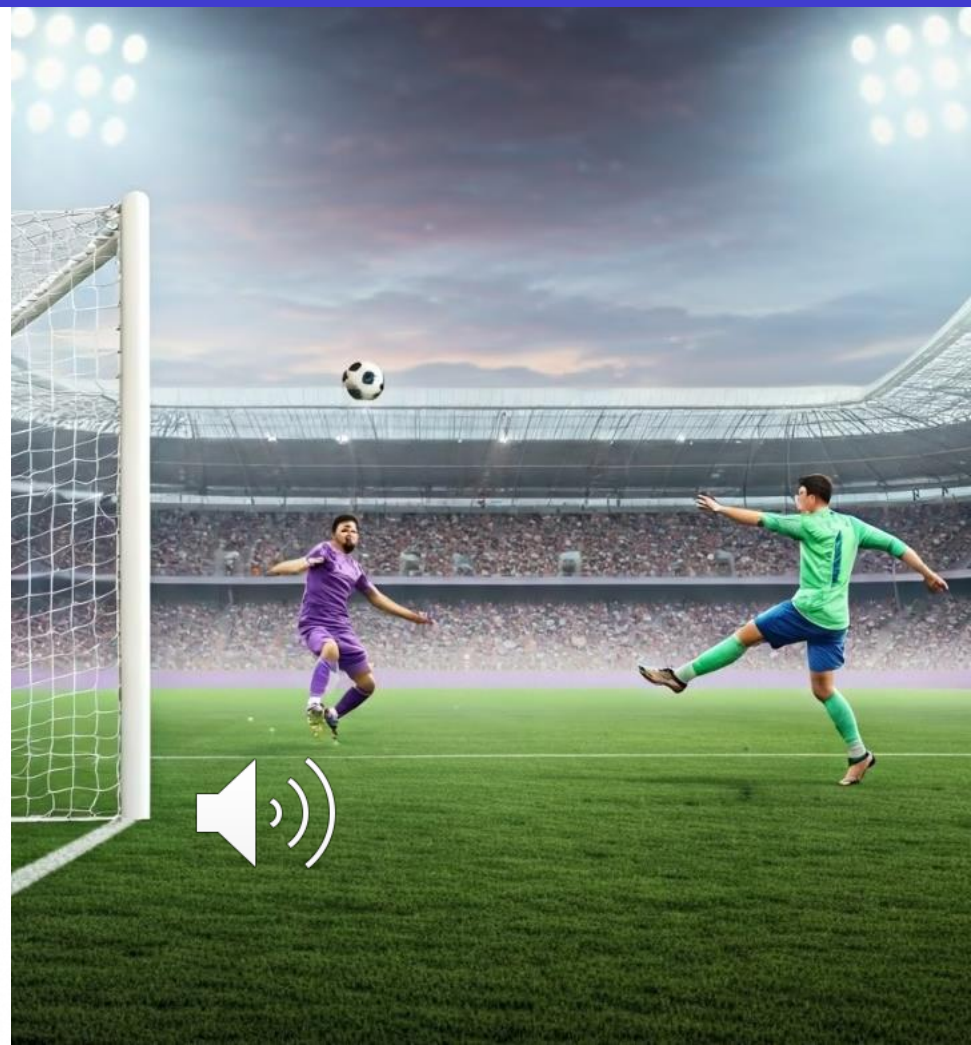
CuJu World 蹴鞠世界

CuJu, dating back 2000 years in China, has been recognized by FIFA as the earliest form of football



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AI-powered Soccer Style Recognition System for Sports Entertainment

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INTRODUCTION

Sports analytics and entertainment are rapidly evolving with advancements in machine learning (ML) and computer vision. This paper introduces an AI-driven system designed to transform the soccer penalty-kick experience into an interactive, personalized entertainment product. By analysing a user's kicking motion in real-time video, the system identifies stylistic similarities to professional soccer players and generates engaging feedback using AI-generated content (AIGC). Traditional sports analytics focus on performance optimization, but few systems bridge the gap between athletic motion analysis and fan engagement. Our work addresses this by combining pose estimation, motion feature extraction, and generative AI to create a novel entertainment platform. The system's core contributions include:

1. Real-time motion recognition using computer vision to decompose a user's penalty kick into biomechanical features.
2. Style-matching prediction via a deep learning model trained on a dataset of professional players' kicks.
3. AIGC-enhanced output that synthesizes comparisons with soccer stars in a visually compelling format.

