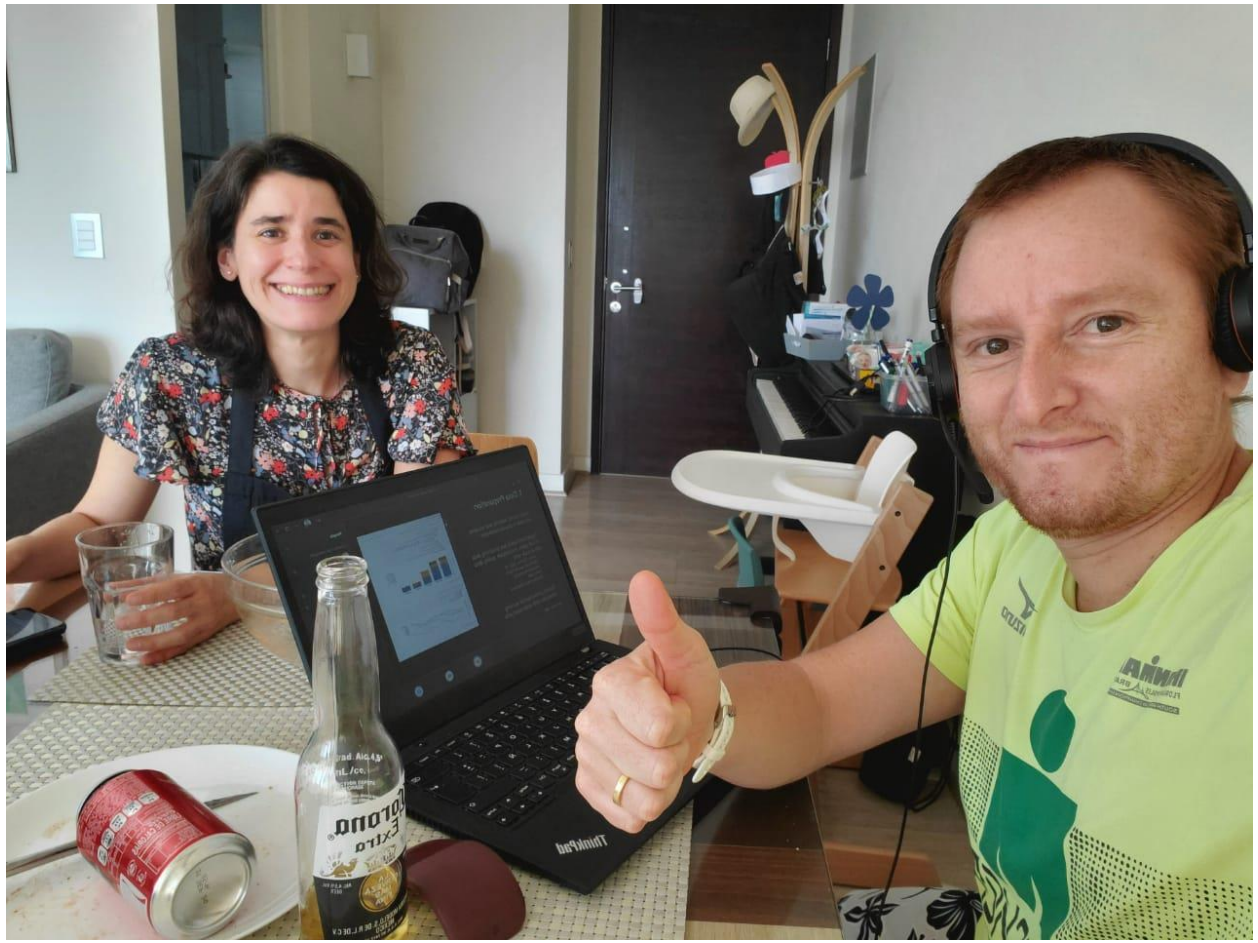
Reinforcement Learning using Azure Cognitive Services

Patricio Cofre @pcofre

EY Parter Data & AI

Microsoft AI MVP & RD

Me, my family…



Agenda

- **Types of Machine Learning**
- Reinforcement Learning
- Personalization
- Azure Personalizer
- Demos

Artificial Intelligence

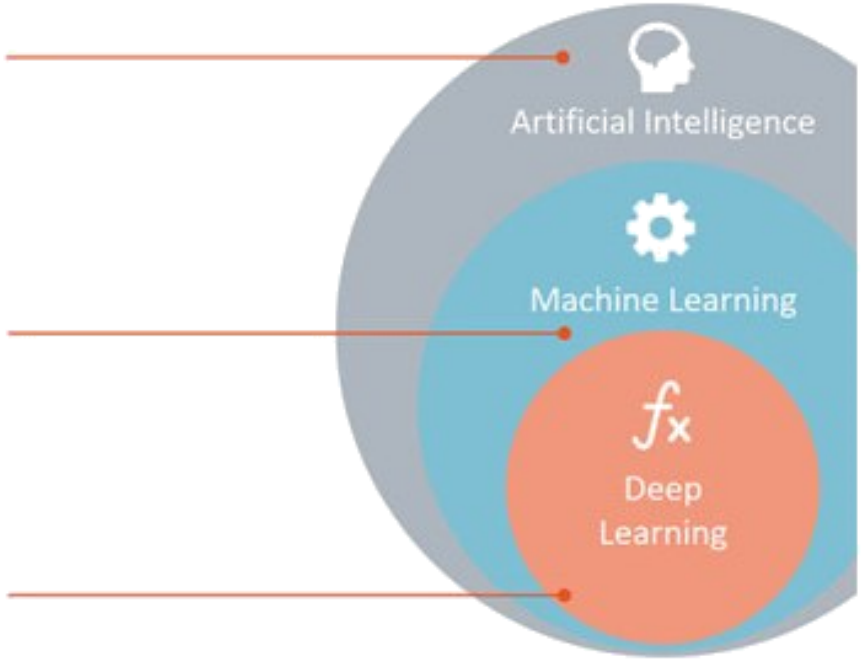
EY MetricArts

The term artificial intelligence is applied when a machine imitates "cognitive" functions. For example: "learn" and "solve problems" without being explicitly programmed in the way to do it

Artificial Intelligence
Any technique which enables computers to mimic human behavior.

Machine Learning
Subset of AI techniques which use statistical methods to enable machines to improve with experiences.

Deep Learning
Subset of ML which make the computation of multi-layer neural networks feasible.



