

算法无处不在

Make Algorithms Ubiquitous

Hulu Architecture: Today and Tomorrow

诸葛越

Vice President, Hulu
December 8, 2017



QCon

全球软件开发大会

成为软件技术专家 的必经之路

[北京站] 2018

2018年4月20-22日 北京·国际会议中心

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AiCon

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2018.1.13 - 1.14 北京国际会议中心



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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

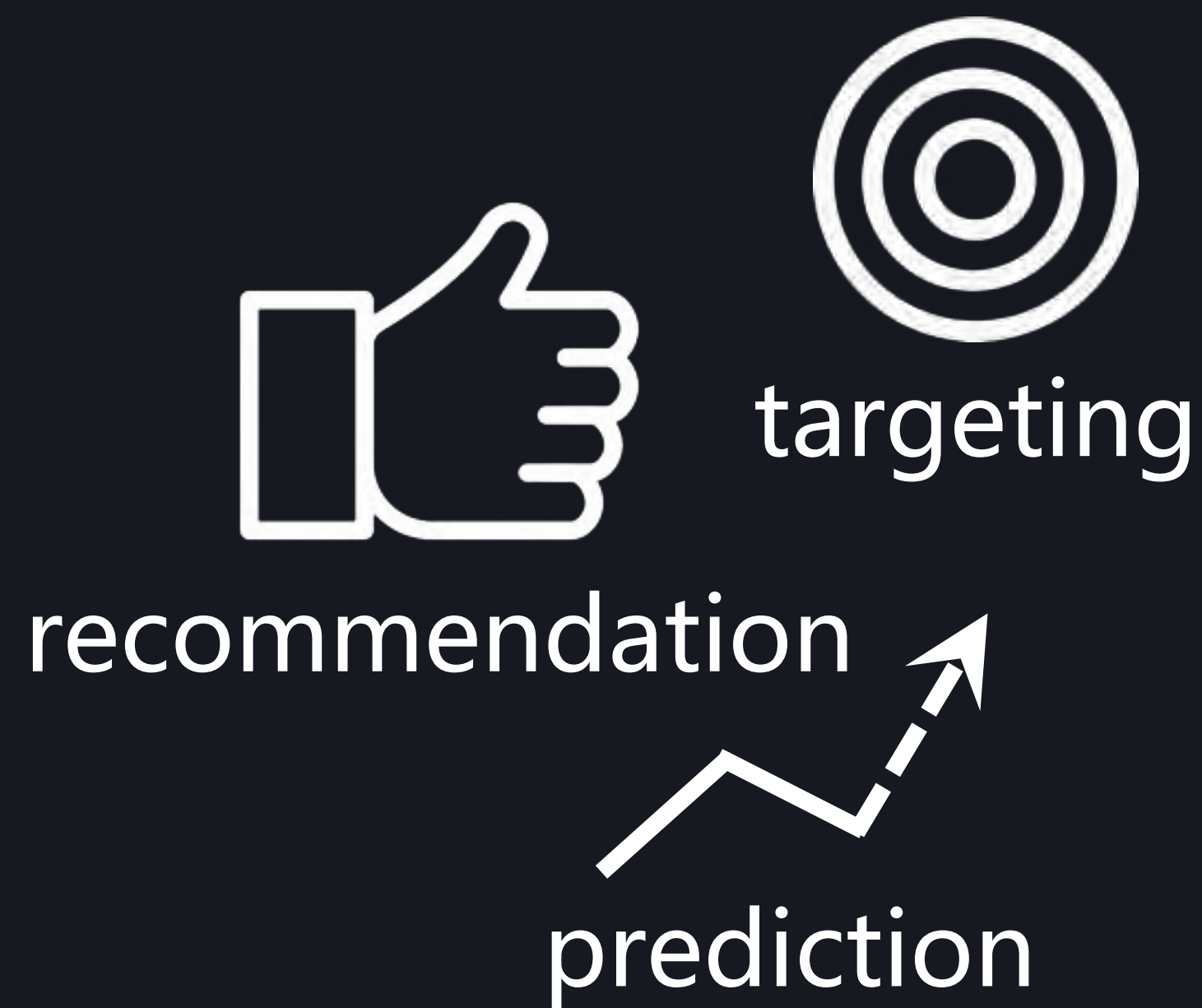
a collection of
instructions

the logic to solve
a class of problems

the method to
learn the logic

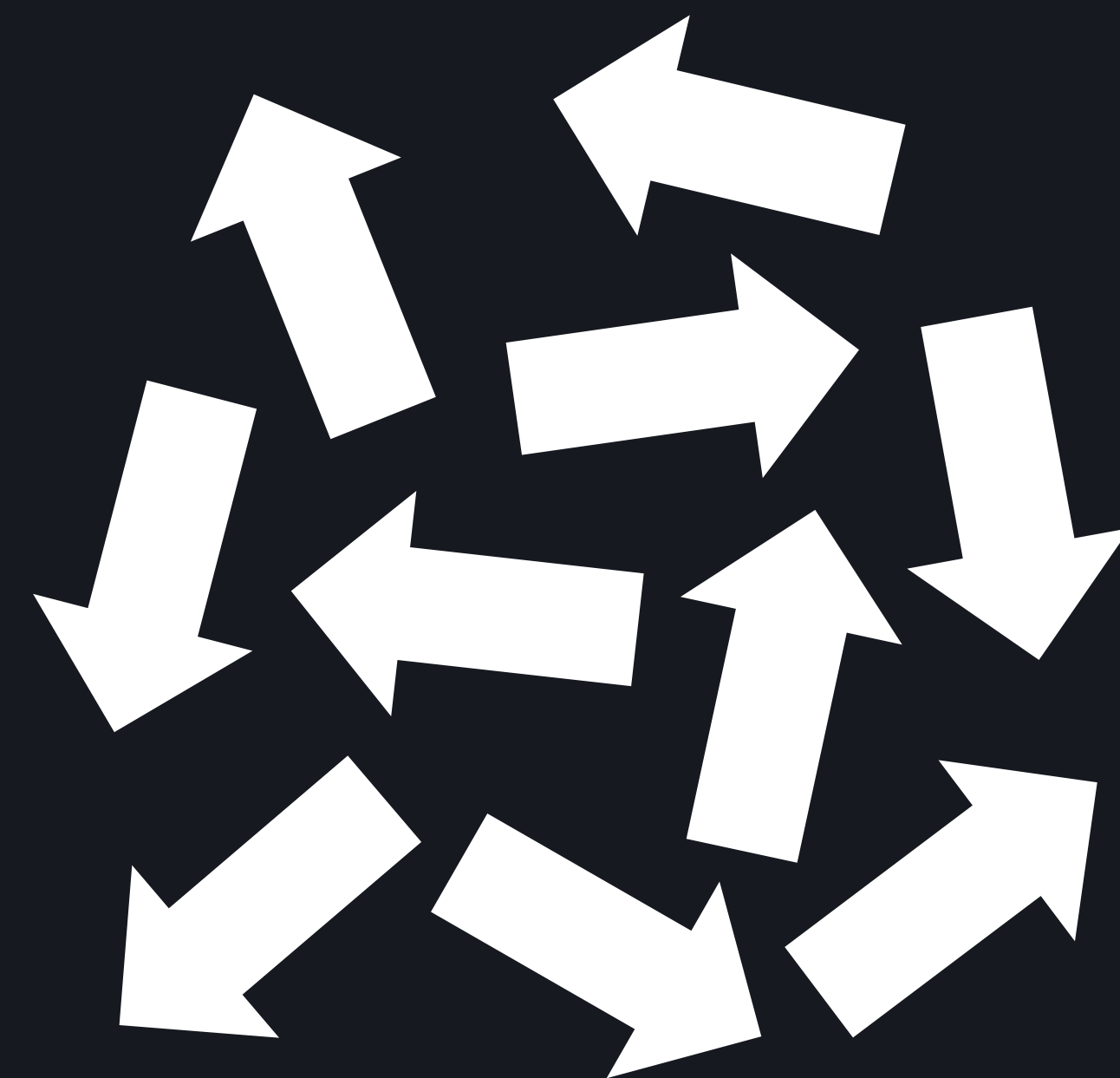
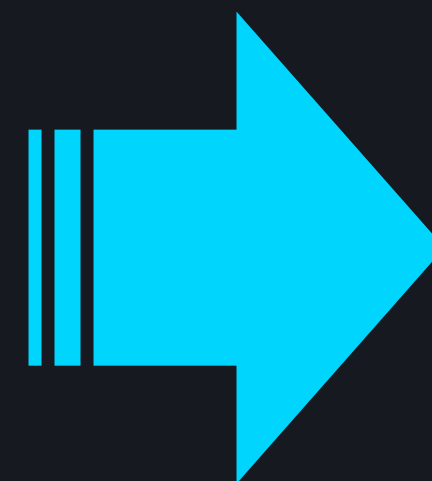
DATA + MODEL

Trend – ML算法应用的趋势



specific scenarios
特定场景

垂直 => 水平
特型 => 通用
专家 => 平民化



ubiquitous
无处不在

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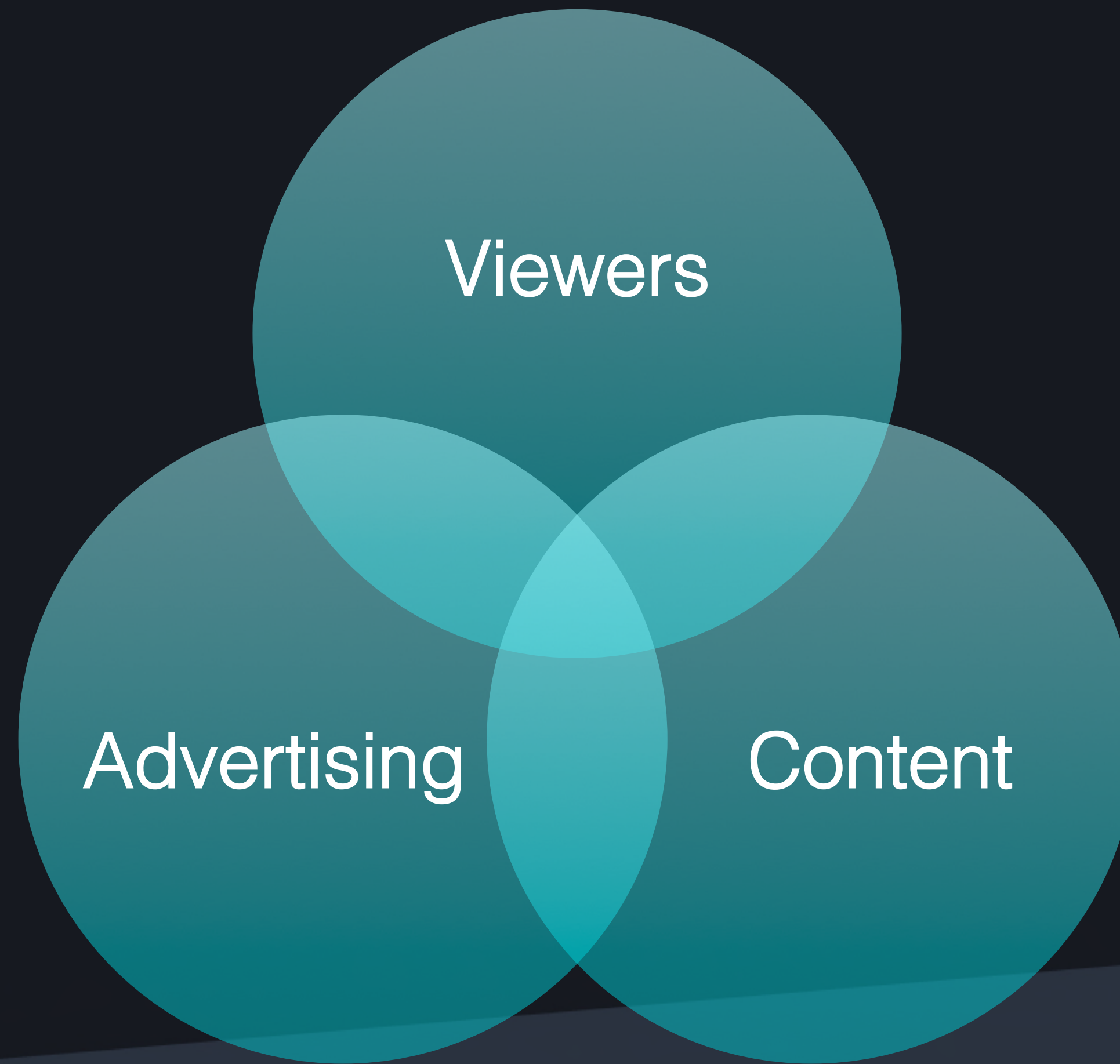
Hulu

