

算法无处不在

Make Algorithms Ubiquitous

Hulu Architecture: Today and Tomorrow

诸葛越

Vice President, Hulu
December 8, 2017



AiCon

全球人工智能与机器学习技术大会

助力人工智能落地

2018.1.13 - 1.14 北京国际会议中心



扫描关注大会官网

SPEAKER INTRODUCE



诸葛越

Vice President, Hulu

工作经历

- Hulu全球副总裁，北京研发中心总经理
- Landscape Mobile联合创始人，CEO
- 雅虎北京全球研发中心产品总监
- 微软北京研发中心资深项目经理
- Senior Data Architect, Yahoo US

教育背景

- PhD, MS Stanford University
Computer Science
- MS Stony Brook University
Applied Math
- 清华大学计算机科学与技术系

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- Machine Learning Algorithms in Industry – 机器学习算法企业应用场景
- ML Algorithms in Hulu –无处不在的机器学习算法在Hulu
- Democratize ML In Hulu – Hulu ML算法案例研究
- AI Platform In Hulu – Hulu人工智能平台
- Future Opportunities – 展望未来

Background – 行业背景

AI

is everywhere



ML centric business

face recognition
self-driving car
medical image analysis

...

?

consumer business

online entertainment
online game
travel / tourist application
e-commerce

...

ML Algorithm – 机器学习算法的技术定义

Program

vs

Algorithm

vs

Machine
Learning
Algorithm

a collection of
instructions

the logic to solve
a class of problems

the method to
learn the logic

DATA + MODEL

Trend – ML算法应用的趋势



垂直 => 水平
特型 => 通用
专家 => 平民化



specific scenarios
特定场景

ubiquitous
无处不在

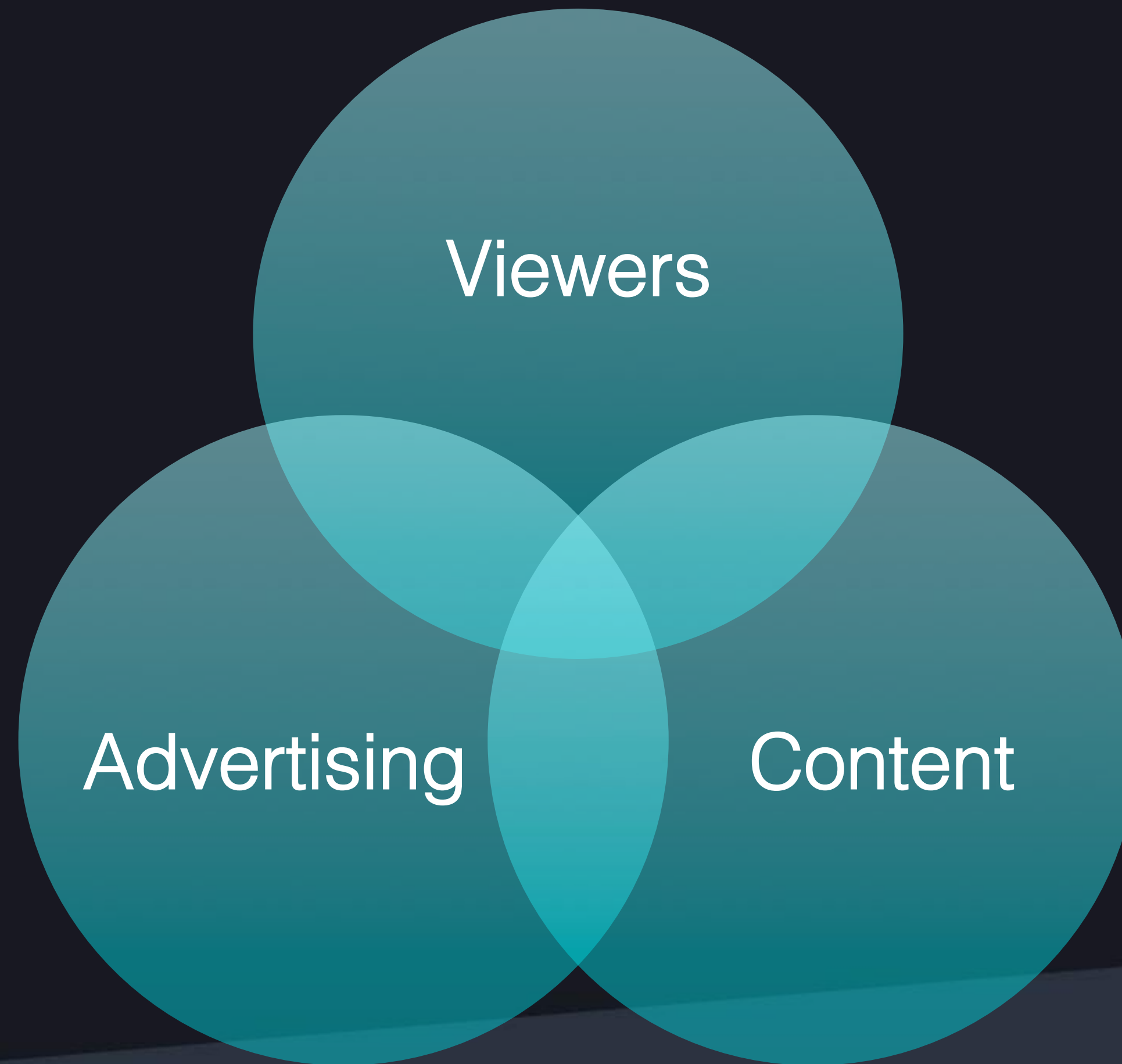
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The word "Hulu" is displayed in a large, white, sans-serif font in the upper left quadrant of the slide.The main title "The Premier Digital Video Company" is centered on the left side of the slide in a large, white, sans-serif font.The descriptive text "Best Quality Content Video-On-Demand and Live Broadcasting" is located on the left side of the slide, below the main title, in a white, sans-serif font.