Types of Machine Learning

EY MetricArts

1. Supervised Learning

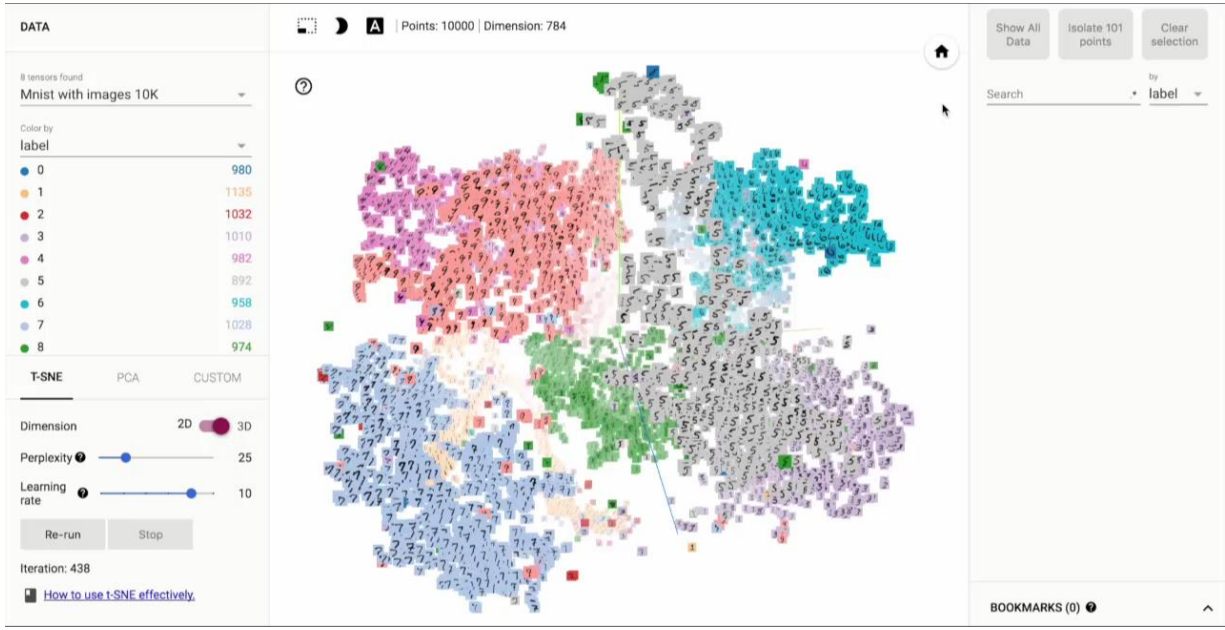
- The system learns based on structured or unstructured data, previously classified
- **Data**: (data, label)
- **Goal**: Learn a function to map x->y
- **Examples**: Classification, Regression, Object Detection, etc

Types of Machine Learning

EY MetricArts

2. Unsupervised Learning

- Model is built using data as input, which have not been previously classified
- **Data**: Just data! No labels
- **Goal**: Learn some underlying hidden structure of the data
- **Examples**: Clustering, Feature Learning, Image Segmentation

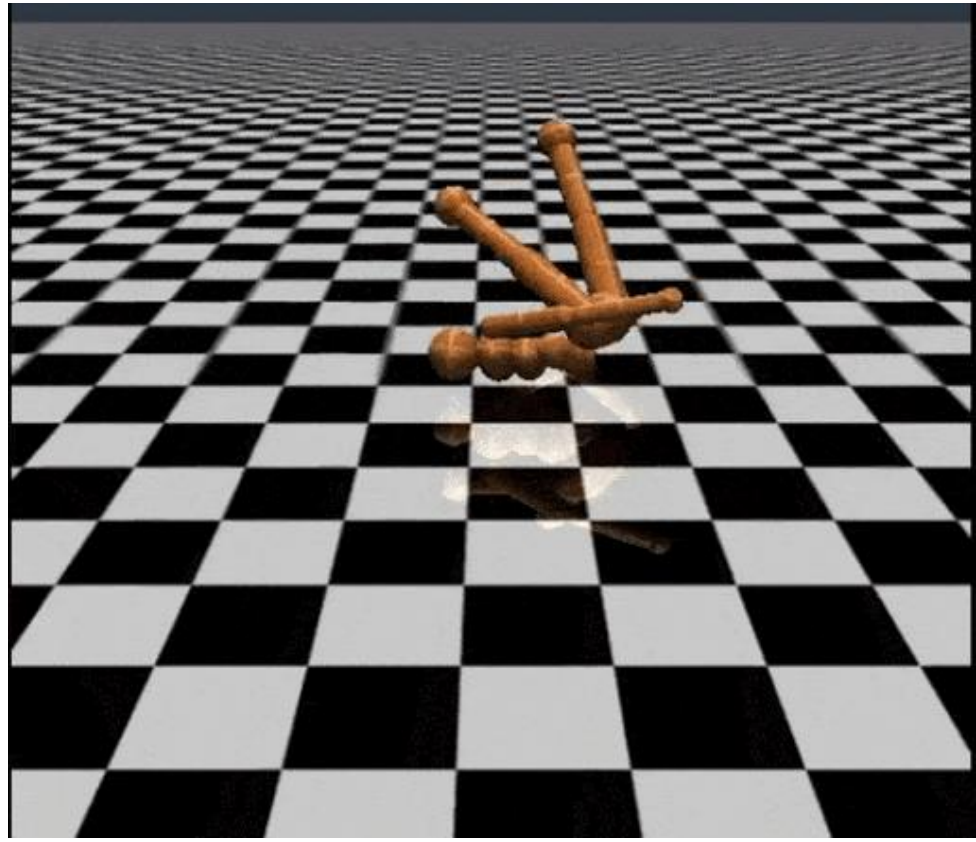


Types of Machine Learning

EY MetricArts

3. Reinforcement Learning

- Inspired by behavioral psychology, determine what actions an agent should choose in an environment in order to maximize a reward
- **Data**: No historical data required!
- **Goal**: Learn to take actions to maximize reward
- **Examples**: Automatic Control, Locomotion, Atari Games, Alpha Zero



Types of Machine Learning

EY MetricArts

Type of Learning	Data	Labels
Supervised	YES	YES
Unsupervided	YES	NO
Reinforcement	NO	NO

Agenda

- Types of Machine Learning
- **Reinforcement Learning**
- Personalization
- Azure Personalizer
- Demos