The Premier Digital Video Company

Best Quality Content
Video-On-Demand
and Live Broadcasting

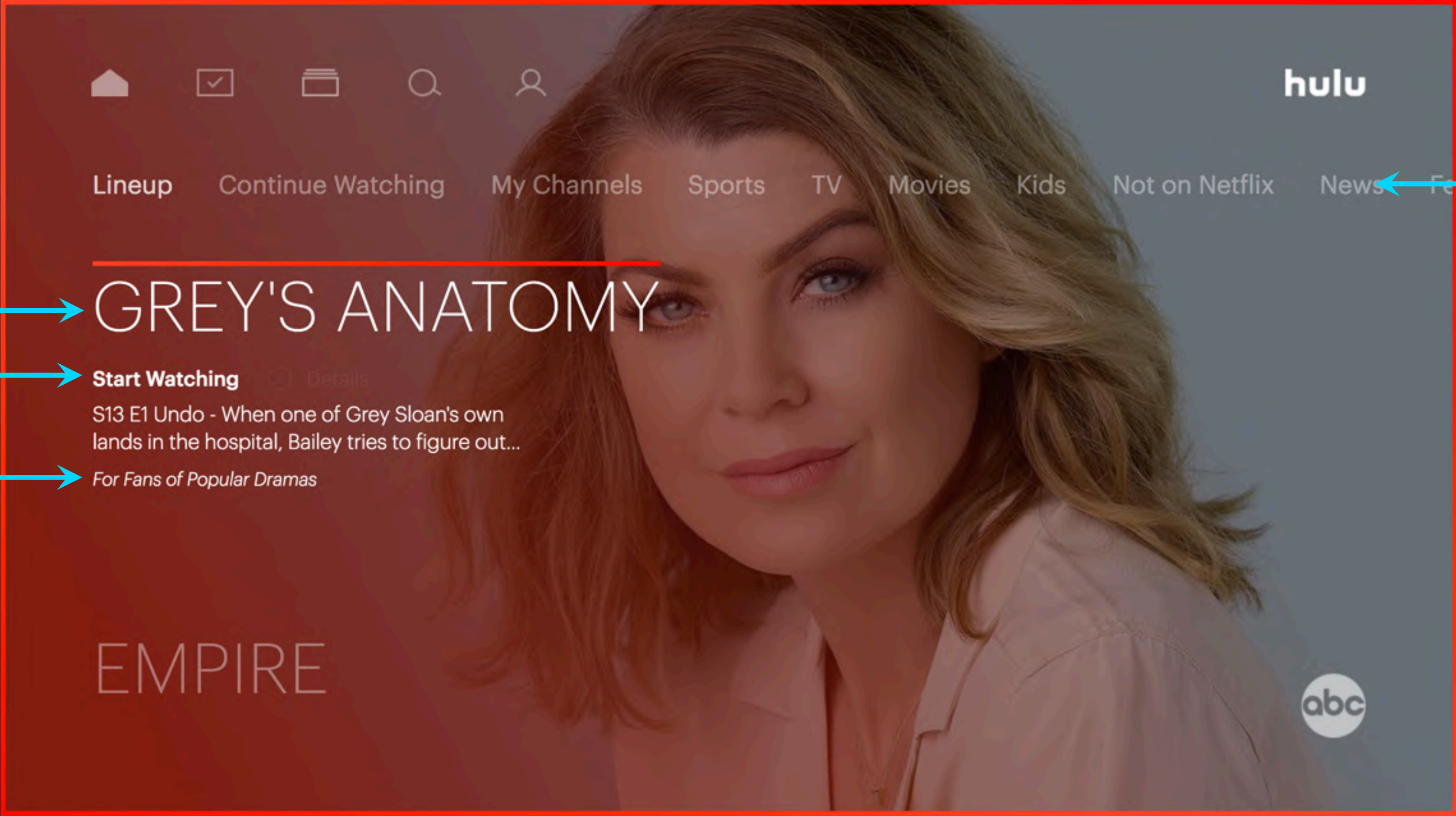
ML Algorithms in Hulu

ML算法在Hulu的应用



Algorithms for Viewers

面向用户的算法



The screenshot shows the Hulu homepage with a background image of a woman. The interface includes a top navigation bar with icons for home, mail, folders, search, and user profile, and the Hulu logo. Below the navigation bar is a horizontal menu with links: Lineup, Continue Watching, My Channels, Sports, TV, Movies, Kids, Not on Netflix, News, and Feeds. The main content area features a large card for 'GREY'S ANATOMY' with a 'Start Watching' button and a 'Details' link. Below this card is a section for 'EMPIRE' and an ABC logo. Annotations with arrows point to specific elements: 'cover story' points to the 'GREY'S ANATOMY' title; 'smart start' points to the 'Start Watching' button; 'recommendation reason' points to the text 'For Fans of Popular Dramas'; and 'layout management' points to the 'News' link in the top navigation bar.

