metrics and generate a structured PDF report that summarizes the athlete's strengths, weaknesses, and shows how they would stack up against other players.

The main stakeholders of this project are athletes, coaches, and recruiting staff. Athletes benefit from having actionable feedback on their performances. Coaches and recruiting staff are able to quickly assess an athlete's potential without having to manually compile data from a variety of different sources. The goal is to ensure that metrics are being updated and reported in a standard way, allowing for scalability of the software for all college football programs.

II. Functional Requirements

The main functional components of this project are to automate the analysis of athlete performances, generating standardized PDFs for coaches. The primary goal is to be able to process athlete data from Excel files and create informative PDFs for coaching and recruiting staff to use. In terms of our direct functional requirements, it was simply to automate the PDF generation for high school athletes. This should:

- Take in the information set in the Excel file
- Convert it into a simple PDF that has all the information a prospective coach is going to look for (Name, Position, High School, State, Graduation Year, Height, Weight, 40/10, Triple Broad, Pro Agility, Vert)

III. Non-Functional Requirements

There were some additional non-functional requirements, which were not directly stated but were crucial in the development of this project. This included:

- Integration to web application currently used by company
- Security concerns with student information
- Support batch processing so multiple Excel files can be uploaded and processed at the same time.

IV. Risks

While going through this process, we expected to encounter both technical and non-technical risks during the duration of the project. The technical risks included:

- The extraction of data might not be in a format that is easy to convert to a readable PDF.
- Issues with deployment of web applications, whether it is a dedicated server or cloud native.
- Cloud native deployment comes with risks and challenges as it requires a decent amount of extra work and learning concepts we don't know yet.

With the necessity of developing new technical skills, such as:

- Web application software in a data science context, such as Django, pandas, PDF generator frameworks, and Docker.

V. Definition of Done

We will know this project is complete if:

- The application generated readable PDF output for every individual athlete with respective stat analysis
- Coaches are happy with the design and look of the data presented in the PDF
- When a coach or user uploads an Excel file, PDF automatically generates and downloads

VI. System Architecture

For the system architecture of the project, it was divided into two main components, the user accessing the system and inputting their Excel file, and the user being able to use the system and look up athletes. In terms of accessing the system, the user should be able to get into the application, submit an Excel sheet for file upload, and then the containerized Python web application should be able to automatically generate the PDFs. These PDFs then get sent into a database, which can then be called to be retrieved so the user is able to download the link and view the PDF on their own device.

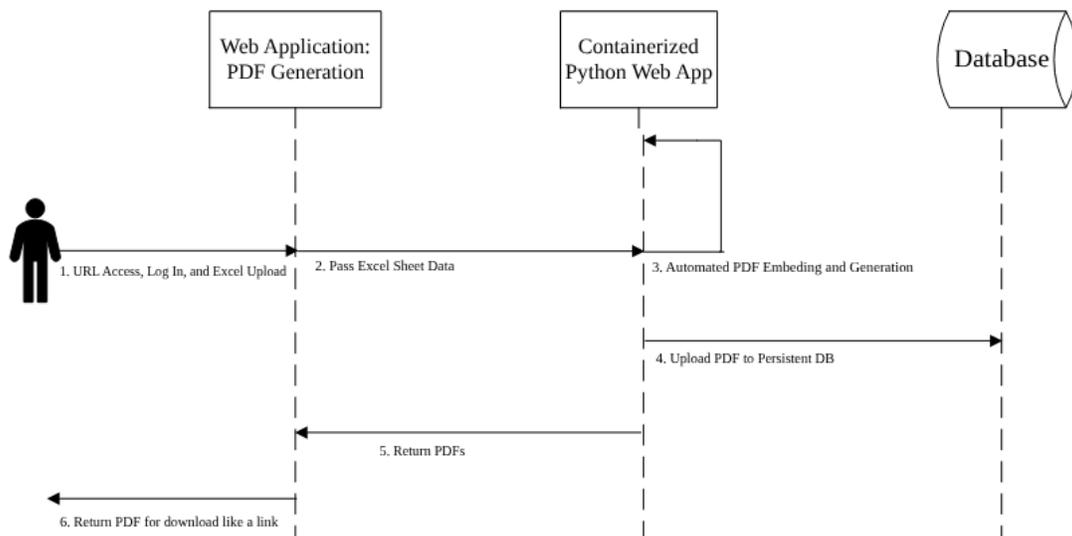


Figure 1. System architecture of user inputting file

For looking up the athletes, the user should be able to search for a name in the interface and be able to pull up the generated PDF for that athlete depending on the school they selected. The implementation of a comparison feature was out of the scope for the current project, but would have utilized another database specifically to be able to pull in saved athletes.

