
AWS
re:Inforce
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TDR310

Developing new findings using machine learning in Amazon GuardDuty

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Amazon Web Services

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Sr. Manager PMT Amazon GuardDuty
Amazon Web Services

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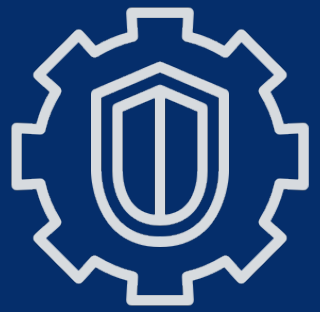
What is Amazon GuardDuty?



Amazon GuardDuty is a threat detection service that uses machine learning, anomaly detection, and integrated threat intelligence to identify and prioritize potential threats to your AWS environment

Tens of thousands of customers across industries and geographies

Used by over 90% of the top 2,000 AWS customers

Helps protect millions of accounts, including over half a billion Amazon EC2 instances & millions of Amazon S3 buckets

Analyzes tens of billions of events per minute

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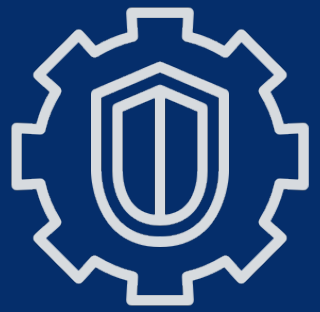

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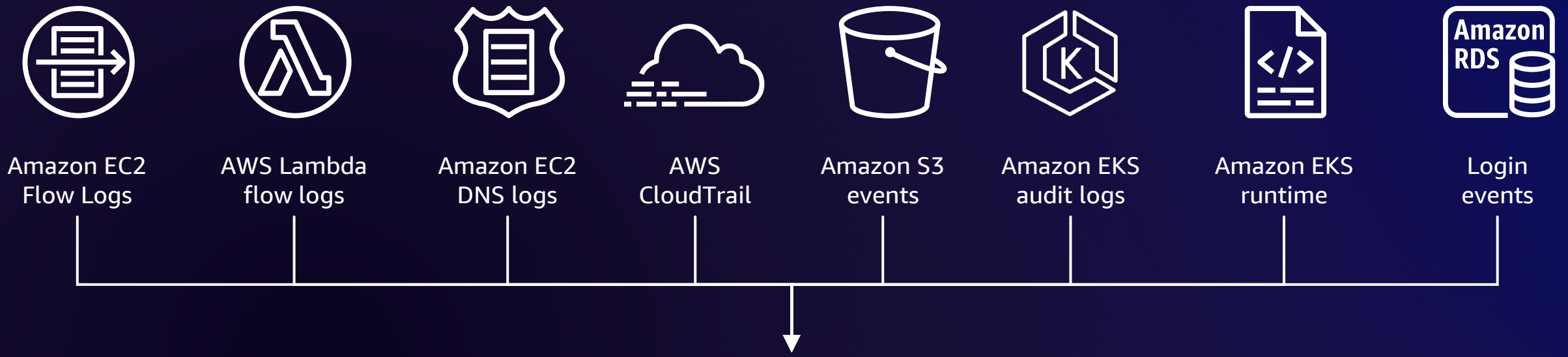

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How can we detect threats when there isn't a strong indicator of compromise?

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We need to look for unusual behavior such as

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We need to look for unusual behavior such as



Does this user normally access this Amazon S3 bucket from this location?

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Does this IAM role normally list and describe Amazon DynamoDB tables?

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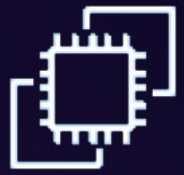

Does this Amazon EC2 instance normally egress this volume of traffic to this remote network?

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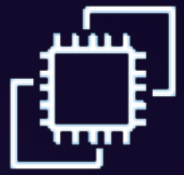
Does this user normally access this Amazon S3 bucket from this location?



Does this IAM role normally list and describe Amazon DynamoDB tables?



Does this Amazon EC2 instance normally egress this volume of traffic to this remote network?



Is this container image normally used in this Amazon EKS cluster?

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Easy! We'll profile what normally happens and then detect when something unusual happens



Unusual API for user



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Unusual API for user





Unusual ASN for bucket

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Unusual API for user





Unusual ASN for bucket



Unusual port for instance

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Not a problem! We'll add rules to make sure we only detect really (really!) unusual activity



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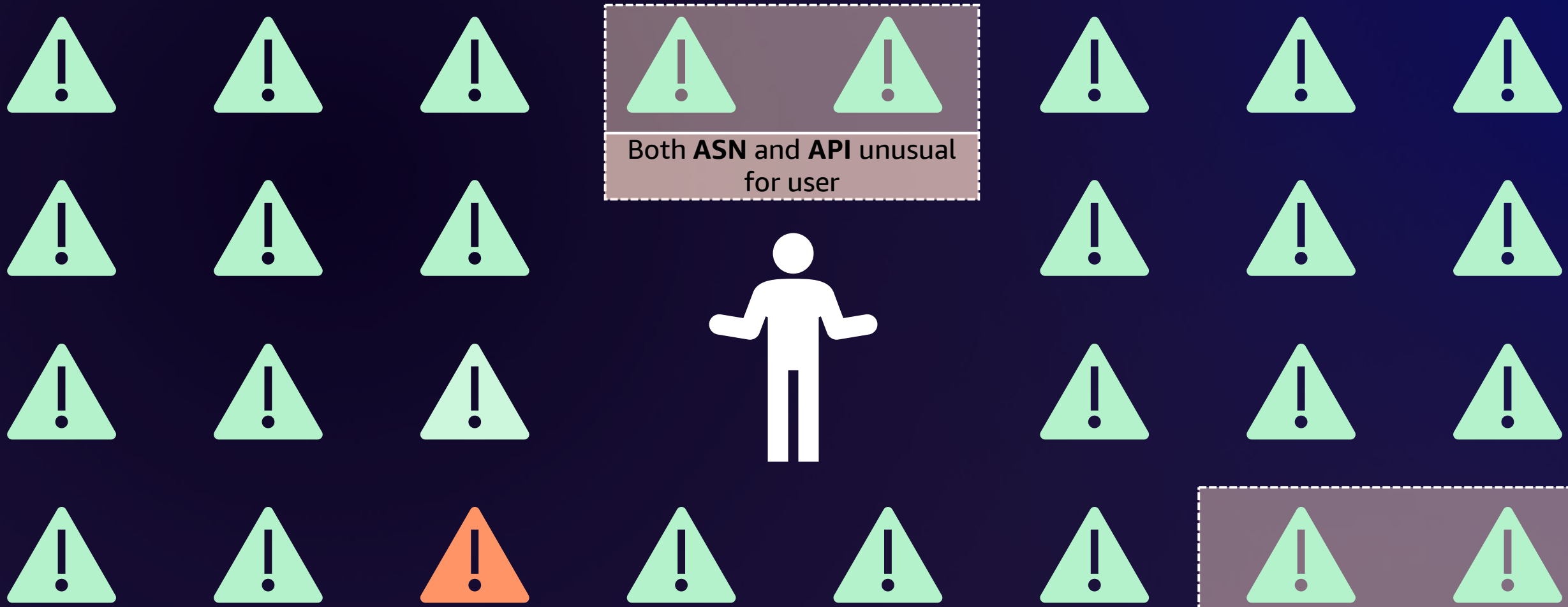

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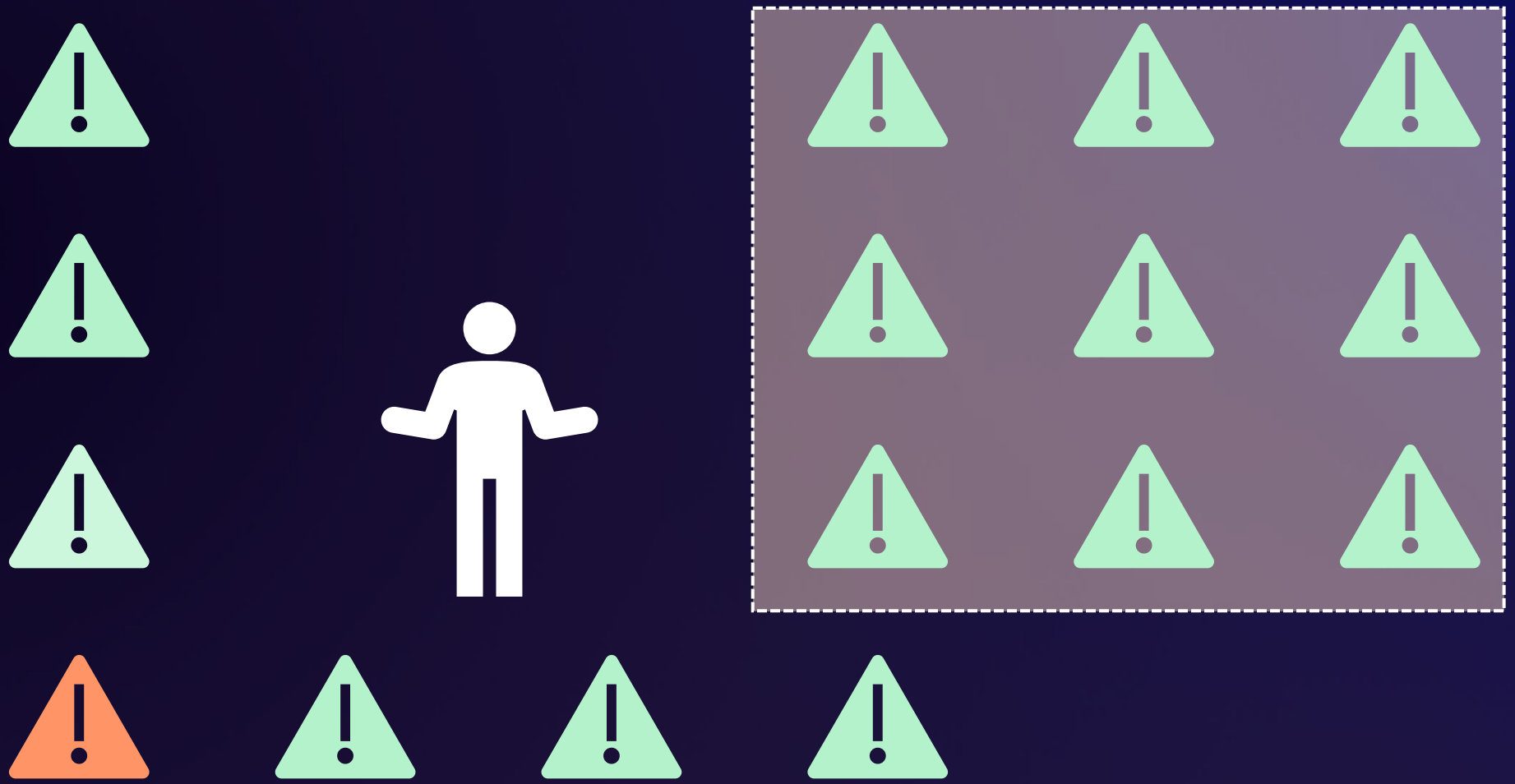

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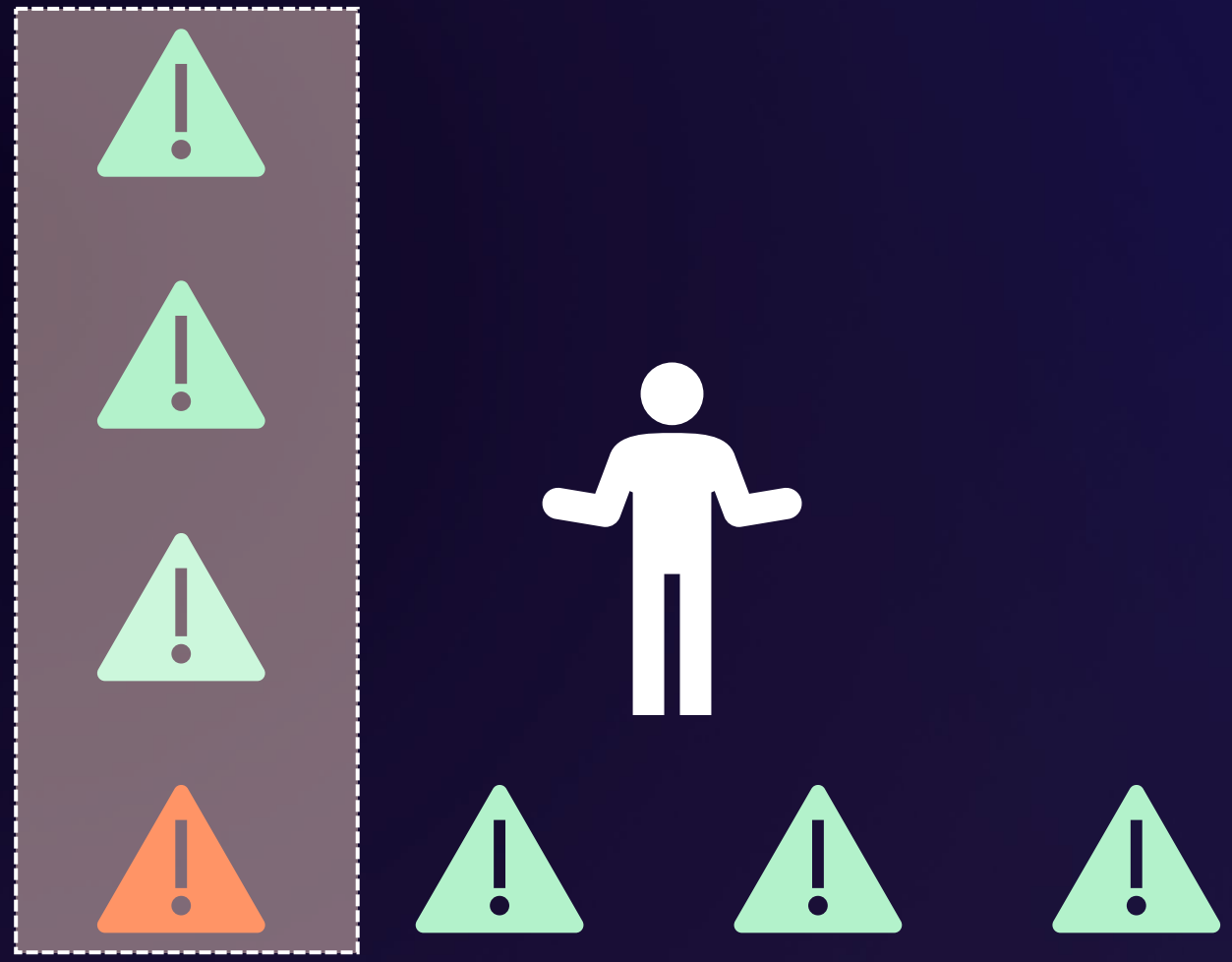

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Using anomaly detection to detect security incidents in complex AWS environments is challenging

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Using anomaly detection to detect security incidents in complex AWS environments is challenging



Looking for anything unusual will result in too much noise

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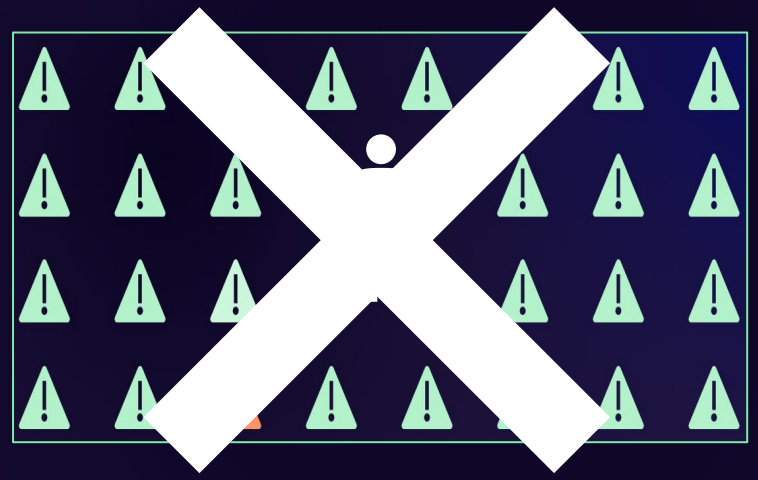

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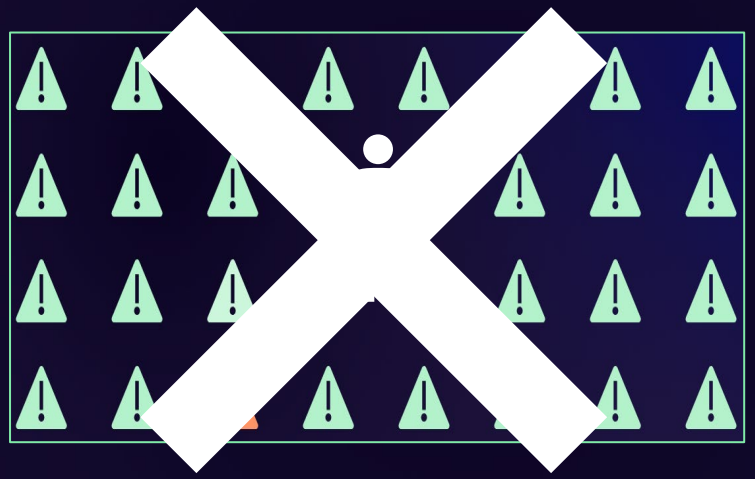

Looking for anything unusual will result in too much noise



Applying rules to get rid of noise will result in missing the signal

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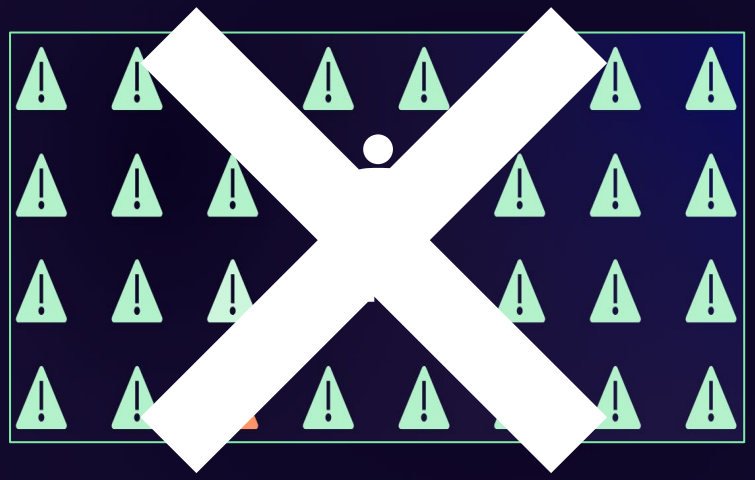
Using anomaly detection to detect security incidents in complex AWS environments is challenging



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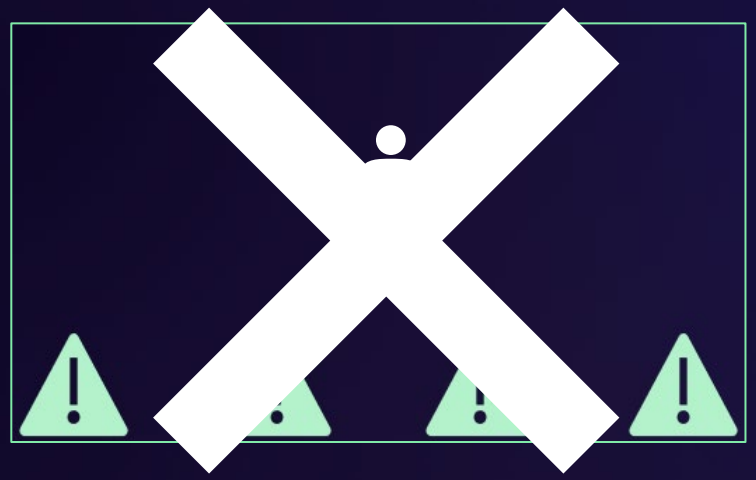

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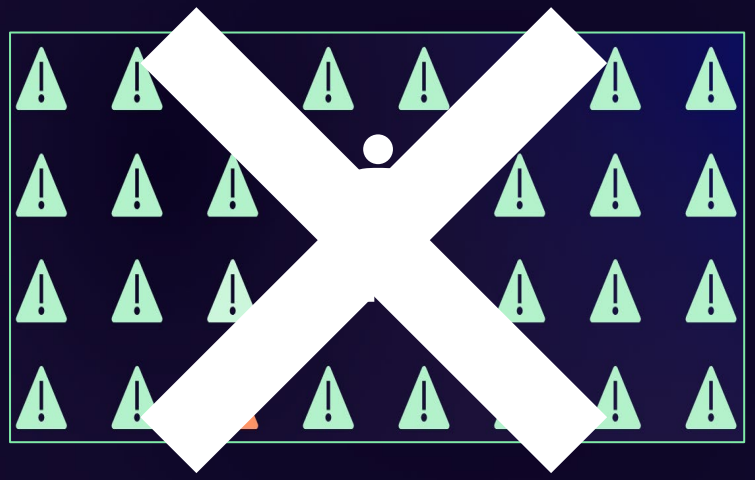

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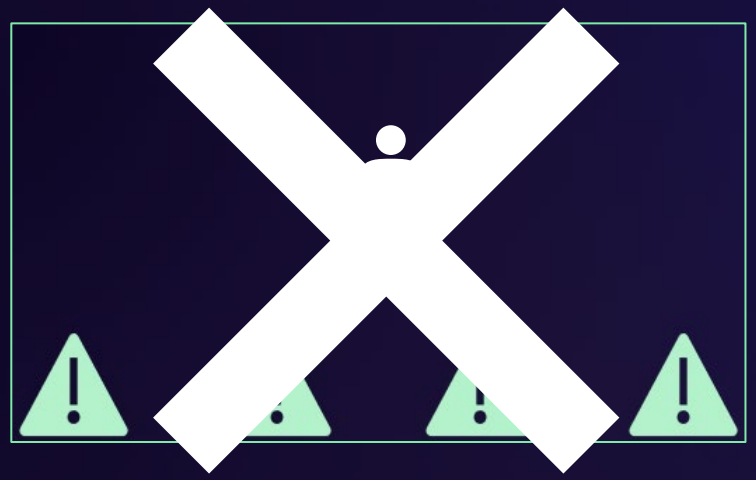

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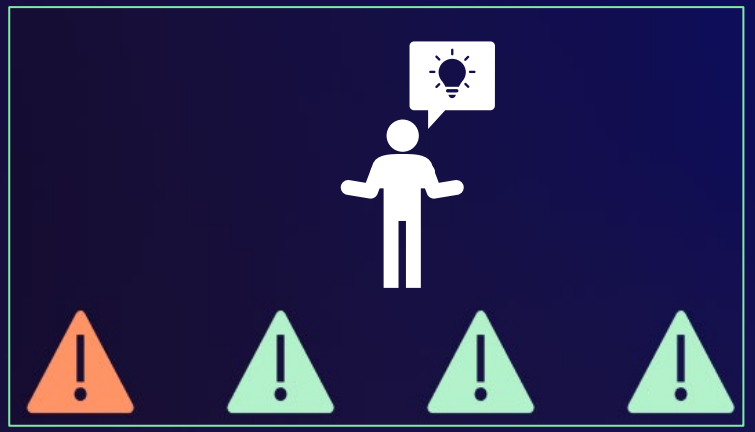

So how do we get rid of the noise without missing the signal?

