! IMPORTANT GUIDELINES NOTICE

Please note: The winning written projects from this event are based on the **previous year's competition guidelines**.

While these sample projects serve as valuable references for understanding competition format and expectations, the guidelines have been updated for the current competitive year. The previous 10-page written entry is now a 20-slide pitch deck.

For 2025-2026, all participants must refer to and follow the guidelines in the DECA Guide when preparing their competitive event projects. Using outdated guidelines may result in disqualification or penalty points being deducted.

refAIree

The Future of Fair Play

INNOVATION PLAN
Clements High School
4200 Elkins Rd.
Sugar Land, TX, 77479
Bryan Wang
April 8, 2025

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Product Overview

refAIree is an affordable **automated officiating, stat-keeping,** and **performance analysis** system designed for semi-professional basketball, baseball, soccer, and American football. Our proprietary **CourtVision** machine learning model uses cameras, sensors, and microchips to **automatically** detect rule violations and **make calls**, allowing refAIree to function as an independent referee. Beyond officiating, refAIree's **StatSight** model allows it to **automatically track** and **analyze player performance**, providing real-time insights and coaching recommendations to optimize practice.

Problem

Referee Shortage
Sports leagues at all levels are facing a growing referee shortage, leading to overworked officials and game cancellations. With fewer referees available, ensuring fair and accurate officiating becomes increasingly difficult.

Referee Accuracy
Without replay tools, spontaneous referee decisions may lead to inconsistent calls. Even with replay tools, manual referee reviews are subjective and still leave room for error.

Inefficient Stat-Keeping
Manually tracking player statistics as a coach is slow and prone to errors, while hiring a dedicated statistician adds significant costs. Without precise analytics, coaches struggle to analyze performance effectively.

Cost
Professional replay systems are extremely **expensive**, with pricing starting at tens of thousands of dollars. Combined with the need for multiple referees per game, these costs strain the budgets of smaller leagues.

Solution

refAIree
refAiree uses AI to assist and even replace human referees. With automated call detection and instant replays, refAIree reduces reliance on officials while improving officiating accuracy.

CourtVision
CourtVision uses cameras, sensors, and microchips to automatically make precise calls in real time, ensuring consistent and objective decision making.

StatSight
StatSight automates stat-keeping using AI-driven tracking. It provides real-time performance insights, helping coaches optimize training and player development.
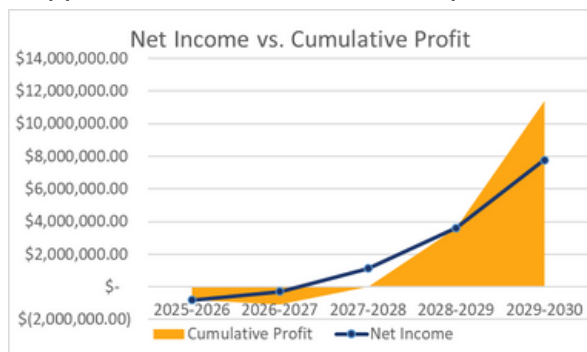
Affordable Pricing
refAIree offers a professional-grade officiating and replay system at a fraction of the cost of traditional solutions, with base pricing starting at just **$5,500**.

Unique Value Proposition

CourtVision makes refAIree the **first and only low-cost automated officiating system** to target the amateur and semi-professional sports markets. With **no direct competitors at our price point**, we provide an unrivaled solution that automates officiating, enhances accuracy, and delivers professional-grade insights—all at a fraction of the cost of existing systems. This **first-mover advantage** positions refAIree to dominate an untapped market and revolutionize sports officiating worldwide

Customer Segments

Primary:
High School Athletics

Secondary:
College Sports

Tertiary:
Minor Sports Leagues

Net Income vs. Cumulative Profit

Why Invest?

we are seeking a **$1,500,000 loan** at a **15% annual interest** rate (compounded monthly) to be repaid over **5 years**, in exchange for a **10% equity stake** in our company. In return, your loan and investment is projected to generate a total return of **$3,403,365.71** over the next 5 years at a Compounded Annual Growth Rate (**CAGR**) of **24.03%**

Problem

Referees

Accuracy

Without replay tools, referees must rely on real-time judgment to make decisions in fast-paced games, often leading to errors in critical moments. This challenge is further compounded by physical limitations —**referees simply cannot see every angle at once**, increasing the likelihood of missed calls or misinterpretations. Research has shown the limitations of traditional officiating, with studies revealing a **7.9% error rate** among referees officiating men's national soccer matches (Zhang et al., 2022) . These repeated errors, without the possibility of review, undermine confidence in officiating, potentially impacting long-term viewership and engagement.

