



# Session-Based Fraud Detection in Online E-Commerce Transactions Using Recurrent Neural Networks

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**1. Background**

**2. Technical Challenges**

**3. Problem Modeling**

**4. Solving Challenges**

**5. Performance Evaluation**

# 1. Background

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**Account Hijacking**

**Card Faking**

# Legitimate vs. Fraudulent Users

Legitimate User	Fraudulent User
Visit JD.com	<b>#1</b>
Search `Apple`	Visit JD.com
Visit `Apple iPad Pro 9.7-inch (128G WLAN, Gold)`	Search `Game Card`
Visit `Apple iPad Pro 9.7-inch (128G WLAN + Cellular, Gold)`	Visit `Shanda Game Card (10,000 Game Points)`
Visit `Apple iPad Pro 9.7-inch (128G WLAN, Space gray)`	Checkout `Shanda Game Card (10,000 Game Points)`
...	<b>#2</b>
Visit `Apple iPad Pro 9.7-inch (128G WLAN, Gold)`	Visit JD.com
Visit `Apple iPad Pro 9.7-inch (128G WLAN, Rose gold)`	Search `Apple`
Visit `Apple iPad Pro 9.7-inch (32G WLAN, Rose gold)`	Visit `Apple iPad Pro 9.7-inch (128G WLAN, Rose gold)`
...	Visit `Apple MacBook Air 13.3-inch (128G)`
Visit `Apple iPad Pro 9.7-inch (128G WLAN, Gold)`	Visit `Apple iPhone 7 Plus (128G, Gold)`
Visit `Apple iPad Pro 9.7-inch (32G WLAN, Gold)`	...
Visit `Apple iPad Pro 9.7-inch Case`	Visit `Apple iPad Pro 9.7-inch (128G WLAN, Rose gold)`
Visit `Apple iPad Pro 9.7-inch Screen Protector`	Visit `Apple iMac 21.5-inch`
Visit `Apple iPad Pro 9.7-inch (128G WLAN, Rose gold)`	Visit `Apple iPhone 6 (32G, Space gray)`
Checkout `Apple iPad Pro 9.7-inch (128G WLAN, Rose gold)`	Checkout `Apple iPad Pro 9.7-inch (128G WLAN, Rose gold)`

