उपभोक्ता मामले विभाग
DEPARTMENT OF
CONSUMER AFFAIRS

सत्यमेव जयते

G20 भारत 2023 INDIA

Dark Patterns Buster
Hackathon 2023

Azadi Ka Amrit Mahotsav

Dark Patterns Buster Hackathon (DPBH-2023)

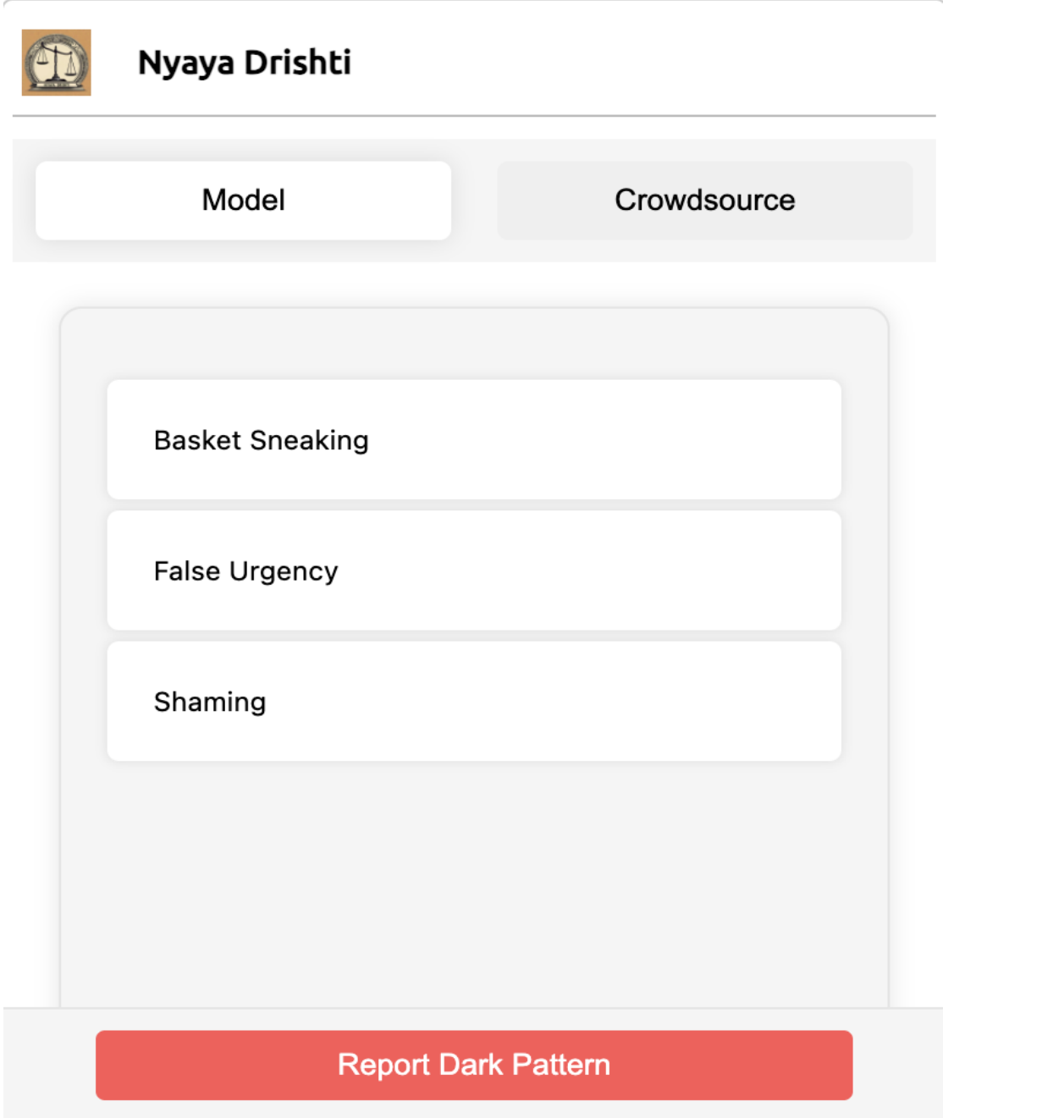
Round 3 Grand Finale @ IIT(BHU), Varanasi

(Feb.17, 2024)