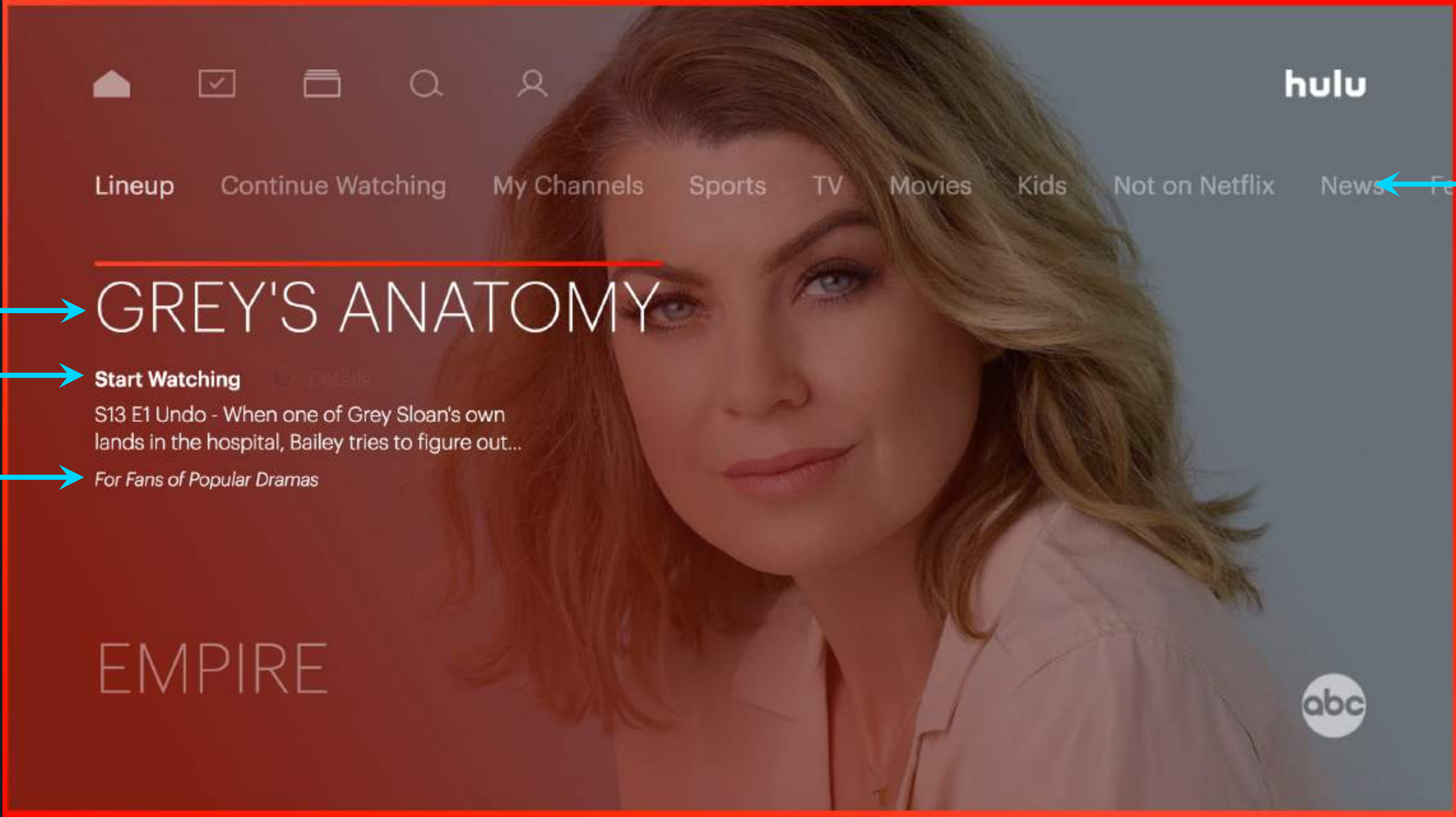
ML Algorithms in Hulu

ML算法在Hulu的应用



Algorithms for Viewers

面向用户的算法



The image shows a screenshot of the Hulu website interface. The top navigation bar includes icons for home, mail, folders, search, and user profile, along with the Hulu logo. Below the navigation bar are menu items: Lineup, Continue Watching, My Channels, Sports, TV, Movies, Kids, Not on Netflix, News, and Feeds. The main content area features a large promotional banner for the TV show 'GREY'S ANATOMY' with a 'Start Watching' button and a 'Details' link. Below this, there is a recommendation section titled 'For Fans of Popular Dramas' with a 'Smart Start' button. The word 'EMPIRE' is visible at the bottom left of the banner, and the ABC logo is at the bottom right. Annotations with arrows point to various elements: 'cover story' points to the 'GREY'S ANATOMY' title; 'smart start' points to the 'Start Watching' button; 'recommendation reason' points to the 'For Fans of Popular Dramas' text; and 'layout management' points to the 'News' and 'Feeds' menu items.