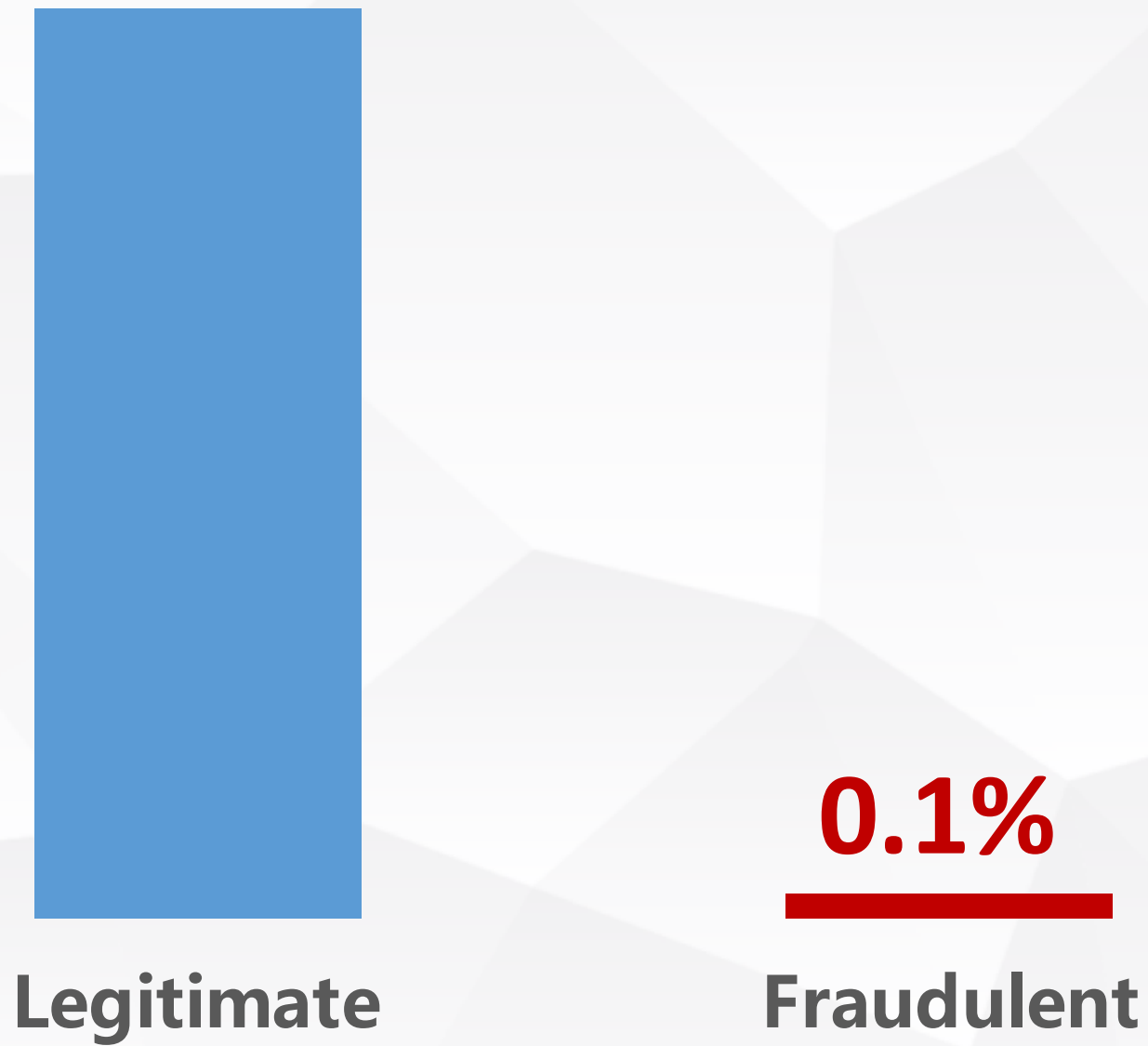
1. Background

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JD has over **220 million** active users!