Team #7
Nyaya Drishti

IIT Indore

Anirudha Bhagwat
Amit Kumar Makkad
Gaurav Jain
Purav Biyani
Abhinav Kumar



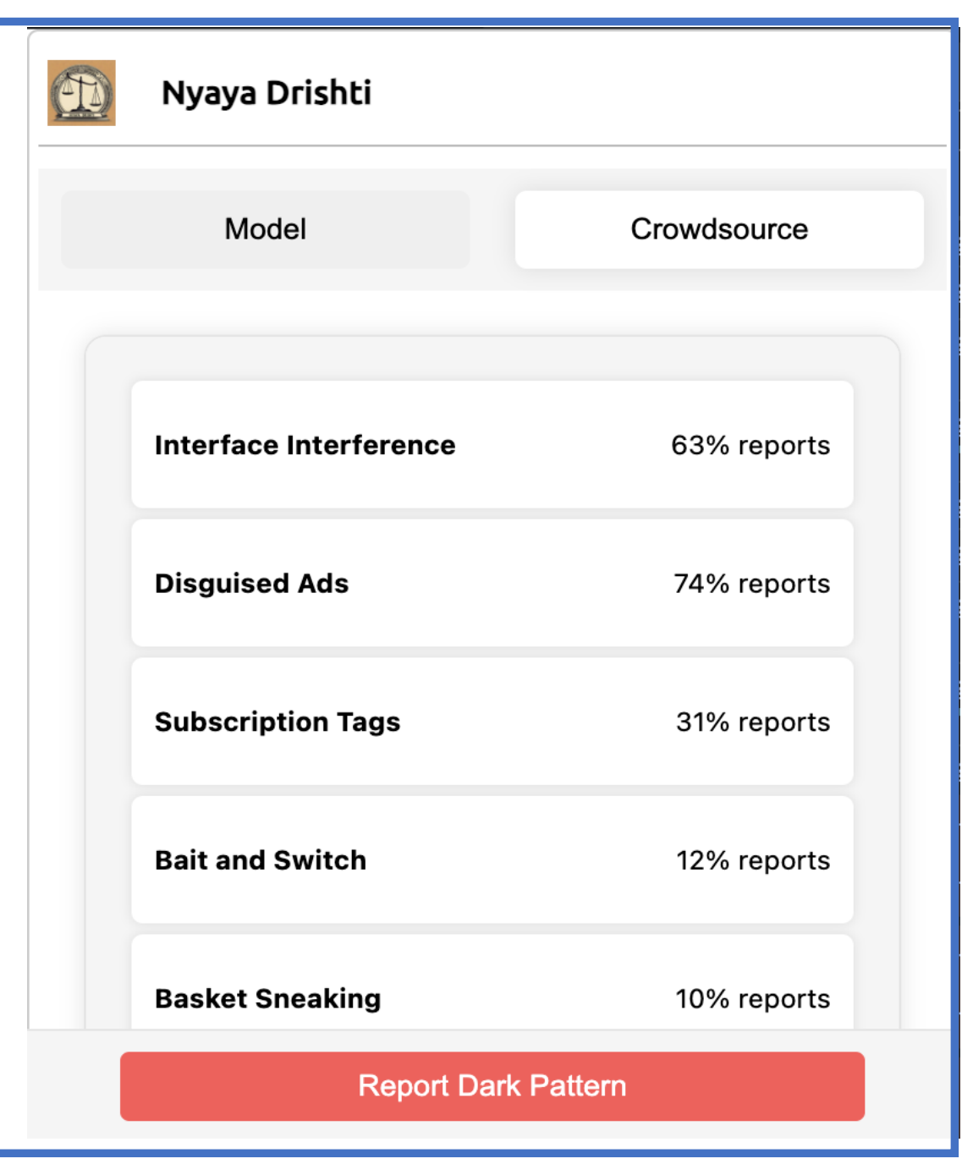
Nyaya Drishti

Model | Crowdsource

Basket Sneaking
False Urgency
Shaming

Report Dark Pattern

Fig 1: Dark patterns reported by our models



Nyaya Drishti

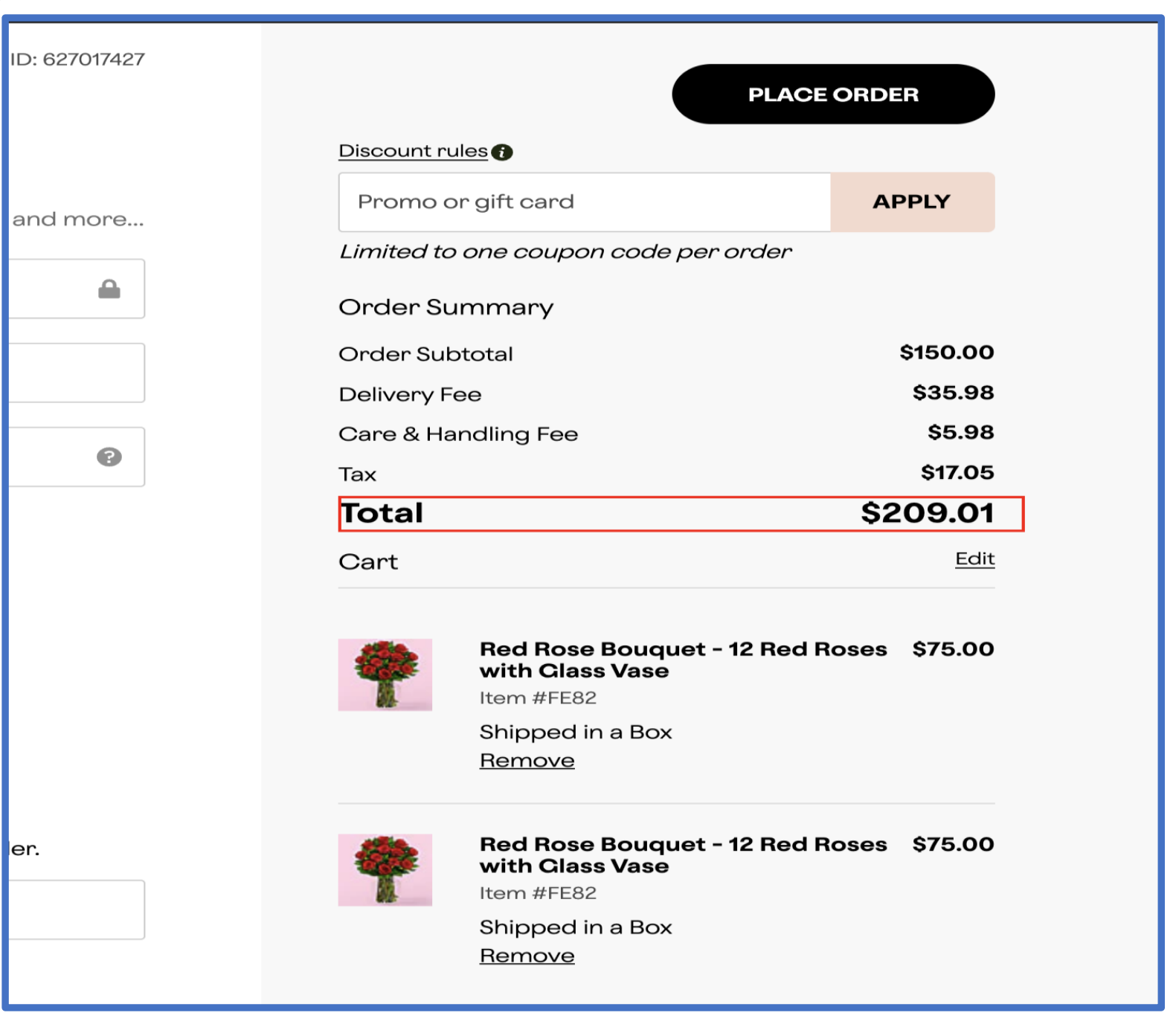
Model | Crowdsource

Interface Interference	63% reports
Disguised Ads	74% reports
Subscription Tags	31% reports
Bait and Switch	12% reports
Basket Sneaking	10% reports

Report Dark Pattern

Fig 2: Dark patterns reported by other users

Works for all



ID: 627017427

and more...

PLACE ORDER

Discount rules

Promo or gift card APPLY

Limited to one coupon code per order

Order Summary

Order Subtotal	$150.00
Delivery Fee	$35.98
Care & Handling Fee	$5.98
Tax	$17.05
Total	**$209.01**

Cart Edit

Red Rose Bouquet - 12 Red Roses with Glass Vase **$75.00**
Item #FE82
Shipped in a Box
Remove

Red Rose Bouquet - 12 Red Roses with Glass Vase **$75.00**
Item #FE82
Shipped in a Box
Remove

Fig 3: Bounding box for detected drip pricing

Native Processing (HTML, CSS, JavaScript)

Local processing utilizing DOM, console and Browser APIs

- Regex based pattern matching on HTML source code of the website.
- CSS analysis to detect useless overlaying content and interface interference (Nagging).
- Using **node.walker** with a modified **Depth First Search** Algorithm on DOM tree to track user's actions before and after visiting a page to identify hidden costs and Drip Pricing.