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



Algorithms for Content and Advertising

面向内容和广告算法



Content

{ content valuation
video understanding
content based video encoding
...



Advertising

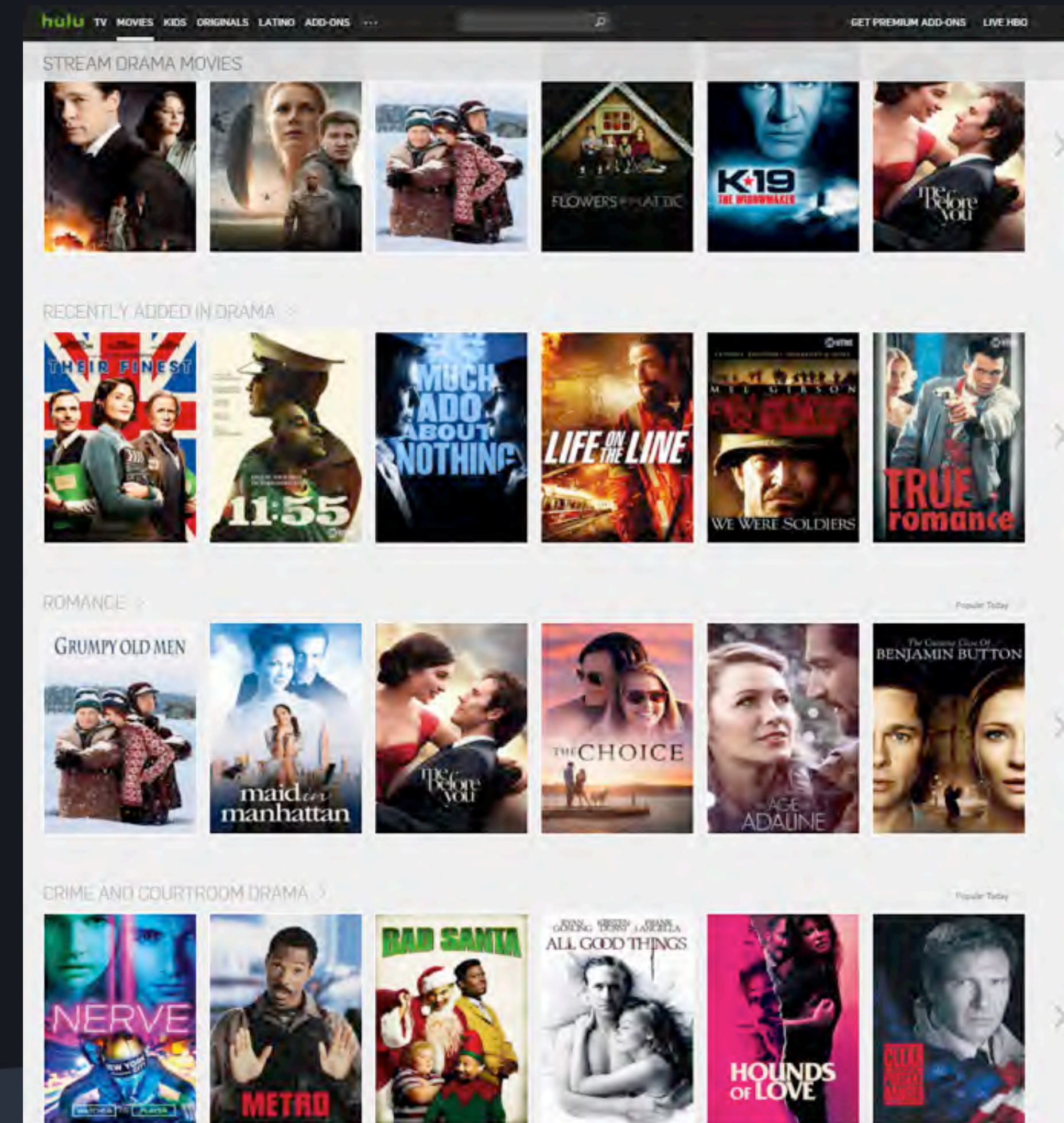
{ rich targeting
inventory prediction
...