Tens of millions of user sessions per day

Millions of transactions per day





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Click

IP

URL

Browser Name

Browser Language

Language

Browser Encoding

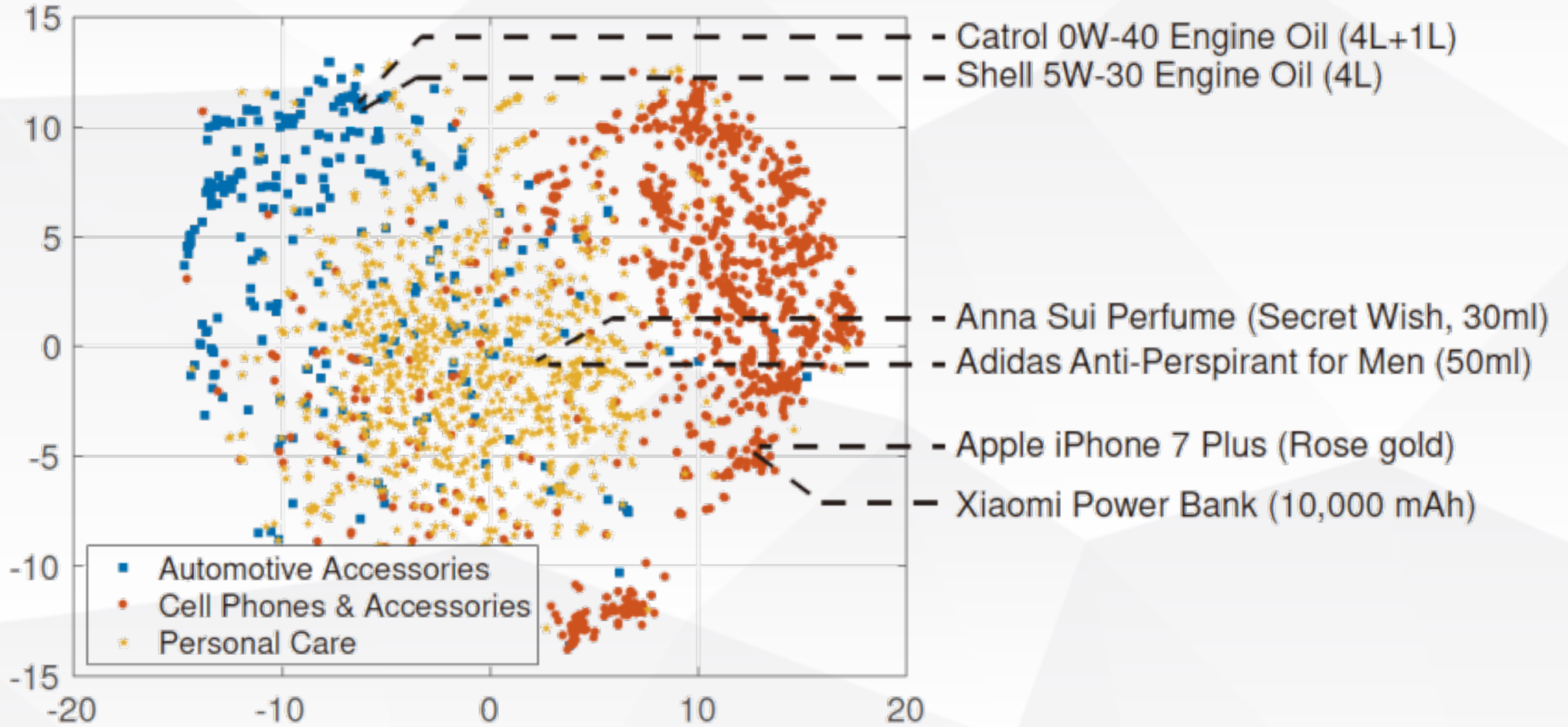
OS

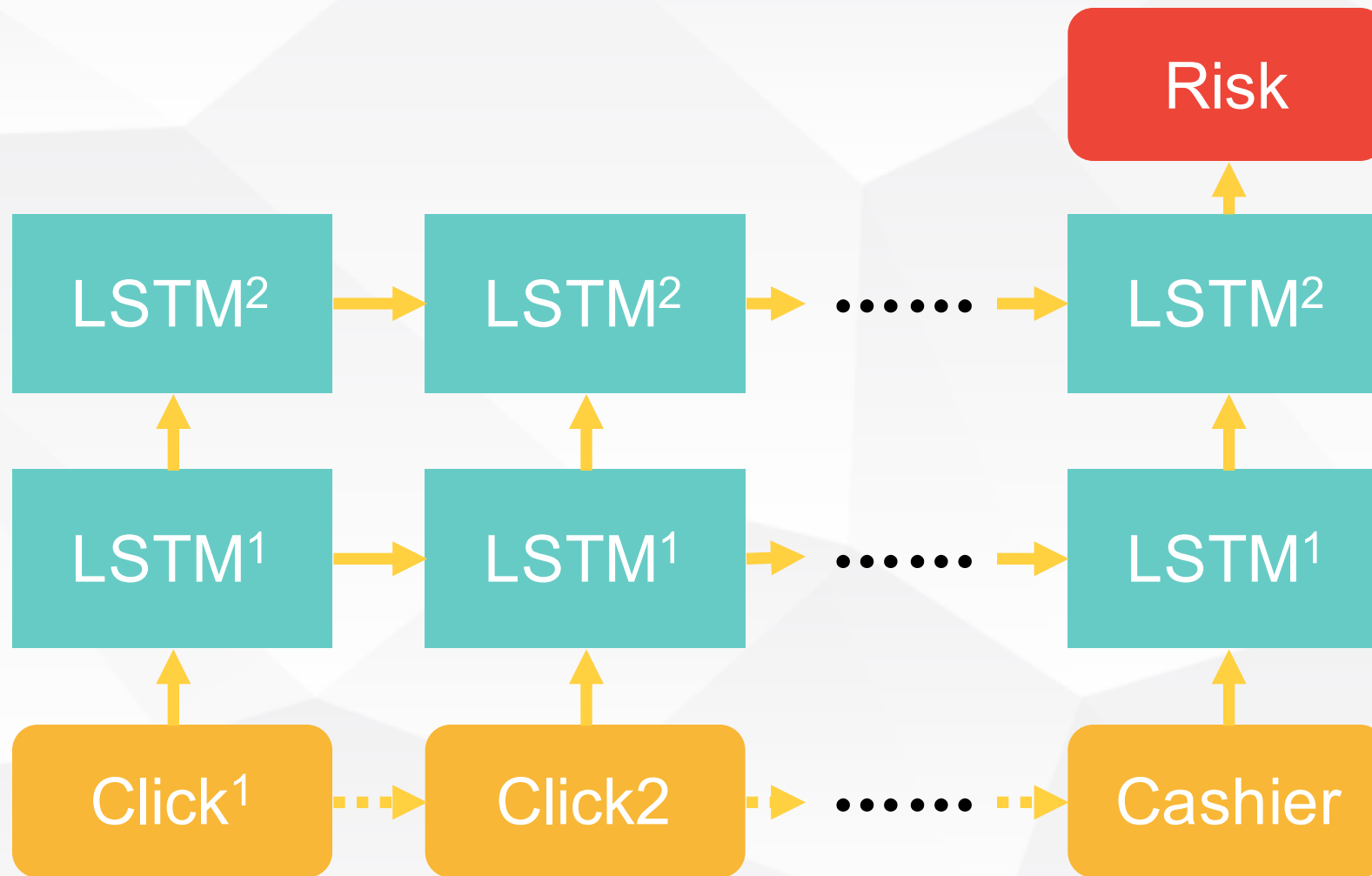
Dwell Time

.....

URL	Type	Category	Item Vector
www.jd.com	89	0	[0.0, 0.0, ...]