Shortage

The United States is experiencing a significant **shortage of sports officials** across various levels, with a survey by the National Federation of High School Associations (NFHS) revealing a nationwide decrease of approximately 50,000 high school officials since the 2018-2019 season. These shortages are further complicated by an aging workforce, with the average age of sports officials rising over 6% from 53.29 in 2017 to 56.68 in 2023 (nfhs.org, 2023). If these trends continue, leagues and schools may struggle to staff games reliably, leading to cancellations, overworked officials, and a decline in the quality of officiating.

Coaches

Stat-Keeping

Amateur and semi-professional coaches often struggle with slow and error-prone manual stat tracking, making it difficult to analyze player performance and refine strategies effectively. Without real-time analytics, they must rely on subjective observations, leading to missed opportunities for improvement. While hiring a dedicated statistician provides more accurate data, it can cost thousands per season—an expense many teams and leagues cannot justify. This lack of accessible, data-driven insights puts them at a competitive disadvantage against teams with advanced performance analysis tools.

Cost

Professional Replay Equipment

Professional replay systems, such as VAR (Video Assistant Referee) in soccer or Hawk-Eye in tennis and other sports, provide exceptional accuracy but come at an unattainable cost for most leagues. For instance, installing a Hawk-Eye system for a single tennis court costs over **$60,000** (Wong, 2016), with VAR costing upwards of **$150,000** per stadium (Adjei-Mintah, 2024). These high costs make such systems inaccessible for semi-professional leagues, high schools, and recreational leagues, which typically operate with constrained budgets and limited resources.
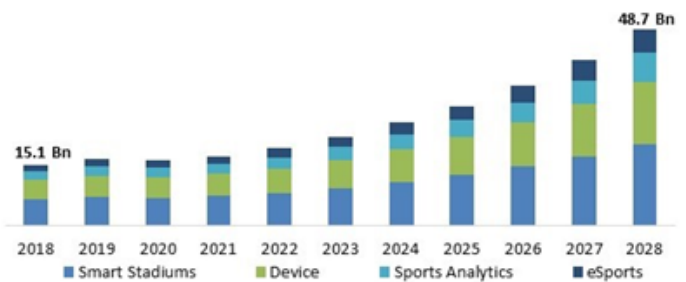
Labor Costs

Hiring and training qualified referees for amateur and semi-professional games is becoming increasingly expensive. For example, a single Texas high school varsity football referee costs a minimum of **$95 per game** (uiltexas.org), creating a major financial burden for leagues with limited budgets. Additionally, sports statisticians are also crucial for tracking player performance, but their hiring costs make them inaccessible for many teams.

refAIree

The sports technology market is growing rapidly, projected to almost **double** in size from **$21.9 billion** in 2022 to over **$40 billion** by 2027 (MarketsandMarkets). High Schools, Colleges, and Minor Sports Leagues are key customer segments in this expansion, as they seek affordable solutions to improve officiating accuracy and enhance game fairness.

Sports Technology Market Size, By Technology, 2018 - 2028

15.1 Bn ... 48.7 Bn

2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028
■ Smart Stadiums ■ Device ■ Sports Analytics ■ eSports

Source: www.kbvresearch.com

Primary Market
High School Athletics

Market Size: **27,000 high schools** (2020, nces.ed.gov)

With over **8 million high school athletes** as of 2024 (nfhs.org), high school sports represent a vast and underserved market that would benefit the most from refAIree. Most high school athletic departments operate on tight budgets, often lacking the resources for advanced replay systems or extensive coaching and officiating staff. refAIree addresses these challenges by offering an affordable, automated solution that reduces staffing needs while providing reliable replay and player analytics capabilities.