cover story → GREY'S ANATOMY

smart start → Start Watching

recommendation reason → For Fans of Popular Dramas

layout management → News

Algorithms for Viewers

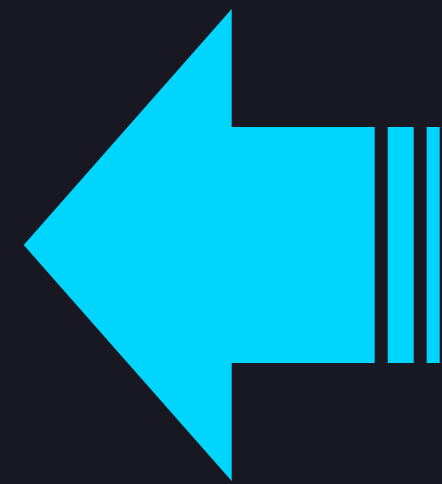
面向用户的算法

onboarding

cold start

convert-to-pay

...



ads

auto-play

QoS to QoE

...

Home Page

cover story

smart start

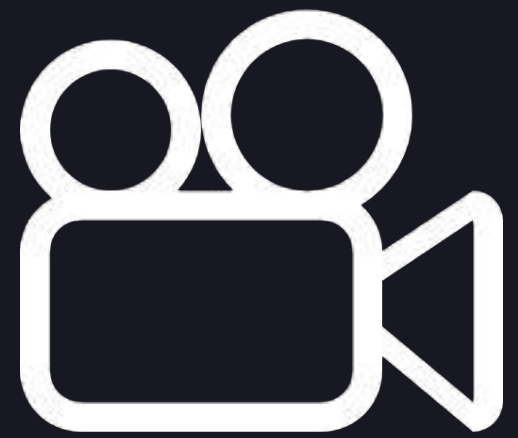
recommendation reason

layout management

...

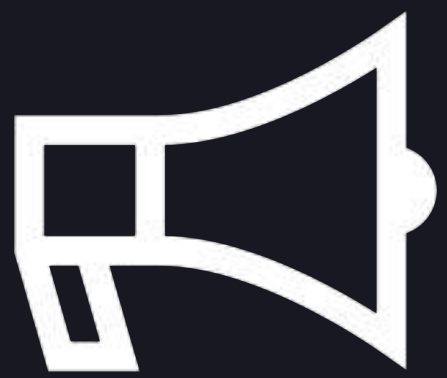
Algorithms for Content and Advertising

面向内容和广告的广告



Content

content valuation
video understanding
content based video encoding
...



Advertising

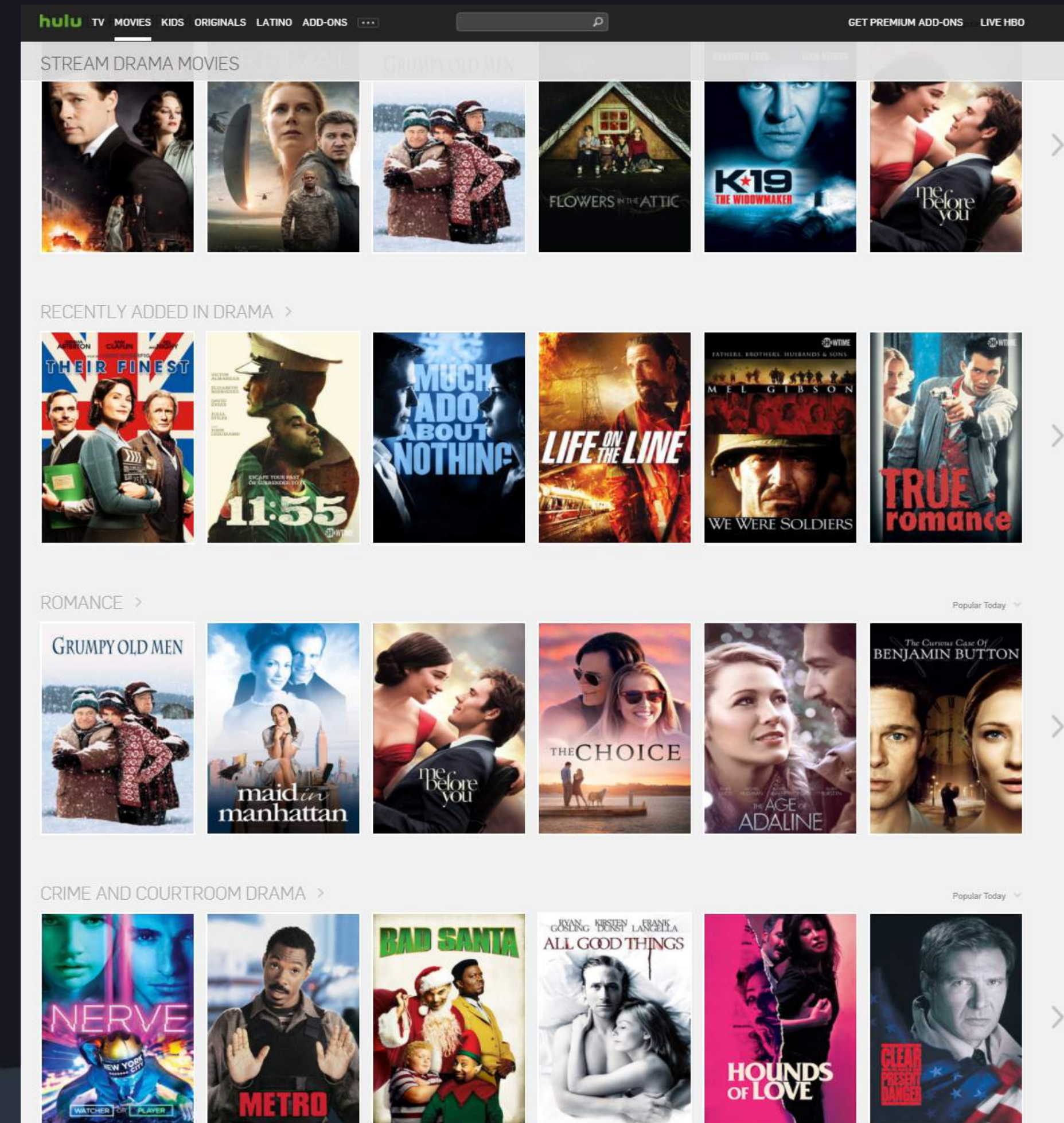
rich targeting
inventory prediction
...