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Activity logs

- API activity
- Network activity
- Database access activity
- Compute runtime activity
- Container cluster activity
- And so on

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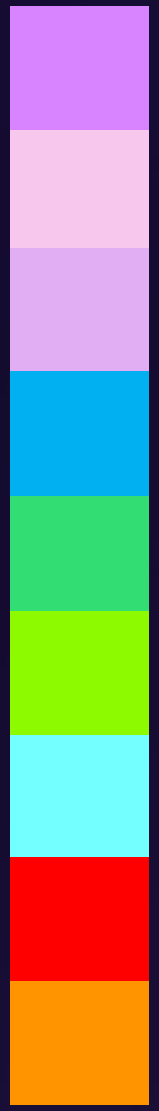

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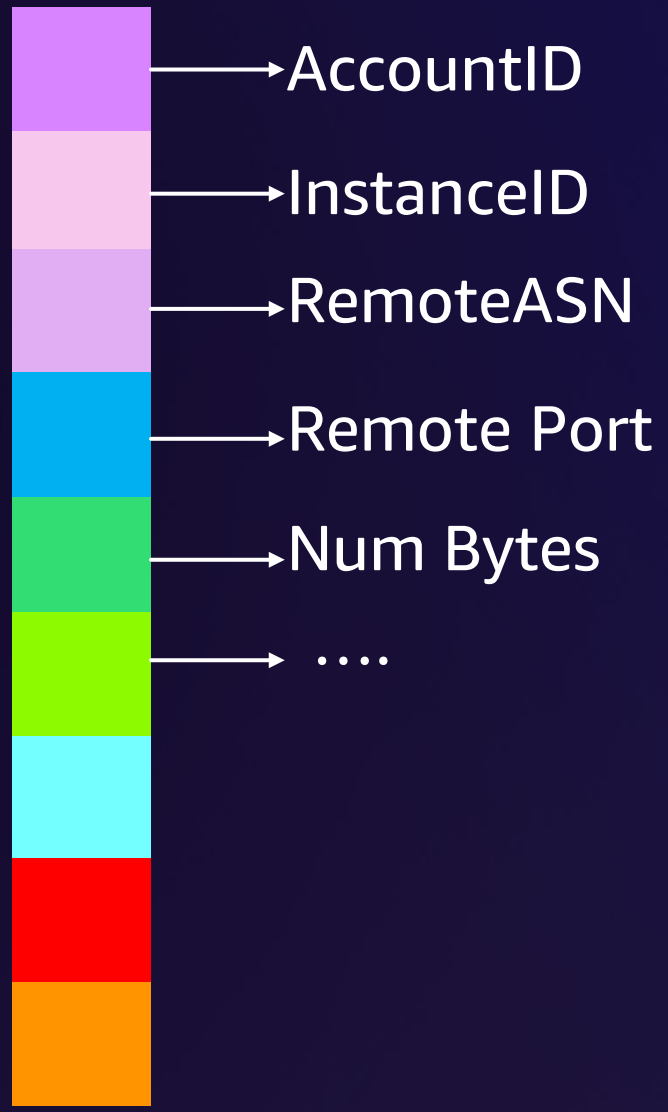

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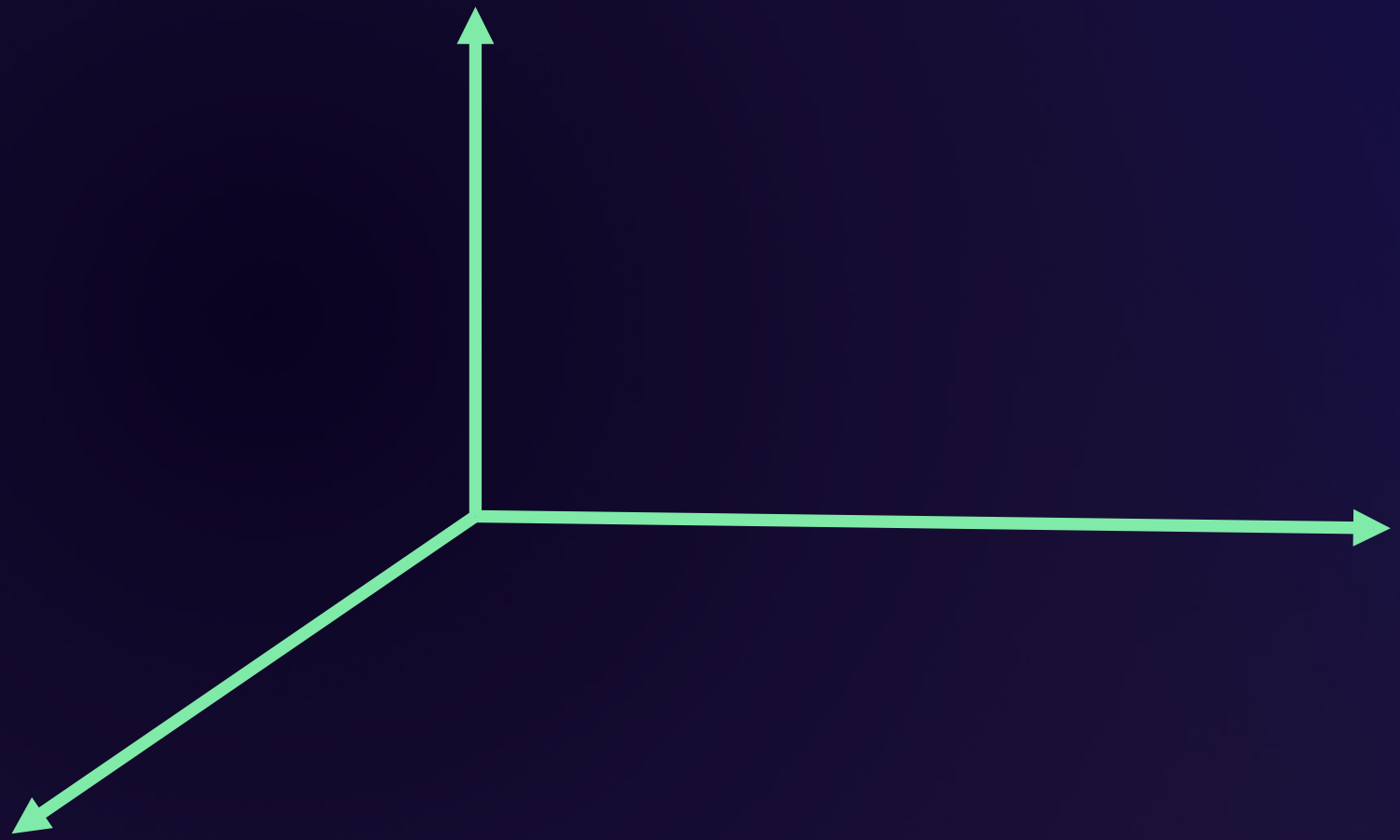
Region of normality



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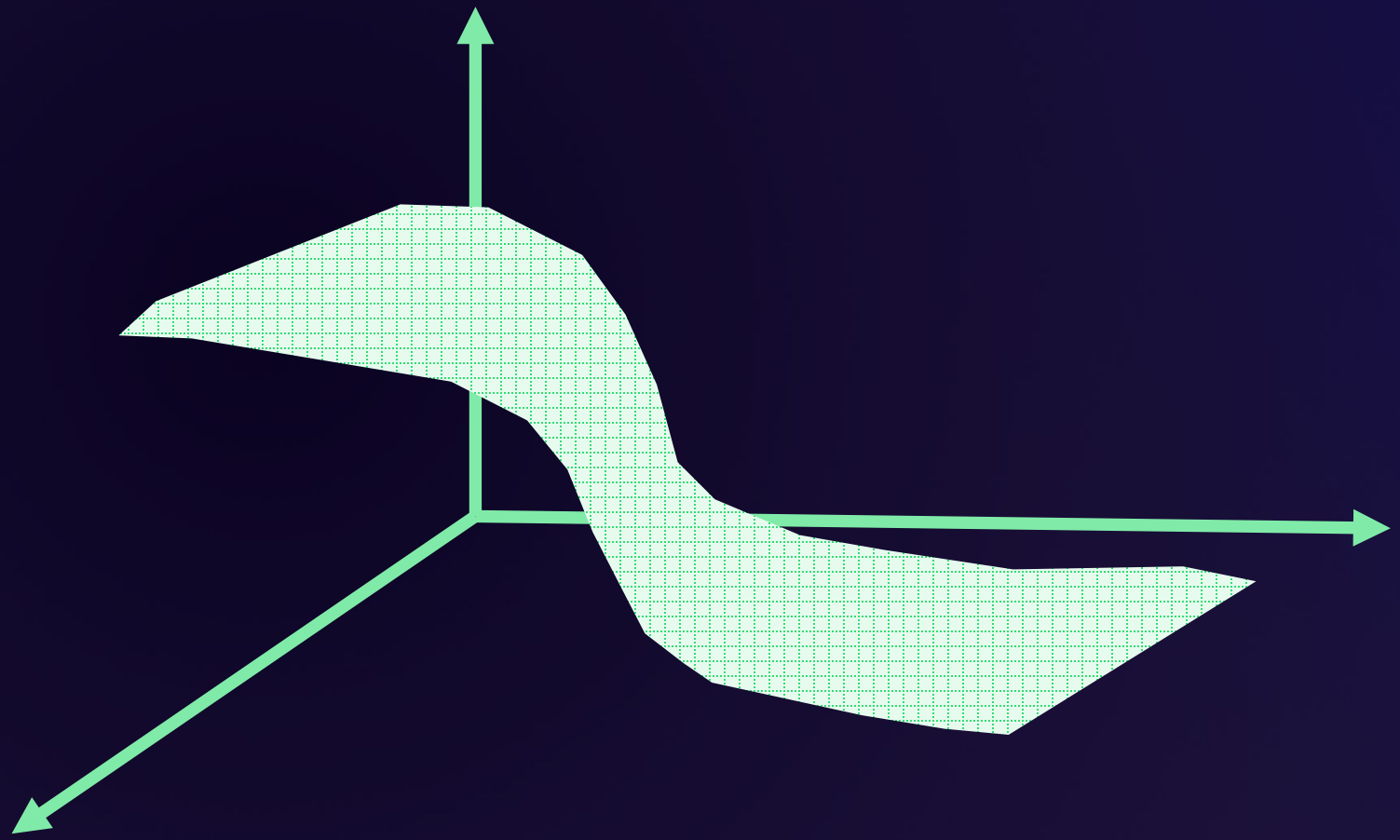

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The model

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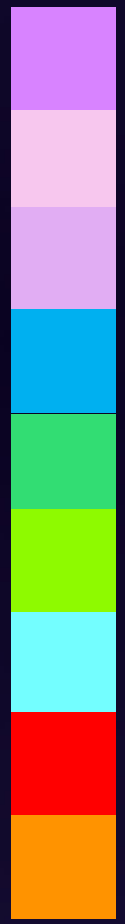
The model



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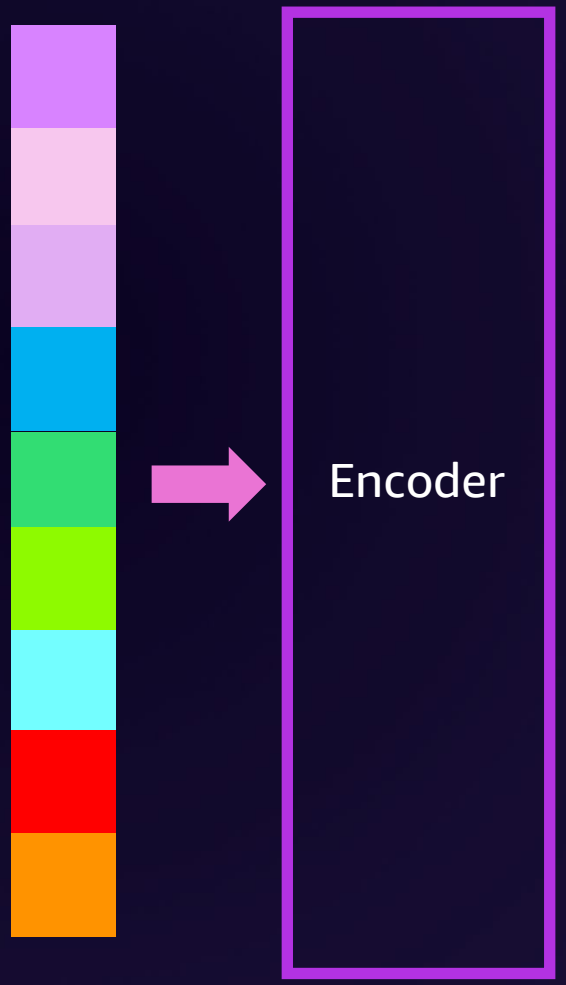

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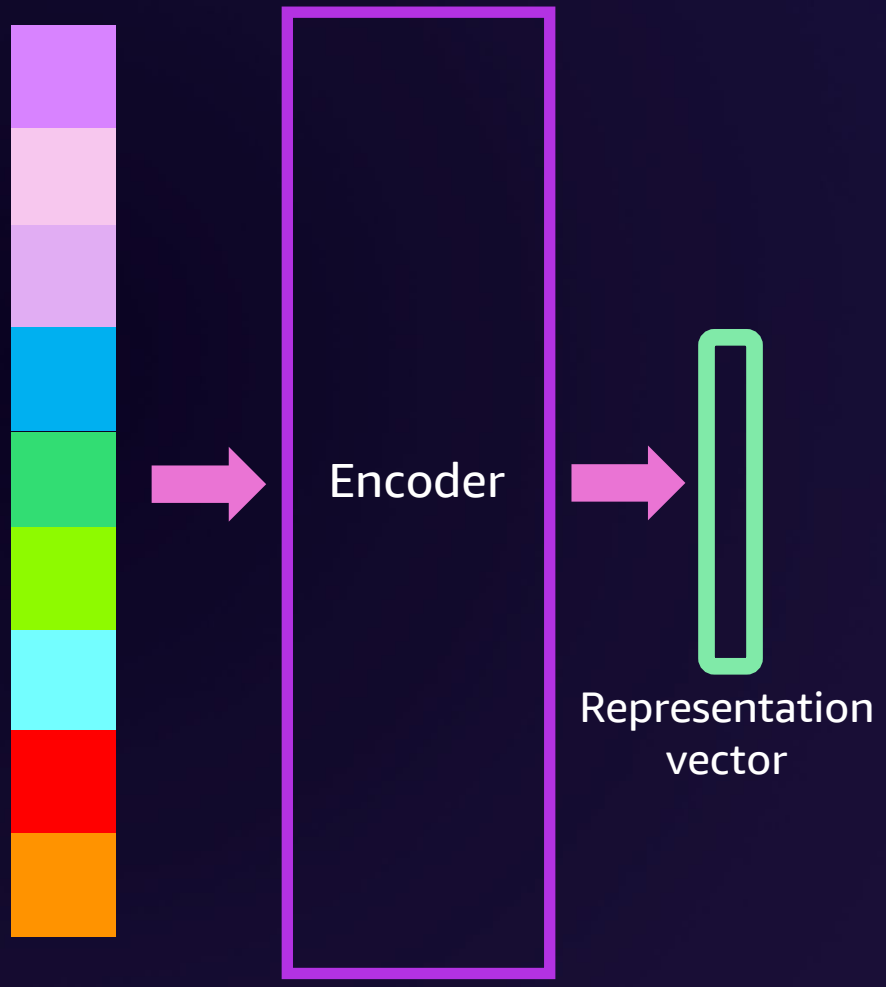

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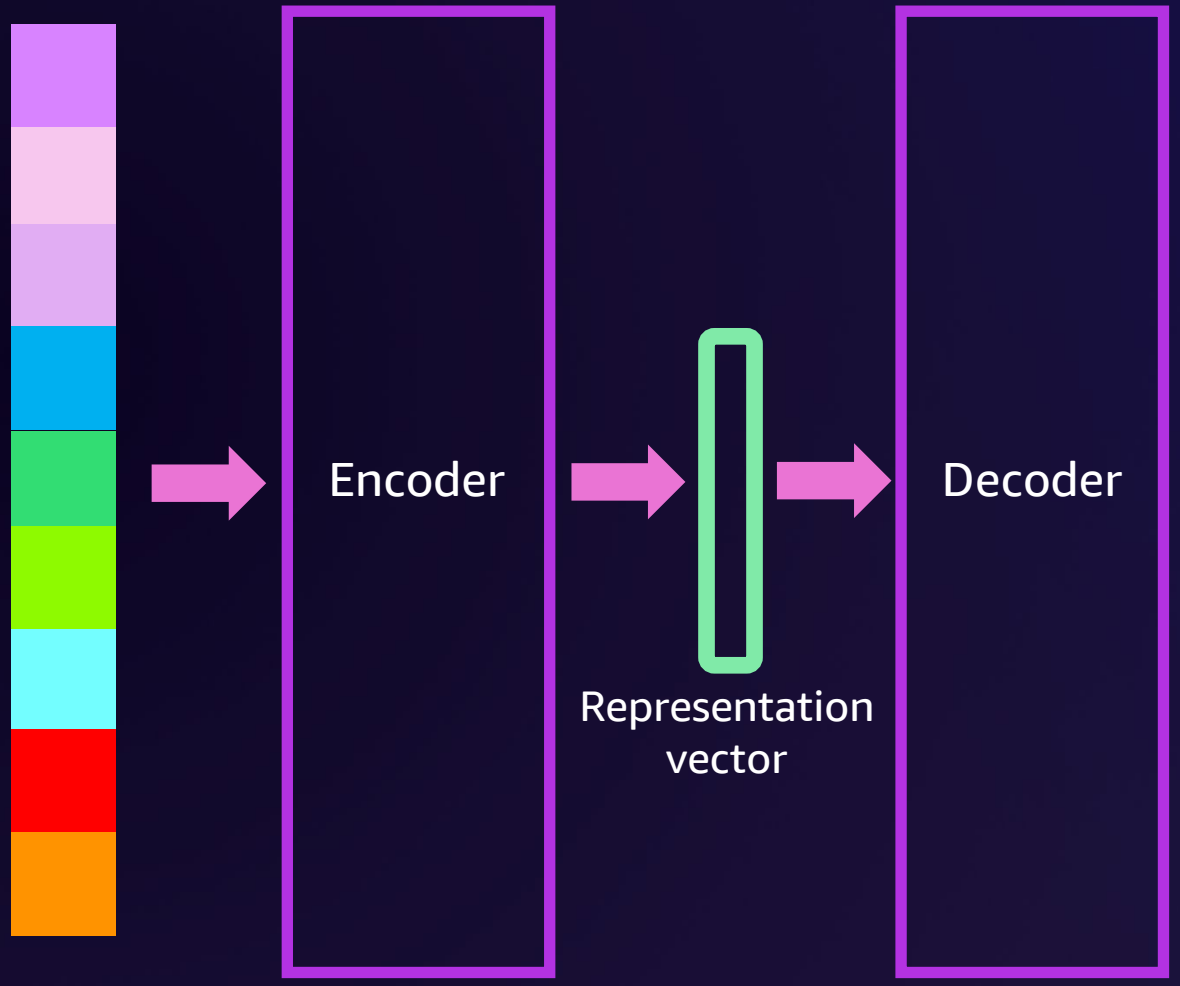

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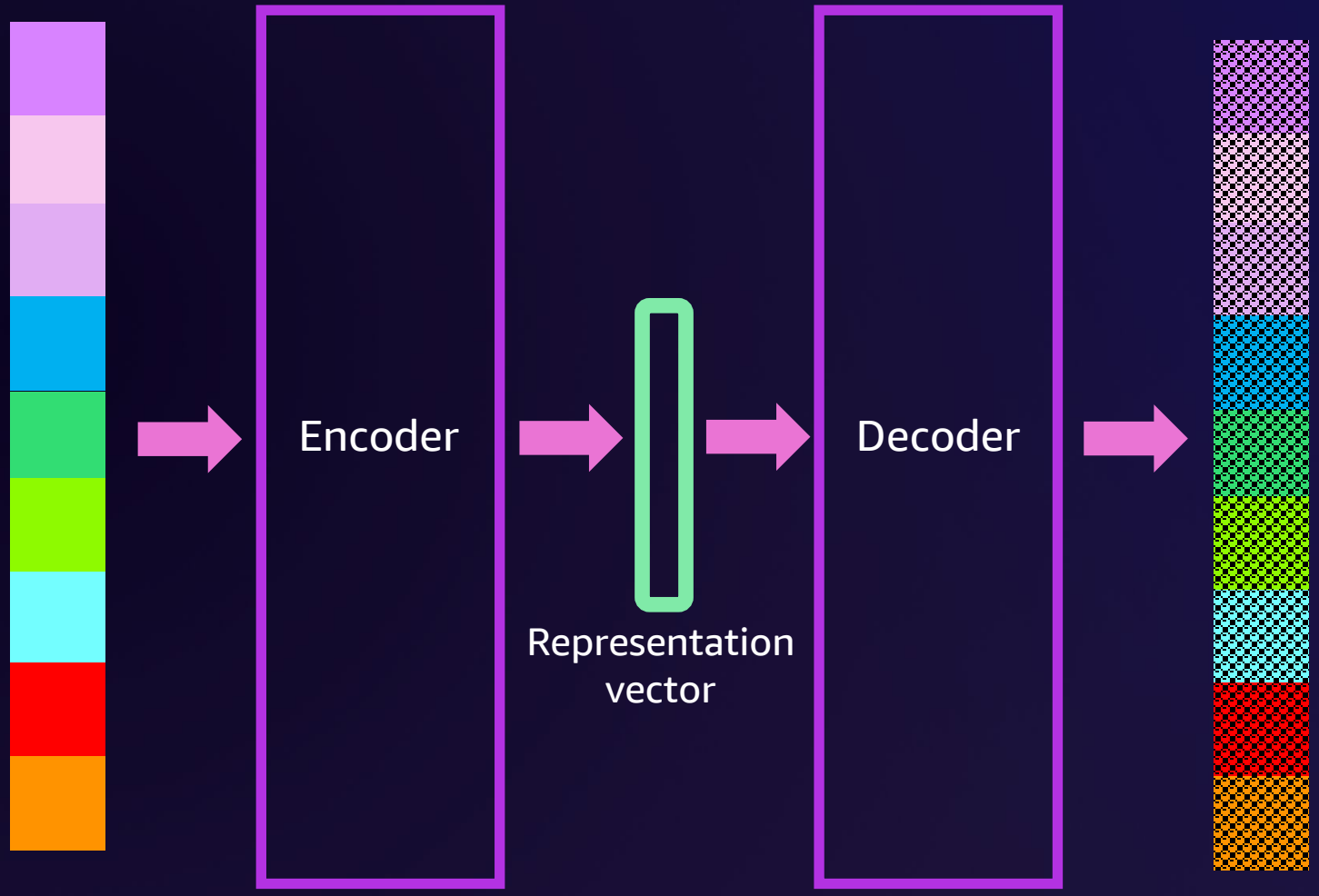