Secondary Market
Collegiate Sports

Market Size: **3,931 colleges** (2020, nces.ed.gov)

The collegiate sports market is immense, generating over **$1 billion** in revenue annually (ncaa.org, 2021). AI-driven referee systems offer a cost-effective way to improve officiating accuracy and game integrity. While top-tier sports programs may already implement replay systems, all colleges stand to benefit from StatSight's player performance analytic capabilities, especially at our low price point.

Tertiary Market
Minor Sports Leagues

Minor and developmental professional sports leagues - such as the NBA G League or Minor League Baseball - demand professional-level officiating and coaching but lack the high revenue of major leagues to afford costly systems. refAIree offers these leagues an affordable way to access advanced officiating and performance analysis technology without the financial burden of traditional systems.

> # The referee that never misses a call.

refAIree stands out from other replay systems with its **proprietary CourtVision** machine learning software, which automatically detects rule violations in real time. This makes refAIree more than just a replay tool—it can also function as an **independent referee**, reducing the need for additional officials and reducing staffing costs. While similar automated call-making exists for professional review systems such as VAR or Hawk-Eye, refAIree offers a comparable level of accuracy and speed at a fraction of the cost, with systems starting at just **$5,500**. Combined with automated stat-keeping and advanced analytics from StatSight, refAIree offers unmatched performance and value for teams at every level.

Affordable
Professional grade tech starting at just $5,500 – accessible for every budget

Accurate
AI-powered sensors and replay make every call count

Automated
From officiating to stat-keeping, refAIree streamlines game management

Competitive Advantage

COMPANY	AUTOMATED STATKEEPING	REPLAY SOFTWARE	REPLAY HARDWARE	AUTOMATED CALLS	STARTING PRICE
SportsVisio	✓				$525 for 20 games
vMix		✓			$1,799
Newtek		✓	✓		$10,000
Hawk-Eye		✓	✓	✓	$60,000
refAIree	✓	✓	✓	✓	$5,500

refAIree

Key Features

FEATURE	DESCRIPTION
CourtVision	CourtVision is an advanced **machine learning** software that integrates visual data from **YOLO** (You Only Look Once) and pose estimation with sensory inputs to **automatically detect rule violations** in real time. This system significantly **reduces human error**, ensuring consistent and accurate officiating. Its innovative use of multiple sensors reduces the need for the costly hardware demanded by professional replay systems, allowing it to maintain **high performance** with significantly **lower requirements**.
StatSight	In addition to officiating, refAIree enhances game analysis with **StatSight**, an AI-powered performance tracking system. By **automatically recording in-game stats** and uploading them online, StatSight **eliminates manual stat-keeping** and reduces staffing costs. It **analyzes** player and team **performance**, identifying strengths, weaknesses, and strategic opportunities. Coaches receive real-time insights and **AI-driven recommendations** to optimize training, improve game strategies, and enhance player development.
Microchipped Sports Balls	Conventional object detection systems like YOLO rely solely on visual AI models to track ball location, but struggle with fast-moving or obscured balls in poor lighting. refAIree solves this using microchipped sports balls with **UWB** (Ultra-Wideband) sensor integration, delivering precise, real-time 3D tracking regardless of camera visibility. This **eliminates** the need for **costly multi-camera setups**, significantly lowering costs. Additionally, microchip integration creates new **revenue opportunities** through **partnerships with sports ball manufacturers**, enhancing both performance and profitability.
Instant Replay	refAIree's replay system uses high-definition, 60 FPS cameras to deliver **multi-angle views** for **slow-motion replay**. Its multi-stream capability enables simultaneous footage from different perspectives, enhancing decision-making precision. With cloud integration for easy access and review, the system offers professional-grade performance tailored for high schools, colleges, and recreational leagues at a fraction of traditional costs.