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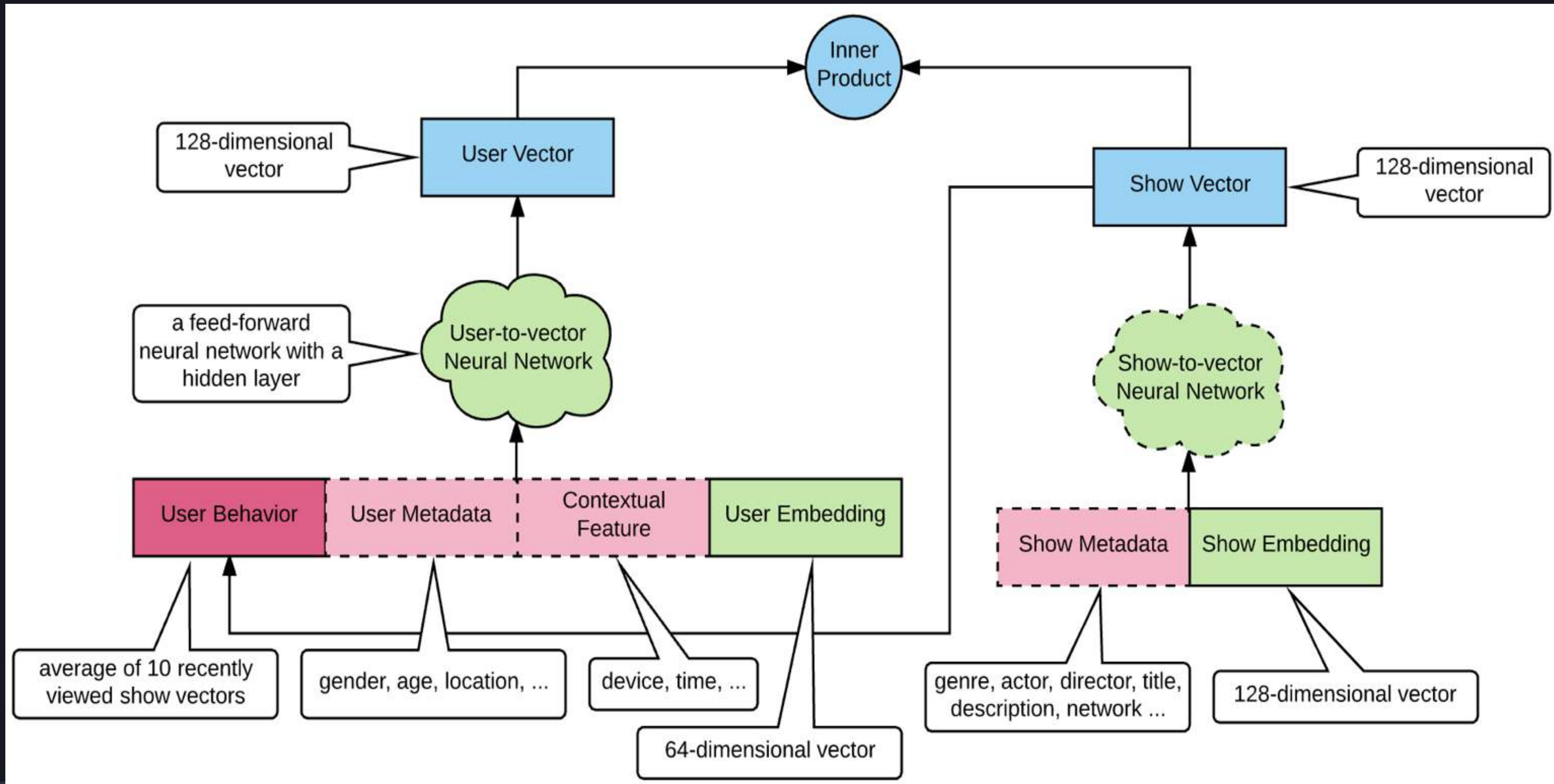
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 - 垂直 – Reco
 - 水平 – Video Content Understanding
 - 水平到垂直 – Contextual + Ads
- AI Platform In Hulu – Hulu人工智能平台
- Future Opportunities – 展望未来