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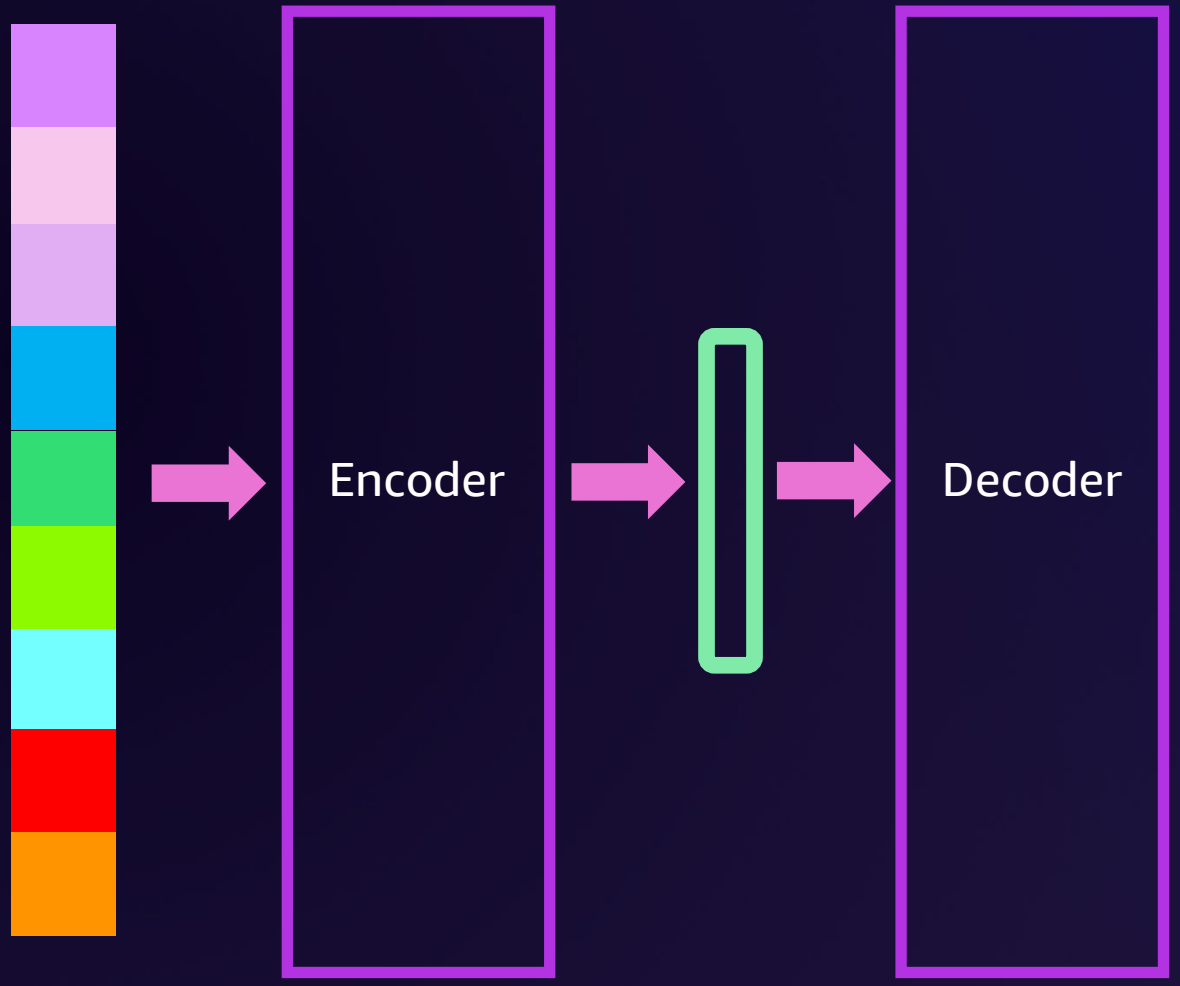
The conditional model



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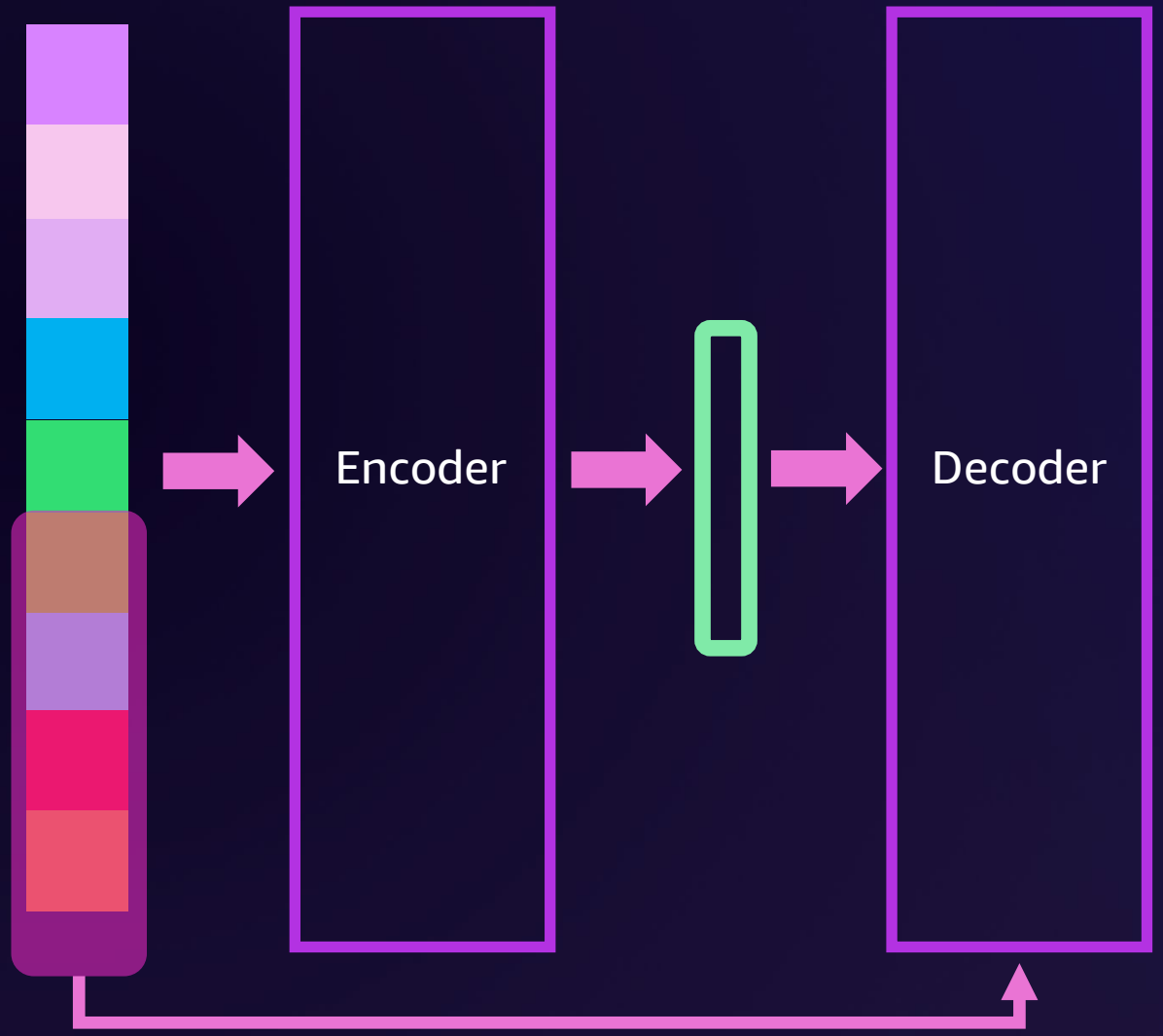

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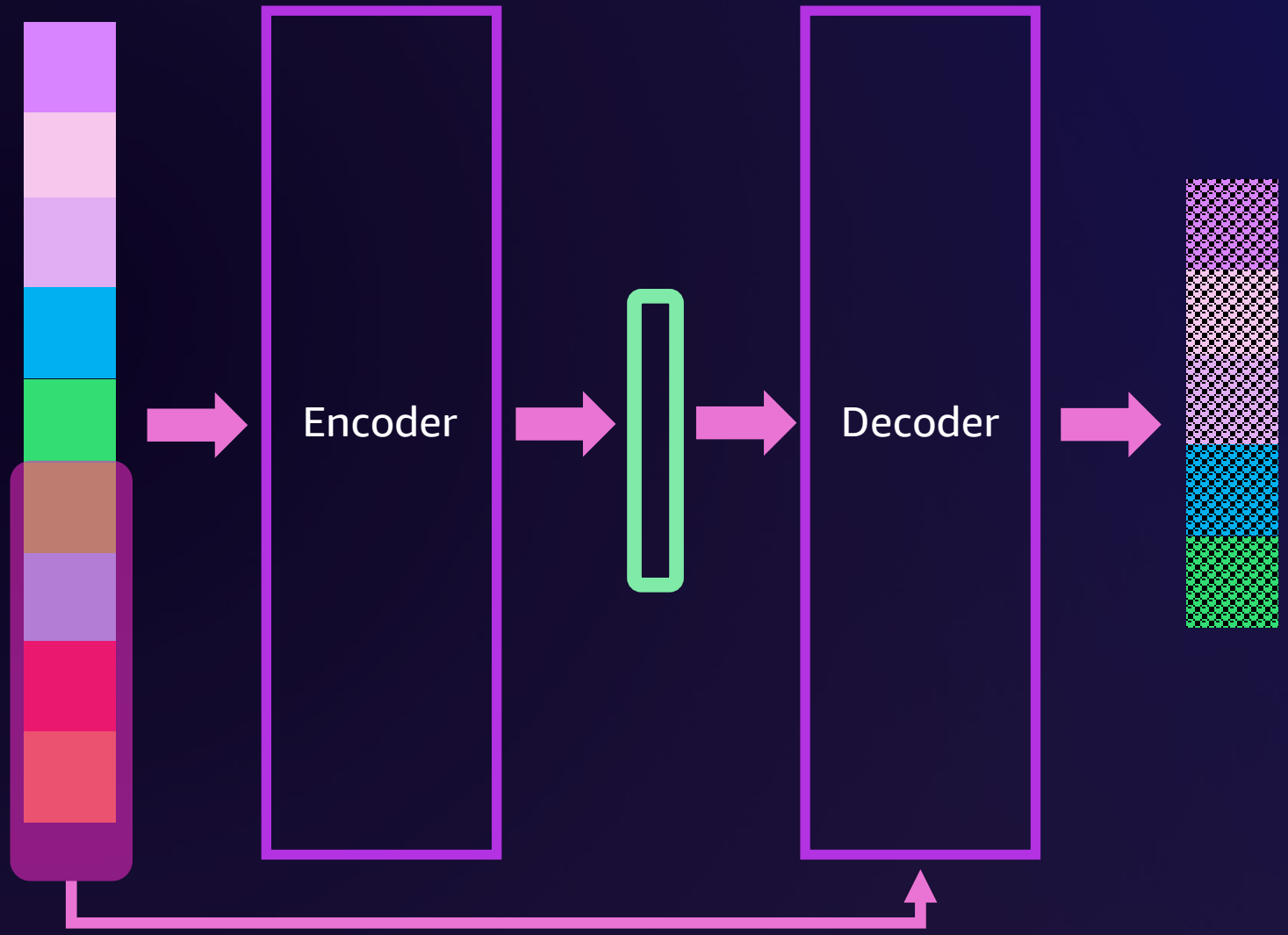

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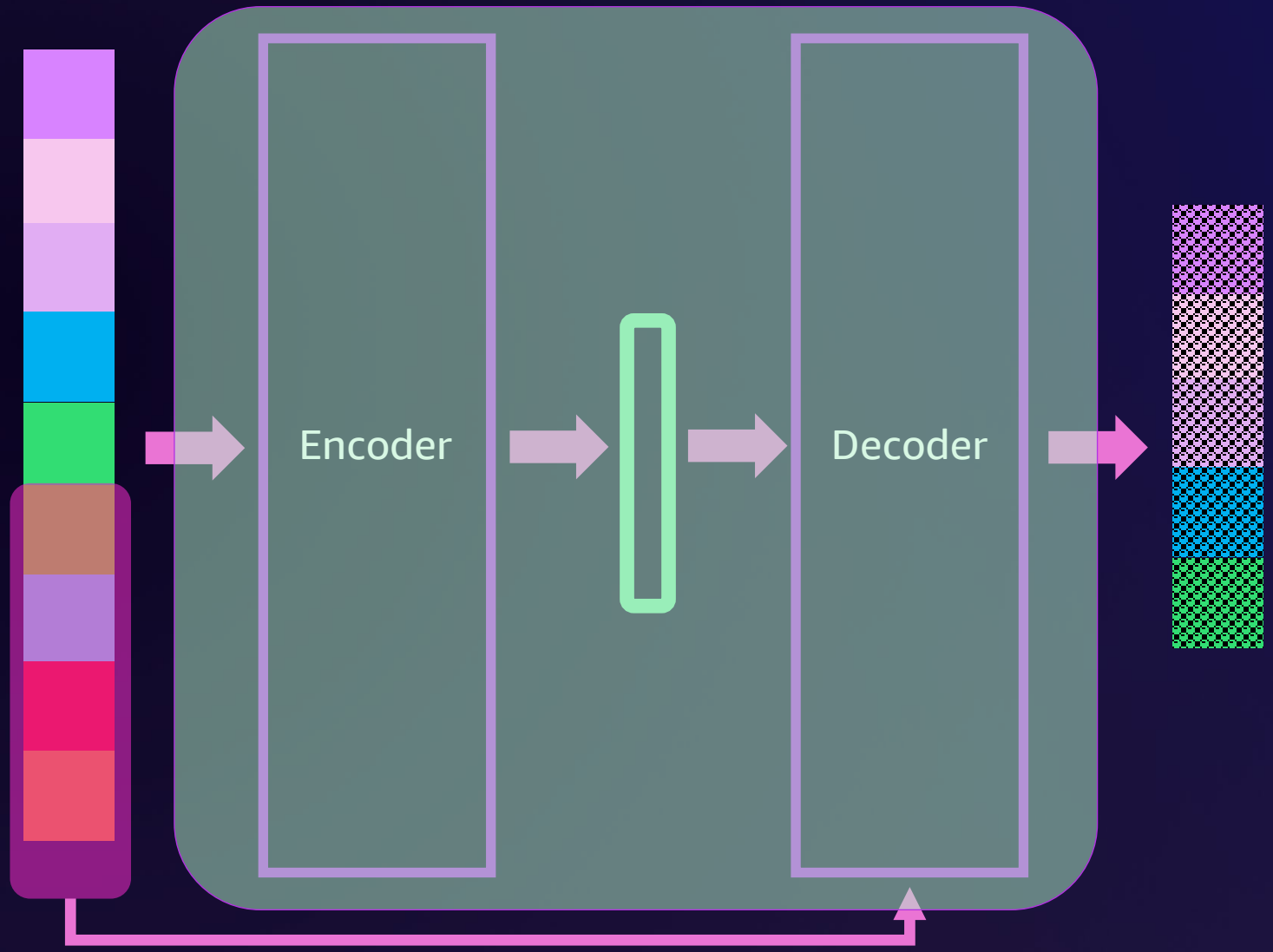

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Training



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Training



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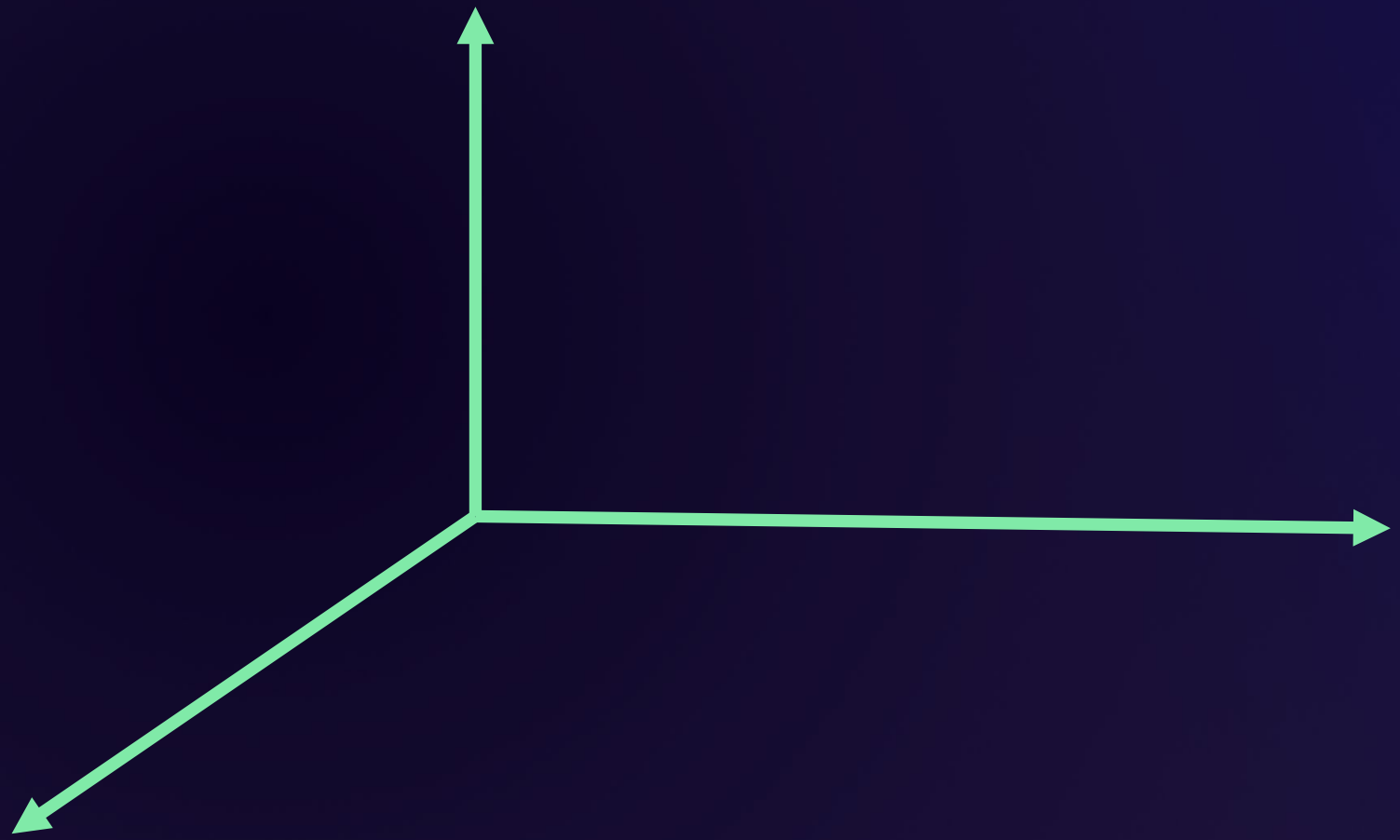
Learning normal activity



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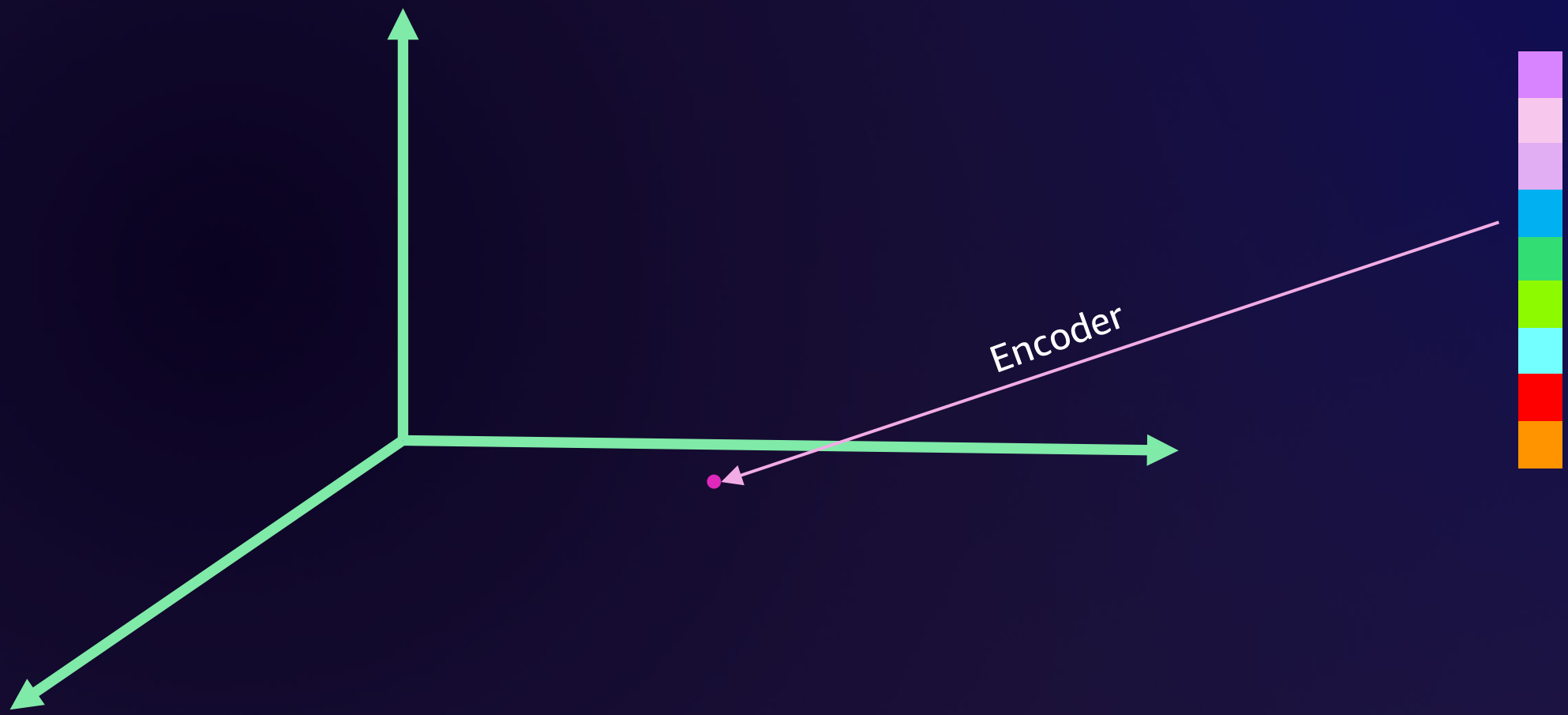