Reinforcement Learning

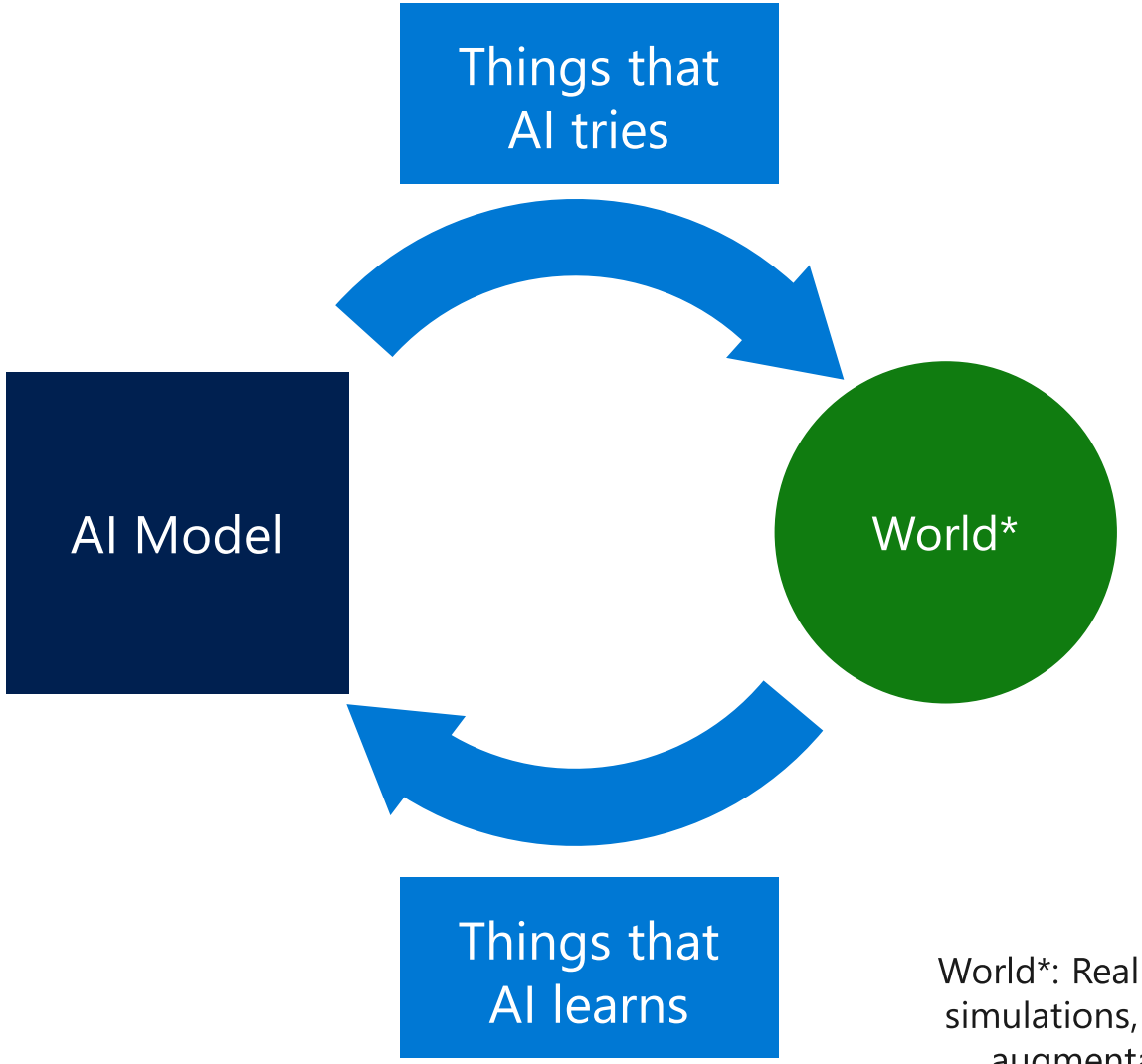
EY MetricArts

Reinforcement learning is the set of techniques that allow AI to experiment and learn

The whole learning cycle happens at digital speed and real world* time.

Experimenting in the world* allows novel patterns to be discovered.

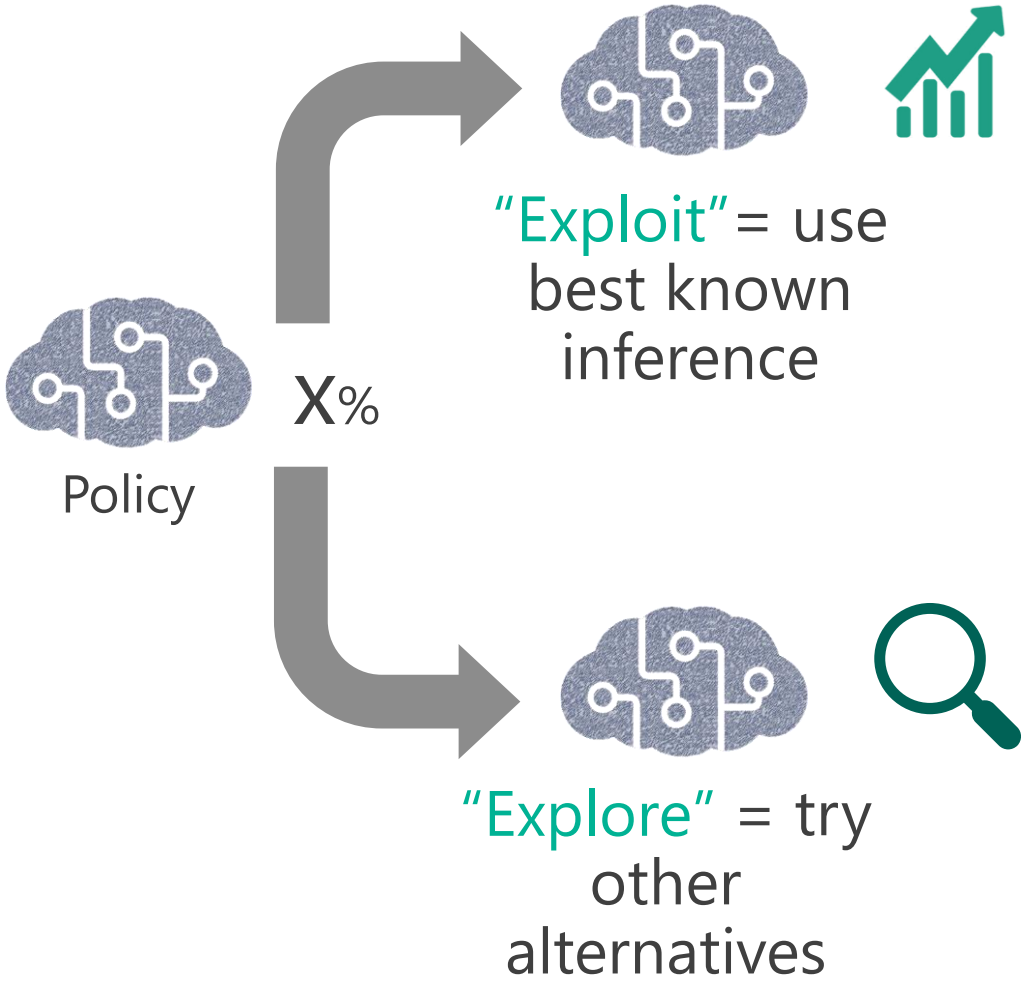
Creativity, curiosity, motivation



World*: Real world and/or simulations, with/without augmentations, etc.