Recommendations: StoreShelf

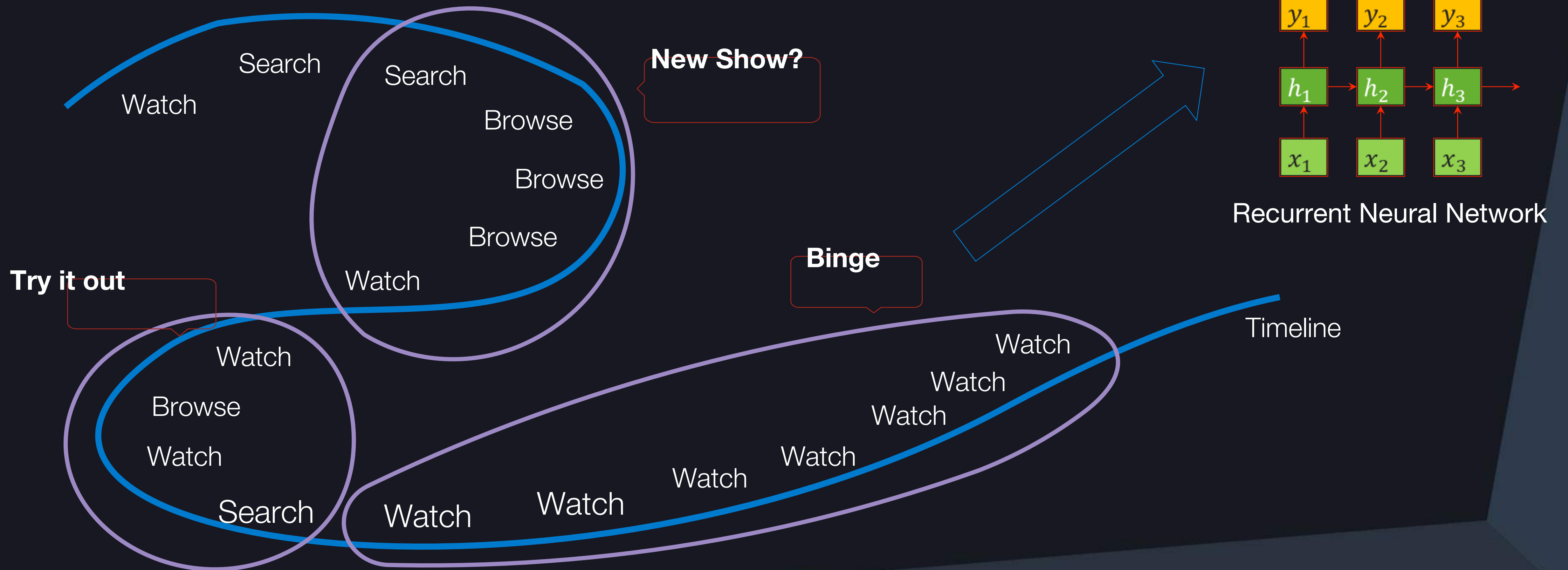
- Item-based Collaborative Filtering
- Matrix Factorization
- Deep Neural Network



DNN-based Relevance Algorithm



Auto-Play, Time Series Model



Video Content Understanding: From Inside 从内部理解视频内容

Video derived meta-data 元数据抽取和发现

Breaks

- Ads break, end credit, ...

Arts

- Video summary, ...

Objects

- Actor, car, animal, ...

Events

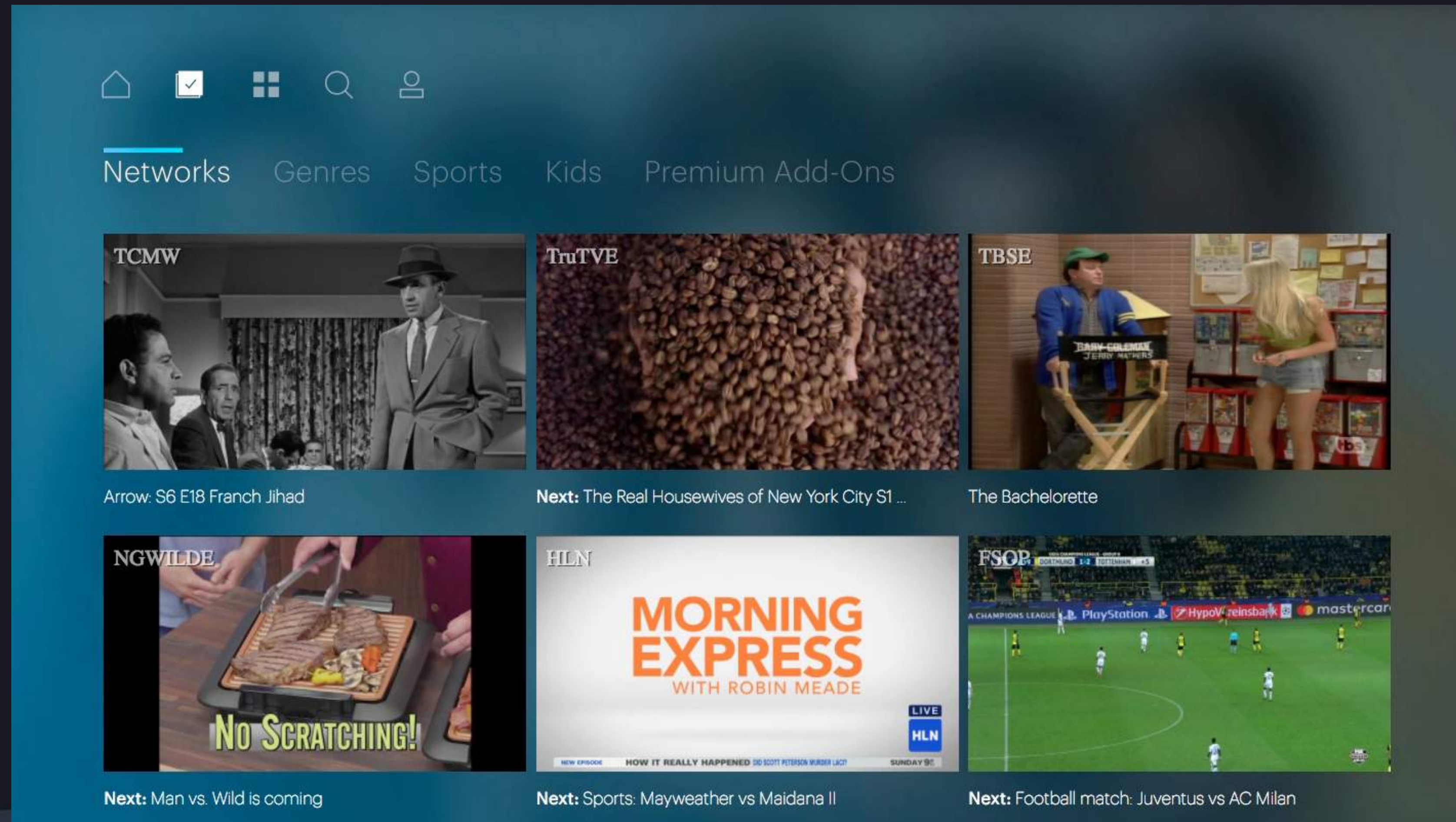
- Cooking, wedding, ...