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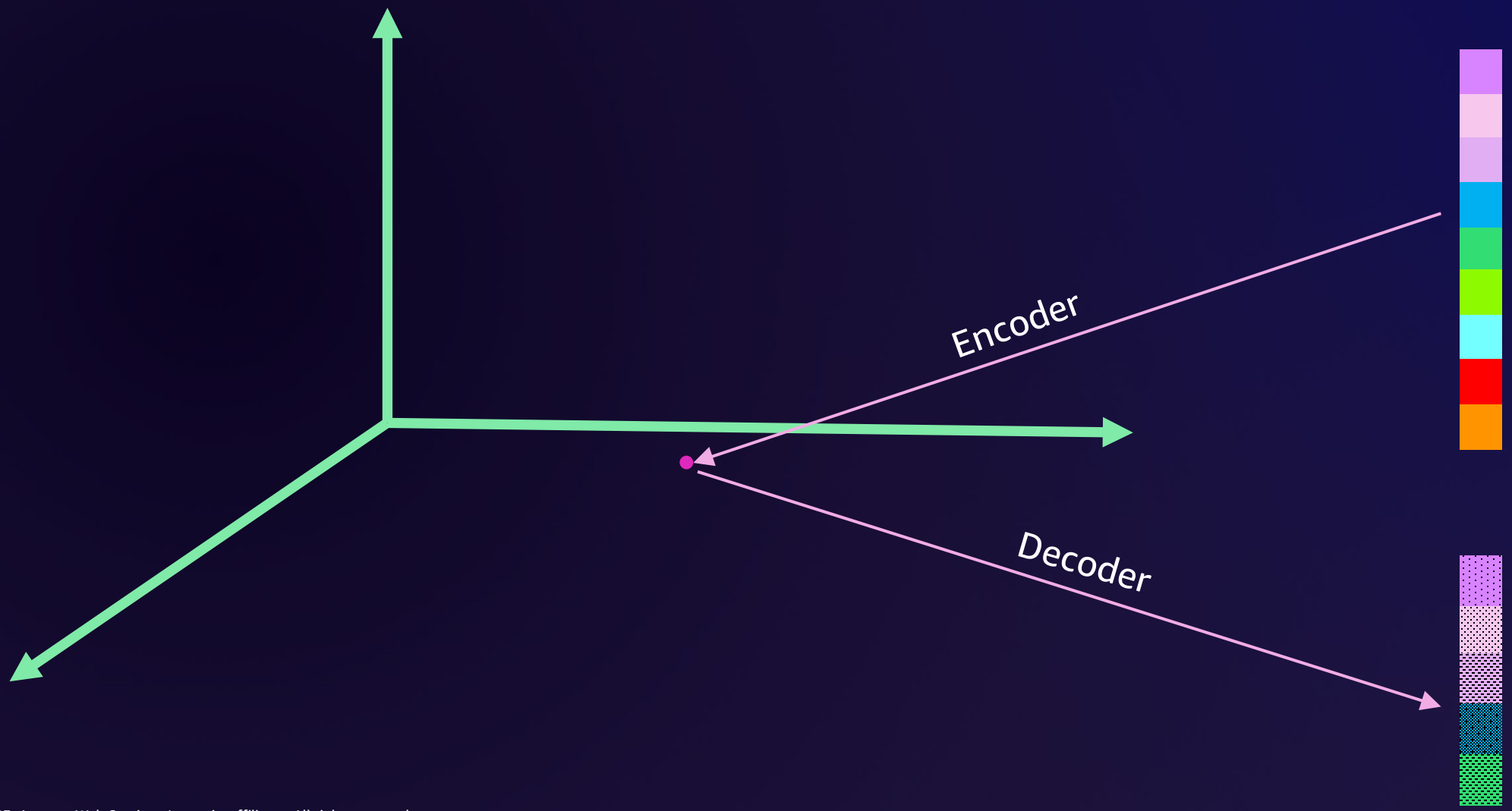

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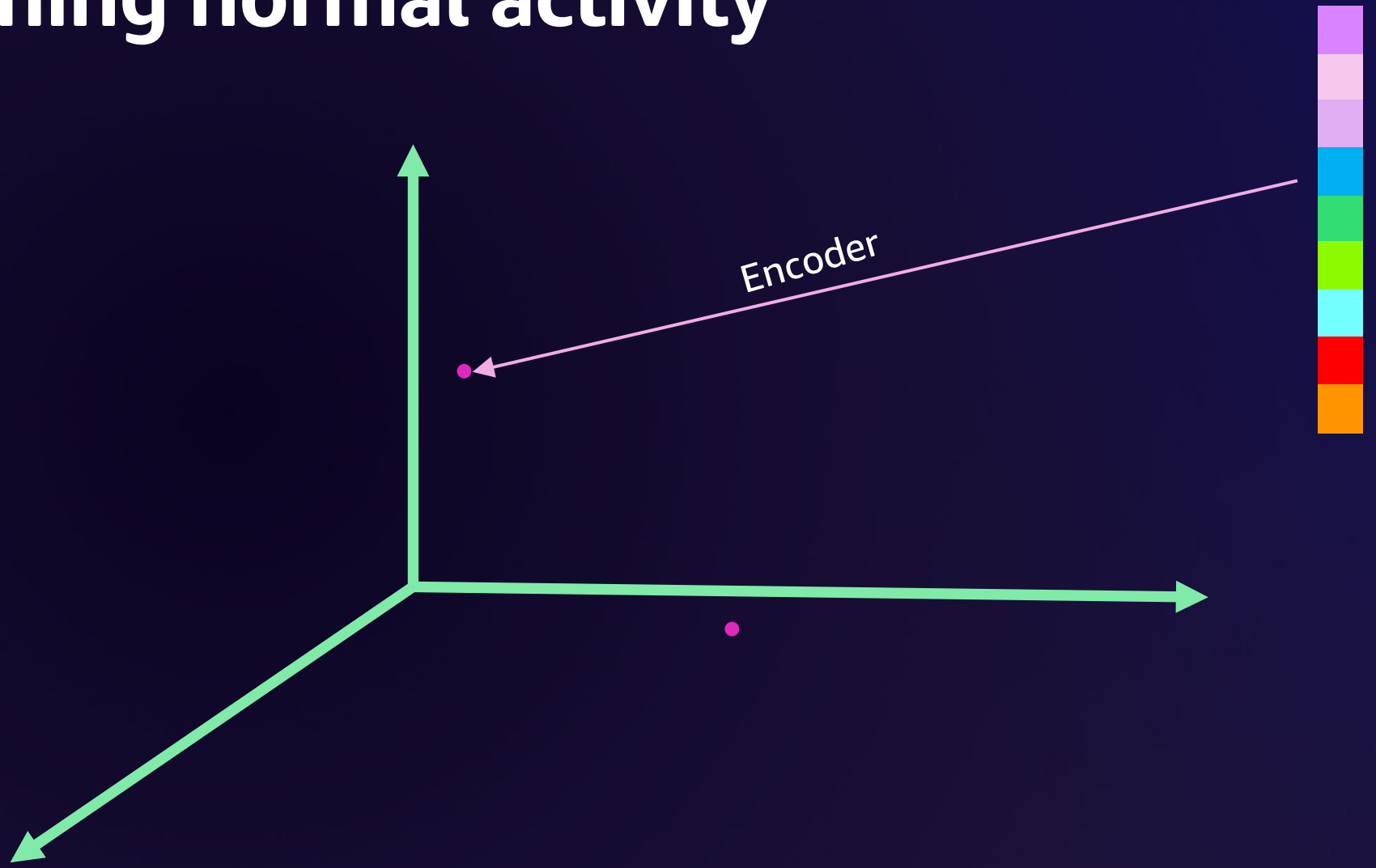

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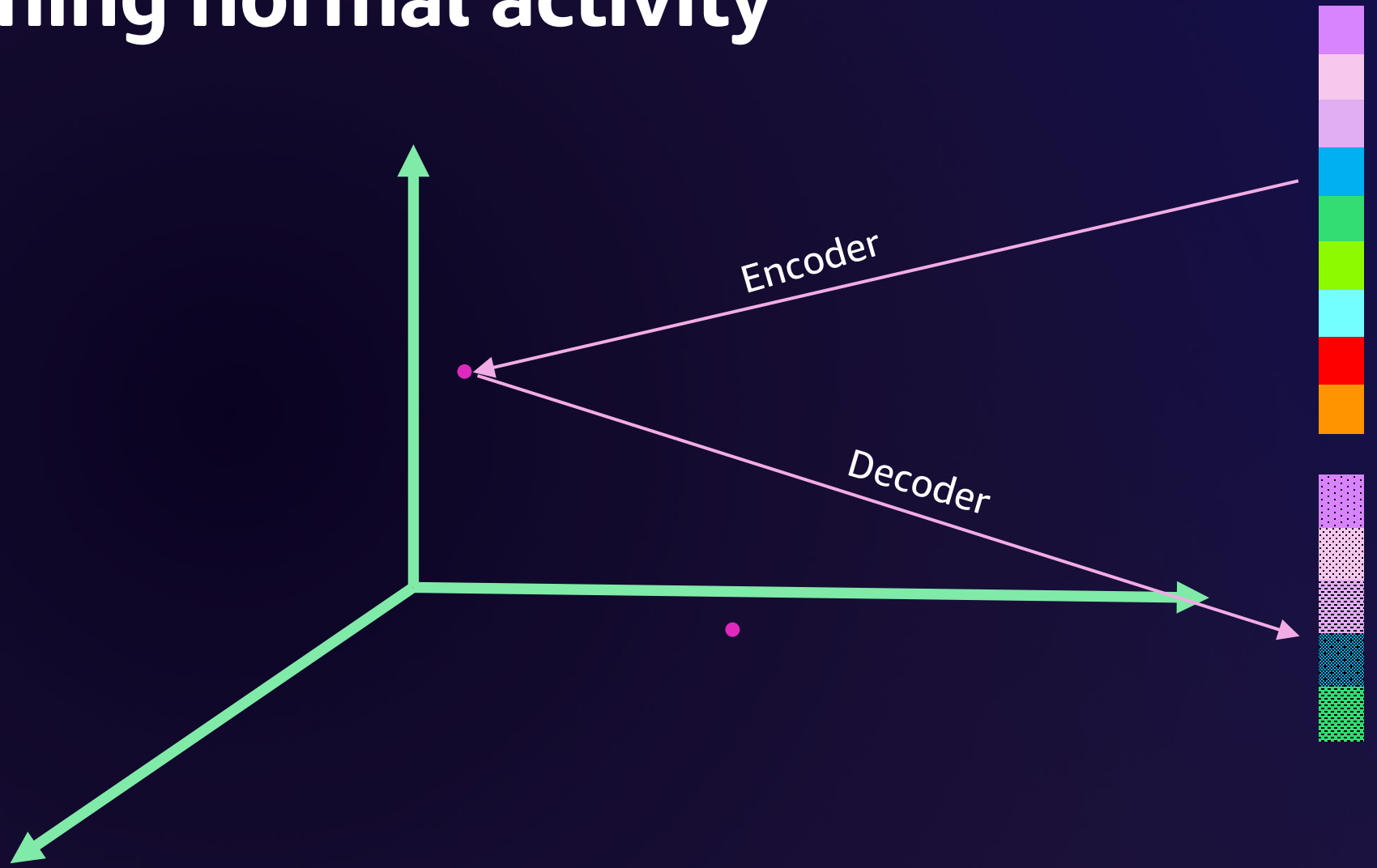

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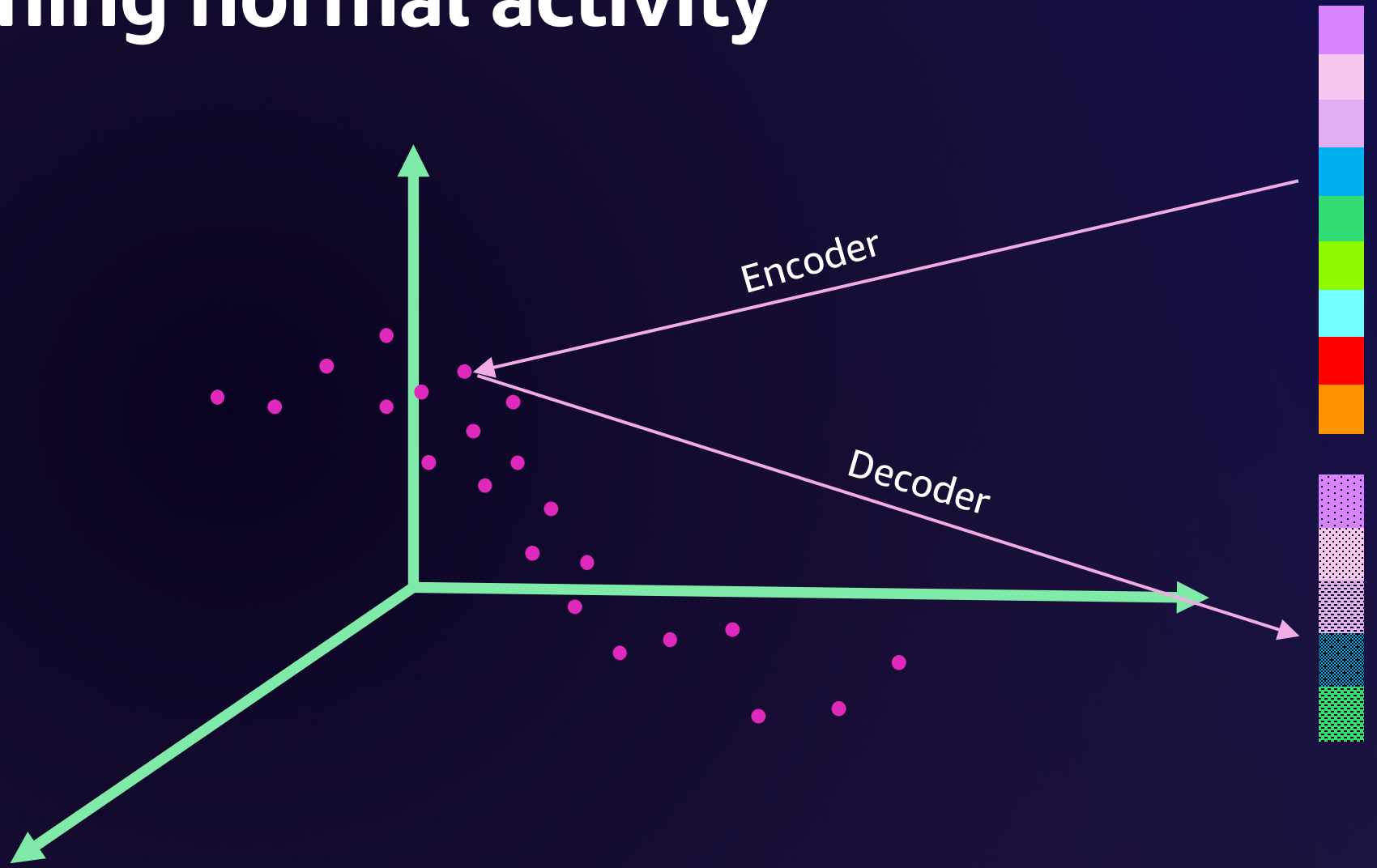

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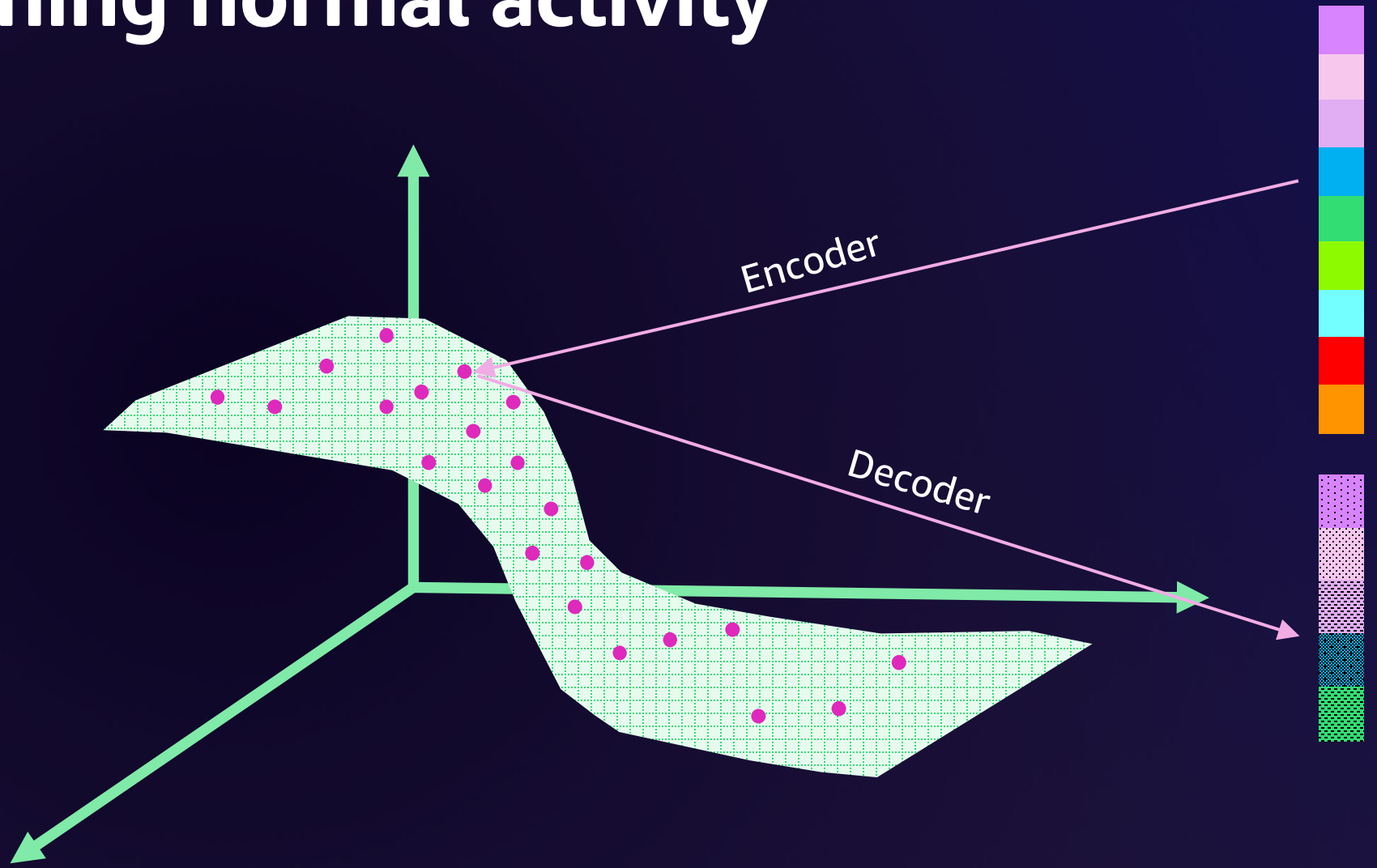

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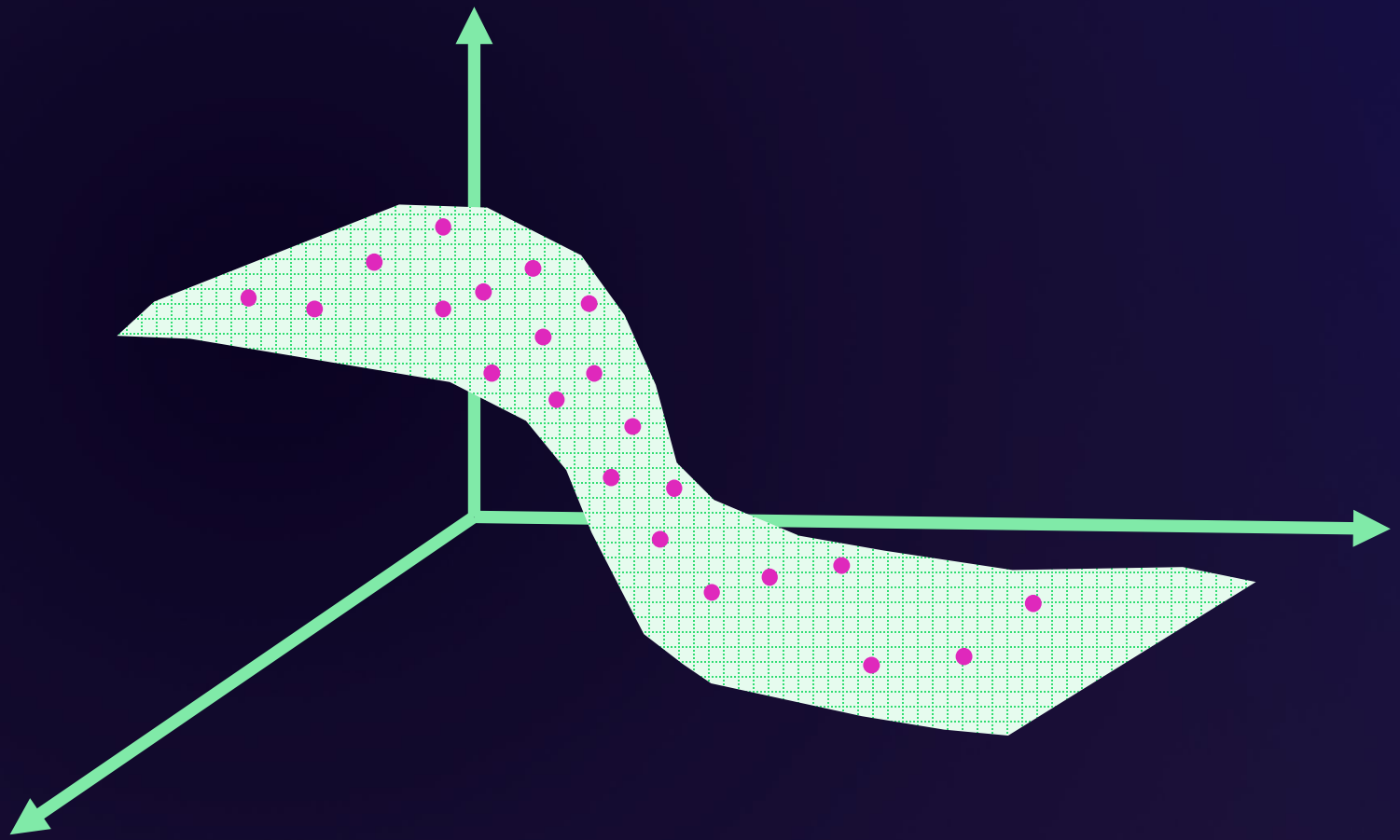