Clements Rangers vs Austin Bulldogs
2/10/25

53 - 48

Final

Game Summary:
- Good ball movement and perimeter defense
- Poor left elbow and 3 point shooting

See Full Report

Game Leaders:

Ethan Rainer - 26 pts, 7 ast, 10 rb

Nate Tsai - 19 pts, 3 ast, 5 rb

See More

UWB microchips track precise location data

YOLOv8 Pose Estimation

Product Specifications

CourtVision Automatic Calls

Base Setups

📷 CAMERA   ((•)) UWB SENSOR   (•)) BOTH
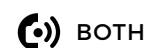
Basketball:
- Fouls
- Travels
- Double Dribbles
- Goaltending
- Shot Clock Violations
- Out of Bounds
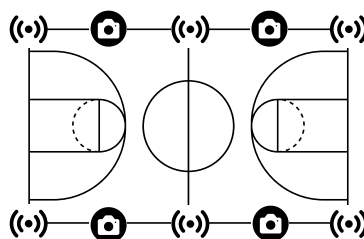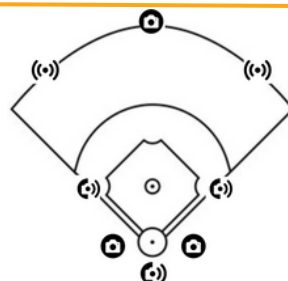
4 Cameras
6 Sensors

Base Price:
$5,500

Baseball:
- Strike Zone detection
- On-Base
- Balks
- Foul Balls
- Home Run Confirmation

6 Cameras
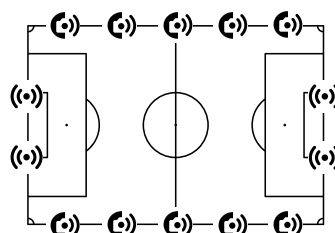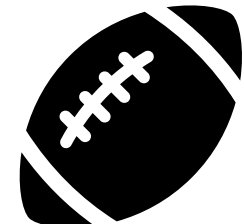5 Sensors

Base Price:
$6,300

Soccer:
- Fouls
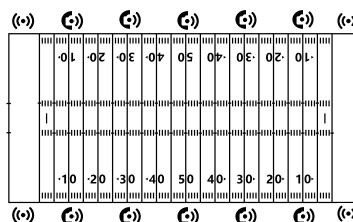- Offsides
- Goal Line detection
- Handballs
- Out of bounds

10 Cameras
14 Sensors

Base Price:
$9,540

American Football:
- Offsides
- False Starts
- Pass Interference
- Out of Bounds

10 Cameras
14 Sensors

Base Price:
$9,540

Unique Applications

Performance Benchmarking

CourtVision can serve as an impartial benchmark to **evaluate referee accuracy** by comparing real-time decisions with AI-detected calls. Over time, it can track trends such as missed calls or inconsistent rulings by individual officials, and even **detect potential biases** based on teams, players, or game contexts. This data can be used to inform promotions and **compensation**, rewarding high-performing refs and identifying those who need additional support.

Movement Analysis

CourtVision's movement tracking helps **prevent injuries** by detecting harmful habits and potential injuries before they become serious. It identifies **poor form** and repetitive stress patterns—like uneven pivots or bad landing mechanics—that often lead to injury. By flagging awkward movements and asymmetries in real time, it helps trainers and coaches intervene before problems escalate, reducing long-term health risks in intensive sports.

refAIree

Business Feasibility

Technology

Basic YOLO-based referees have already proven their viability. In 2023, Georgia Tech student Ayush Pai built an AI basketball officiating system using YOLO to detect travels and double-dribble calls with impressive accuracy. His low-cost prototype showed that real-time officiating with computer vision is not only technically possible but also accessible. refAIree builds on this foundation by combining advanced models with UWB sensors and real-time analytics, making scalable, affordable AI officiating a practical and profitable business opportunity.

Ayush Pai's AI referee prototype

Business Strategy

Phase 1:
Aggressive Expansion (Years 1-3)

RefAIree will start by prioritizing market entry and establishing brand recognition, heavily investing in **marketing** and R&D. In year 1, we will target local high schools and colleges in the Greater Houston Area, before expanding to statewide outreach in year 2 and covering the Southern US in year 3. Despite initial losses, this phase drives early adoption and secures a **large user base**, setting the stage for rapid **royalty revenue growth**.