Machine Learning (Python, Scikit-learn, NLTK, Keras, Torch)

NLP Model	Accuracy
Bag of Words with *Random Forest* Classifier	93.8%
GloVe Word Embeddings with *LSTM*	92.8%
Fine-tuned Custom *BERT* Model	93.08%

- Utilized public dataset of labeled dark pattern examples merged with additional non-dark pattern text.
- Detected Patterns: Confirmation Shaming, Subscription Traps, False Urgency, Sneaking, Nagging
- Additionally, We trained Roberta model to identify fake reviews on website

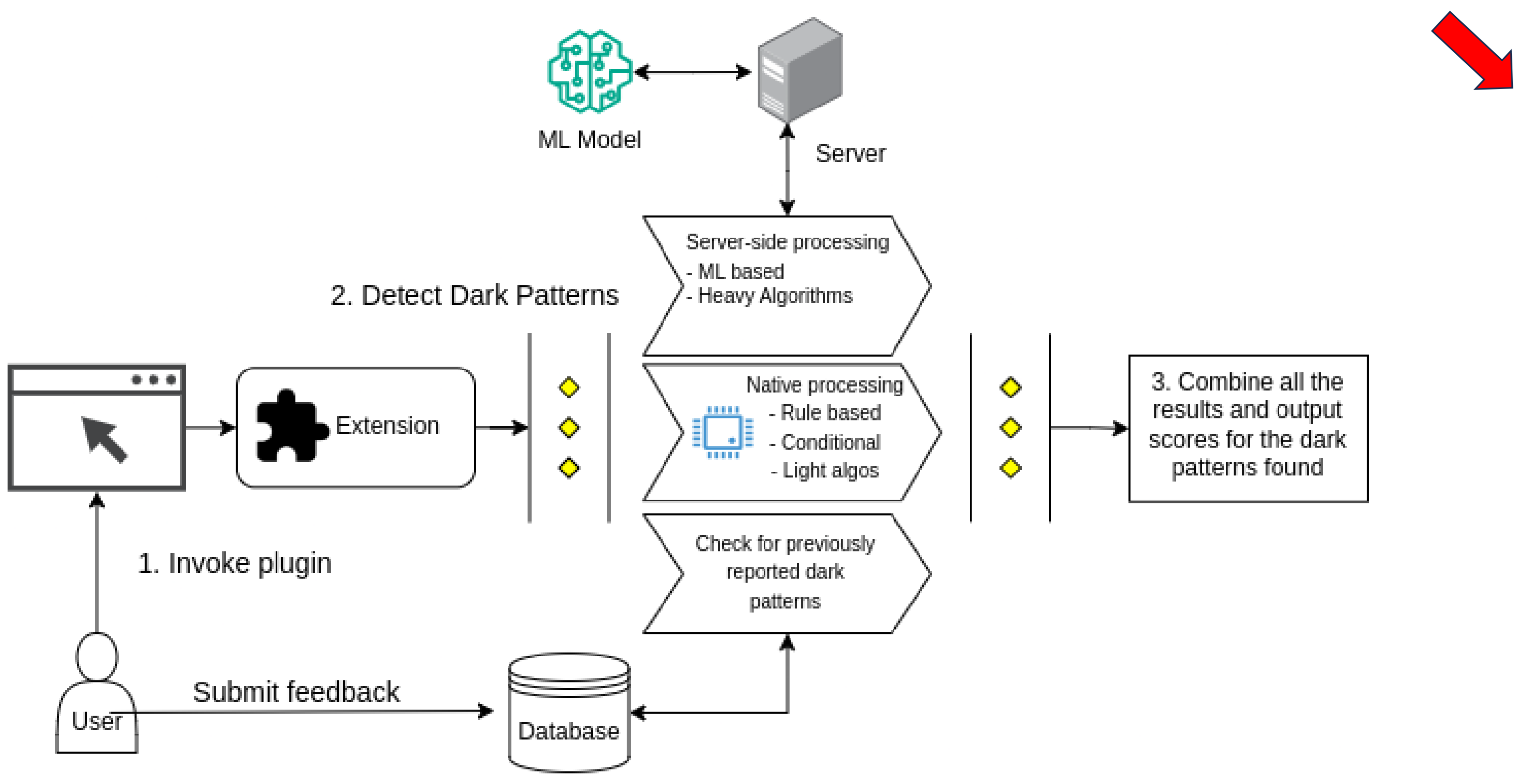
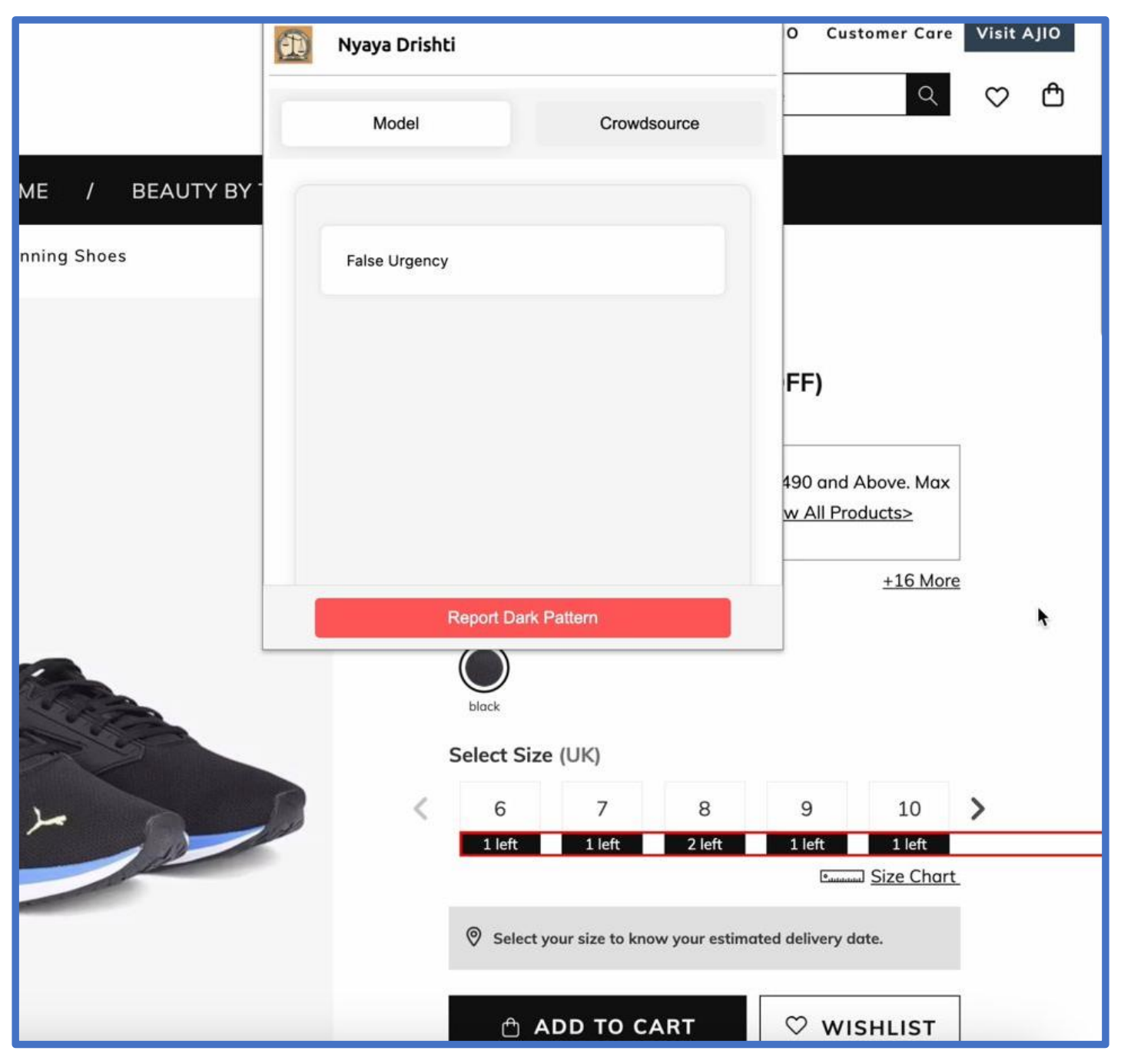