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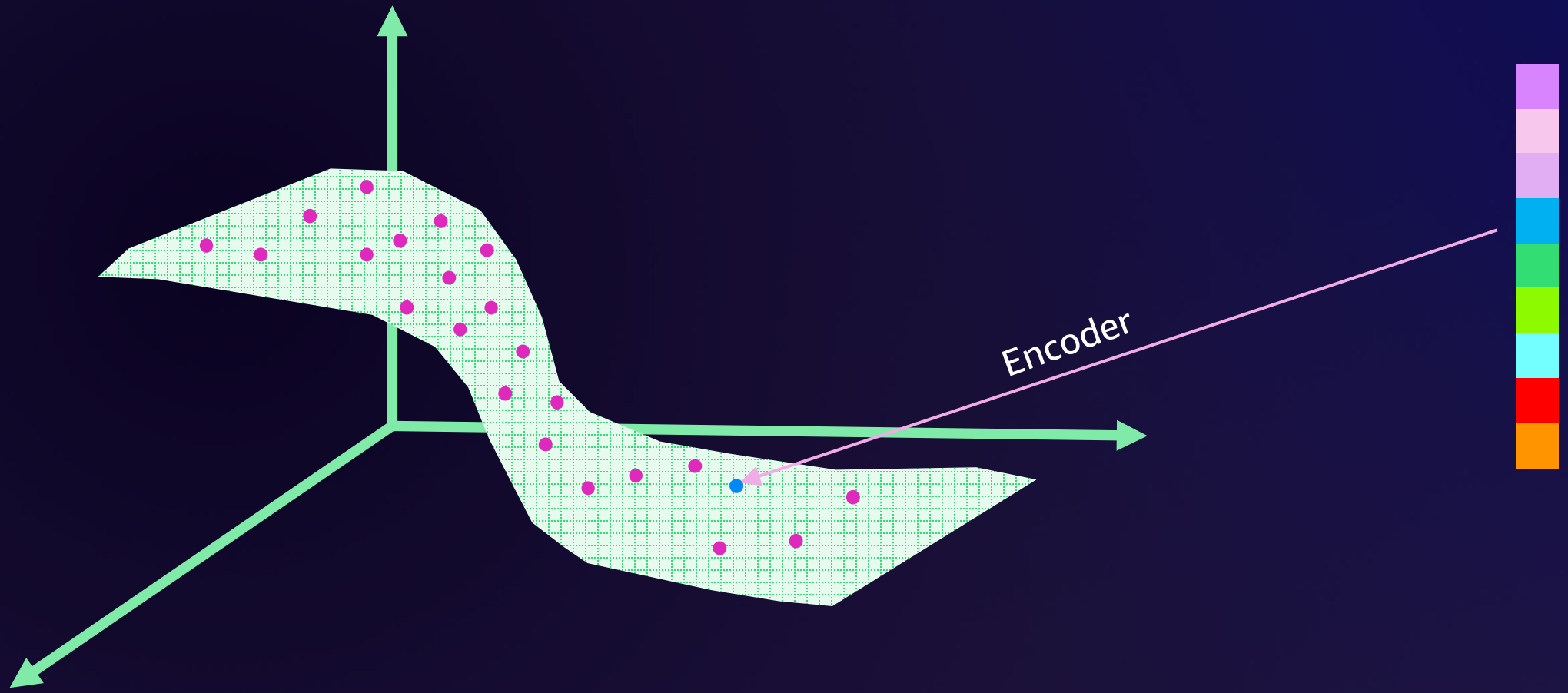

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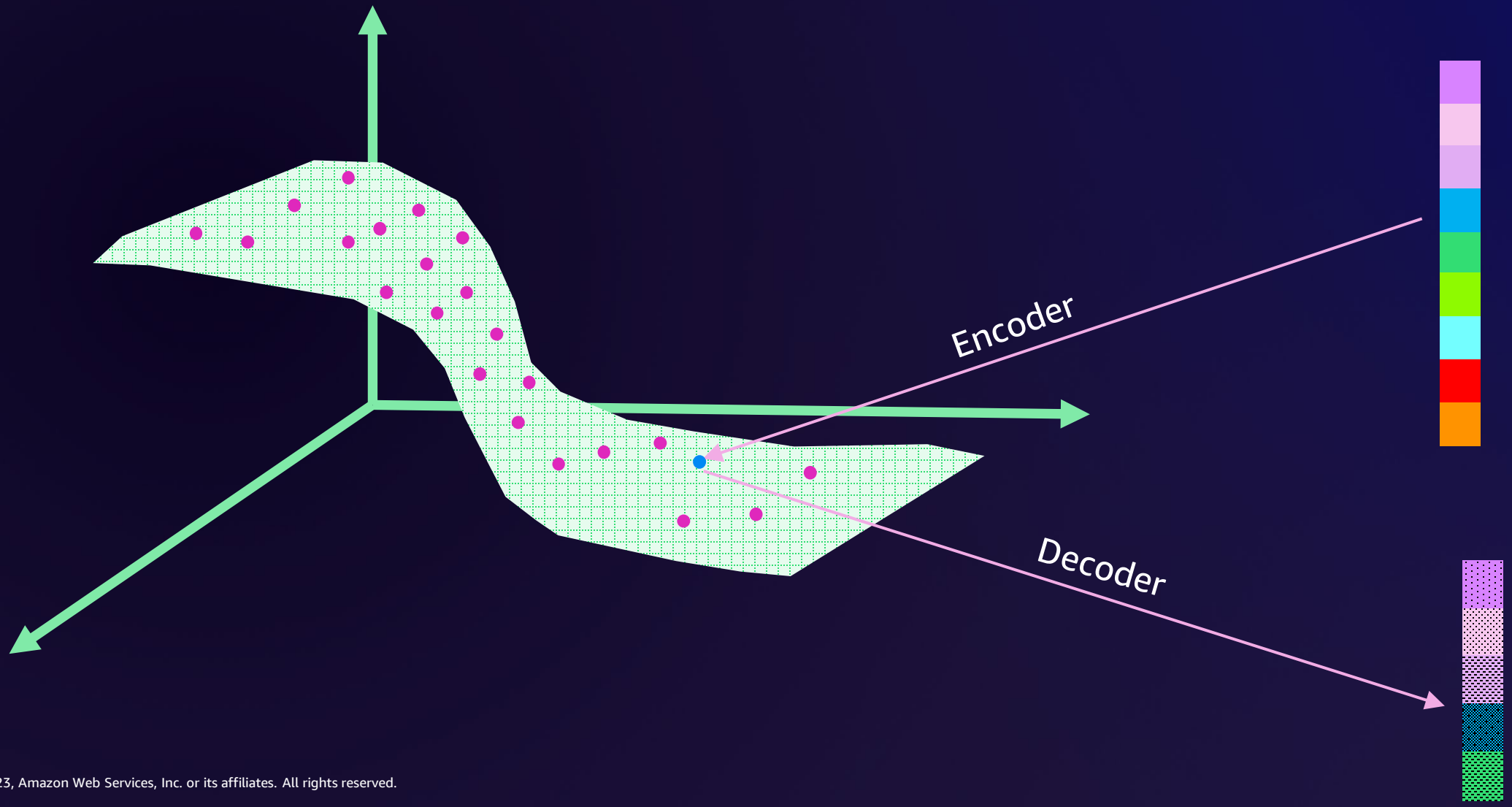

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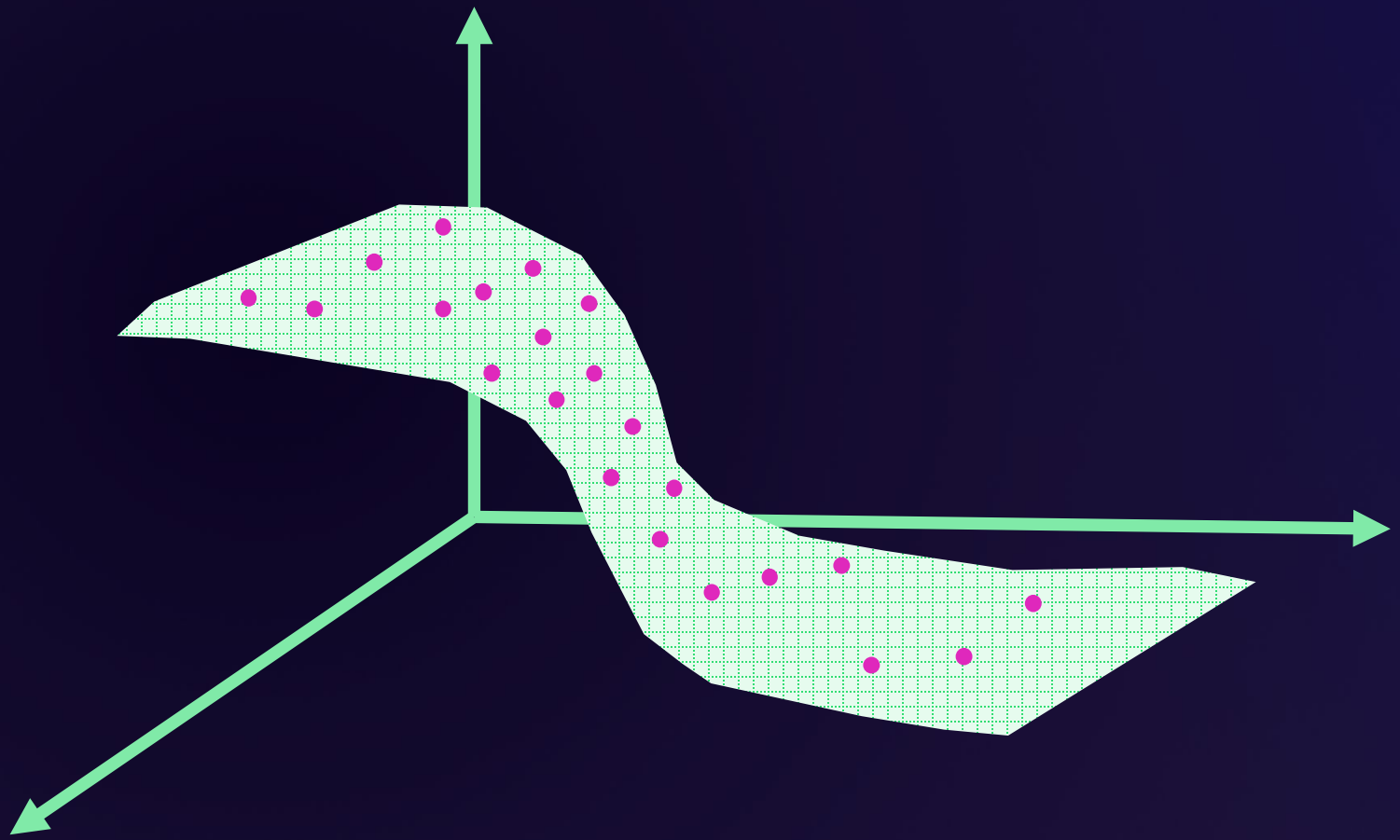

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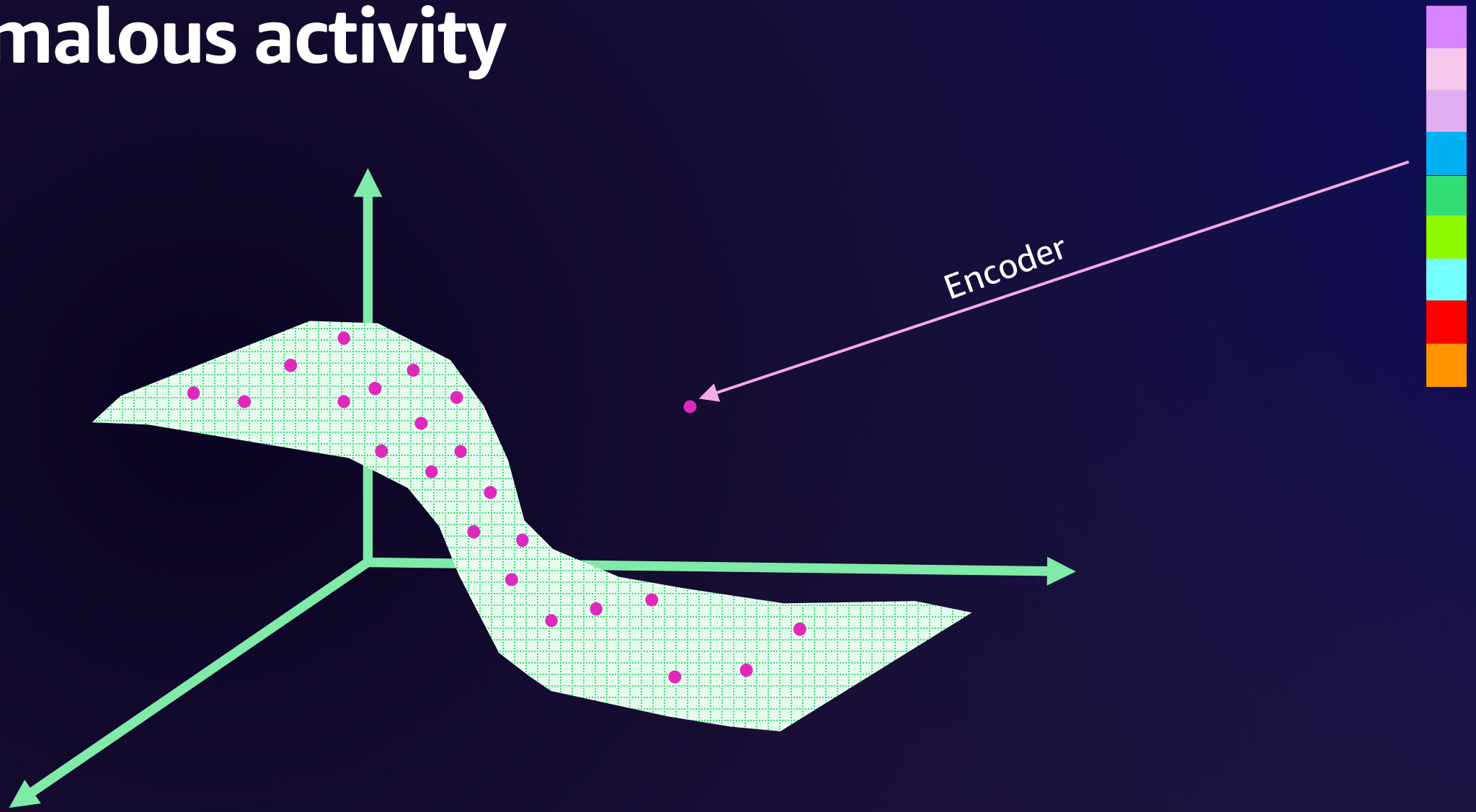

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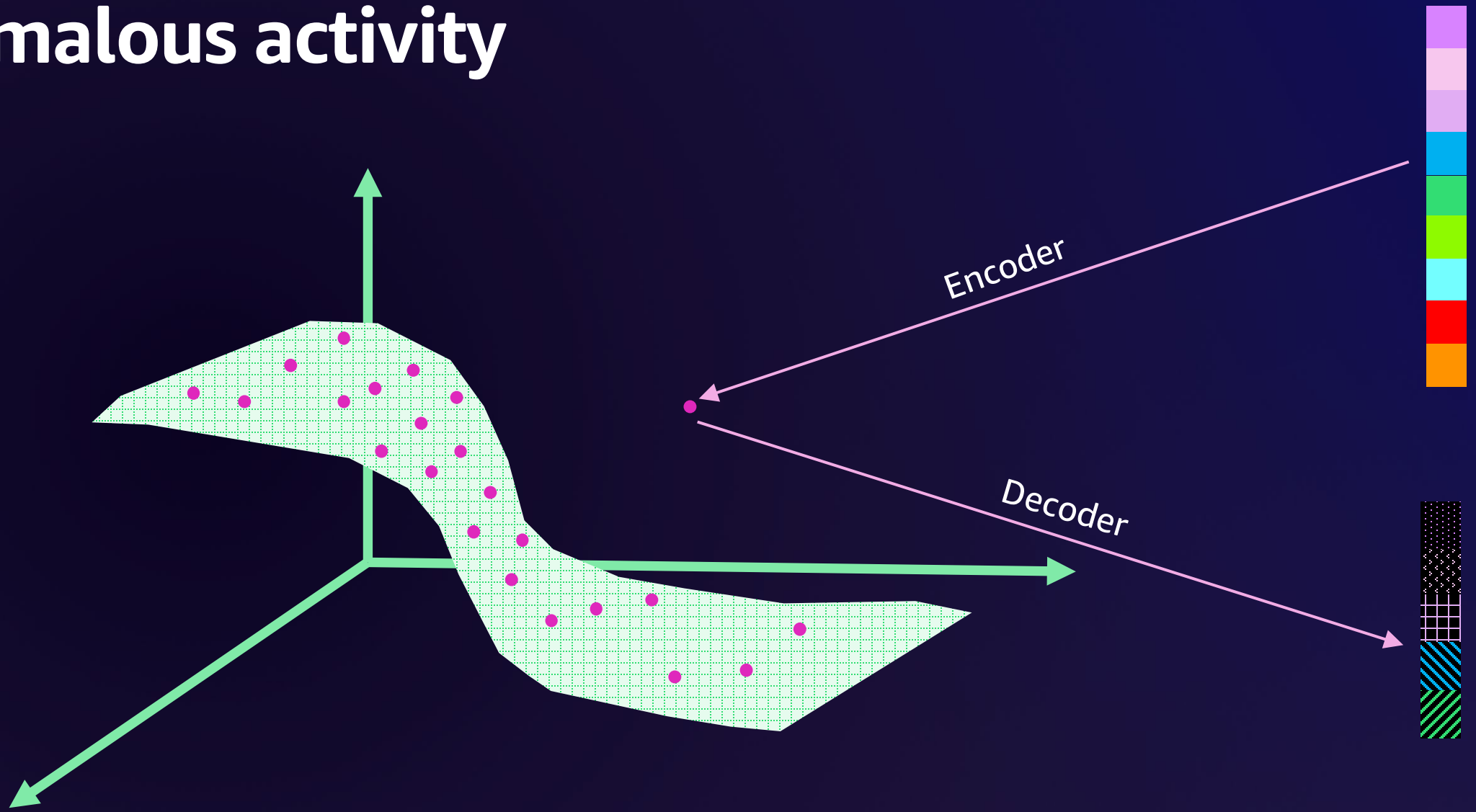

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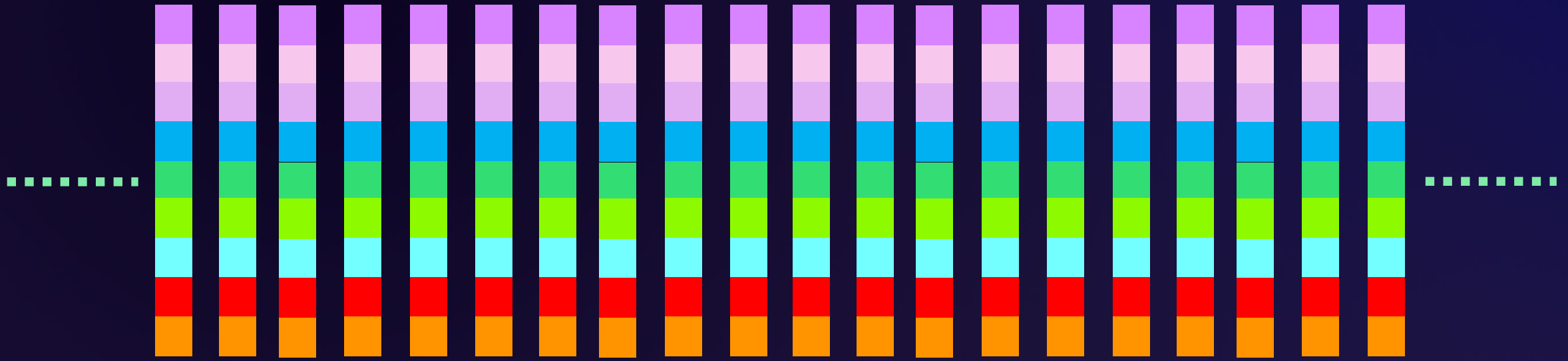
Inference