sale.jd.com/act/SzPTlx3jyXdgBa.html	15	0	[0.0, 0.0, ...]
fresh.jd.com	23	0	[0.0, 0.0, ...]
search.jd.com/search?keyword=ipad	2	0	[0.0, 0.0, ...]
list.jd.com/list.html?cat=670,671,2694	3	33	[0.0, 0.0, ...]
item.jd.com/2538742.html	4	0	[-0.119, -0.077, ...]

# Item2Vec Illustration





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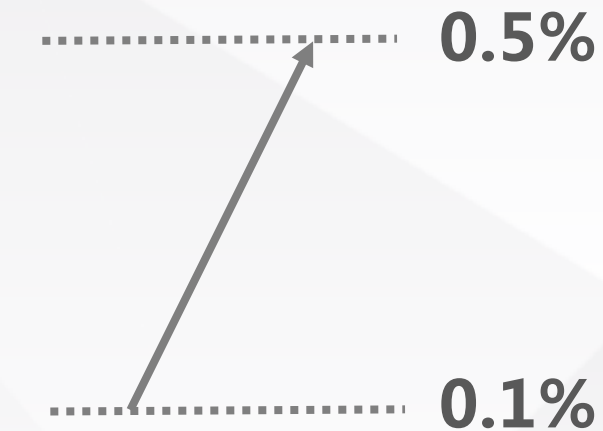