This approach not only democratizes access to sports analytics but also reimagines how fans interact with their favourite athletes' playing styles.

METHODS

The proposed system comprises three modular components: video input processing, style-matching prediction, and AIGC-based output generation.

Video Input Processing

A pre-trained convolutional neural network (CNN) from the user's video. A recurrent neural network (RNN) processes frame-by-frame key points to capture dynamic motion patterns.

Style-Matching Prediction

The system was trained on a curated dataset of 526 penalty kicks from five elite soccer players, categorized as follows:

Category 0 (CR—Cristiano Ronaldo): 100 videos
Category 1 (LM—Lionel Messi): 93 videos
Category 2 (BZ—Karim Benzema): 128 videos
Category 3 (KK—Kaká): 102 videos
Category 4 (Mod—Luka Modrić): 103 videos

Each video was annotated with player-specific stylistic labels by domain experts. A Siamese network embeds user motion features into a latent space alongside the professional dataset for feature extraction. Cosine similarity quantifies alignment between the user's kick and the nearest player cluster. The top-3 matches are retained for AIGC output.

AIGC-Based Output Generation

A fine-tuned LLM (e.g., Google Gemini) generates a narrative comparing the user's technique to matched players. A generative adversarial network (GAN) overlays the user's pose onto a professional player's kick or renders a stylized animation.

LIMITATION AND RESULTS

The limitation was due to performance degrades with poor lighting or occlusions in input video. Future work could integrate multi-camera setups. This framework extends to other sports offering scalable entertainment and training tools. By fusing computer vision, ML-based style analysis, and generative AI, this work pioneers a new paradigm for sports entertainment. That is interactive, personalized, and accessible. The system's success underscores the potential of AI to enhance sports fan experiences beyond traditional analytics.

ACKNOWLEDGEMENT

The study was financially supported by the Grant from the Hong Kong Polytechnic University (Ref. No. P0053673). The authors thanked all the participants in this study.

Technology Edge

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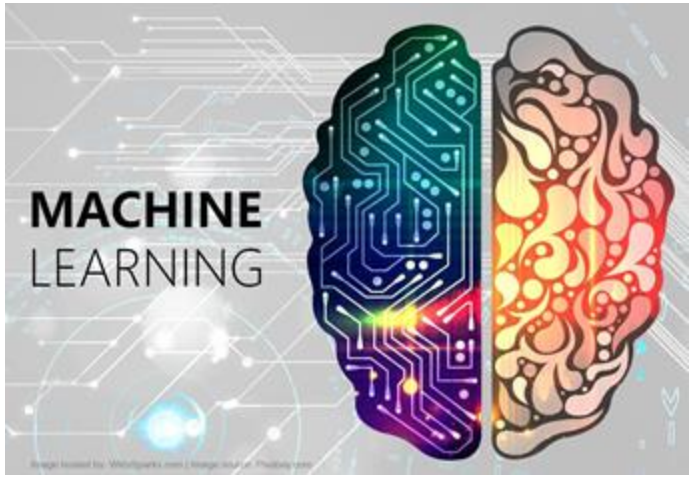

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Kinematic Kinetic

PolyU Supervised ML
Algorithm

Soccer-native Ai

Unlocking Pro-Players' Shooting Skills by Capturing Bio-Mechanics data and feeding into Sports-Native Machine Learning