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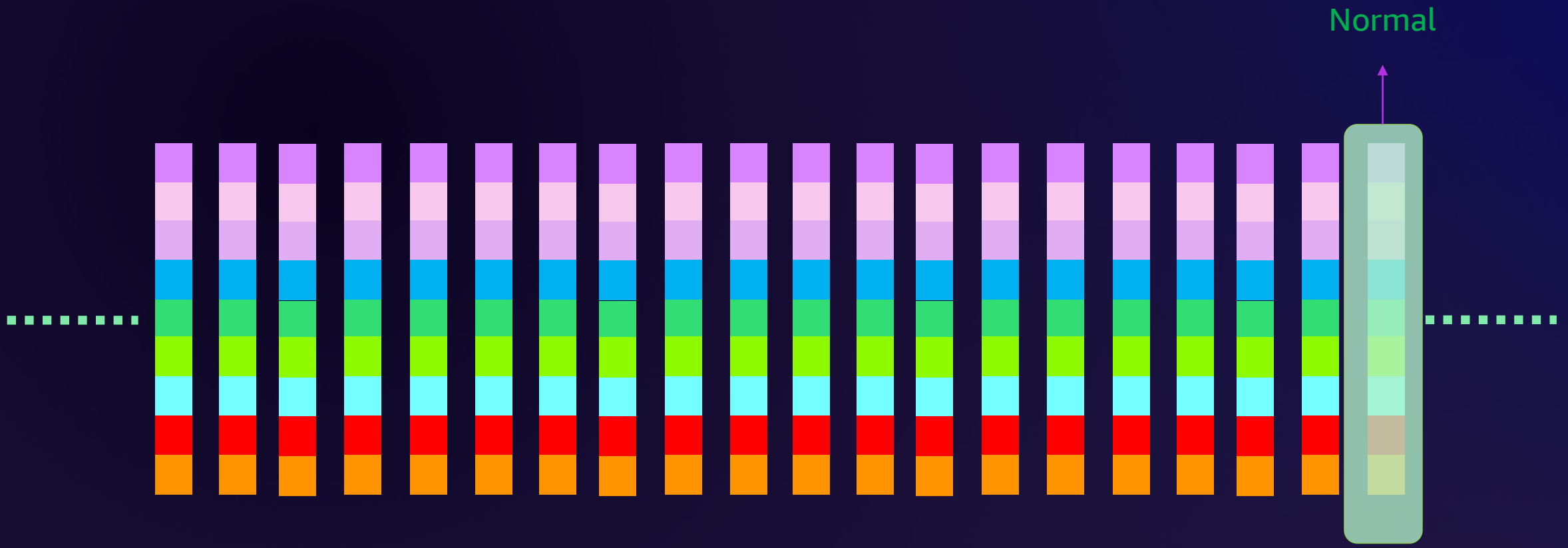
Inference



aws

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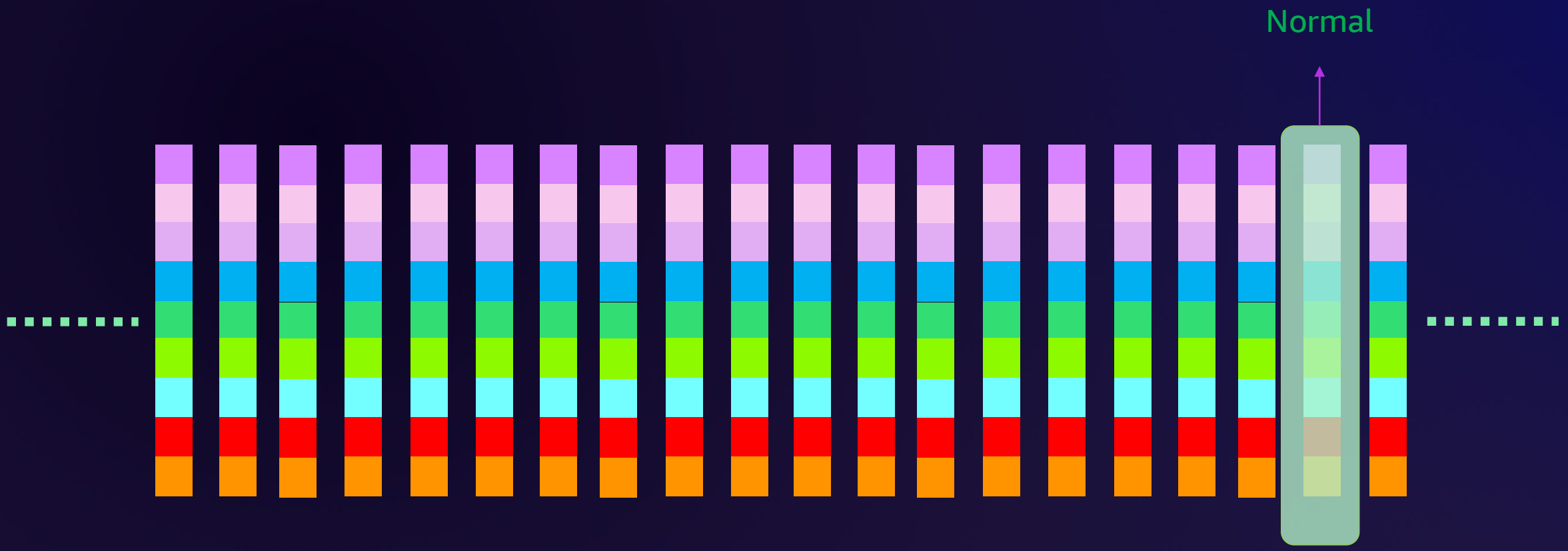
Inference



aws

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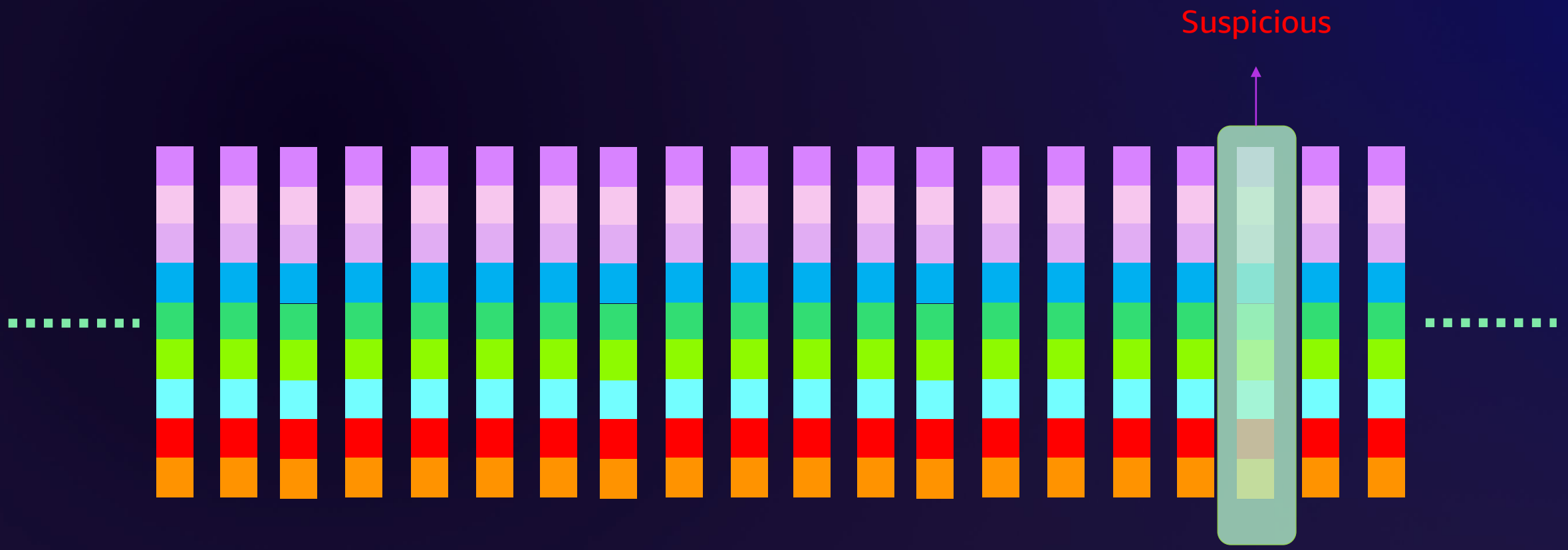
Inference



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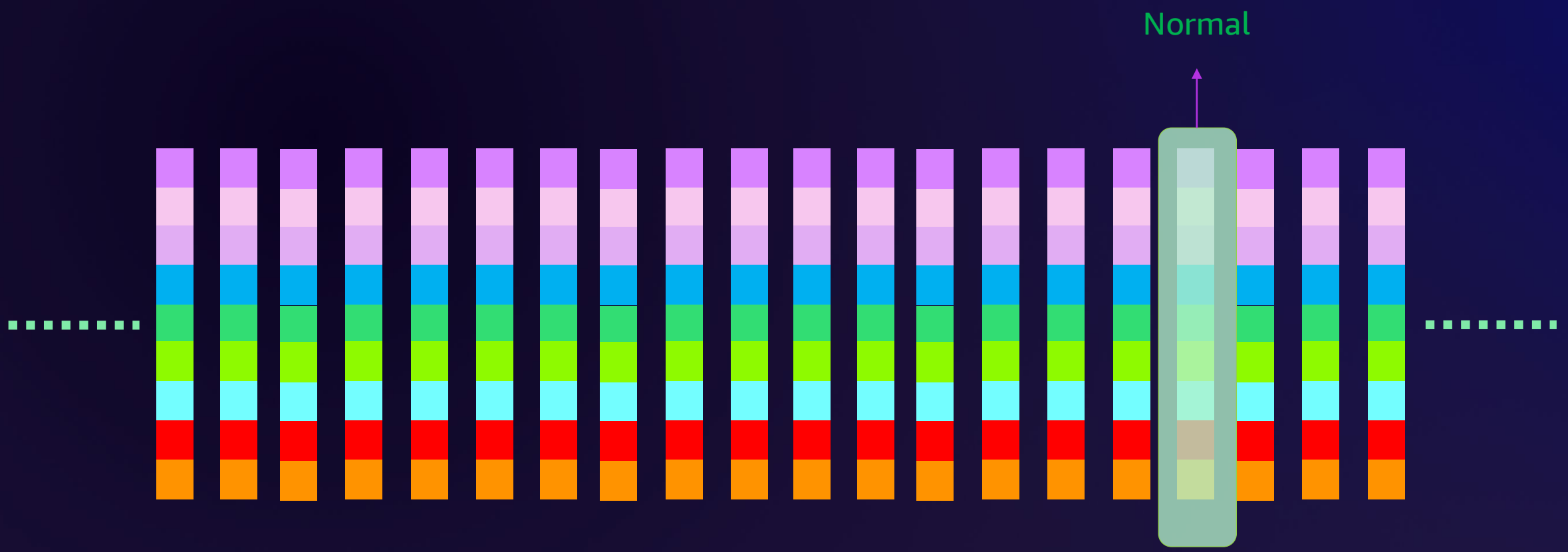
Inference



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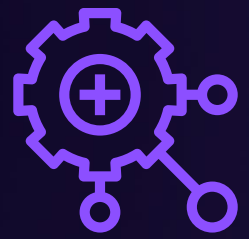
Post-processing



Security value filtering



Aggregation



Gathering context



Finding generation

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Tuning and evaluation



Low alert rate



Detect known attack patterns



Signs of true positives



No glaring false positives

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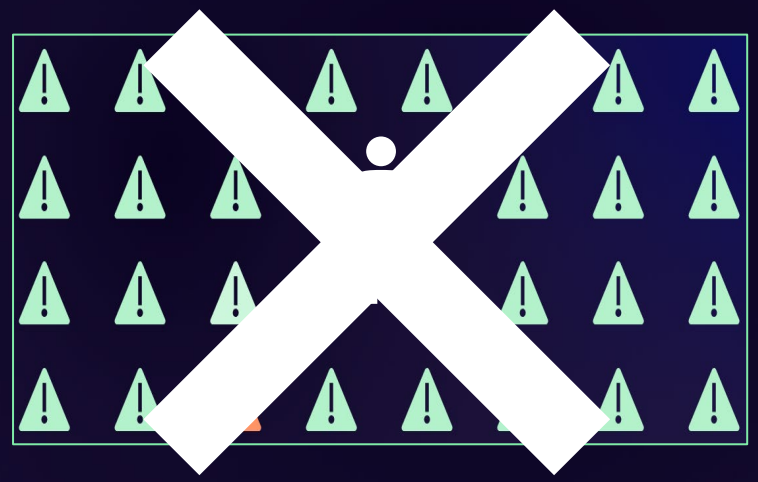
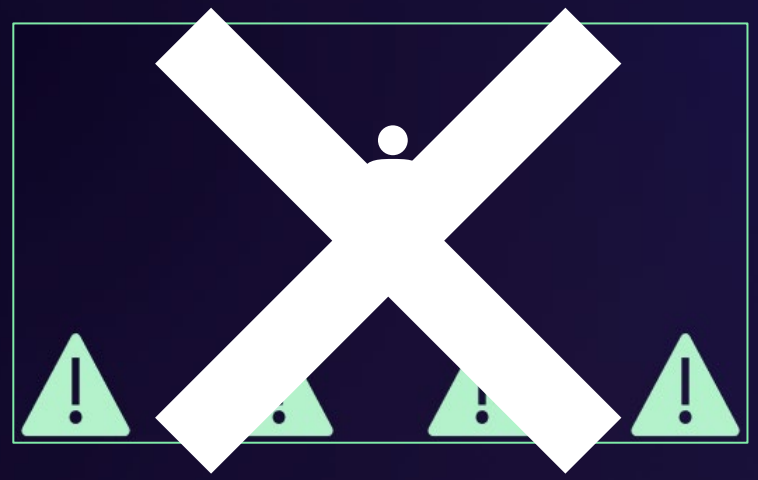
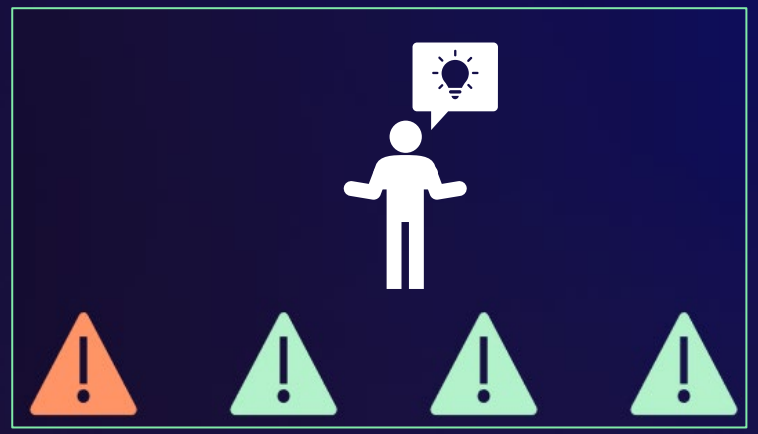
Where we left off – How do we get rid of noise without missing the event?







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Improved accuracy

88% reduction in
likely benign findings



1,200% increase in
highly suspicious findings



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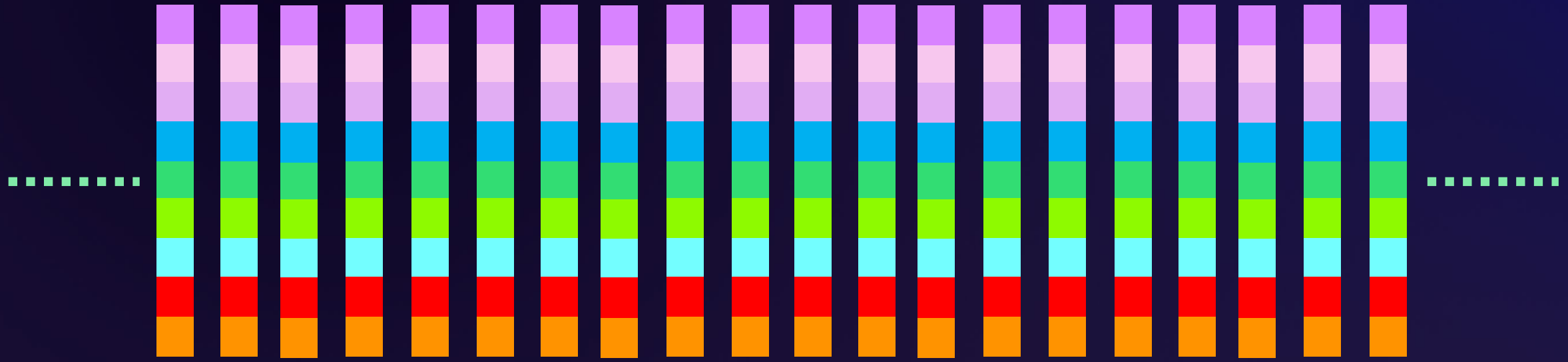
From an ML model to a GuardDuty finding – Detection



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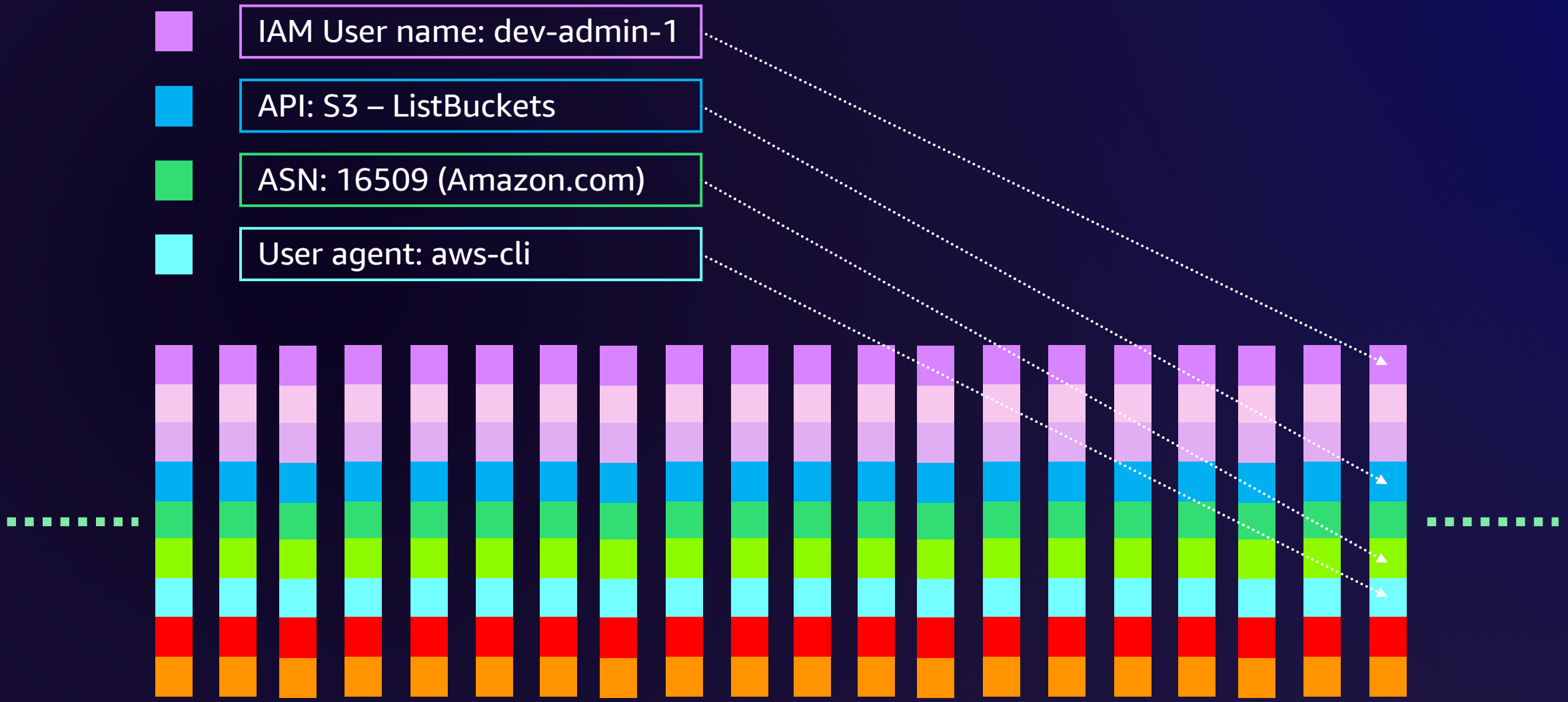
From an ML model to a GuardDuty finding – Detection



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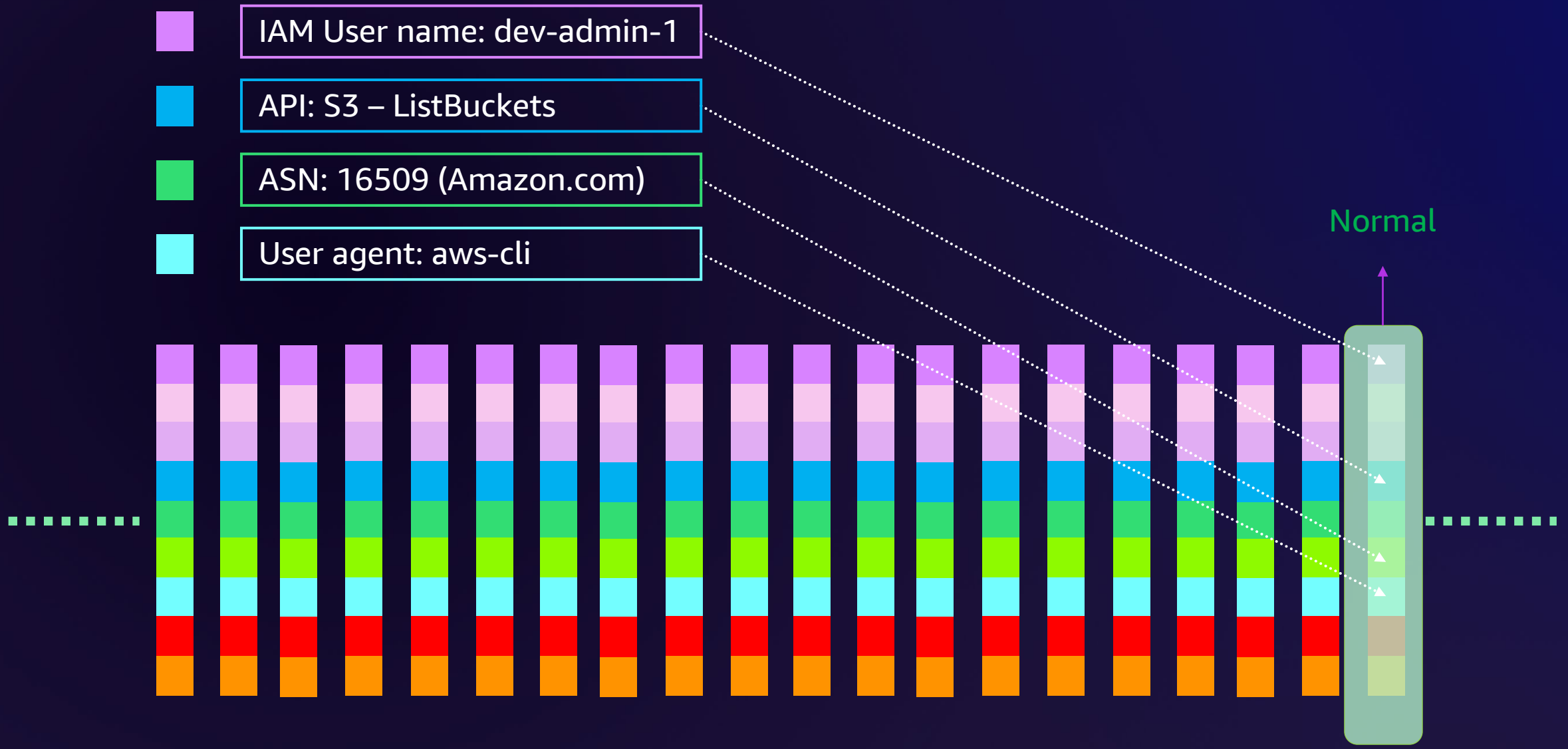
From an ML model to a GuardDuty finding – Detection