## Data Level



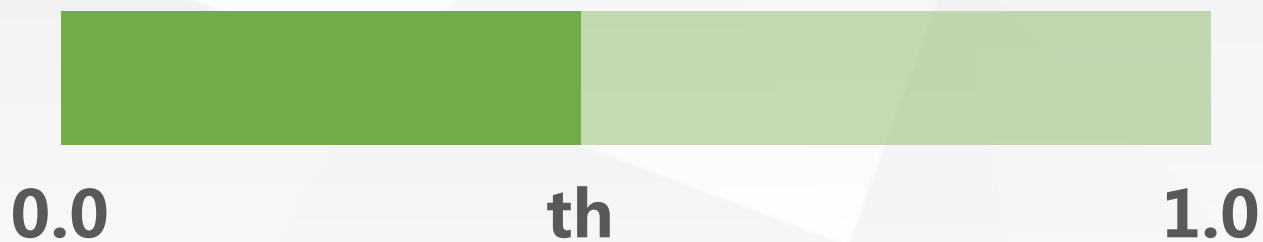
Under-Sampling

Risk Ratio

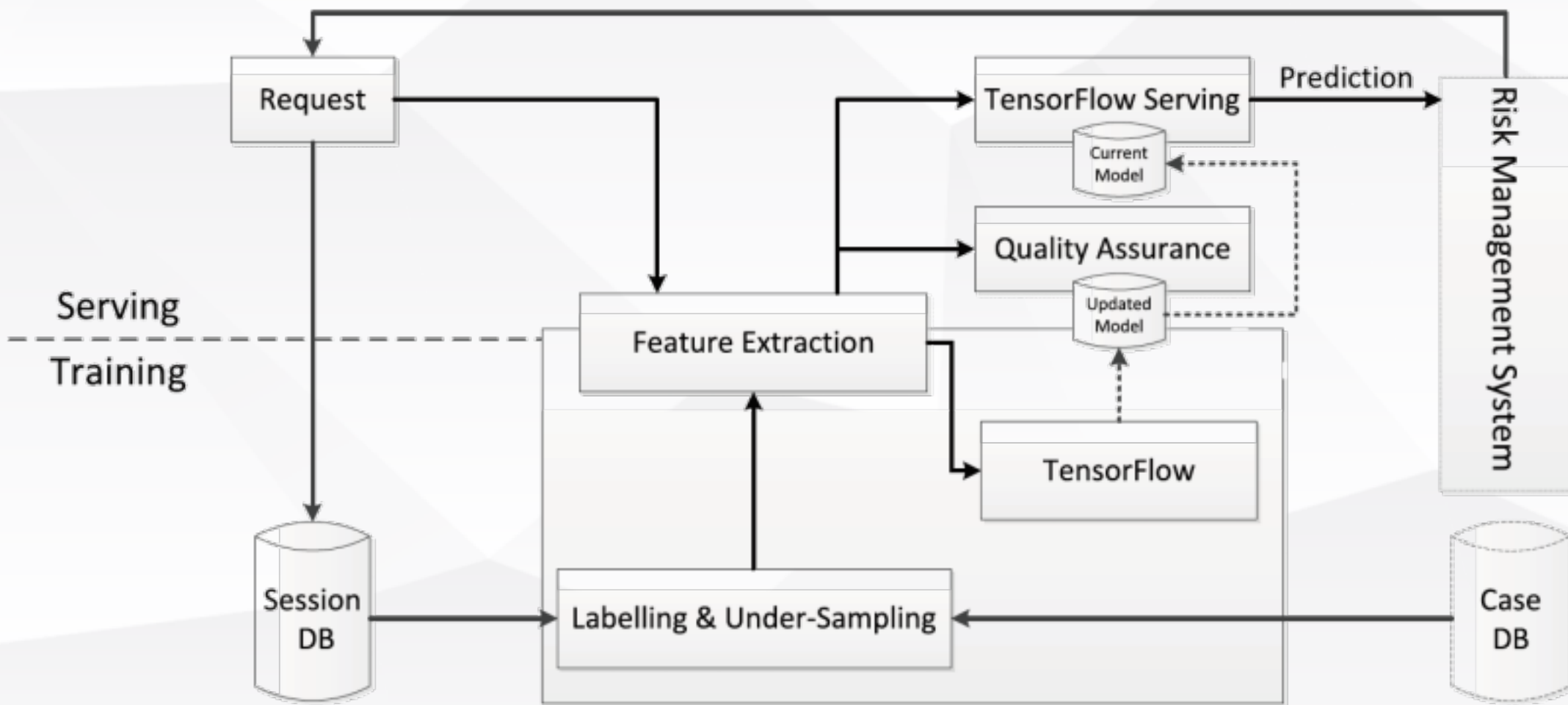


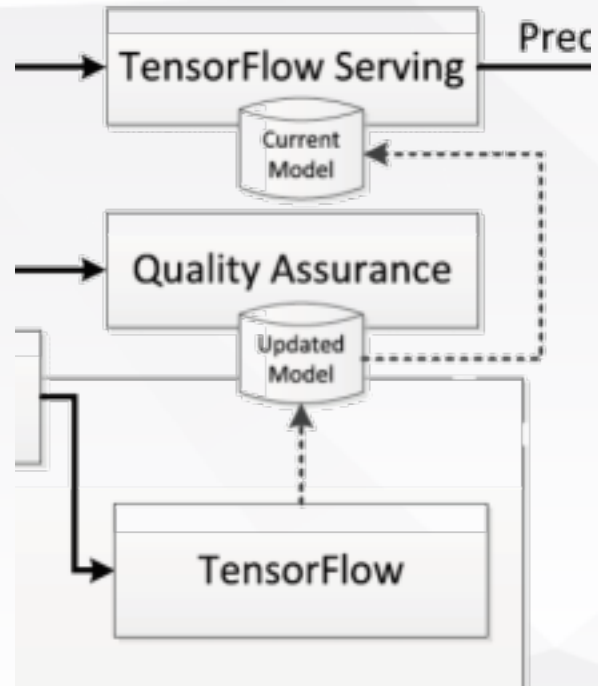
No Over-Sampling

## Model Level



Thresholding