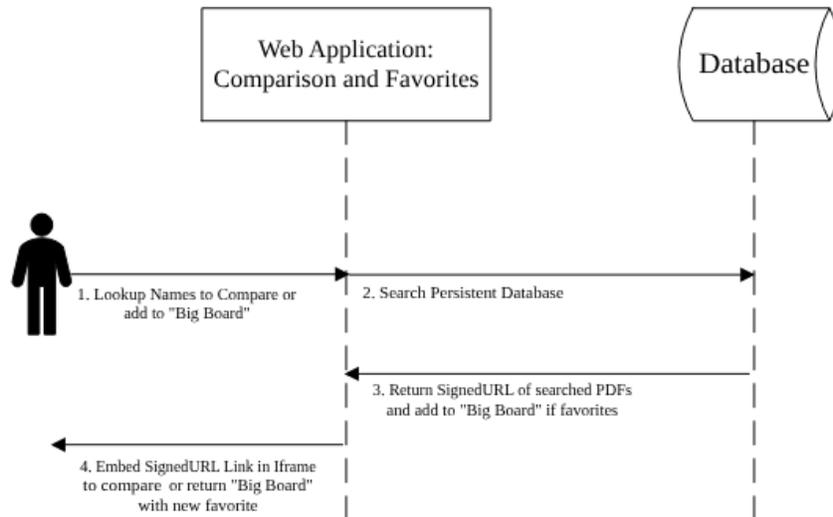


Figure 2. System architecture of user searching for player

VII. Software Test and Quality

Our quality plan focuses on making accurate and reliable features that are integrated into the web application given. The major quality goals are outlined below:

- Convert data from an Excel file to a readable PDF
 - The primary goal of this project is to create a script that is integrated into the web application to convert the data from an Excel file to a readable PDF for coaches and scouts that looks like this:

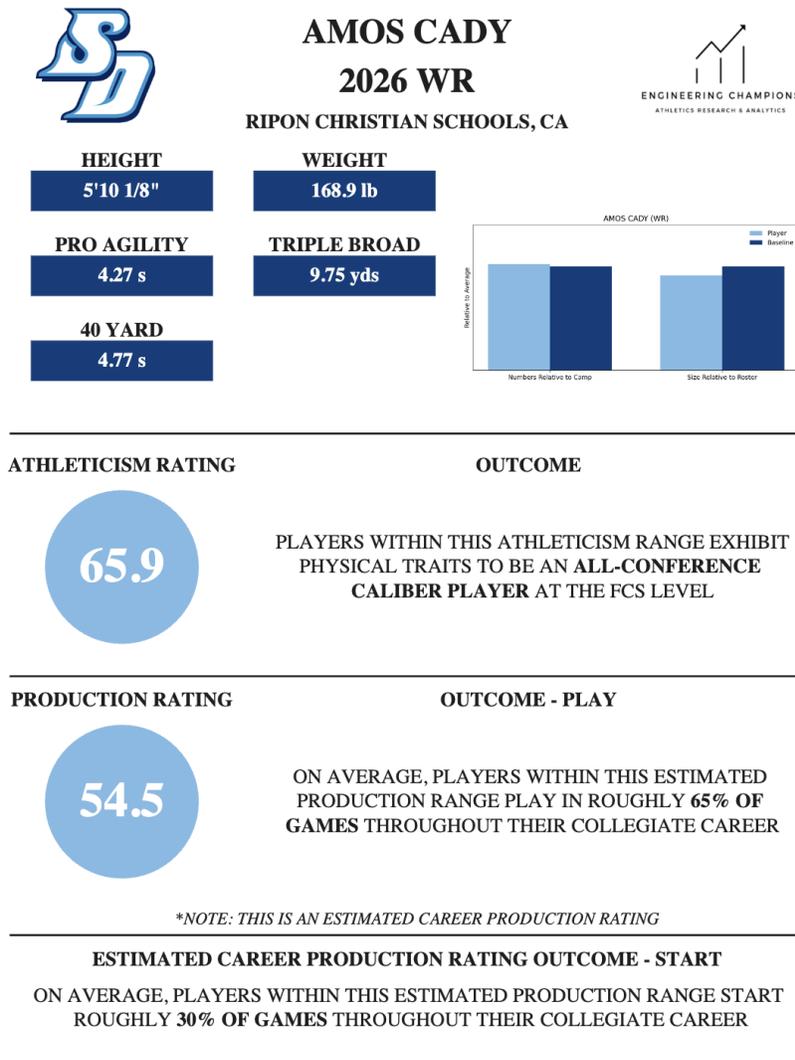


Figure 3. Example PDF output for athlete "Amos Cadly" going to the University of San Diego

- To ensure correctness and scalability, we will run edge case unit tests on the PDFs with corrupt data or data not in explicit format to make sure our product works and is not defective.
- Develop the web interface to put data into the Excel file in a user-friendly way
 - Another key requirement is making sure that coaches are able to input the player data and receive their PDF in an easy and intuitive manner.
 - We will run integration tests with the current web application so the application works with the bigger system that is already made. This will ensure there is no defect in the product.
 - Testing will focus primarily on UI defects and issues with the data-mapping.
- Add an area to filter/compare different players by pulling up multiple PDFs
 - If coaches want to compare different players, there should be an option to open up multiple PDFs to see them side by side.
 - Additionally, there should be a filter component built into the PDF backlog where a coach can search for different attributes, like position and year.

- Incorporate transfer players with online data
 - Scrape data from online transfer portal, automatically delete players when they are out of eligibility

To ensure all of this is done effectively, code reviews were utilized in pairs and required approvals before merging into the main branch of the production line. This ensured verification and validation.

VIII. Project Ethical Considerations

There are several ethical considerations to keep in mind during the development of this product, and the following are the principles that are most pertinent to our project. These were evaluated via the ACM and IEEE ethics frameworks, which are ethical standards that are to be upheld in the field of computer science. If the software quality plan is not implemented properly, the following ethical concerns could arise.

ACM 1.4 - Be fair and take action not to discriminate.

This is pertinent as coaches are going to use this product to help guide their decision-making on recruiting players. The system must promote ideas of fairness and accuracy to ensure that players aren't misrepresented. The software should not mislead coaches with incorrect data to avoid harm. Being fair and taking action not to discriminate is crucial because not being able to reflect accurate information can absolutely cause harm to potential athletes and coaches who are investing in players based on the metrics we are providing them with.

IEEE 1 - Software engineers shall act consistently with the public interest.

It is crucial we act with public interest, not just of our client specifically, but all acting parties who are going to use this product. This includes Engineering Champions as a company, coaches who want to recruit players, and players who are looking to play football in college.

IEEE 3 - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.

The product must meet all of the highest professional standards possible because of the vast outreach of who this program is directed towards. This is one of the principles that is most at risk of being violated. If coaches are missing data to bugs in the system or miscalculations, they aren't able to make accurate choices and our code isn't accurately reflecting the information we were given. This can cause players to lose opportunities to get recruited and teams to lose out on valuable players

IEEE 4 - Software engineers shall maintain integrity and independence in their professional judgment.

Any code we push must be made with integrity and in an effort to look at the good of the group.

Michael Davis Tests

To further evaluate the ethical framework of this project, we applied the following Michael Davis tests:

Reversibility Test - If I were on the receiving end of this action, would I find it acceptable?

If we were in the position of the coaches recruiting players, we believe that this software would be a great decision and we would be happy to use it because of its interface and our ability to interact with it. If I were a student, I would be happy that a coach has access to reliable information in a way that is easily digestible for them to understand so that they can truly see the potential I have on their team.