Video Content Understanding: From Inside 从内部理解视频内容

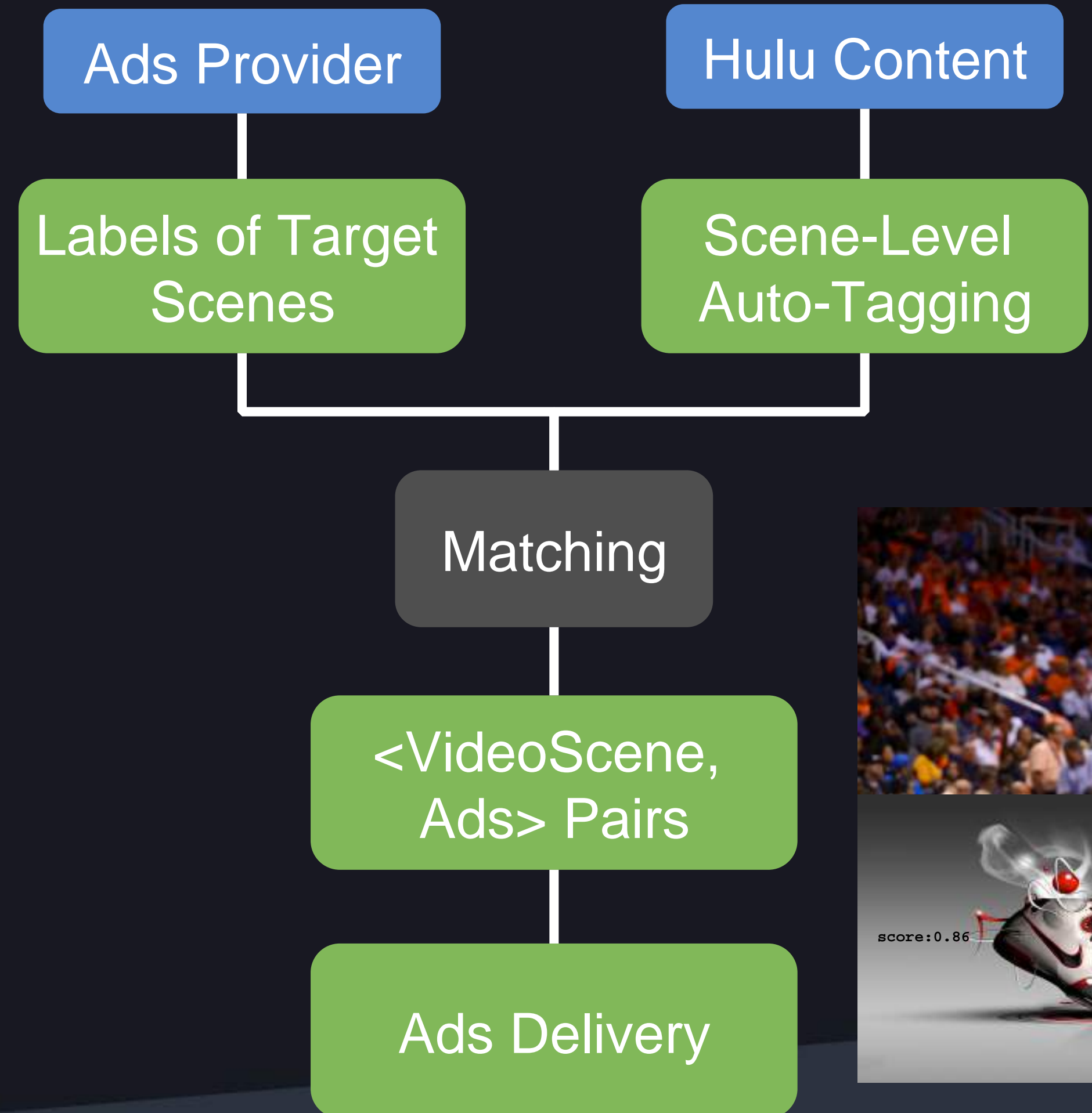
Live Channel
Thumbnail
Preview

直播频道预览



Contextual Ads: 视频和广告的结合

- Deliver semantic related or visual similar ads to viewers during playback
- 视觉连贯的广告
- 语义相关的广告
- Use video derived data to match ads and content