Phase 2:
Product Expansion (Years 4-5)

As revenue grows and refAIree becomes profitable, our focus shifts from aggressive marketing to long-term growth. Marking expenses are scaled back while **R&D** investment **increases**, allowing refAIree to expand into **other sports** and **diversify product offerings**. By broadening its capabilities, refAIree ensures continued growth, wider customer appeal, and a stronger competitive moat in the sports technology space.

Phase 3:
Institutional Integration and International Reach (Years 6+)

By year 6, refAIree leverages its industry traction and financial stability to **collaborate with institutions** and expand **internationally**. By partnering with athletic associations and collegiate conferences such as the **NCAA**, refAIree can secure long-term contracts and **exclusive vendor rights**, ensuring continued profitability. These partnerships also build refAIree's credibility, helping it build a strong international presence.

refAIree

Revenue Streams

Product Sales

refAIree's initial revenue will primarily come from product sales, offering fully customizable officiating systems that leagues can scale to fit their specific needs. Customers can scale their systems by selecting from a range of camera qualities, sensor packages, and hardware configurations to match their budget and performance requirements.

Royalty Partnerships

In the long run, refAIree's primary revenue stream will shift to royalty partnerships with sports ball manufacturers. CourtVision's precise location data requirements necessitates the use of **microchipped sports balls**. By **licensing** CourtVision-compatible microchips to manufacturers, refAIree can charge a **40% royalty** on each unit sold. This approach provides a **recurring income stream** that **scales exponentially** with our growing customer base, making refAIree...

not just a product, but an **ecosystem**

Repairs and Maintenance

Additionally, refAIree will generate recurring revenue through maintenance and repair services, ensuring long-term system performance and customer support. Clients can also opt into an annual insurance coverage plan for $500, providing protection against hardware damage and reducing unexpected costs. These add-on services help create a reliable, ongoing revenue stream while reinforcing customer satisfaction and retention.

Marketing Strategy

Direct:

Social Media Marketing

RefAIree's social media strategy drives brand awareness through engaging videos, viral officiating challenges, and influencer partnerships. Targeted ads and interactive campaigns on platforms like Instagram and TikTok will showcase our technology and convert interest into sales.

Tournament Sponsorships

RefAIree will financially sponsor local and regional tournaments by contributing to prize pools and event costs in exchange for brand promotion and system integration. This strategy boosts visibility among athletes, coaches, and spectators while positioning refAIree as a supporter of amateur and developmental sports.

Live Product Demonstrations

RefAIree will be showcased at key sporting events and industry conferences, highlighting its real-time decision-making capabilities and impact on fairness srnd efficiency. Live testing and Q&A sessions will drive engagement and adoption.

Indirect:

Game Viewership

As high school and college teams use refAIree, players, coaches, and spectators will naturally become familiar with our product. To maximize this exposure, we will offer **free installations** to select **powerhouse teams** before our official launch, leveraging the visibility their games generate. These high-profile matchups often attract large crowds and online streams, creating organic advertising opportunities. This strategy builds brand recognition and credibility while positioning refAIree as a trusted standard in modern sports officiating.
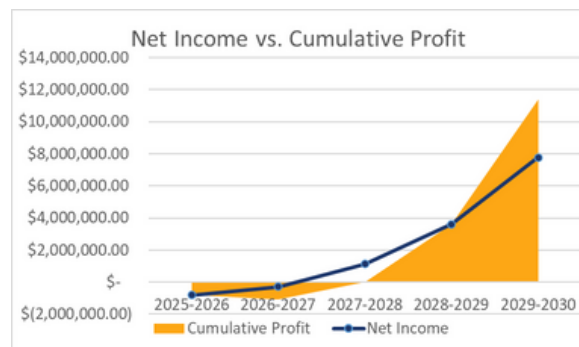
refAIree