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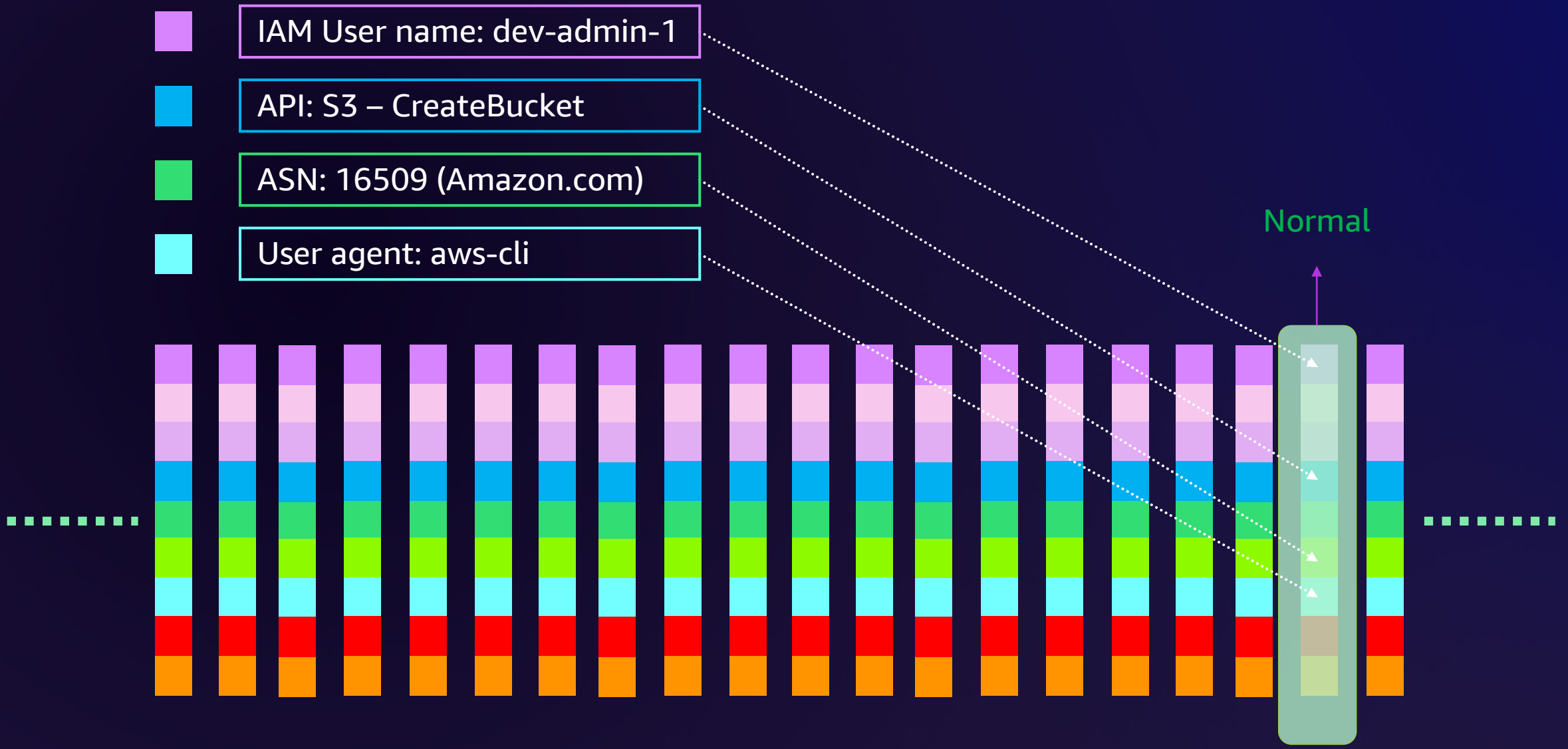
From an ML model to a GuardDuty finding – Detection



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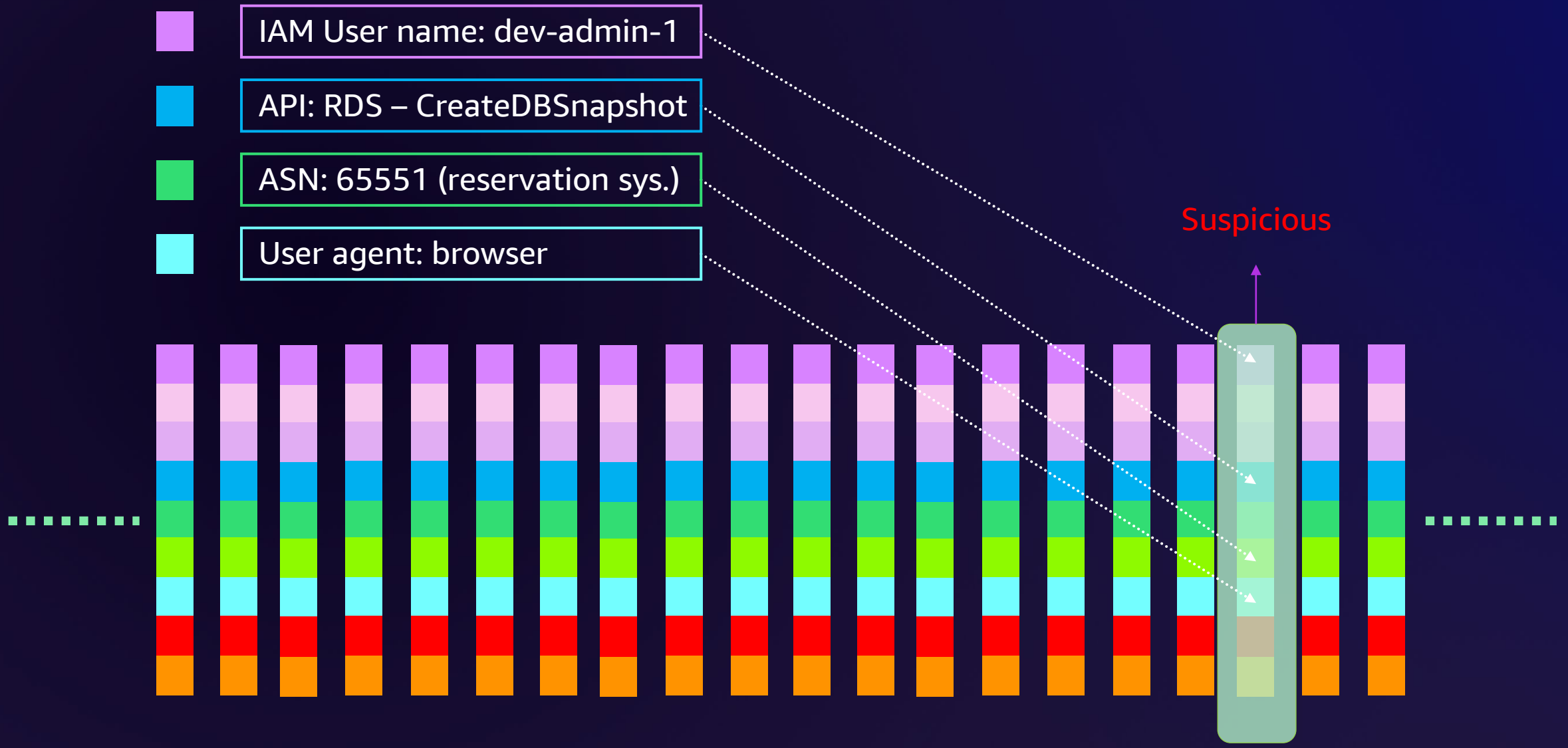
From an ML model to a GuardDuty finding – Detection



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From an ML model to a GuardDuty finding – Post-processing



Security value filtering



Amazon RDS – **CreateDBSnapshot** associated with observed **unauthorized user techniques**

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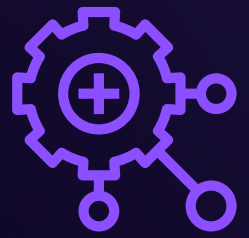
From an ML model to a GuardDuty finding – Post-processing



Security value filtering



Aggregation



Amazon RDS – **CreateDBSnapshot** associated with observed **unauthorized user techniques**



Additional APIs in the session: [IAM] – ListRolePolicies, ListPolicies, ListUsers, ListUserPolicies | [Amazon RDS] – CopyDBSnapshot | [Amazon Redshift] – DescribeClusters (FAILED), DescribeClusterSecurityGroups (FAILED), DescribeClusterSnapshots (FAILED) |

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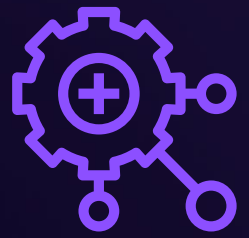
From an ML model to a GuardDuty finding – Post-processing



Security value filtering



Aggregation



Gathering context



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Profiled ASNs: 16509 (Amazon.com), 64496 (phone services)
Unusual ASNs: 65551 (restaurant reservation system)

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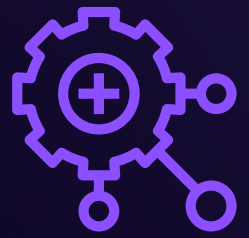
From an ML model to a GuardDuty finding – Post-processing



Security value filtering



Aggregation



Gathering context



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Unusual APIs: [Amazon RDS] CreateDBSnapshot, [Amazon Redshift] DescribeClusters, DescribeClusterSecurityGroups, DescribeClusterSnapshots

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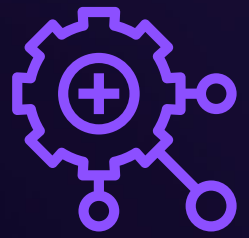
From an ML model to a GuardDuty finding – Post-processing



Security value filtering



Aggregation



Gathering context



Finding generation



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Unusual APIs: [Amazon RDS] CreateDBSnapshot, [Amazon Redshift] DescribeClusters, DescribeClusterSecurityGroups, DescribeClusterSnapshots



API mapped to exfiltration tactic → Exfiltration:IAM/AnomalousBehavior, severity is HIGH

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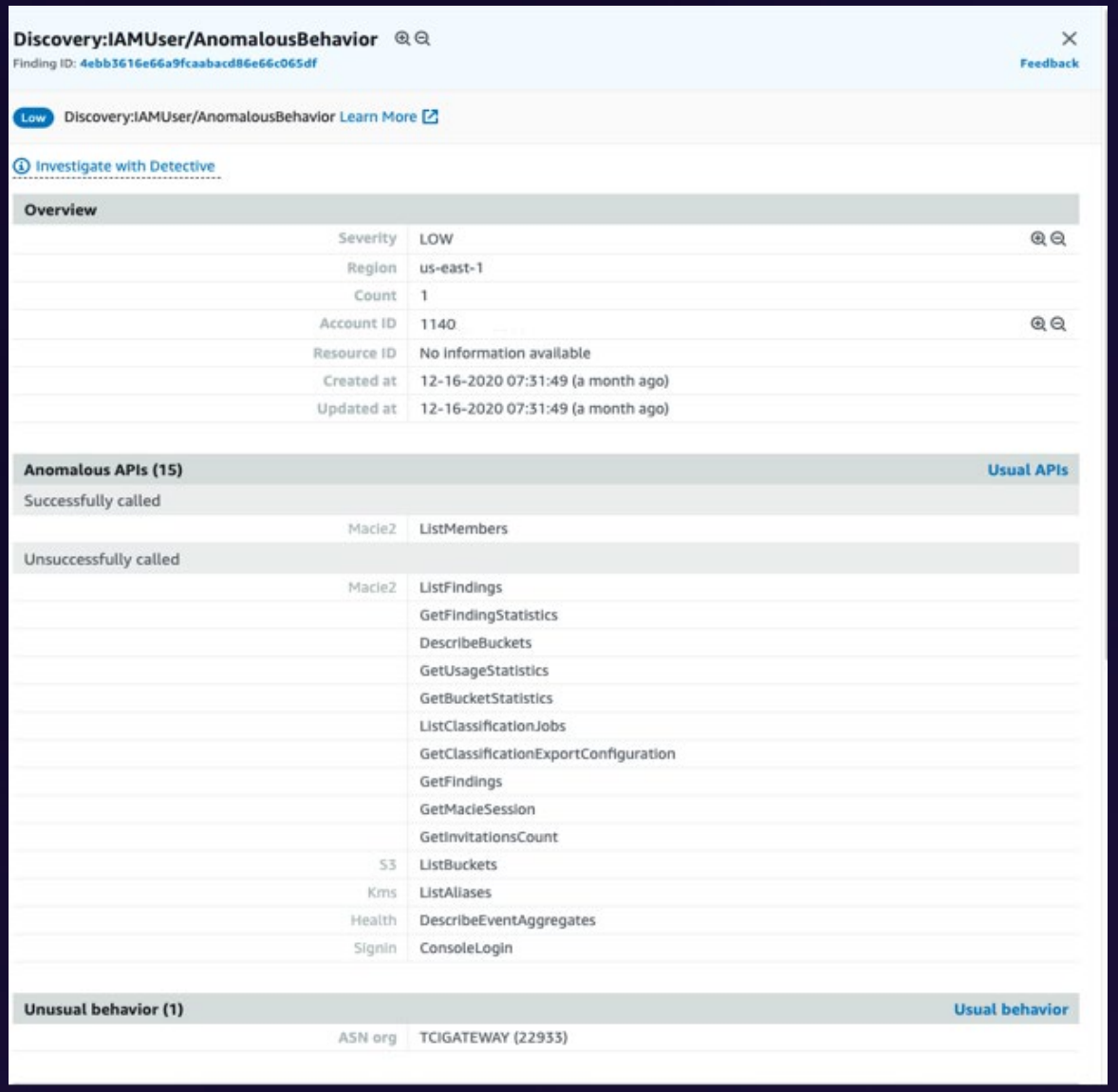
From an ML model to a GuardDuty finding – Putting it all together



Discovery:IAMUser/AnomalousBehavior

Finding ID: 4ebb3616e66a9fcaabacd86e66c065df

Feedback

Low Discovery:IAMUser/AnomalousBehavior Learn More

Investigate with Detective

Overview

Severity	LOW
Region	us-east-1
Count	1
Account ID	1140
Resource ID	No information available
Created at	12-16-2020 07:31:49 (a month ago)
Updated at	12-16-2020 07:31:49 (a month ago)

Anomalous APIs (15) Usual APIs

Successfully called

Macie2	ListMembers

Unsuccessfully called

Macie2	ListFindings
	GetFindingStatistics
	DescribeBuckets
	GetUsageStatistics
	GetBucketStatistics
	ListClassificationJobs
	GetClassificationExportConfiguration
	GetFindings
	GetMacieSession
	GetInvitationsCount
S3	ListBuckets
Kms	ListAliases
Health	DescribeEventAggregates
Signin	ConsoleLogin

Unusual behavior (1) Usual behavior

ASN org	TCIGATEWAY (22933)

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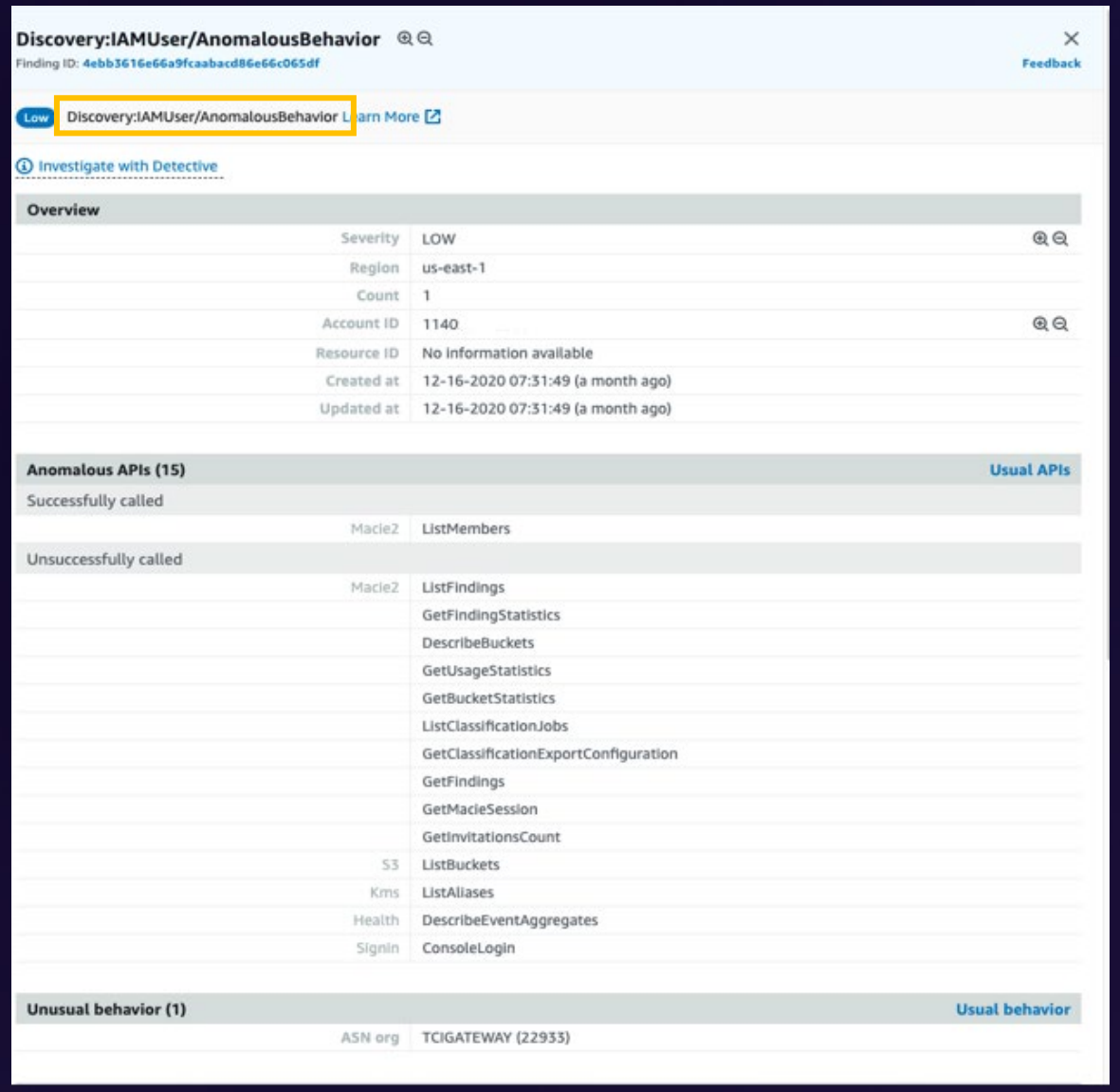
From an ML model to a GuardDuty finding – Putting it all together



Findings are categorized by attack stage based on MITRE ATT&CK Matrix

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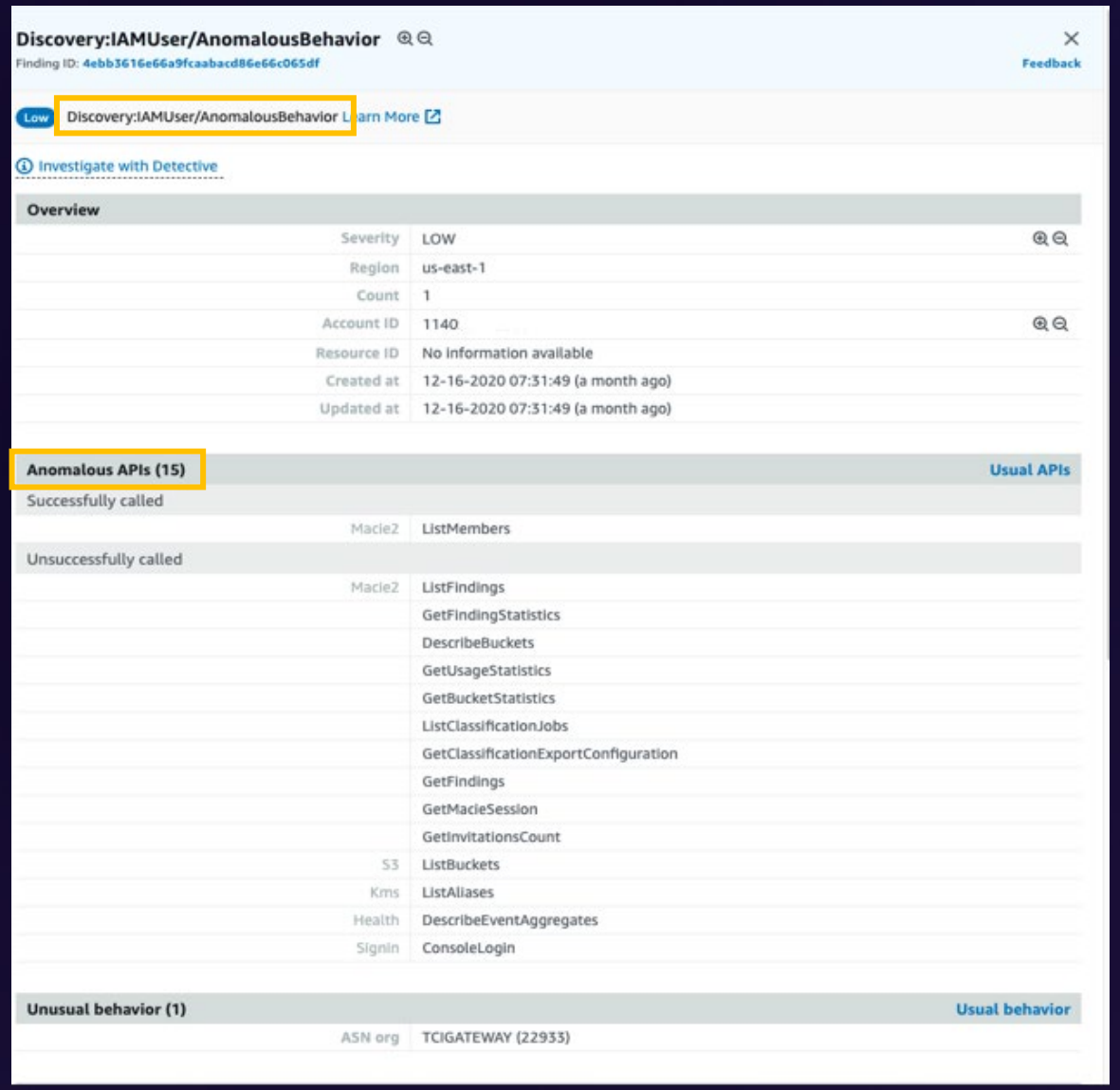
From an ML model to a GuardDuty finding – Putting it all together