Exploit and Explore

EY MetricArts



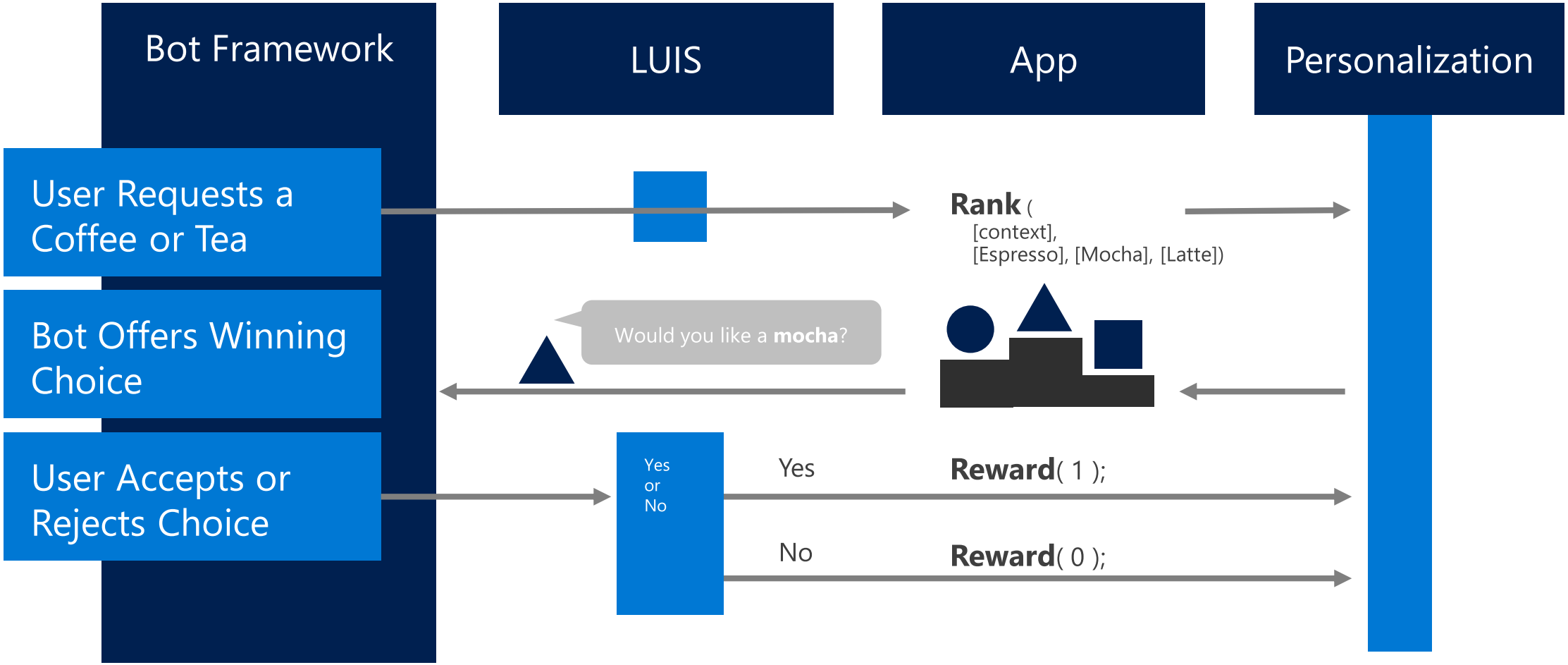
Exploit for performance

"How much should I explore to discover how to best perform?"

Explore to discover new things

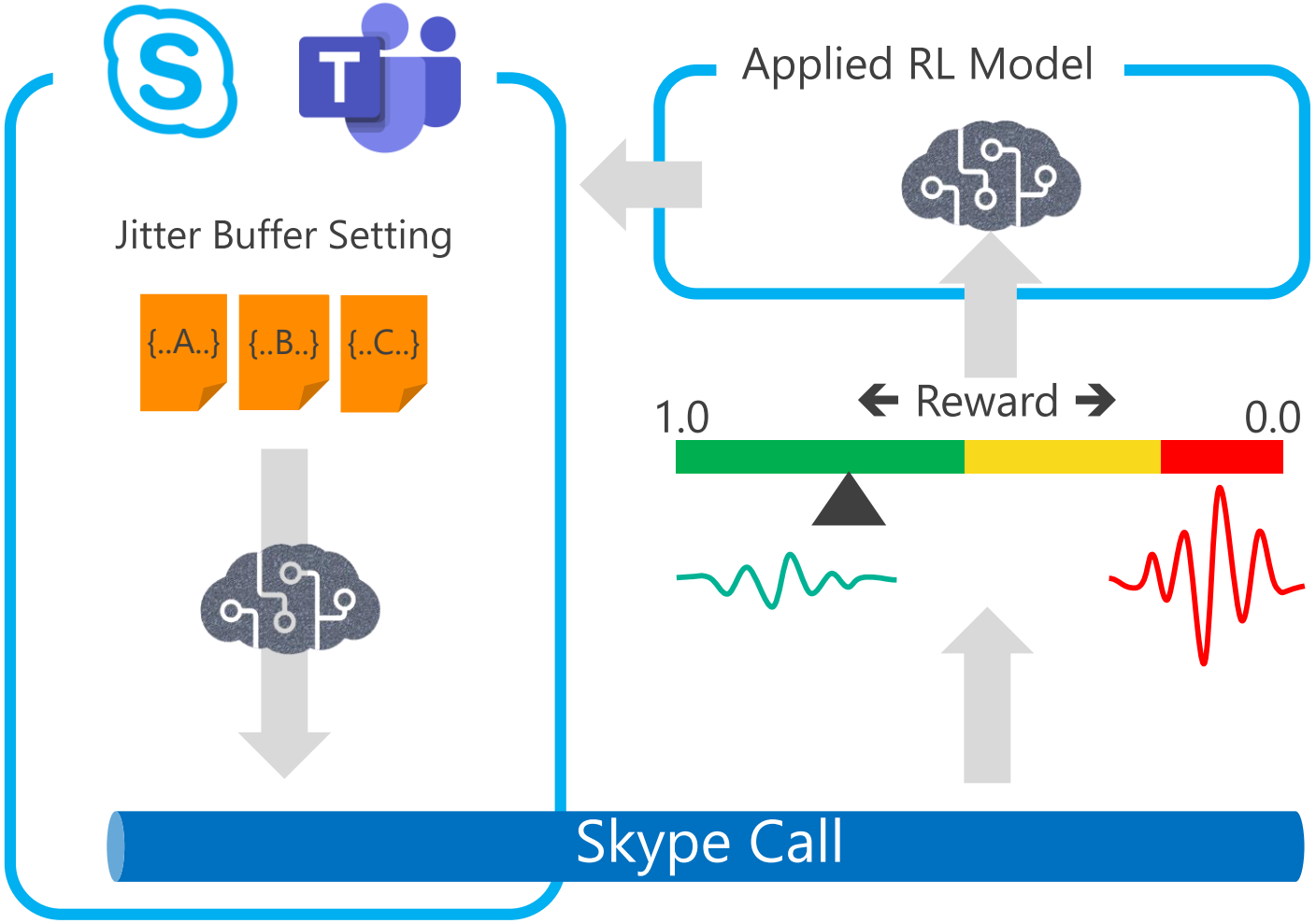
Chatbot Quickstart

EY MetricArts



Optimizing Call Experience with RL

EY MetricArts



Personalization

EY MetricArts

Content Action: New Suggestion? Continue Watching/Reading? Social Activity? Buy pass?