Contextual Ads: 视频和广告的结合

- 视觉连贯的广告
- 语义相关的广告



Contextual Ads: 视频和广告的结合

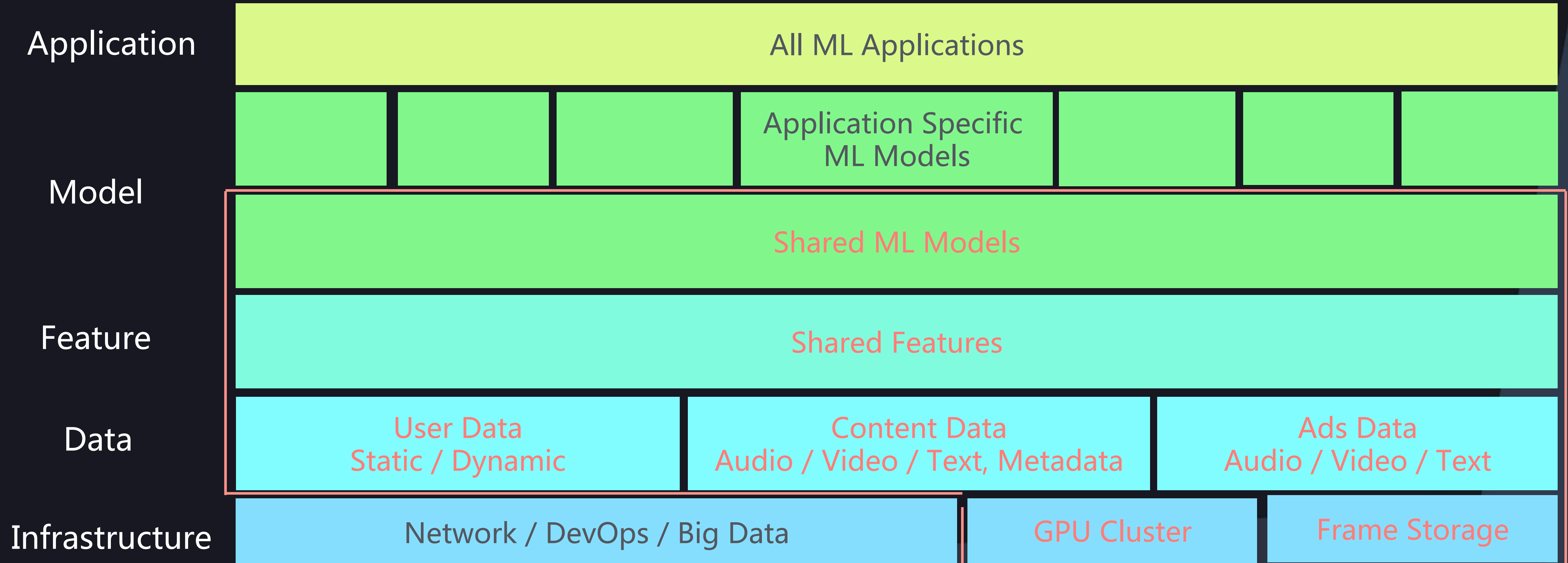
- 视觉连贯的广告
- 语义相关的广告



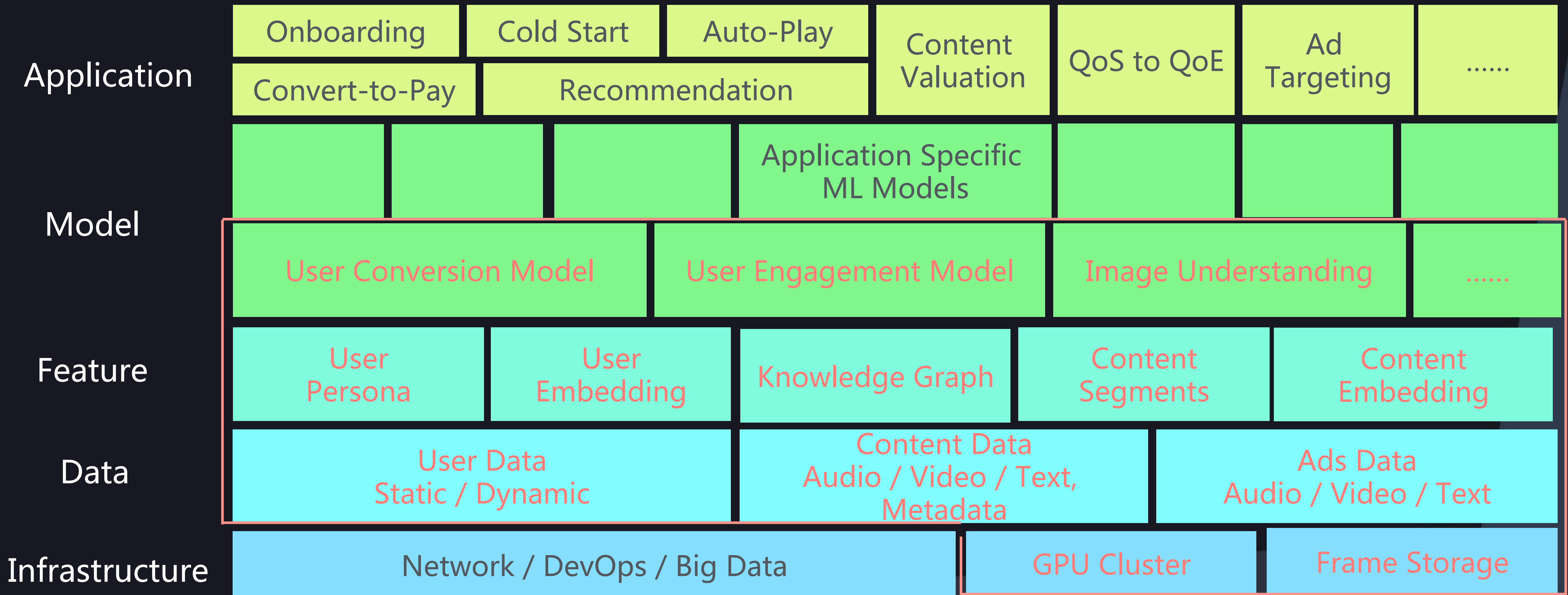
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AI Platform – 人工智能平台