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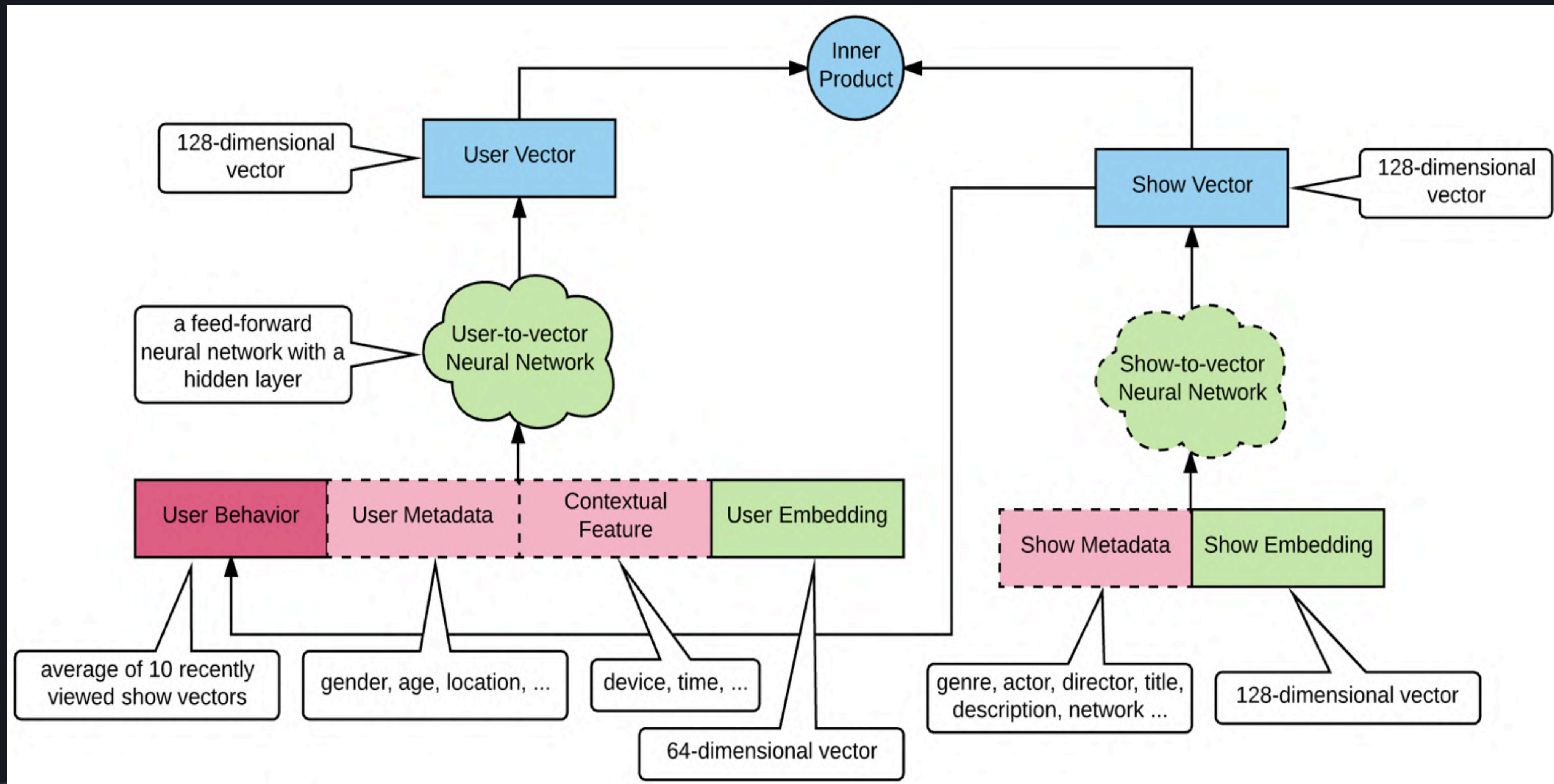
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- Democratize ML In Hulu – Hulu ML 算法案例研究
 - 垂直 – Reco
 - 水平 – Video Content Understanding
 - 水平到垂直 – Contextual + Ads
- AI Platform In Hulu – Hulu人工智能平台
- Future Opportunities – 展望未来

Recommendations: StoreShelf

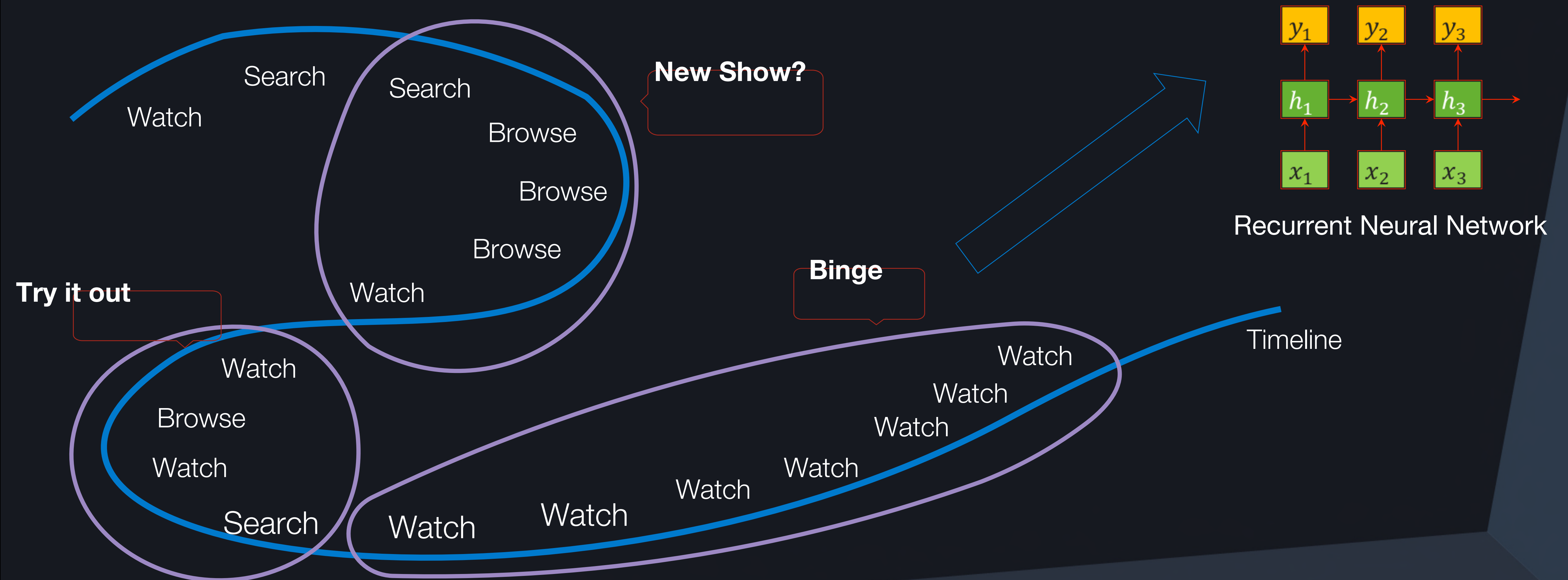
- Item-based Collaborative Filtering
- Matrix Factorization
- Deep Neural Network