Content Creative/Layout: For a given item, choose thumbnail creative options, descriptions

Alerts: Personalize what to alert users about, and *when* to do it

Playlist/Stations: “Best thing to play next”

Email Campaigns: Choose content, or personalize layout and message

Suggesting from a Menu: Put a likely option one click away, instead sending lists to users

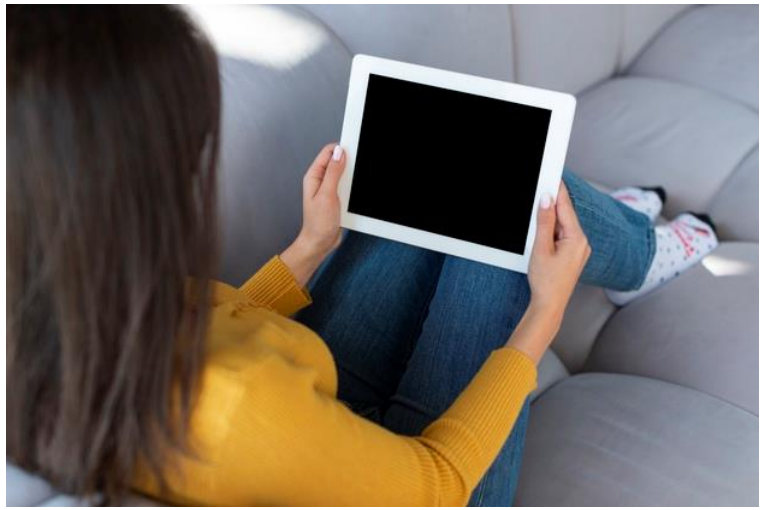
Agenda

- Types of Machine Learning
- Reinforcement Learning
- **Personalization**
- Azure Personalizer
- Demos

Personalization

EY MetricArts

Paula watches an original series on weekends from home

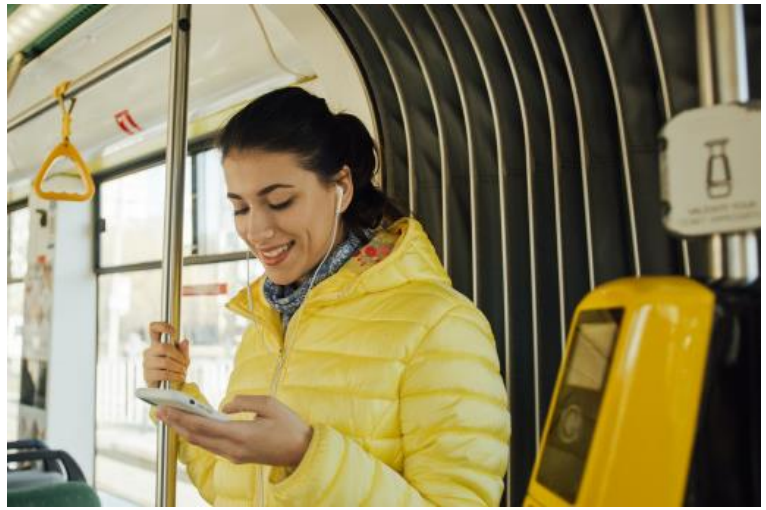


Why should Susan and Paula see the same content?

What content do they seek at different times, places, and devices?

What drives them to make different choices?

Susan likes to watch documentaries from his phone while communting

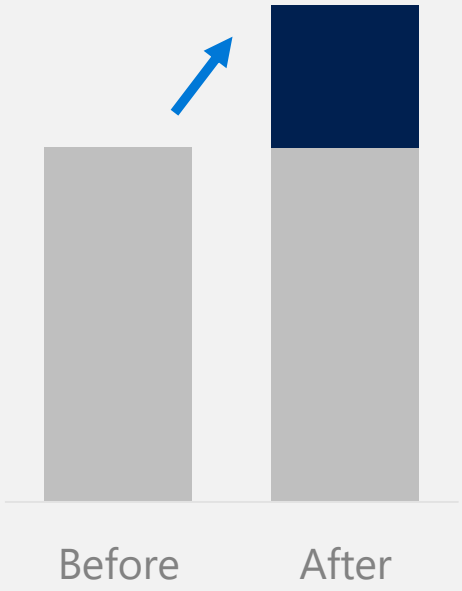


Proven ROI

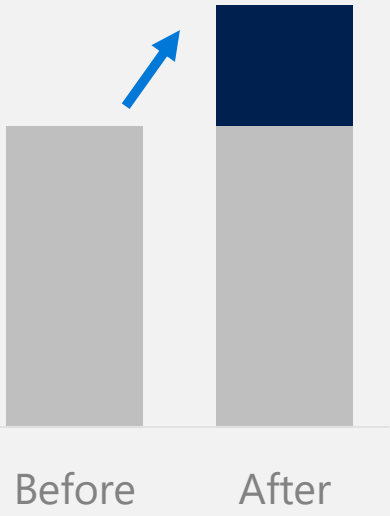
EY MetricArts

Customer Experience Transformation Pays Off

Increase Customer Satisfaction by up to **20 percent**



Increase Revenue Growth by **10-15 percent**



Lower Cost To Serve by **15 to 20 percent**

Source: McKinsey, Microsoft Services

But…

EY MetricArts

Personalized Experiences Are Still a Work in Progress

81%

Executives believe they'll soon compete on customer experience alone

22%

Executives claim to deliver an experience that exceeds customer expectations

Source: Gartner

Pitfalls of Typical Approaches

EY MetricArts

Personalization requires exploring the intersection of complex, dynamic factors:

Changing Interests

- Novelty?
- Popular?
- Classic?
- Viral?