AI Platform – 人工智能平台



Computational Mode – 计算模式

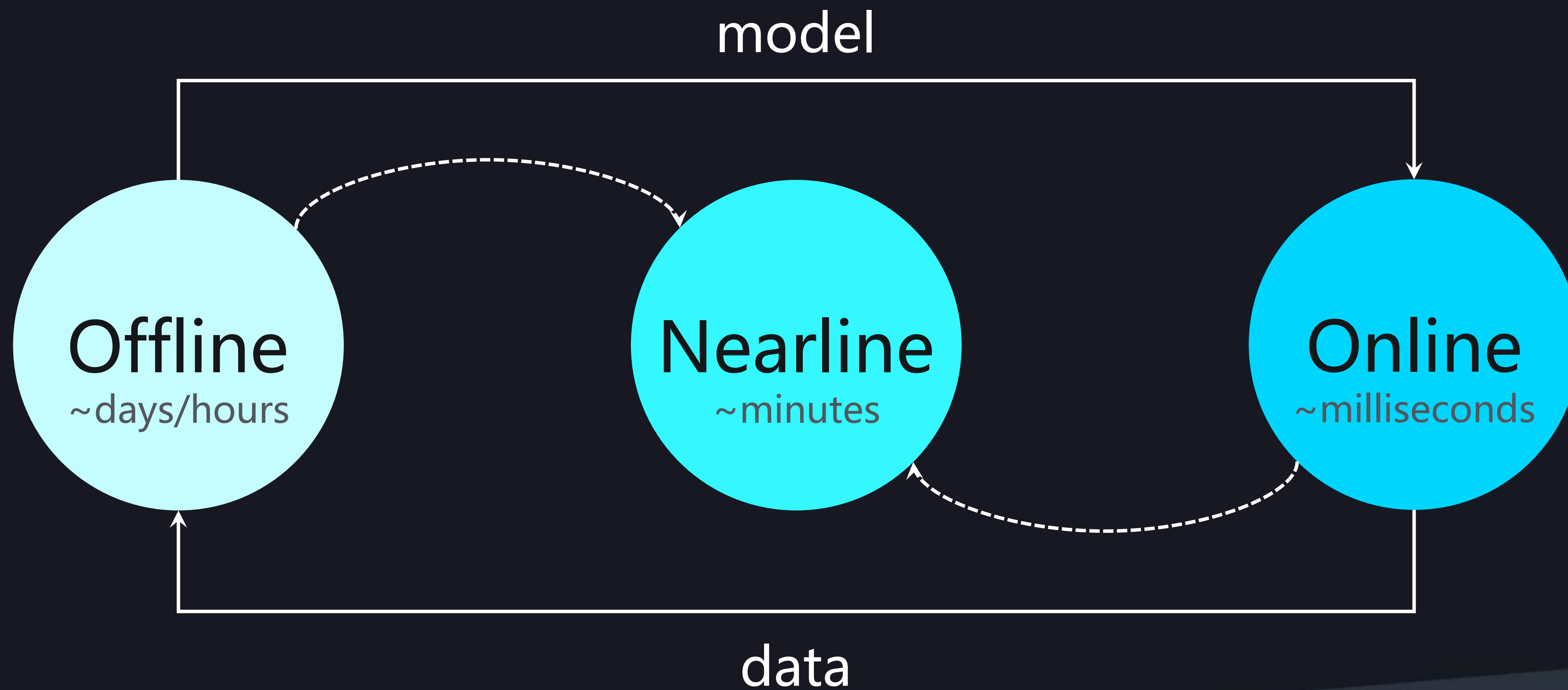


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Future Opportunities – 展望未来

- Smarter interactions 更有创意的交互体验
- Live Video 实时的个性化体验
- Personalized design 个性化设计

THANK YOU

如有需求，欢迎至 [讲师交流会议室] 与我们的讲师进一步交流