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

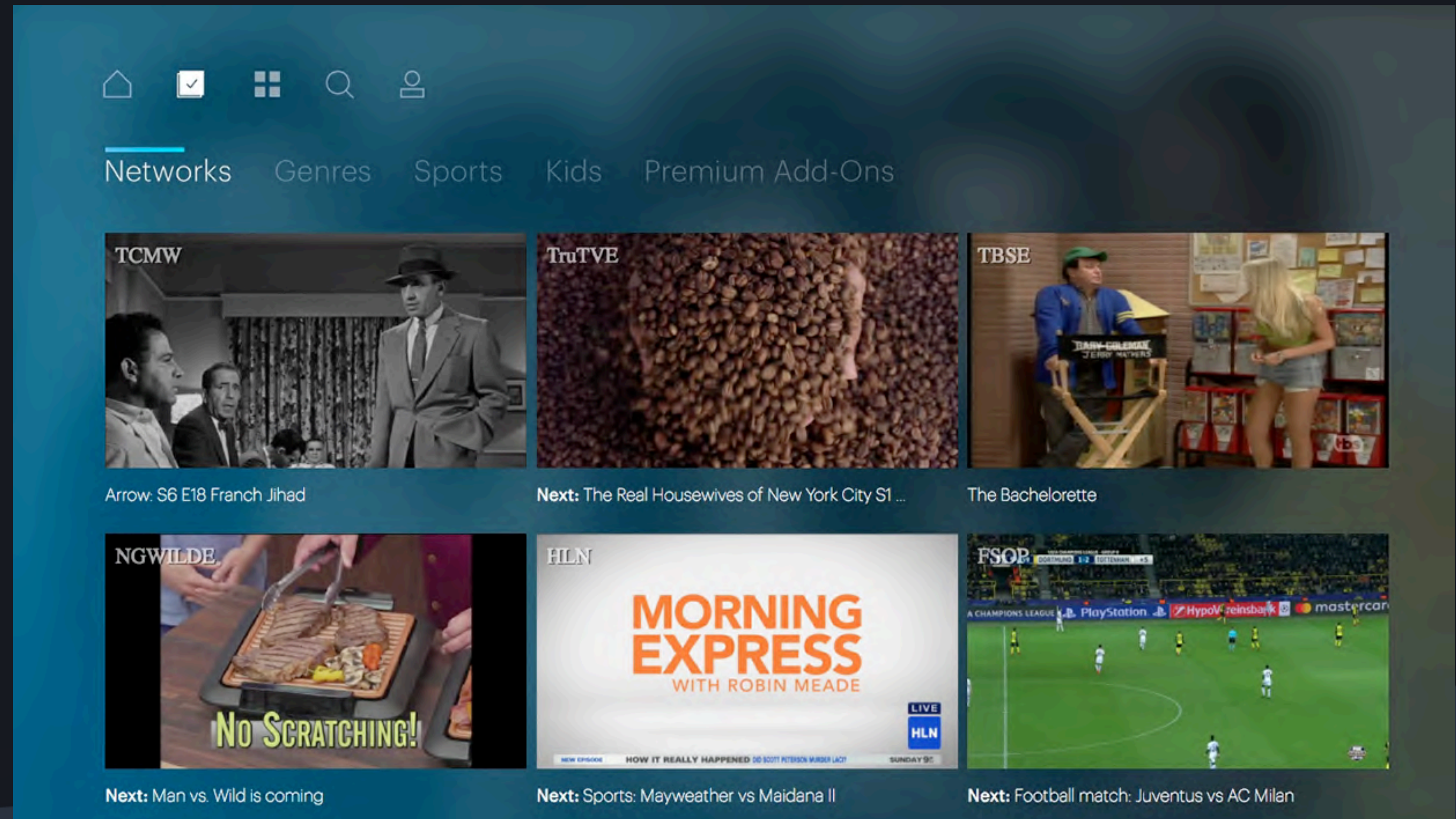
- Cooking, wedding, ...