Complex Behavior

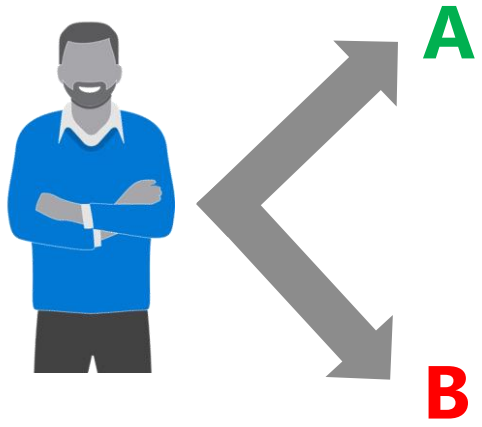
- Mobile or TV?
- Commuting?
- Battery Level?
- Past content?

Complex Content

- Pace?
- Visual Style?
- Sentiment?
- Plotlines?

A/B Testing vs. RL Evaluation

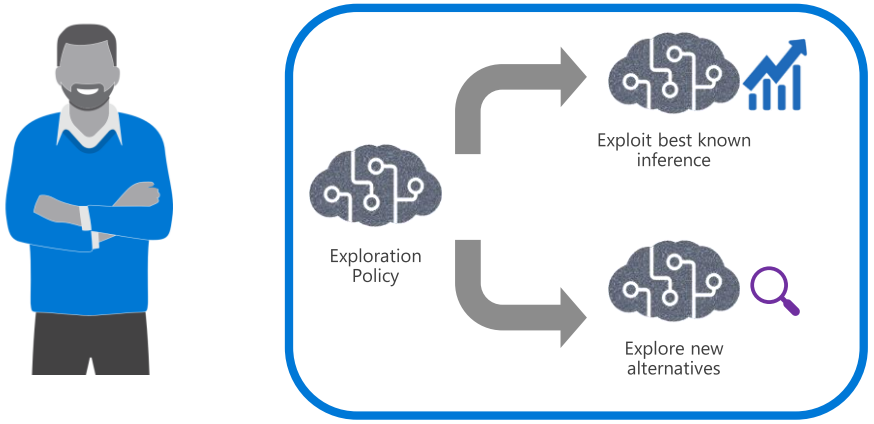
EY MetricArts



x1

A/B Test:

1. Design the Right Experiment,
2. Test online once, Get data once
3. Start over



x100,000

RL Experiment:

1. Use models that exploit and explore
2. Record User Interaction
3. Find the policy and model that fits reality

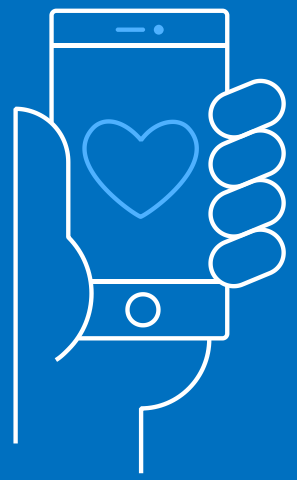
Agenda

- Types of Machine Learning
- Reinforcement Learning
- Personalization
- **Azure Personalizer**
- Demos

Azure Personalizer

EY MetricArts

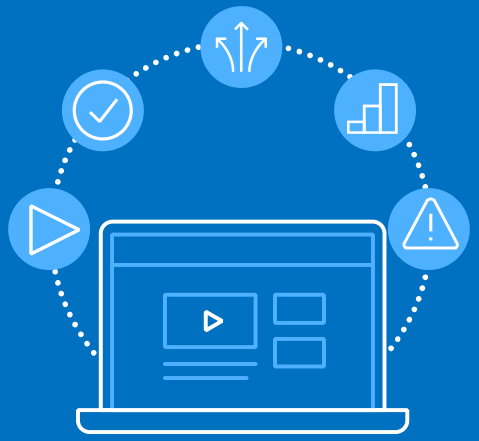
Personalizer: Drives increased engagement by delivering personalized experiences for every user



Contextual Engagements across Customer Journey

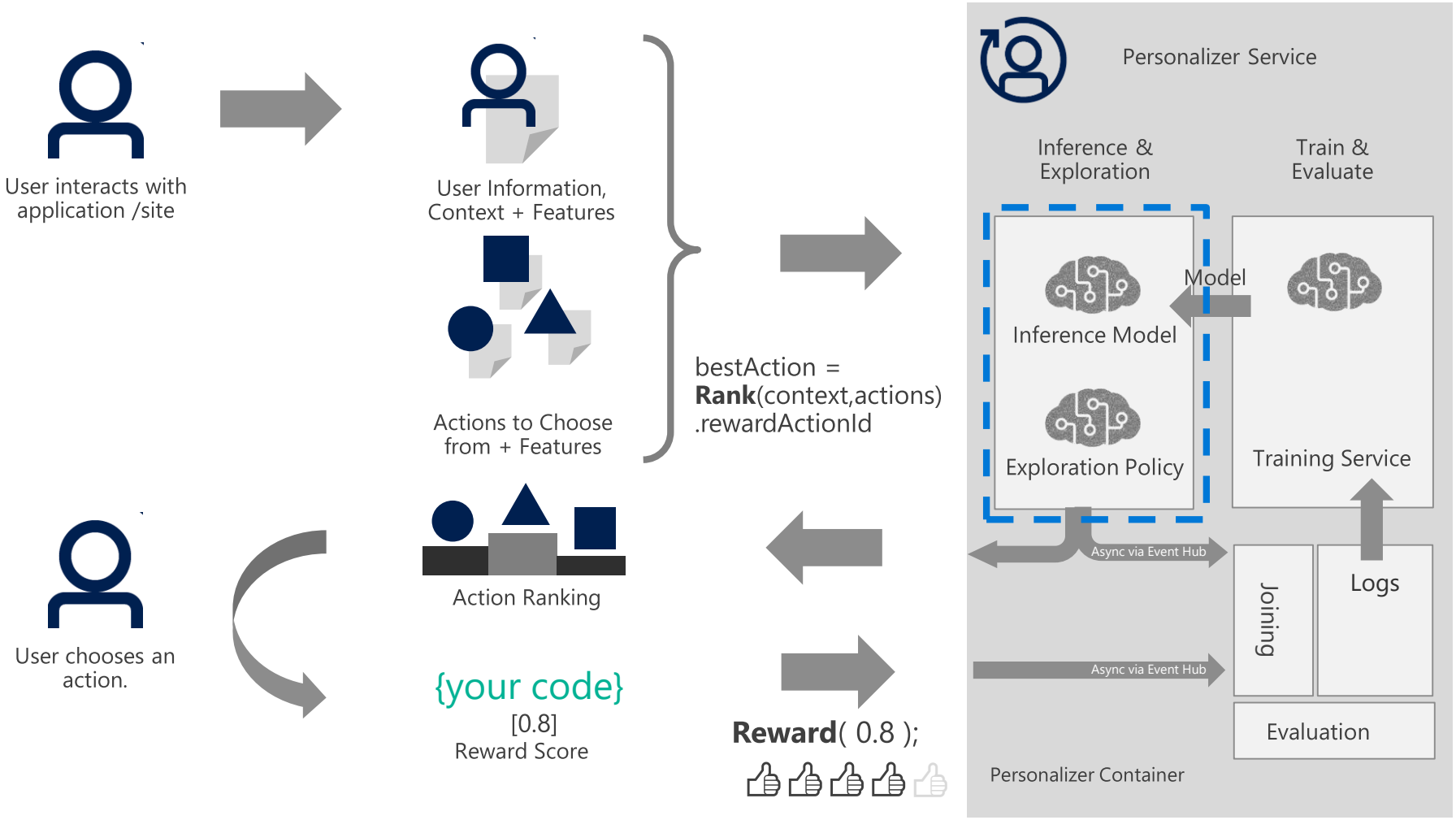
Real-Time Personalization at Scale through 2 APIs