# Finances

5-year Projected Income Statement

refAIree Projected Income Statement - Summary

	2025-2026	2026-2027	2027-2028	2028-2029	2029-2030
Revenue					
Standard Unit Sales	$ 199,360.00	$ 1,845,720.00	$4,684,560.00	$ 8,604,480.00	$12,535,160.00
Royalties	$ 20,096.00	$ 264,592.00	$ 987,643.00	$ 2,615,482.00	$ 5,491,653.00
Insurance and Maintenance	$ 6,500.00	$ 45,052.00	$ 180,731.00	$ 314,895.00	$ 589,436.00
Total Revenue	$ 225,956.00	$ 2,155,364.00	$5,852,934.00	$11,534,857.00	$18,616,249.00
Cost of Sales					
Standard Unit Sales	$ 49,840.00	$ 461,430.00	$1,171,140.00	$ 2,151,120.00	$ 3,133,790.00
Royalties	$ 6,441.00	$ 59,425.00	$ 176,900.00	$ 571,250.00	$ 1,049,800.00
Distribution	$ 15,000.00	$ 90,000.00	$ 180,000.00	$ 250,000.00	$ 400,000.00
Total Cost of Sales	$ 71,281.00	$ 610,855.00	$1,528,040.00	$ 2,972,370.00	$ 4,583,590.00
Gross Profit	$ 154,675.00	$ 1,544,509.00	$4,324,894.00	$ 8,562,487.00	$14,032,659.00
Operating Expenses					
Marketing					
Social Media Marketing	$ 250,000.00	$ 400,000.00	$ 750,000.00	$ 750,000.00	$ 750,000.00
Tournament Sponsorships	$ 50,000.00	$ 200,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00
Product Demonstrations	$ 50,000.00	$ 100,000.00	$ 150,000.00	$ 200,000.00	$ 250,000.00
Total Marketing Expenses	$ 350,000.00	$ 700,000.00	$1,200,000.00	$ 1,250,000.00	$ 1,300,000.00
Research and Development					
Total R&D Expenses	$ 300,000.00	$ 600,000.00	$1,100,000.00	$ 2,250,000.00	$ 3,000,000.00
General					
Wages and Salaries	$ 150,000.00	$ 250,000.00	$ 400,000.00	$ 670,000.00	$ 900,000.00
Servers - Microsoft Azure	$ 50,000.00	$ 120,000.00	$ 250,000.00	$ 400,000.00	$ 500,000.00
Lease	$ 25,000.00	$ 40,000.00	$ 60,000.00	$ 100,000.00	$ 150,000.00
Utilites	$ 4,000.00	$ 6,000.00	$ 10,000.00	$ 15,000.00	$ 25,000.00
Legal Fees/Permits	$ 25,000.00	$ 30,000.00	$ 50,000.00	$ 75,000.00	$ 100,000.00
Insurance	$ 12,000.00	$ 20,000.00	$ 30,000.00	$ 50,000.00	$ 75,000.00
Other	$ 50,000.00	$ 75,000.00	$ 100,000.00	$ 150,000.00	$ 200,000.00
Total General Expenses	$ 316,000.00	$ 541,000.00	$ 900,000.00	$ 1,460,000.00	$ 1,950,000.00
Total Operating Expenses	$ 966,000.00	$ 1,841,000.00	$3,200,000.00	$ 4,960,000.00	$ 6,250,000.00
Totals					
Gross Profit	$ 154,675.00	$ 1,544,509.00	$4,324,894.00	$ 8,562,487.00	$14,032,659.00
Total Operating Expenses	$ 966,000.00	$ 1,841,000.00	$3,200,000.00	$ 4,960,000.00	$ 6,250,000.00
Net Income	$ (811,325.00)	$ (296,491.00)	$1,124,894.00	$ 3,602,487.00	$ 7,782,659.00
Cumulative Net Income	$ (811,325.00)	$(1,107,816.00)	$ 17,078.00	$ 3,619,565.00	$11,402,224.00

Net Income vs. Cumulative Profit

While refAIree is projected to operate at a net loss over its first two years of business, cumulative profits **break even in the third fiscal year**, demonstrating strong growth potential.