Findings are categorized by attack stage based on MITRE ATT&CK Matrix

Full list of all anomalously called APIs that were part of the session

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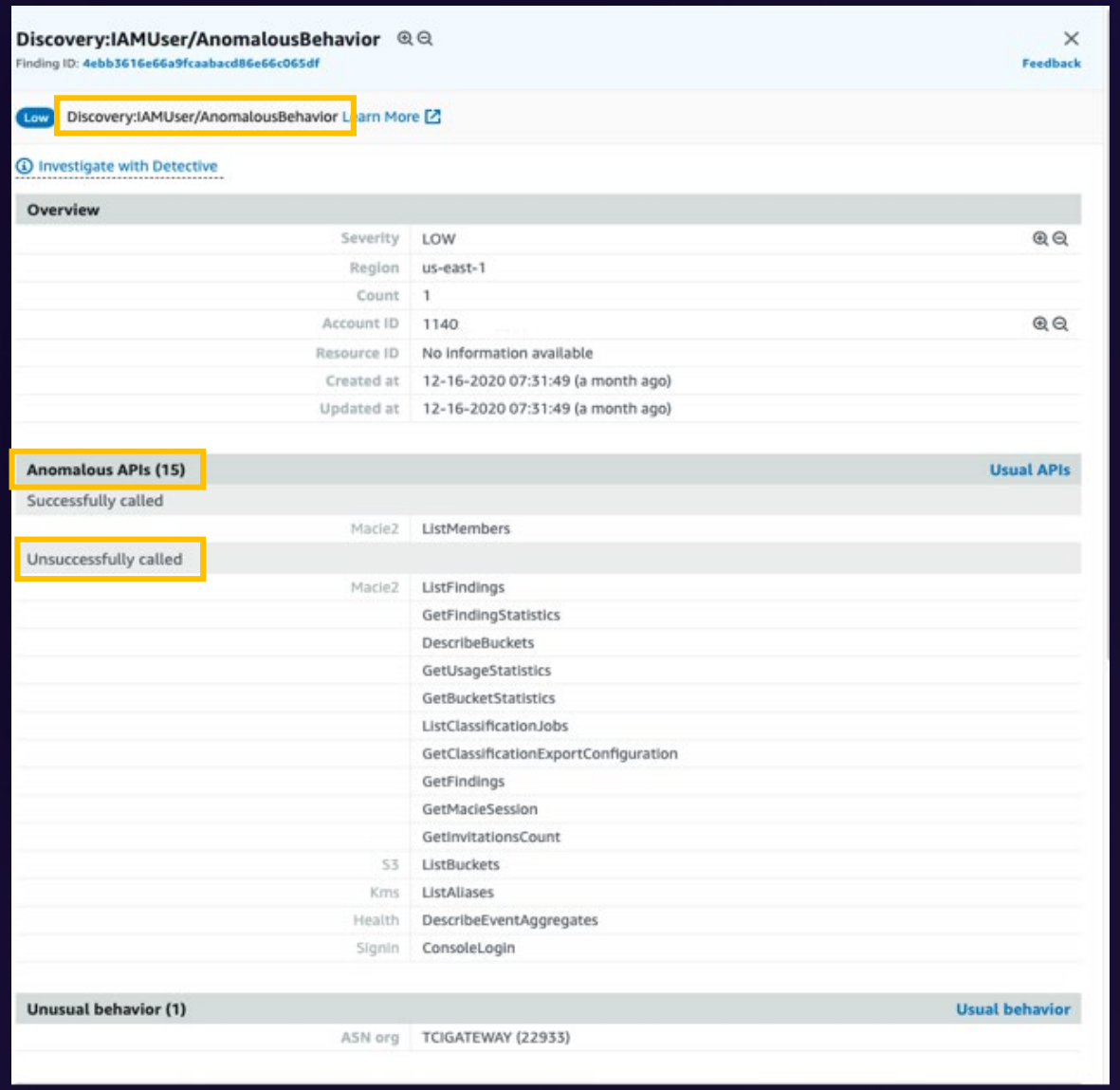
From an ML model to a GuardDuty finding – Putting it all together



Findings are categorized by attack stage based on MITRE ATT&CK Matrix

Full list of all anomalously called APIs that were part of the session

API calls are broken down into successful/unsuccessful

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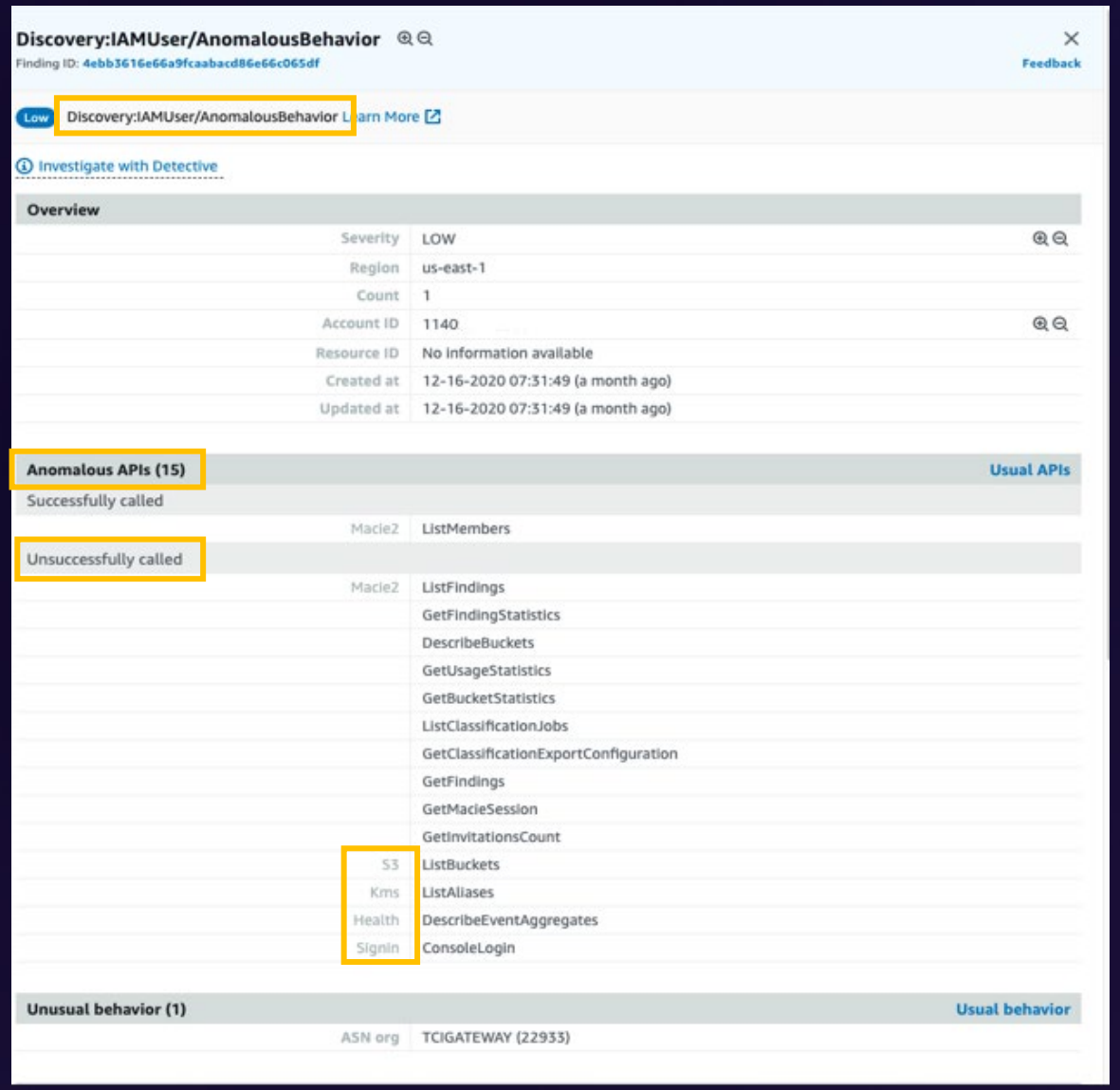
From an ML model to a GuardDuty finding – Putting it all together



Findings are categorized by attack stage based on MITRE ATT&CK Matrix

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API calls are broken down by associated AWS Service

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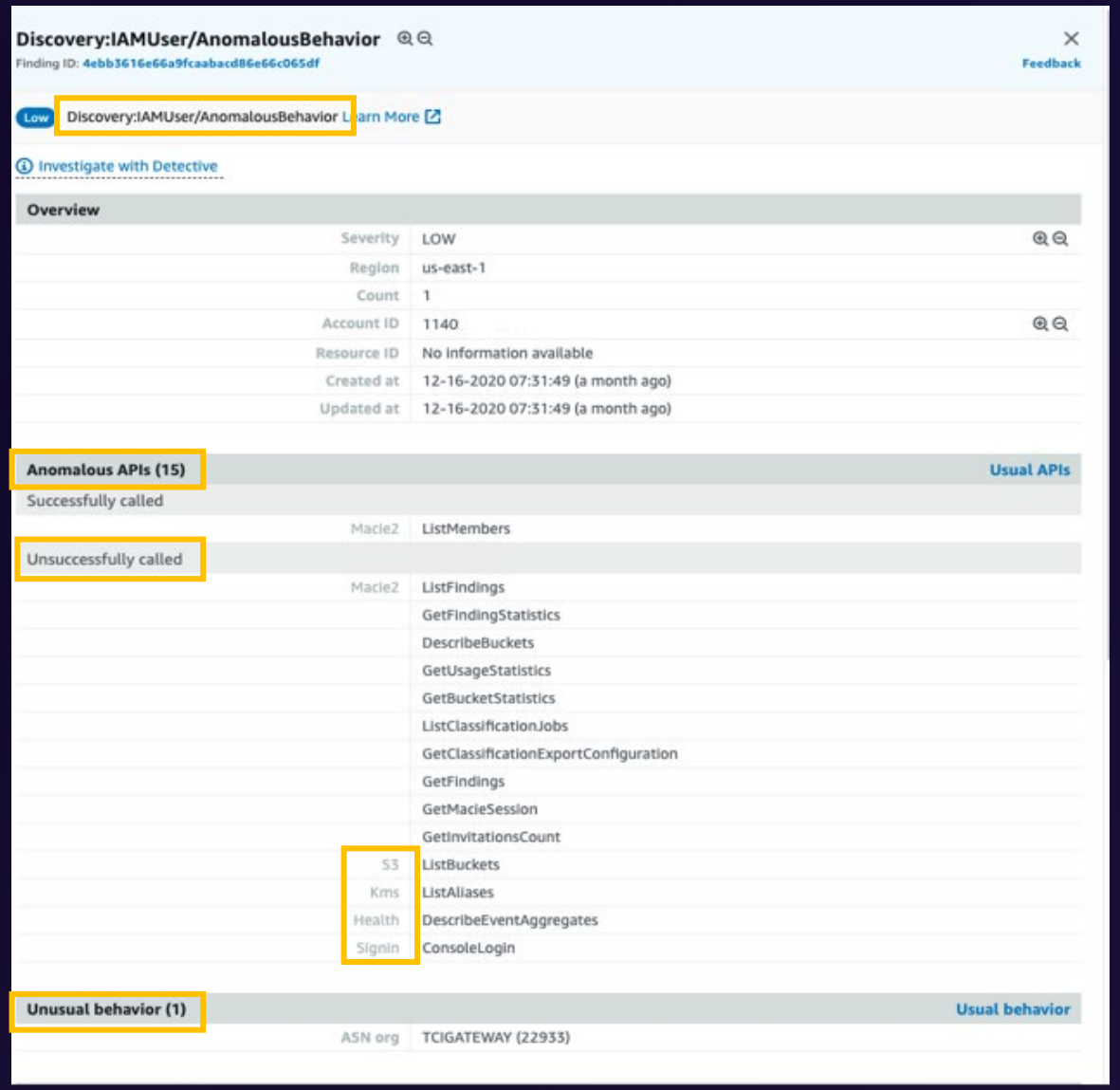

Findings are categorized by attack stage based on MITRE ATT&CK Matrix

Full list of all anomalously called APIs that were part of the session

API calls are broken down into successful/unsuccessful

API calls are broken down by associated AWS Service

At a glance, we can see what was unusual about this activity

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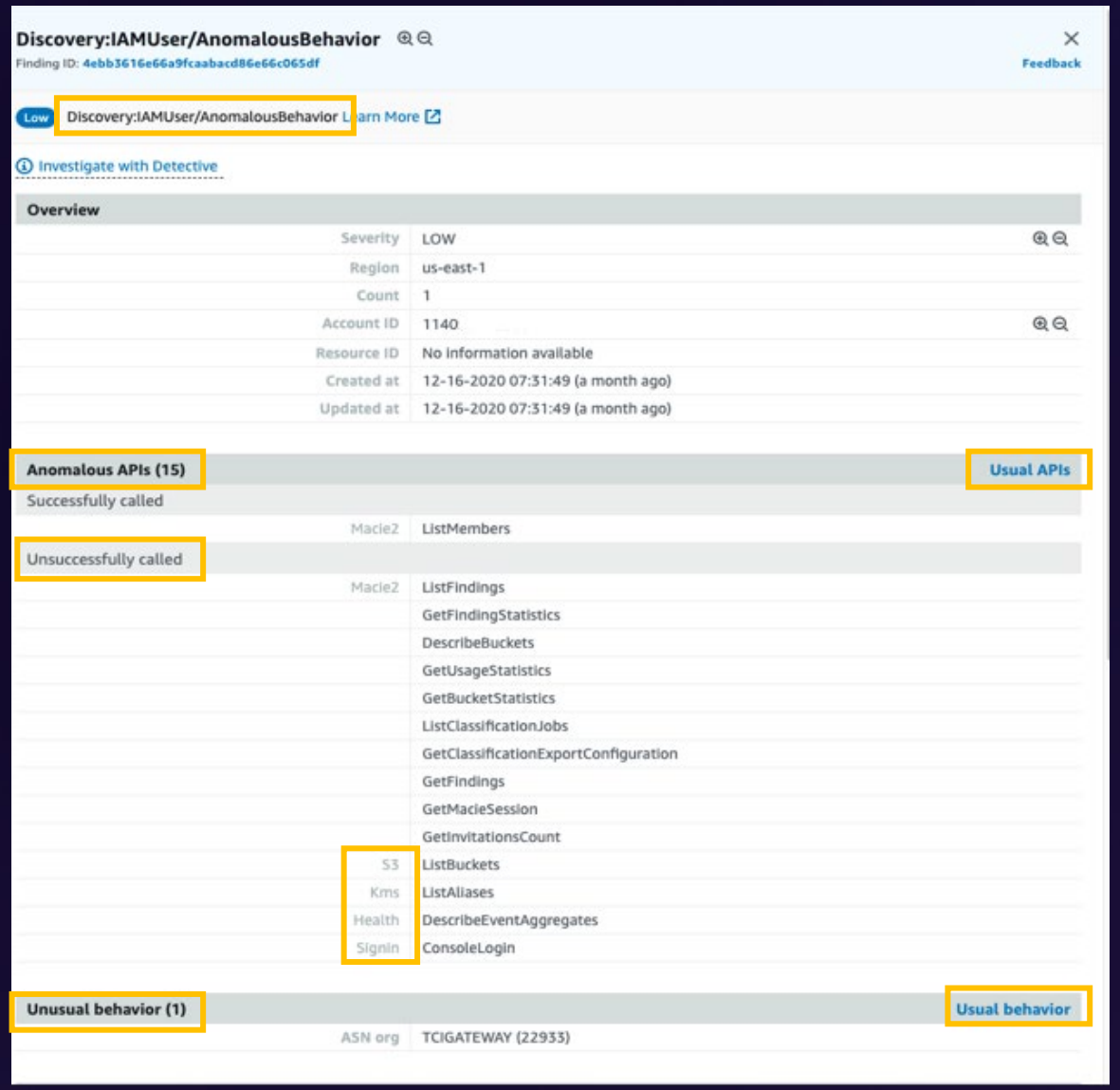
From an ML model to a GuardDuty finding – Putting it all together



Findings are categorized by attack stage based on MITRE ATT&CK Matrix

Full list of all anomalously called APIs that were part of the session

API calls are broken down into successful/unsuccessful

API calls are broken down by associated AWS Service

At a glance, we can see what was unusual about this activity

Click to view profiled behavior for user and all users in the account

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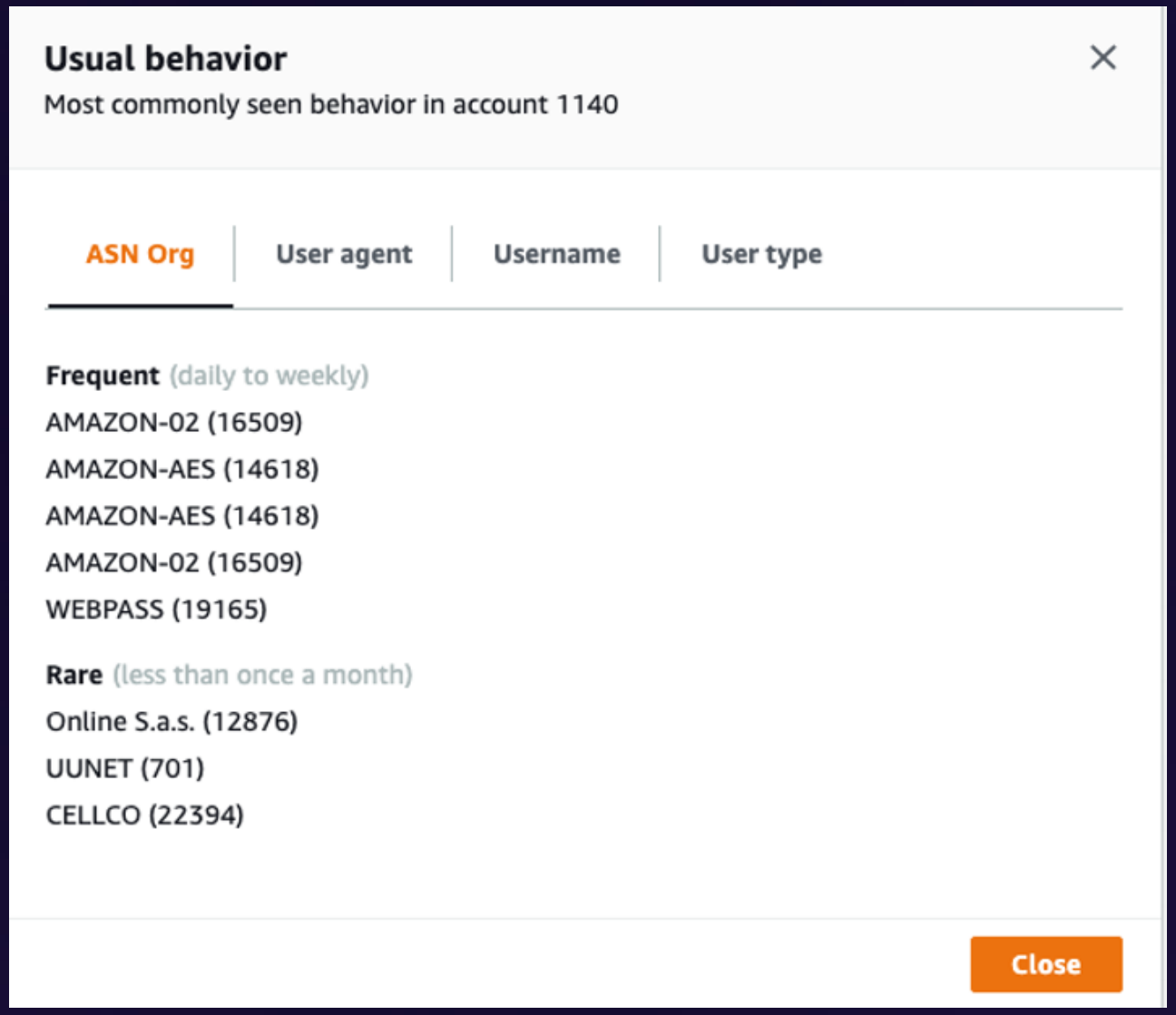
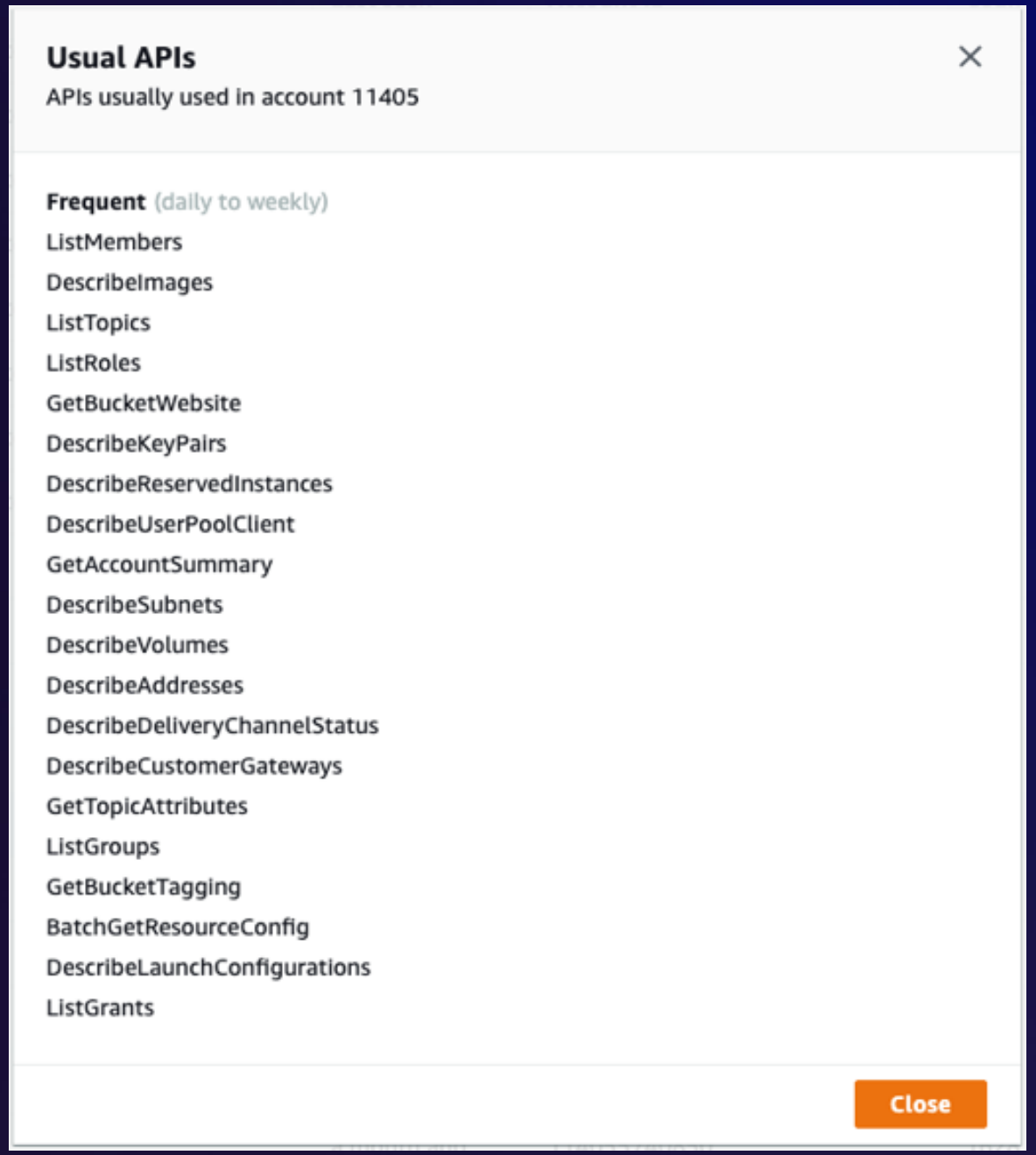
Context helps us understand what the expected behavior is for the user that performed the action as well as for all users in the account





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13 New GuardDuty findings – *AnomalousBehavior

- Discovery
- Initial Access
- Credential Access
- Defense Evasion
- Privilege Escalation
- Persistence
- Exfiltration
- Impact







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"GuardDuty helped us to quickly scale anomaly detection across all our infrastructure and expand advanced threat detection capabilities quickly and efficiently."

Mrunal Shah

Head of container security at Warner Bros. Discovery

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Takeaways

1. GuardDuty is continually evolving
2. Machine learning anomaly detection has proven to detect high-risk credential compromise (*AnomalousBehavior)
3. Feedback

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Thank you!



Please complete the session survey in the mobile app

Baris Coskun
linkedin.com/in/coskubar

Amit Megiddo
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