Leverage Data about Users, Context, Content, and AI-Generated Features



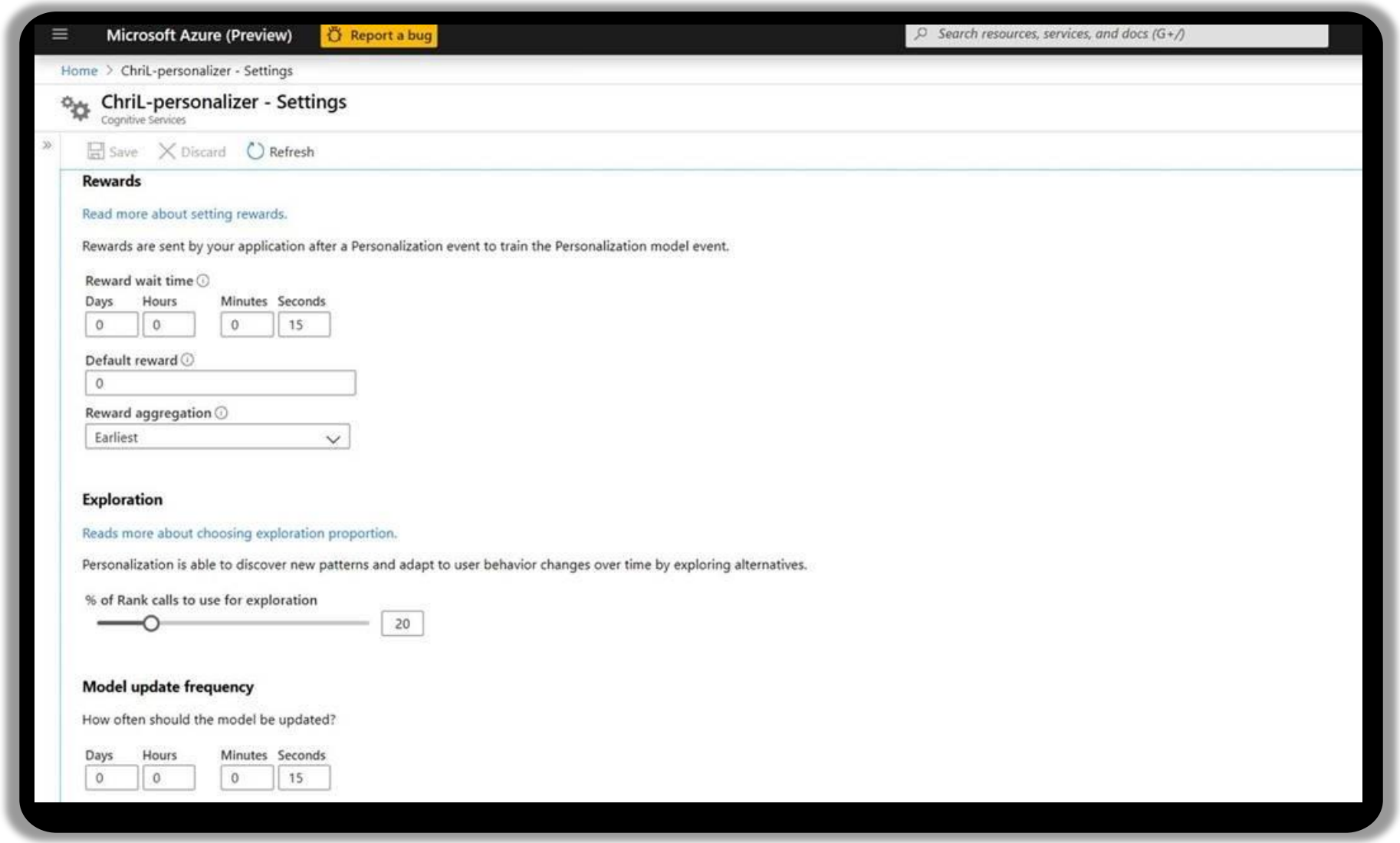
Based on Business KPIs, Continuous Improvement through Reinforcement Learning