Publicity Test - Would I be comfortable if my actions were made public?

If this were to be published in a newspaper, we would be thrilled because that means people are able to see student athletes being evaluated fairly. Because the software is providing coaches with unbiased data, simply the statistics that it was given, students will be able to trust that their abilities are being represented and they are being assessed fairly. We believe people would think this is fair and socially responsible to ensure all athletes are given a fair shot when going through the recruitment process.

IX. Project Completion Status

Due to time constraints and the limitations of the scope, some planned features were only partially implemented. The live transfer pool with automatic scraping is currently incomplete, and plans to address this issue are in the works for the future. Additionally, the comparison dashboard was partially implemented, where the backend can be filtered, but the frontend is still under development.

Performance testing of our current features shows that the system is able to handle multiple Excel uploads without a significant decrease in processing time. The generation of the PDFs for large Excel files leads to an increase in generation time, but nothing unexpected. Since the application currently operates on the client side, performance can vary across systems, with larger files taking a bit more time depending on the user's hardware and available resources.

A combination of unit tests and integration tests were used to be able to see the full functionality of the project. Before showcasing the current MVP, we were able to conduct user acceptance testing (UAT) through our client contact (Zimmermann) to make sure the PDF generation met their needs and was functional. We were also able to utilize unit tests during the development to separate the program and test its functionality individually. For example, unit testing the Excel upload and data processing.

The team conducted informational testing with the client, who represents the target demographic. The audience said that the generated PDFs were clear and contained all of the relevant statistics that were required. Additionally, the client appreciated the readability of the data.

X. Future Work

Future work will focus on three primary ways to expand the system: data acquisition, user authentication, and access control.

Integrating transfer market data directly into the platform via web scraping will be difficult, but is important to ensure there is functionality across players from different backgrounds. By incorporating this data into the pipeline, we can have a better overview of the insights of the program. It provides additional support to players who are already going through a transitory period, ensuring that they get the same equal chance to be seen by recruiting staff and coaches.

Second, we want to be able to implement a full user authentication system to support login functionality. This should include persistent user accounts, password hashing, session management, and secure credential storage. Adding authentication will make it possible for users to personalize their experiences, saving certain players and comparison metrics to be able to log back in and check them later.

Finally, for more complex usage, we wanted to introduce a role-based access control system on top of general user authentication. This will help us to define specific roles with different needs, like standard users, administrators, etc. This will help to restrict certain features to different roles, like administrators could have a greater need for more advanced dashboards and administrators should be able to handle the data and do manual data refreshes. This provides a more scalable and secure workflow.

All of these were out of the scope of the original project, but these improvements will help to make the system more secure overall and really help players at all stages around the country.

XI. Lessons Learned

This project focused on learning about the combination of ensuring accurate data and also taking on ethical responsibility when it comes to personal information. Although the roster and information we worked with was publicly available, it was important we understood the difference between public and risk free. Any minor inconsistencies, like formatting issues, incorrect attribution, duplicate entries, could propagate throughout the system and produce misleading analytics. These inaccuracies could completely change how players are evaluated, how coaches are able to make decisions, and how programs are able to understand how competitive they are. This reinforced the idea that handling any type of data about real people will always carry an ethical perspective, and it is important to honor that and take responsibility to ensure that all information presented is reliable and respectful.

The team learned how to use PDF generation frameworks, clean and process data in Python, and embed the work into an older web app. We also got better at asking the right questions and keeping communication concise so we don't waste time.

On the technical side, the project required extending an existing web application instead of building one from the ground up, which introduced an entirely new set of challenges. We had

to understand how the current architecture was structured, figure out how to where our new features are going to fit, and ensure that all of our additions remained maintainable for when we leave the project. In doing this, we learned a lot about integration of data pipelines, validating information, and maintaining consistent system behavior even though functionality is expanding.

Additionally, this project stressed the importance of clear documentation throughout the process, making sure that anyone who works on the project after us has an understanding of the UI design and integration on the backend. Overall, this project helped to strengthen our abilities in balancing technical implementations and ethical considerations, showing the importance of both when it comes to implementing real world software.

XII. Acknowledgments

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XIII. Team Profile



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