Macro Pain Points

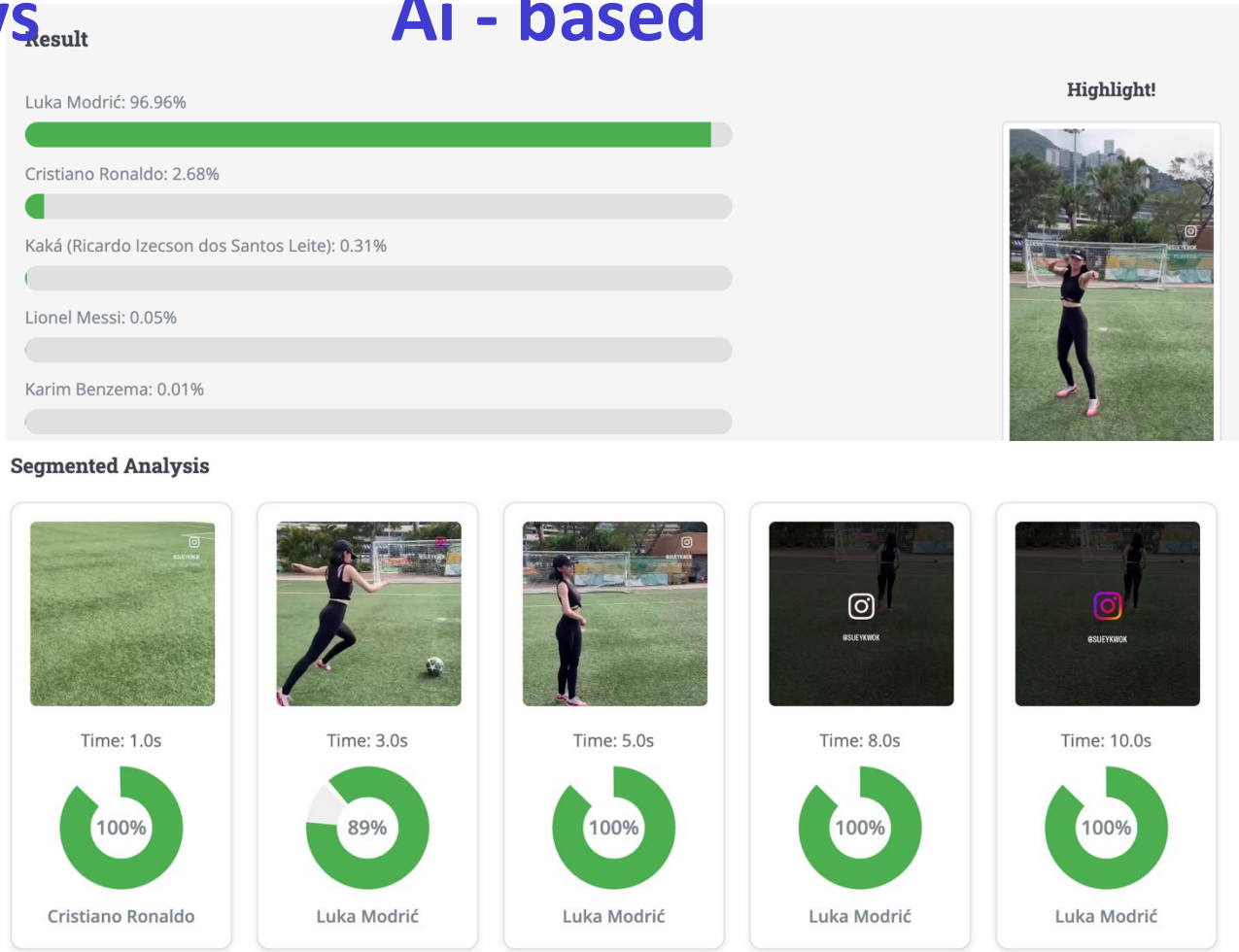
"For a long time, the development of our nation's soccer, volleyball and basketball on the men's side has been unsatisfactory. Men's soccer, in particular, is slumping. The soccer industry now has a number of problems, and fails to live up to people's expectations," Gao, a deputy to the 14th National People's Congress, said in an interview on Sunday following a plenary meeting at the Great Hall of the People in Beijing.

"Achieving good results in men's soccer, basketball and volleyball are important yardsticks for a sporting superpower. So, leveling up our strength in these sports is a must for us to become a stronger sports nation."

The sports minister's interview instantly became trending news on Chinese social media. The hashtag "Sports minister bids to boost three big-ball team games" was viewed over 90 million times in just five hours, with most netizens expressing frustration at the stagnation in men's basketball, volleyball and, especially, soccer.

Chinese men's soccer hit a historic low when the national team failed to qualify for last year's FIFA World Cup in Qatar, even with the ad[illegible]n of naturalized players.