Fig 4: Working of our Solution



Nyaya Drishti

Model | Crowdsource

False Urgency

Report Dark Pattern

O Customer Care Visit AJIO

ME / BEAUTY BY

nning Shoes

FF)

490 and Above. Max
w All Products>

+16 More

black

Select Size (UK)

6	7	8	9	10
1 left	1 left	2 left	1 left	1 left

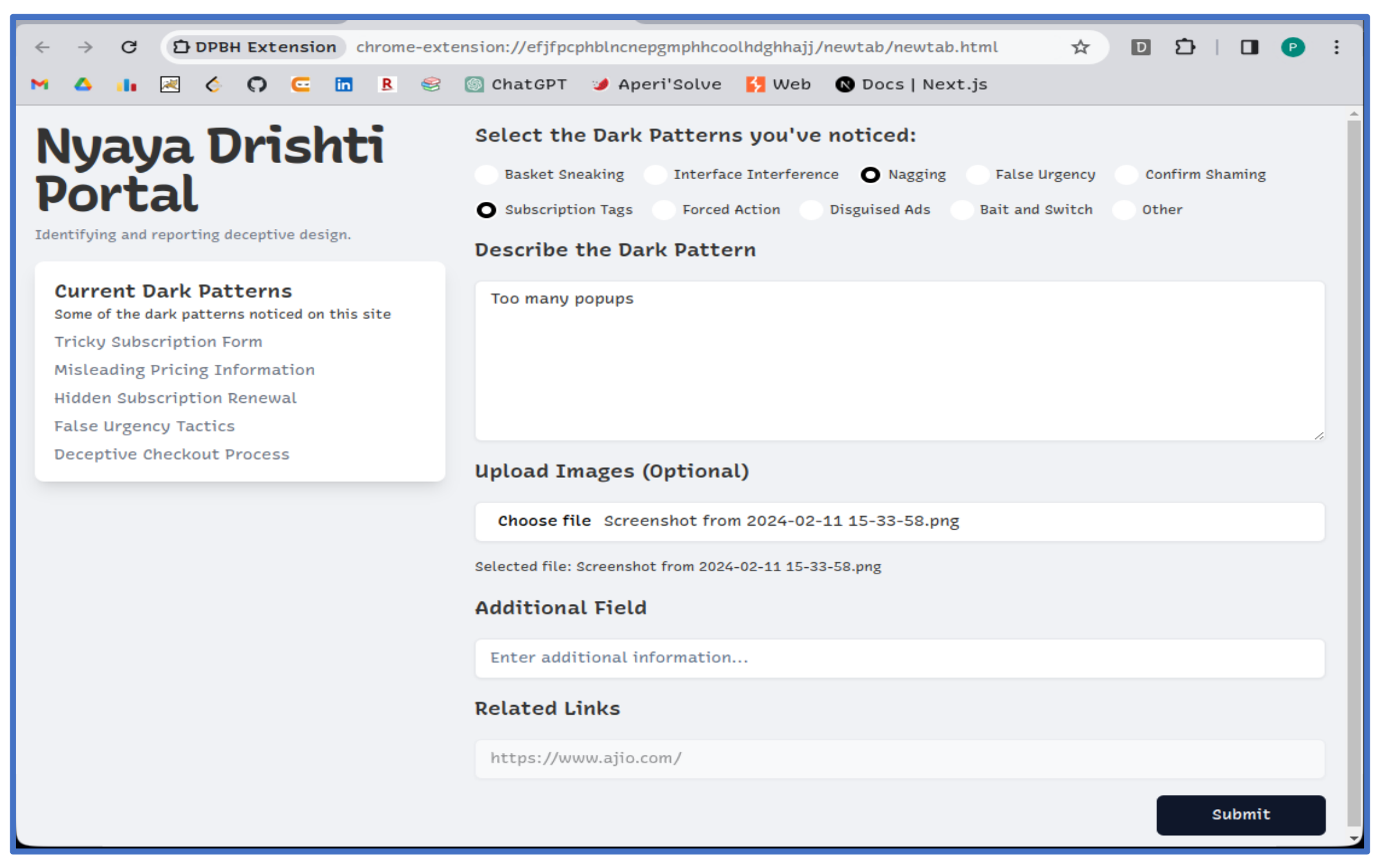
Size Chart

Select your size to know your estimated delivery date.

ADD TO CART WISHLIST

Fig 5: Bounding box for detected False Urgency

Crowdsource Portal (HTML, CSS, JavaScript, Django, SQLite, Python)



DPBH Extension chrome-extension://efjfpcphblncnepgmphhcoolhdghhajj/newtab/newtab.html

ChatGPT Aperi'Solve Web Docs | Next.js

Nyaya Drishti Portal
Identifying and reporting deceptive design.

Current Dark Patterns
Some of the dark patterns noticed on this site
Tricky Subscription Form
Misleading Pricing Information
Hidden Subscription Renewal
False Urgency Tactics
Deceptive Checkout Process

Select the Dark Patterns you've noticed:
○ Basket Sneaking ○ Interface Interference ● Nagging ○ False Urgency ○ Confirm Shaming
● Subscription Tags ○ Forced Action ○ Disguised Ads ○ Bait and Switch ○ Other