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

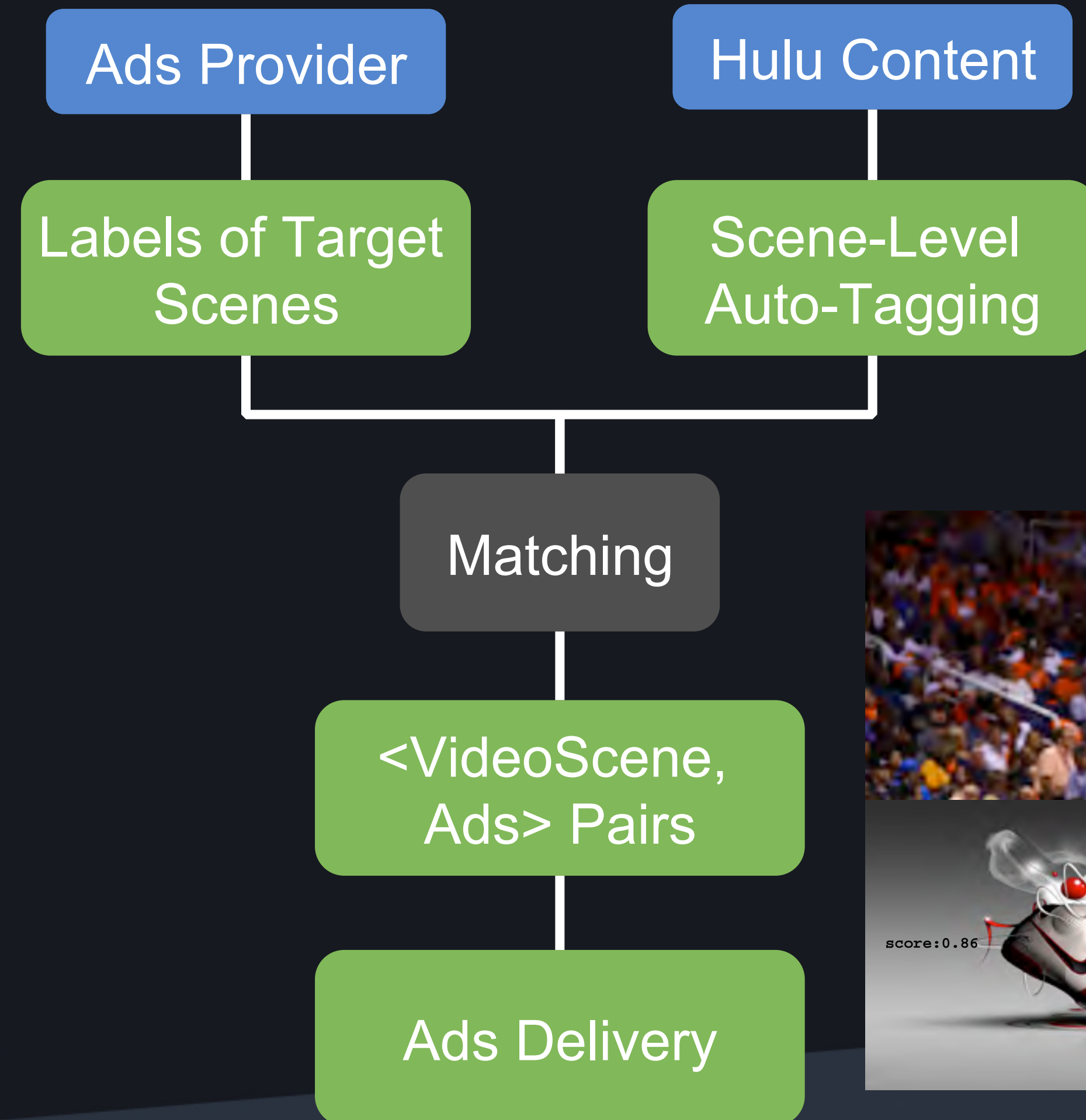
Live Channel
Thumbnail
Preview

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

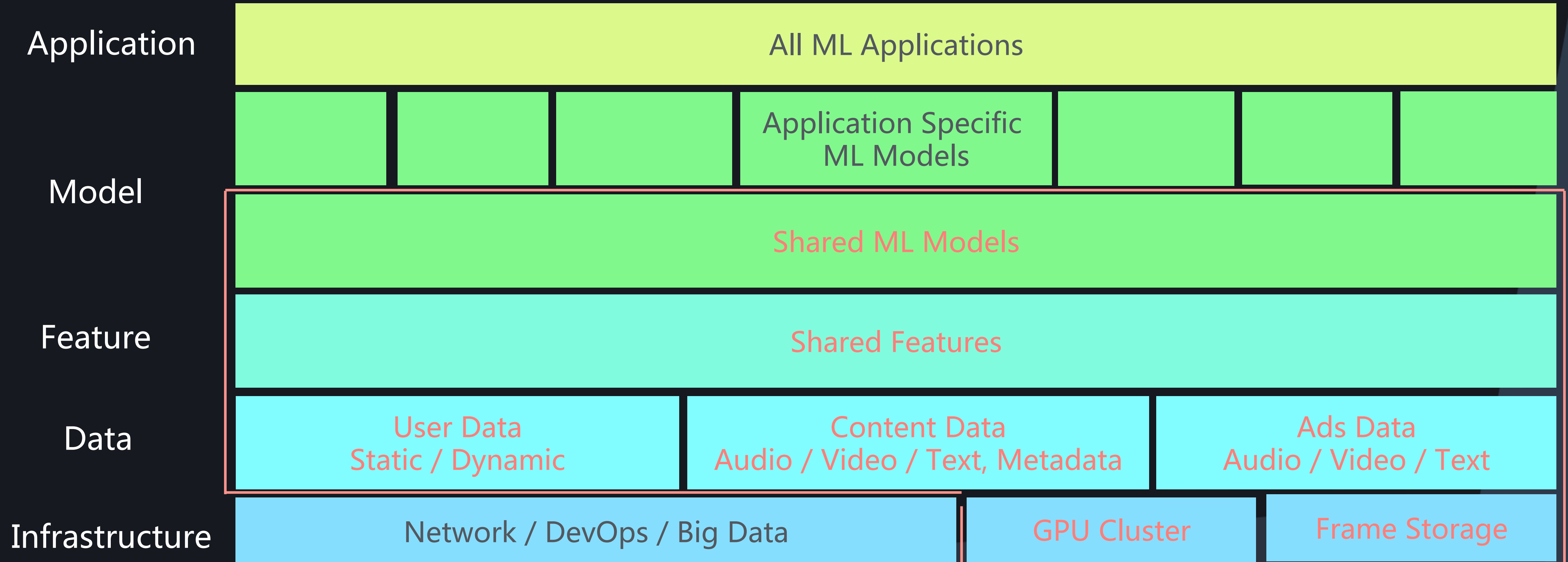
- 视觉连贯的广告
- 语义相关的广告



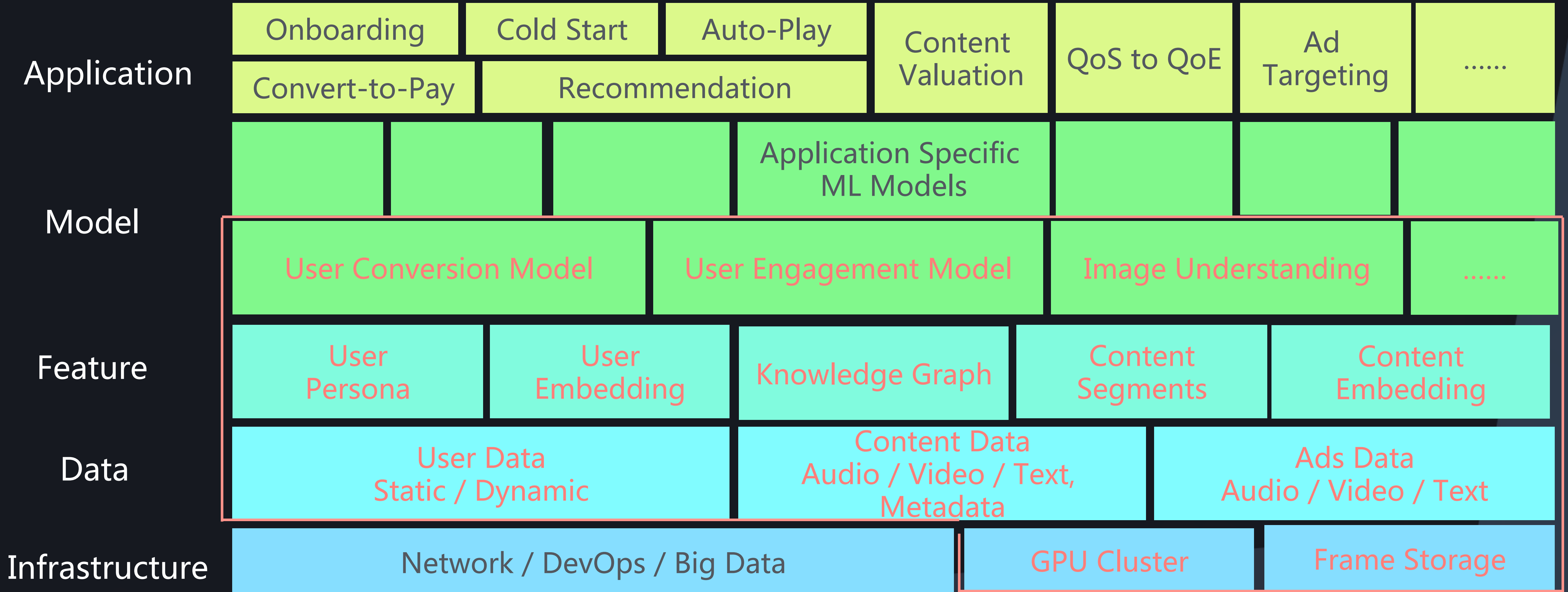