Traditional Training vs Ai - based



- Undersupply of qualified/professional coaches
  >> overbooked class
- High ratio of students : coach
  >> Monotonous training
- Top Coach availability only in 1-tiers cities
  >> Unaffordable pricing

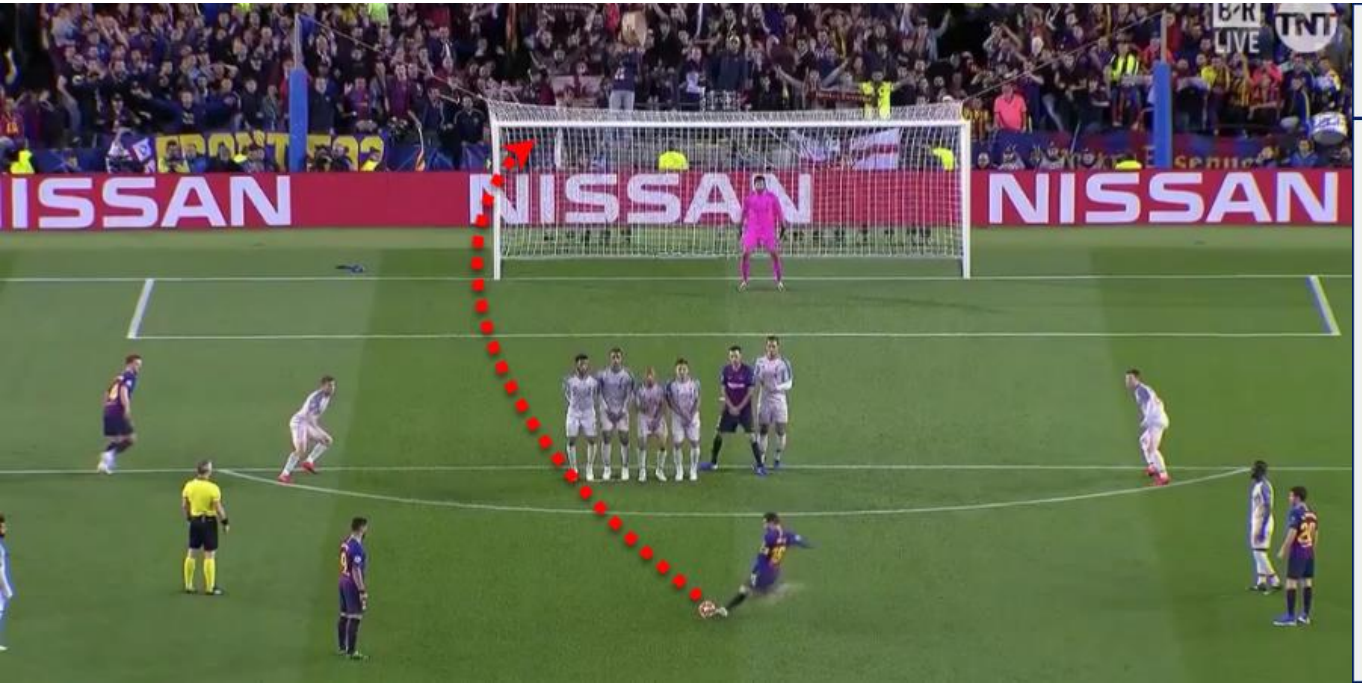
- ✓ Accessible anytime and anywhere
- ✓ Optimization based on big data
- ✓ Comprehensive performance analysis
- ✓ Personalized and Tailored made
- ✓ Cost-effective

Market size

Top 5 Ball Sports by Annual Revenue (2023)

Rank	Sport	Revenue (USD)	Fans	Key Revenue Drivers
1	**Soccer**	$80B+	4.0B+ fans (55% of world population)	Media rights, sponsorships, merchandise
2	Basketball	$25B	2.2B fans (US/China-centric)	NBA, endorsements, broadcasting
3	Tennis	$15B	1.1B fans (global elite events)	Grand Slams, endorsements, events
4	Cricket	$10B	2.5B fans (India, UK, Australia-driven)	IPL, ICC events, broadcasting
5	Volleyball	$5B	900M fans (strong in Europe/Asia)	Leagues, sponsorships, int'l competitions