Expense Distribution (100% Stacked)
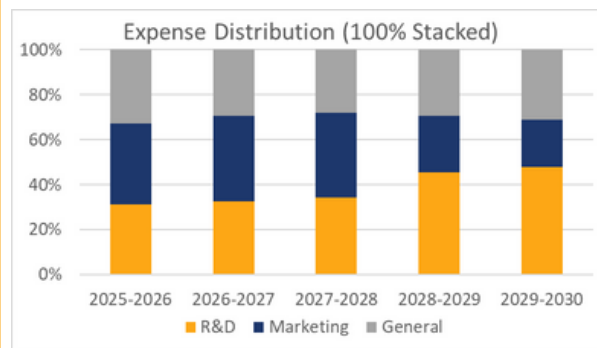
Marketing expenses hover around 35% during refAIree's first three critical years before decreasing to 20% as the business stabilizes. Meanwhile, research and development investment starts at 30% and grows to nearly 50% by year 5 to support expansion into additional sports.
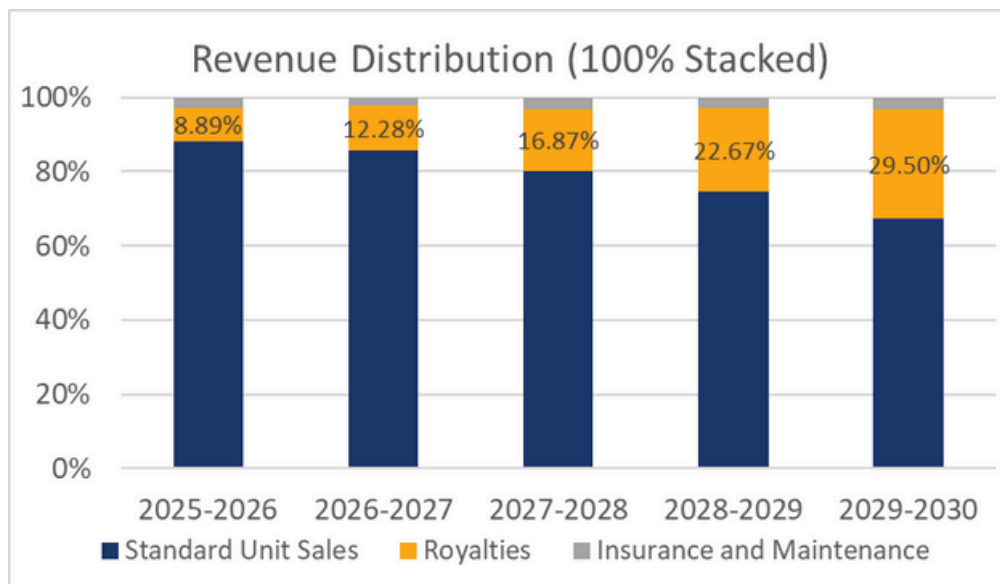
Royalty revenue from microchipped sports balls **grows exponentially** from 8.89% to 29.5% as we expand our customer base, and is expected to surpass direct product sales as our primary revenue stream in following years.

Revenue Distribution (100% Stacked)

Summary

refAIree is an AI-powered officiating and performance analysis system designed to bring professional-grade accuracy to semi-professional, collegiate, and high school sports at an affordable price. Its proprietary CourtVision technology uses cameras, sensors, and machine learning to detect rule violations in real time, reducing reliance on human referees. Beyond officiating, its StatSight system tracks player performance metrics, providing coaches with real-time insights and data-driven recommendations to optimize training and strategy. Offering a cost-effective alternative to high-end systems like VAR and Hawk-Eye, refAIree makes advanced replay tools and automated decision-making accessible to teams and leagues operating on tighter budgets.

As the **first and only professional-grade** officiating system **targeting** the **semi-professional** sports **market**, refAIree has a significant competitive edge due to the **absence of direct competitors** in this segment. This unique positioning offers tremendous growth potential in an untapped market valued in the billions.

Ask

To capitalize on this opportunity, we are seeking a **$1,500,000** loan at a **15%** annual interest rate (compounded monthly) to be repaid over **5 years**, in exchange for a **10%** equity stake in our company.

This funding will be used to heavily invest in **marketing** and cover our initial **cash burn** during the first 2 years of business.

In return, your loan will generate **$641,093.71** in profit from interest. On top of that, your equity is projected to **break even by 2028** and generate a return of **$2,762,272**. Adding these values together, we project your investment to generate a return of **$3,403,365.71** over the next 5 years at a Compounded Annual Growth Rate (**CAGR**) of **24.03%**.

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