Describe the Dark Pattern
Too many popups

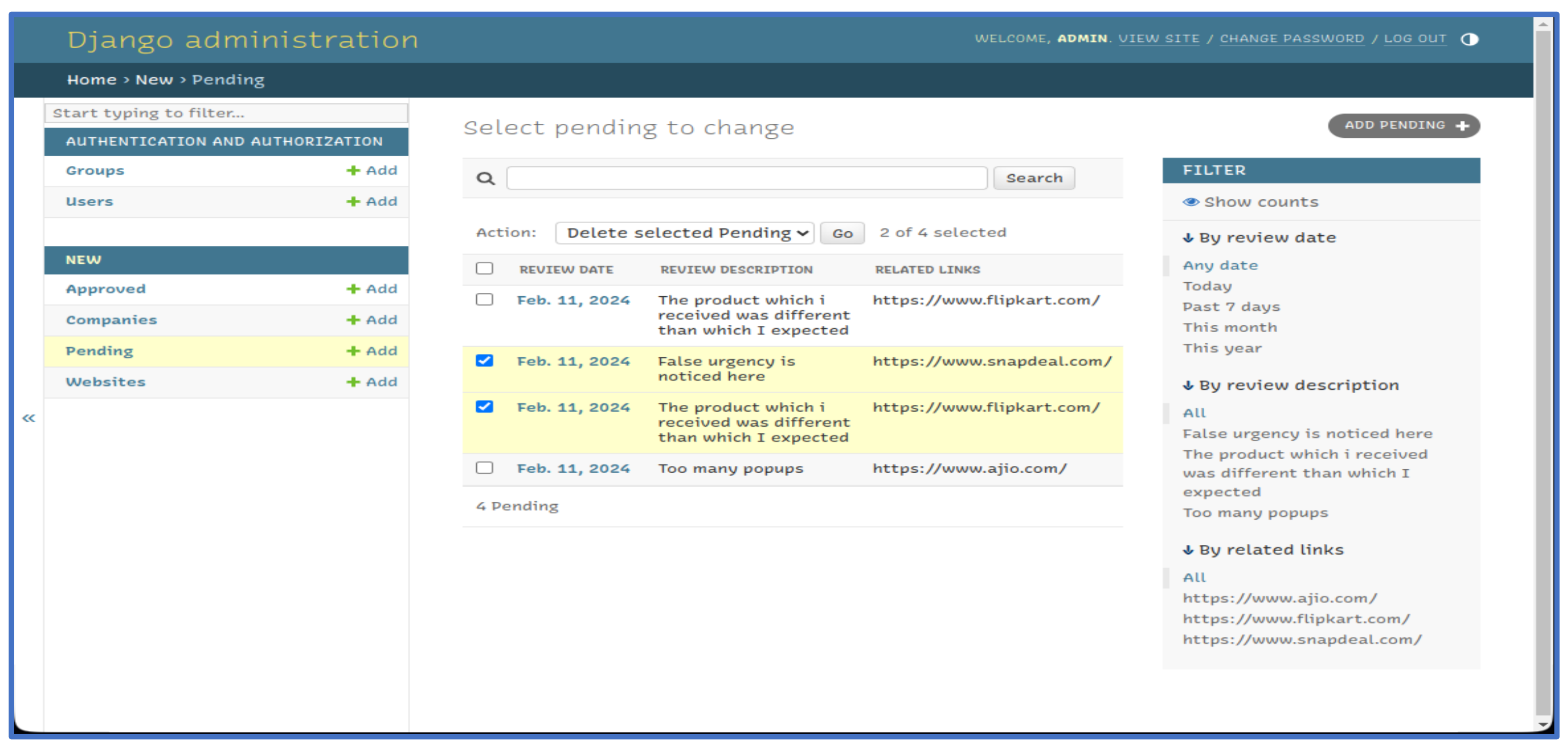
Upload Images (Optional)
Choose file Screenshot from 2024-02-11 15-33-58.png
Selected file: Screenshot from 2024-02-11 15-33-58.png

Additional Field
Enter additional information...

Related Links
https://www.ajio.com/

Submit

Fig 5: User feedback from



Django administration

WELCOME, ADMIN. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home › New › Pending

Start typing to filter...