Value of Ai and Big Data to Soccer Clubs

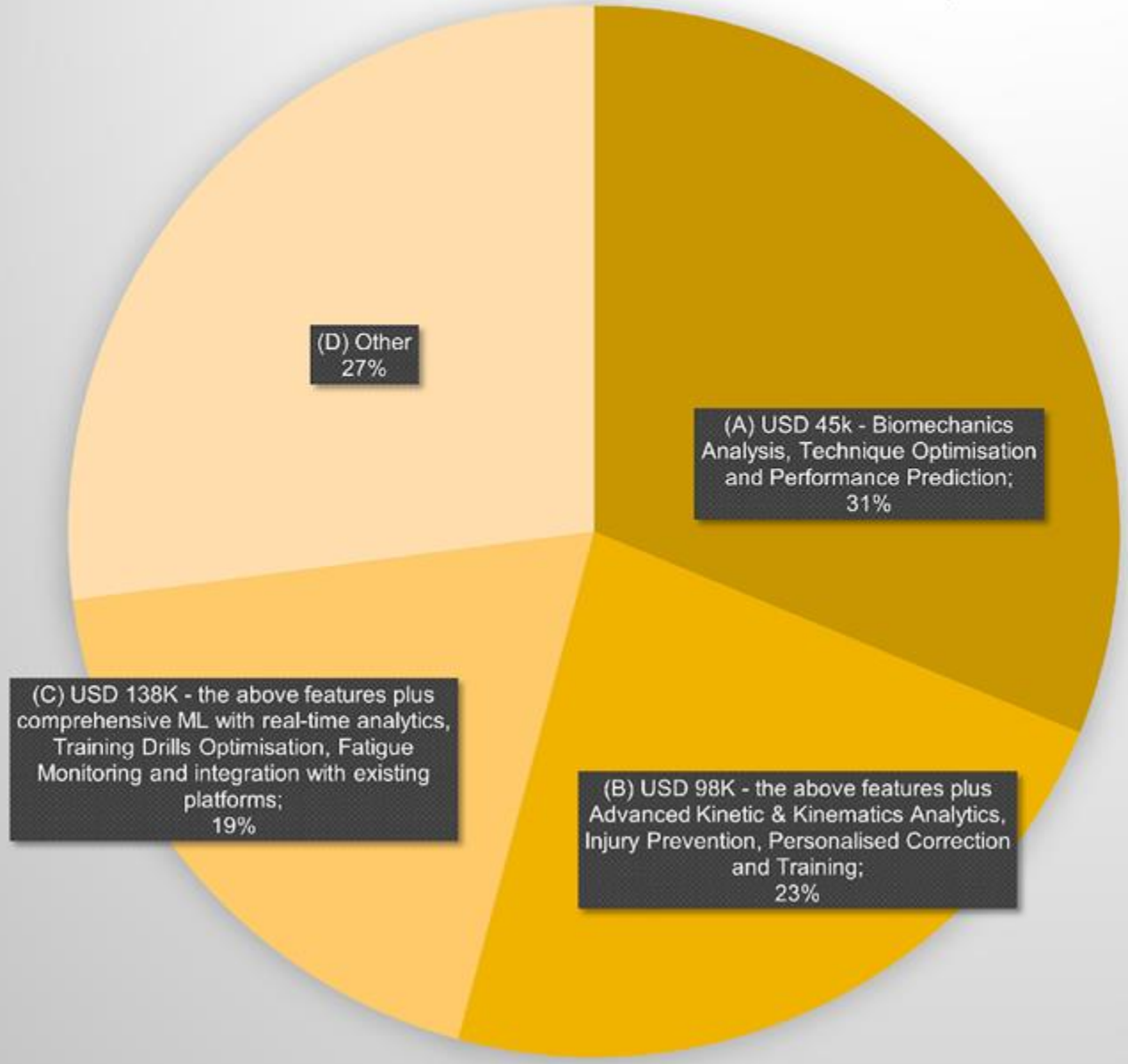


1. Player Performance Metrics
2. Talent Identifications
3. Team Formations
4. Game Strategy and
5. Injury Prevention

Over US$ 230 Billion by 2032

What is the reasonable market price for Ai-SportNative Training System to Sports Association/Clubs/Institutes/Team ?