Update With **Full** Data

OR

Update With **Incremental** Data

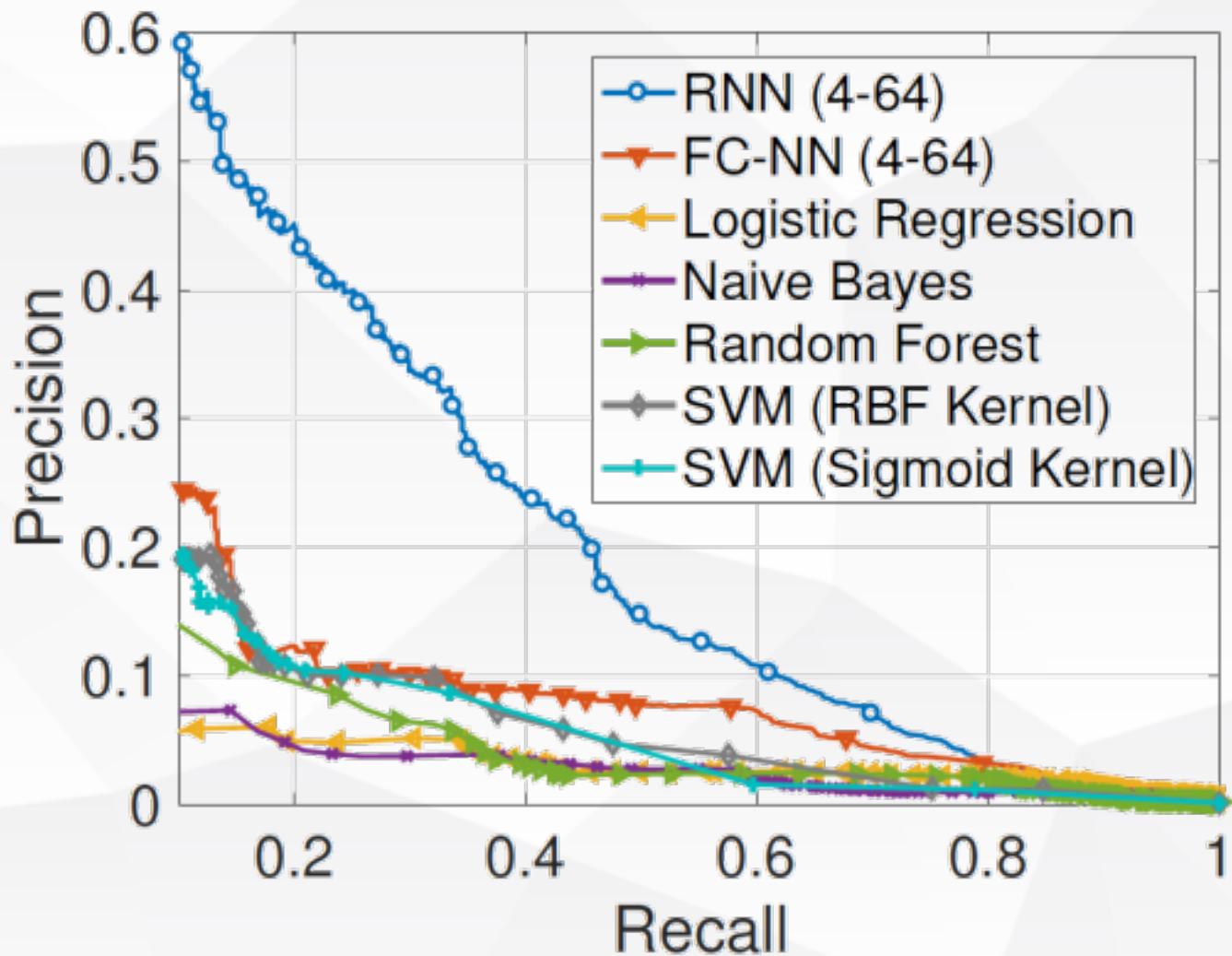
1. Background

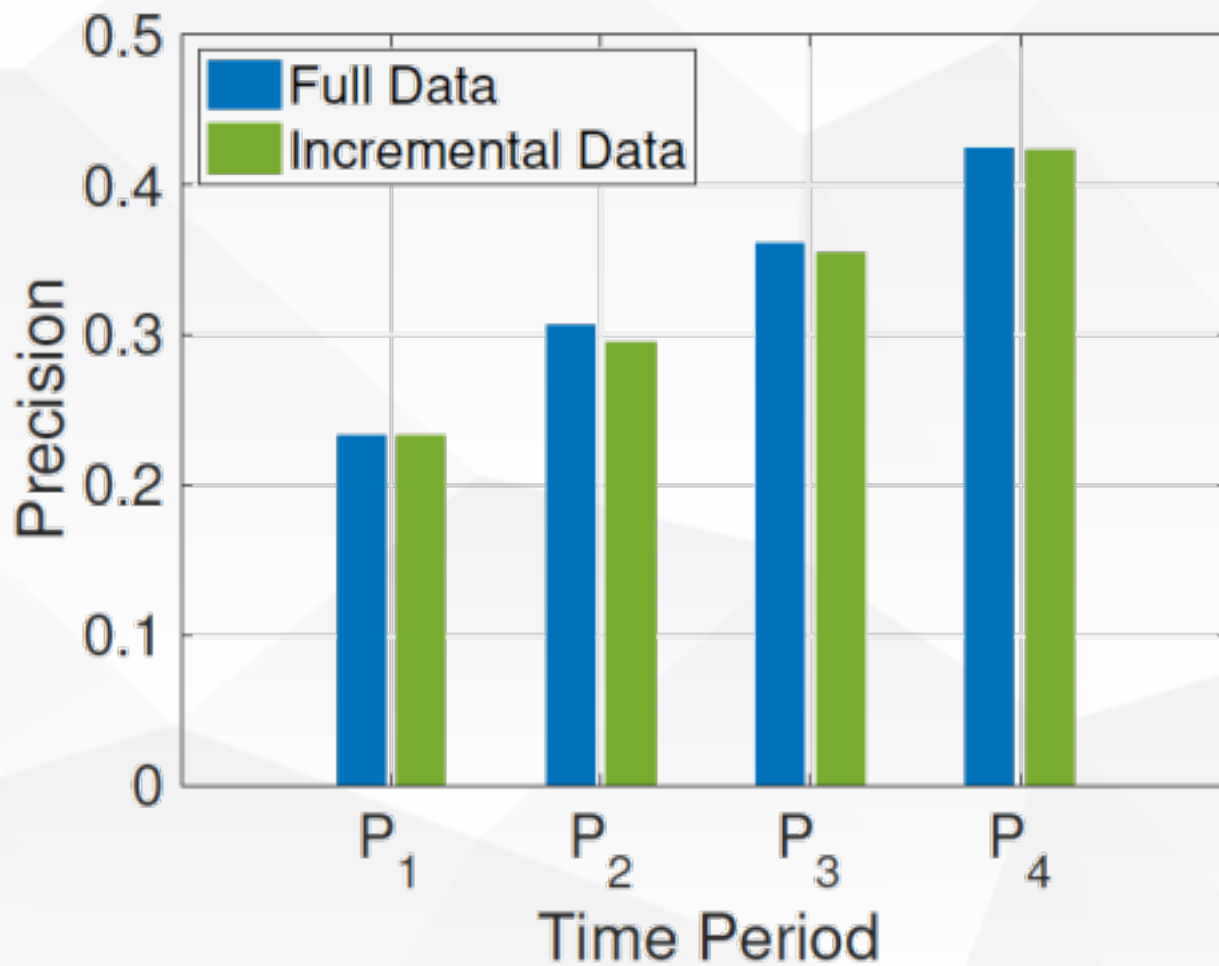
2. Technical Challenges

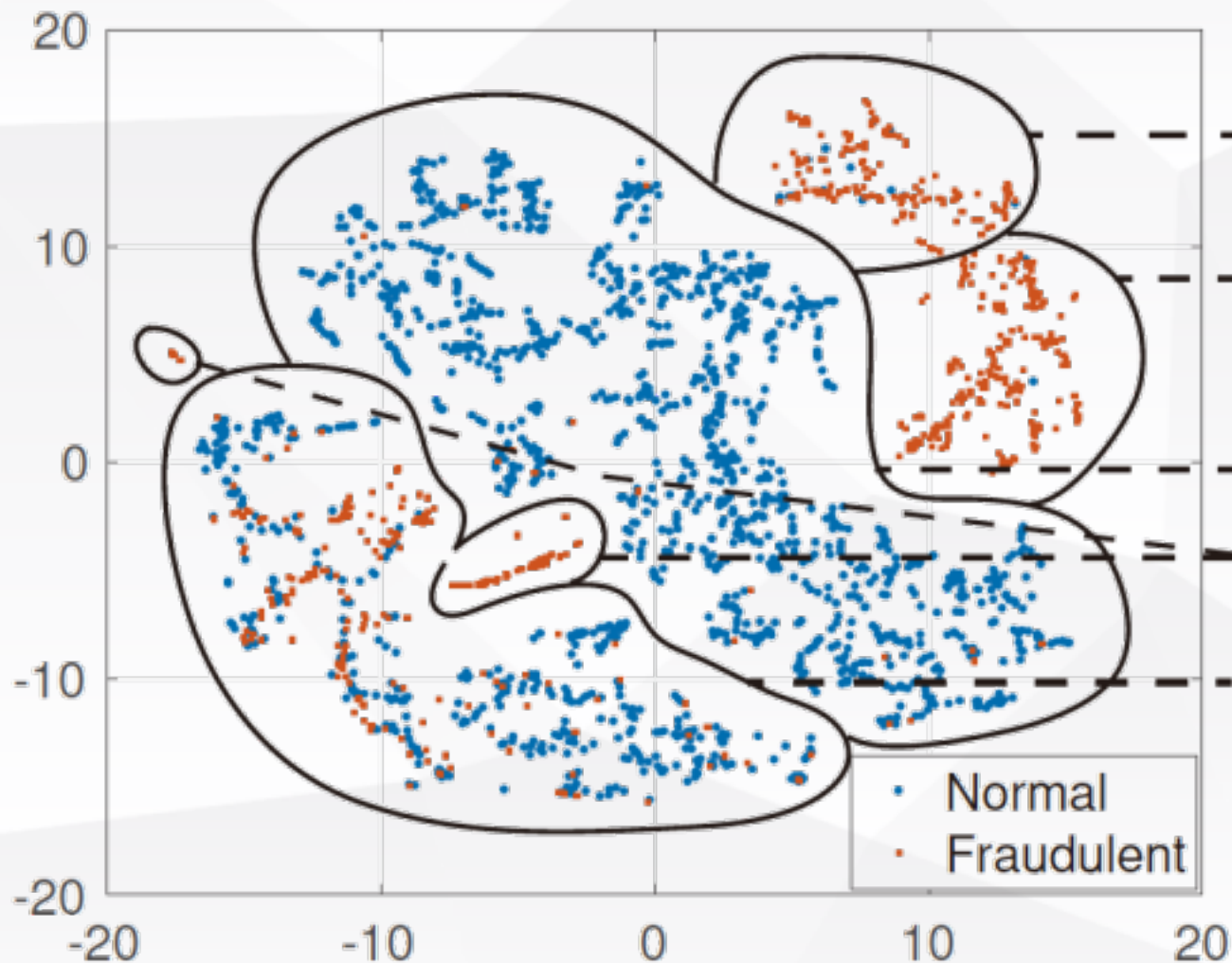
3. Problem Modeling

4. Solving Challenges

**5. Performance Evaluation**







- - - Checkout Directly (No Item Page in the Session)
- - - 1) Sensitive Account Operations  
2) Random Browsing and Then Buy (Virtual & Non-Virtual Items)
- - - Normal Browsing
- - - Directly Buy (Virtual Items)
- - - 1) Directly Buy (Non-Virtual Items)  
2) Random Browsing and Then Buy (Non-Virtual Items)



# Thank You

Q & A

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