How Personalizer Works



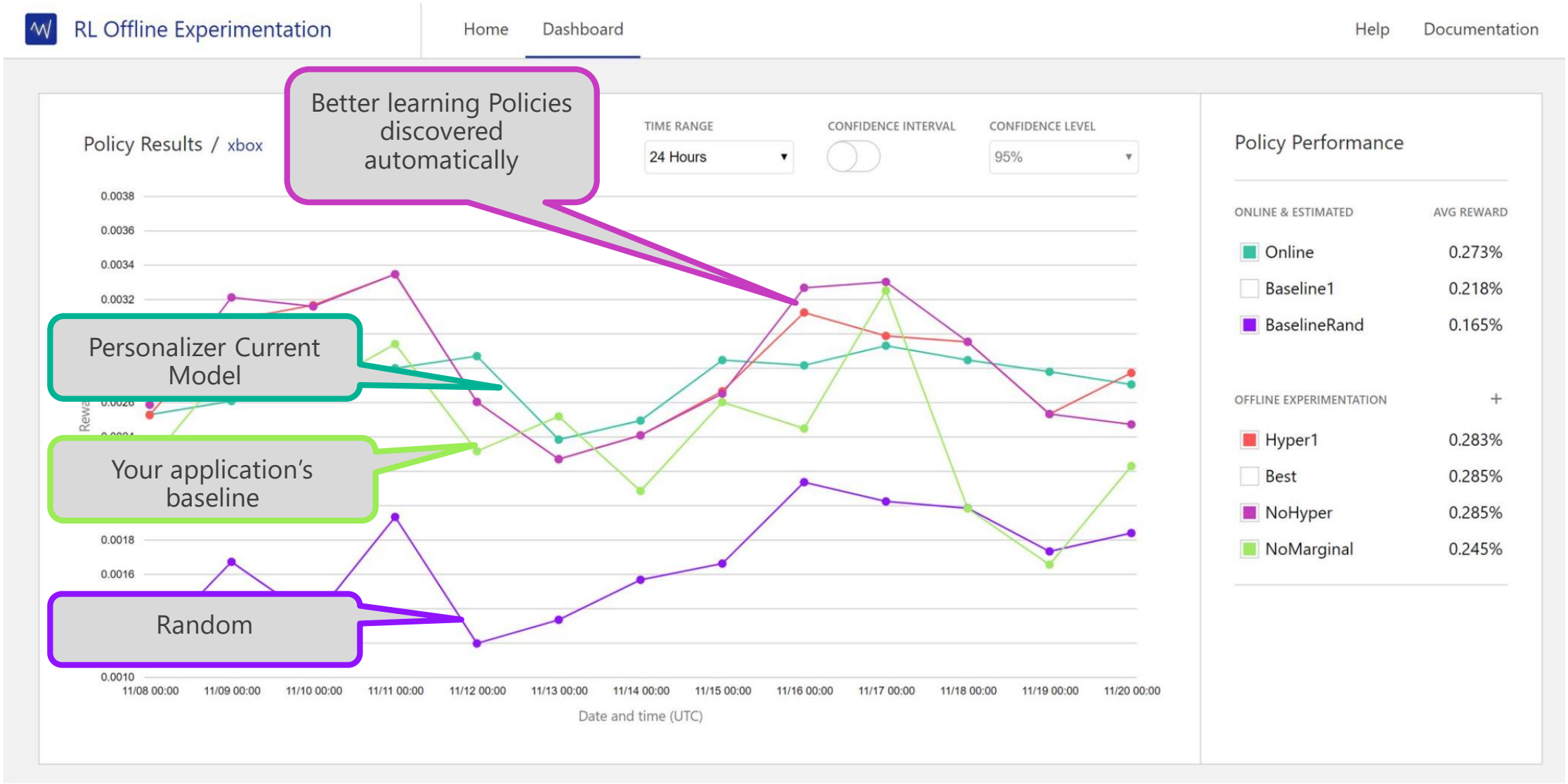
Azure Personalizer Settings

EY MetricArts



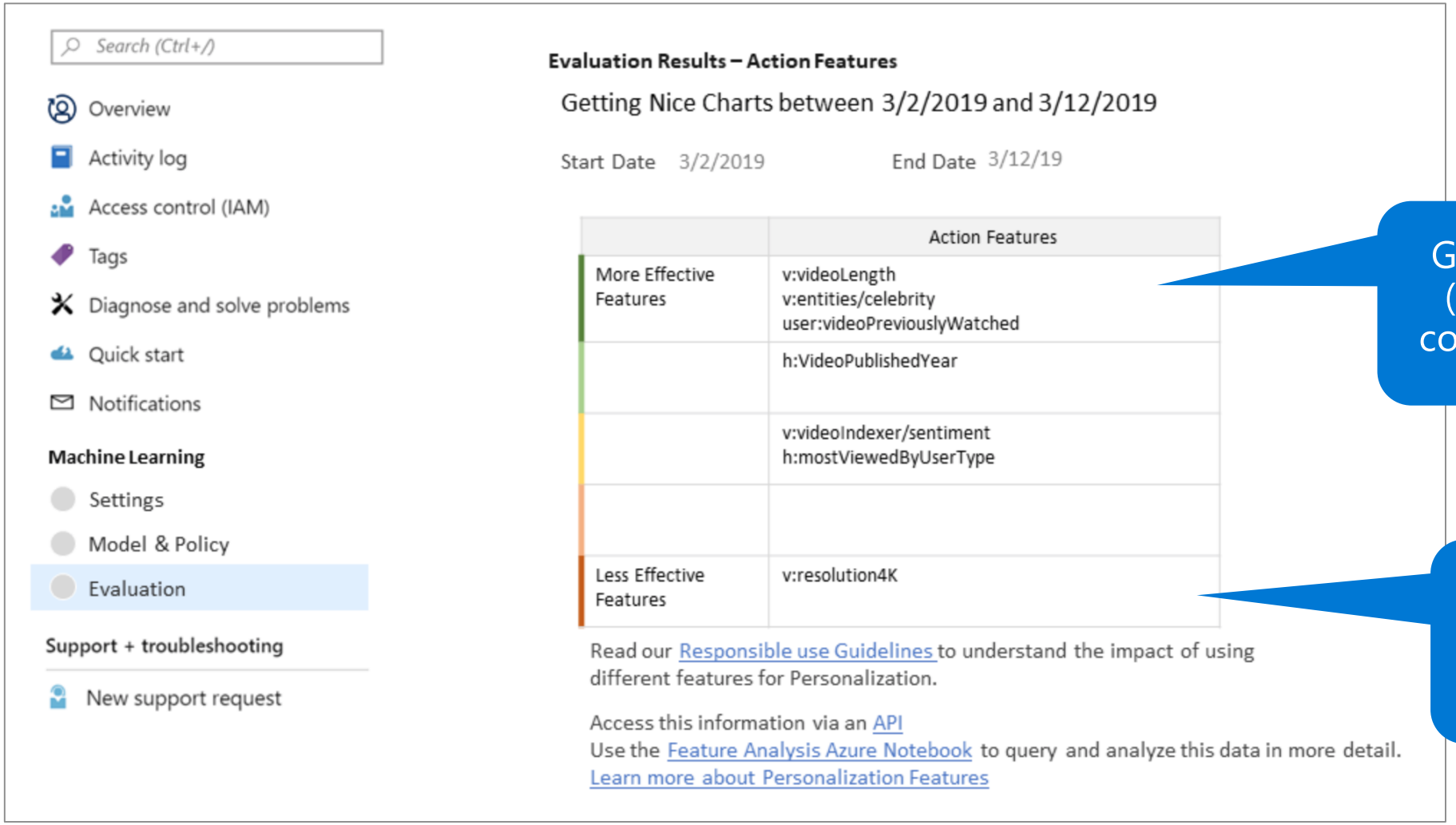
Controlling Effectiveness

EY MetricArts



Feature Explainablity

EY MetricArts



Good Features (What others could you come up with?)

Features adding noise

Agenda

- Types of Machine Learning
- Reinforcement Learning
- Personalization
- Azure Personalizer
- **Demos**


ENOUGH TALK
SHOW ME THE DEMO!

Reinforcement Learning using Azure Cognitive Services

Patricio Cofre @pcofre

EY Parter Data & AI

Microsoft AI MVP & RD