Ans: HK$650k (take the conservative estimation)



- (A) USD 45k - Biomechanics Analysis, Technique Optimisation and Performance Prediction;
- (B) USD 98K - the above features plus Advanced Kinetic & Kinematics Analytics, Injury Prevention, Personalised Correction and Training;
- (C) USD 138K - the above features plus comprehensive ML with real-time analytics, Training Drills Optimisation, Fatigue Monitoring and integration with existing platforms;
- (D) Other

Total Addressable Market Size

1	Manchester City	England
2	Real Madrid	Spain
3	Arsenal	England
4	Bayer Leverkusen	Germany
5	Inter Milan	Italy
6	Barcelona	Spain
7	Liverpool FC	England
8	Bayern München	Germany
9	Paris Saint-Germain	France
10	Sporting	Portugal
11	Borussia Dortmund	Germany
12	Atlético Madrid	Spain
13	Atalanta	Italy
14	RB Leipzig	Germany
15	VfB Stuttgart	Germany
16	FC Porto	Portugal
21	Monaco	France
22	Aston Villa	England
23	Athletic Bilbac	Spain
24	Palmeiras	Brazil
25	Feyenoord	Netherlands
26	AC Milan	Italy
27	Sparta Prague	Czech Republic
28	Newcastle Uni	England
29	Botafogo FR	Brazil
30	Slavia Prague	Czech Republic
31	Girona	Spain
32	Galatasaray	Turkey
33	Villarreal	Spain
34	Roma	Italy
35	Al Hilal	Saudi Arabia
36	Tottenham Ho	England
51	Internacional	Brazil
52	Fiorentina	Italy
53	The New Saints	Wales
54	Olympiakos	Greece
55	PFC Ludogorets 19	Bulgaria
56	Fortaleza Esporte C	Brazil
60	Fulham	England
61	Flora Tallinn	Estonia
62	Lens	France
63	Red Bull Salzburg	Austria
64	PAOK FC	Greece
65	Zenit St. Petersbur	Russia
66	Lille	France
71	Dynamo Kyiv	Ukraine
72	Maccabi Tel A	Israel
73	FCI Levadia Ta	Estonia
74	Mainz 05	Germany
75	FC Twente	Netherlands
76	Peñarol	Uruguay
77	AEK	Greece
78	Dinamo Zagre	Croatia
79	Braga	Portugal
80	Brest	France
81	Fluminense FC	Brazil
82	Cruzeiro	Brazil
83	West Ham Uni	England
84	América	Mexico
85	Atlético Mineir	Brazil
85	Atlético Mineiro	Brazil
86	AFC Bournemouth	England
87	Flamengo	Brazil
88	Nice	France
89	Brentford FC	England
90	Ajax Amsterdam	Netherlands
91	Werder Bremen	Germany
92	Bahia	Brazil
93	Rennes	France
94	Lyon	France
95	Al Nassr	Saudi Arabia
96	Mamelodi Sundowns FC	South Africa
97	Club Brugge	Belgium
98	Nottingham Forest	England
99	Union St.Gilloise	Belgium
100	Deportivo Alaves	Spain

3000

3-year Financial Plan and Scalability …

	Each Shooting-Native Ai = HKD 650k; annual 15%			Total Available Market size (Global Top-Tier Soccer Teams = 3000)
		Units Sold		
12 months		PoC with Azure/Google/IBM and PolyU Soccer team		
24 months		2	1,300,000	0.07%
36 months		4	2,600,000	0.20%
		2	195,000	
R & D			(1,400,000)	
Other Running Cost			(900,000)	
			1,795,000	*0.2% has 1.8 mil profit*
		Market Share		
		0.20%	**1,795,000**	*Still have lots of room to grow (scale up)*
		0.60%	5,385,000	
		1.00%	8,975,000	

19:01

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Eligibility requirements

Startups will be matched with the tier and benefits that best suit their stage. Startups eligible for Scale tier must:

- Have received startup equity funding* from pre-seed to Series A (if Series A, raised within the last 12 months) by an institutional investor or common Web3 funding sources
- Have been founded within the last 10 years
- Have not received more than $5,000 in Google Cloud credits

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Google for Startups Cloud Program Team 8 November 2024 at 12:14 AM

[Approved] CuJu World Limited: You're Approved for the Google for S...