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AI Platform – 人工智能平台



AI Platform – 人工智能平台



Computational Mode – 计算模式

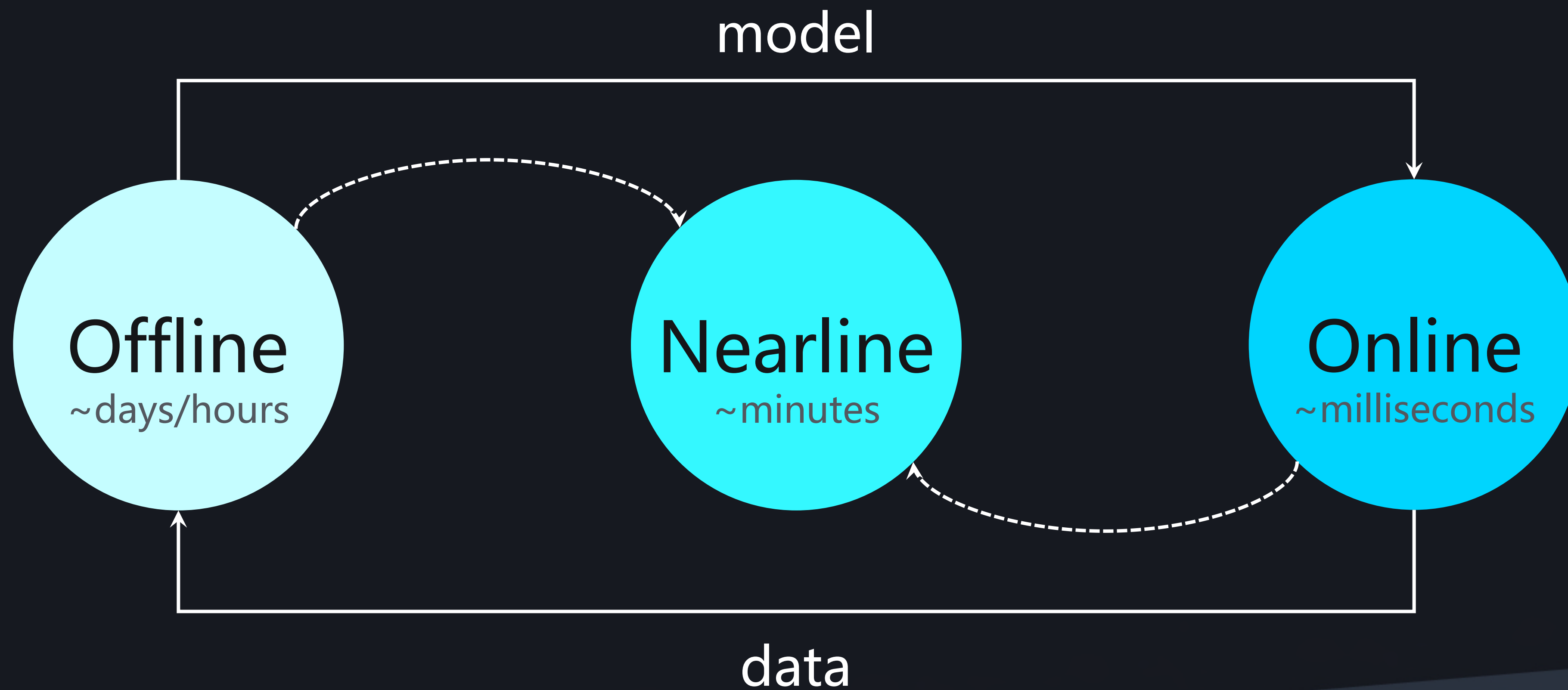


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Future Opportunities – 展望未来

- 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