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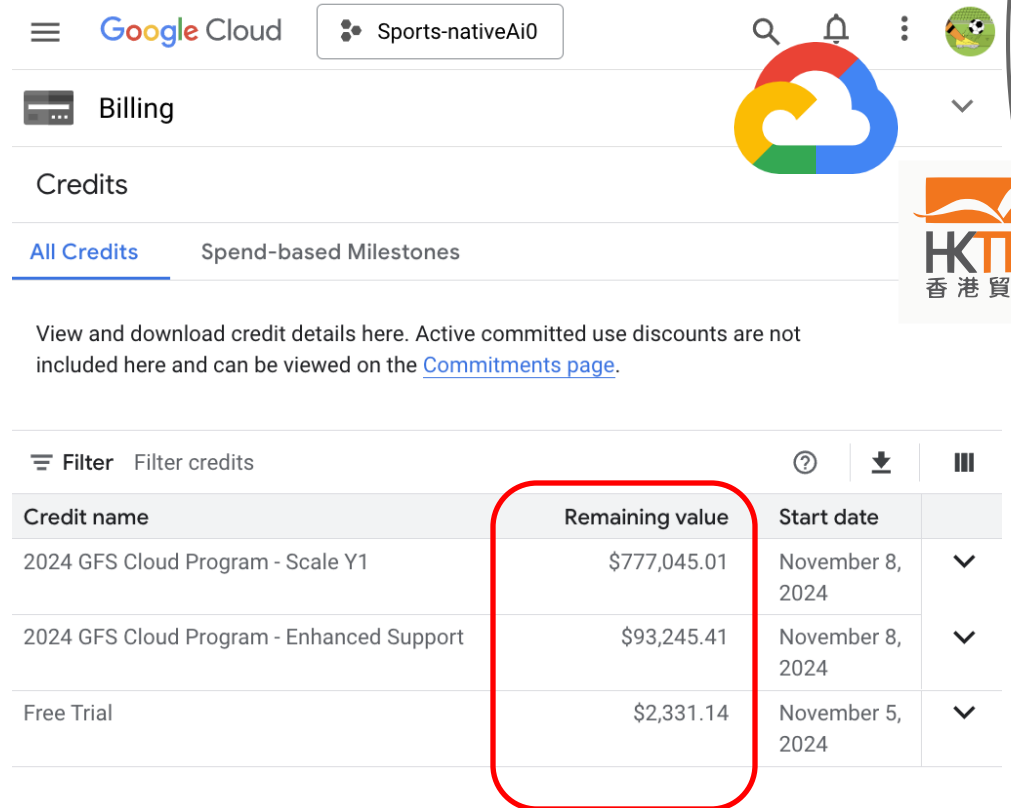

Commercialization

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Asian Football Confederation
The Future is Asia

CFA

THE FOOTBALL ASSOCIATION
HONG KONG, CHINA

Products
- Sports Biomechanics
- Product Exp Design
- Smart Wearable PMT
- AI
- Patent

Places
- Hong Kong
- Mainland China
- GBA Office

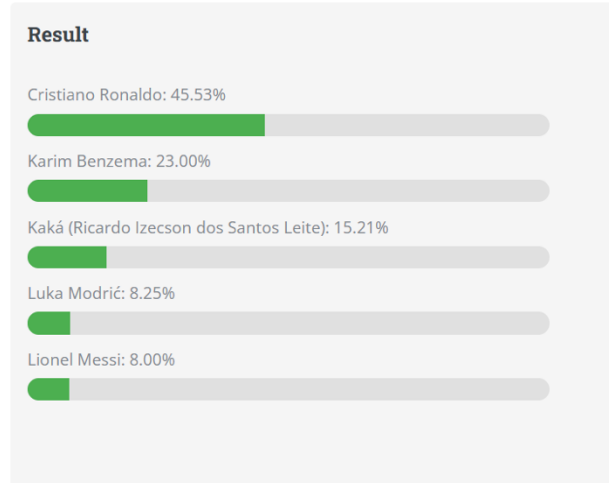
Skills
- Shooting/Dribbling
- Joint Orientation
- Limbs Muscle

Soccer-native Ai

Cooperation
- Sports Association
- Government
- Education Institutes
- University Research
- Training Academies
- Company

Users
- Coaches
- Professional Players
- Teenagers
- Parents

From Sports-native AI to Medals 体育强 中国强



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Thank You 谢谢