AUTHENTICATION AND AUTHORIZATION
Groups + Add
Users + Add

NEW
Approved + Add
Companies + Add
Pending + Add
Websites + Add

Select pending to change ADD PENDING +

Search

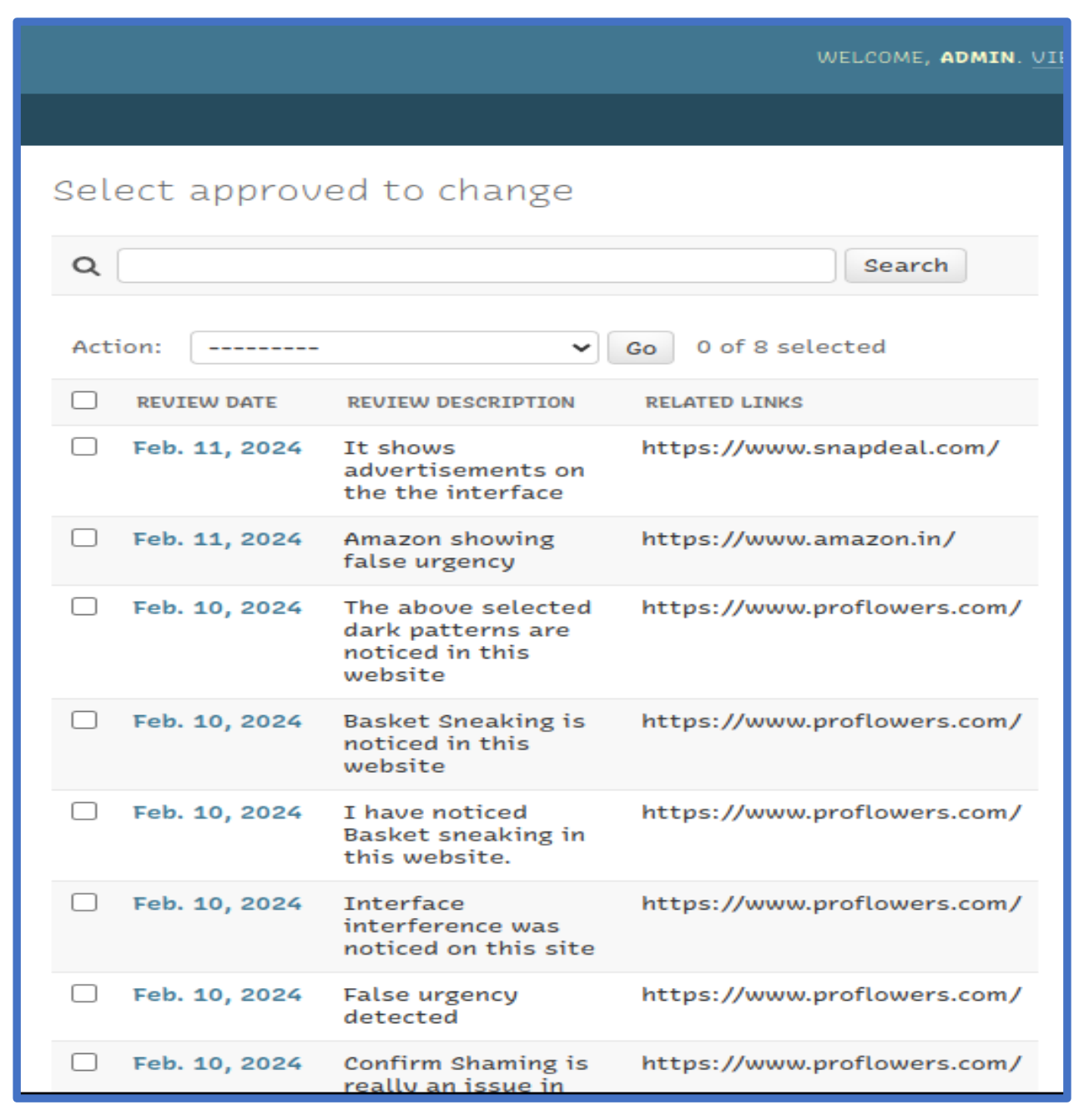
Action: Delete selected Pending Go 2 of 4 selected

☐	REVIEW DATE	REVIEW DESCRIPTION	RELATED LINKS
☐	Feb. 11, 2024	The product which i received was different than which I expected	https://www.flipkart.com/
☑	Feb. 11, 2024	False urgency is noticed here	https://www.snapdeal.com/
☑	Feb. 11, 2024	The product which i received was different than which I expected	https://www.flipkart.com/
☐	Feb. 11, 2024	Too many popups	https://www.ajio.com/

4 Pending

FILTER
Show counts
By review date
Any date
Today
Past 7 days
This month
This year
By review description
All
False urgency is noticed here
The product which i received was different than which I expected
Too many popups
By related links
All
https://www.ajio.com/
https://www.flipkart.com/
https://www.snapdeal.com/

Fig 6: Admin Portal (Managing Feedbacks)



WELCOME, ADMIN. VI

Select approved to change

Search

Action: --------- Go 0 of 8 selected

☐	REVIEW DATE	REVIEW DESCRIPTION	RELATED LINKS
☐	Feb. 11, 2024	It shows advertisements on the the interface	https://www.snapdeal.com/
☐	Feb. 11, 2024	Amazon showing false urgency	https://www.amazon.in/
☐	Feb. 10, 2024	The above selected dark patterns are noticed in this website	https://www.proflowers.com/
☐	Feb. 10, 2024	Basket Sneaking is noticed in this website	https://www.proflowers.com/
☐	Feb. 10, 2024	I have noticed Basket sneaking in this website.	https://www.proflowers.com/
☐	Feb. 10, 2024	Interface interference was noticed on this site	https://www.proflowers.com/
☐	Feb. 10, 2024	False urgency detected	https://www.proflowers.com/
☐	Feb. 10, 2024	Confirm Shaming is really an issue in	https://www.proflowers.com/

Fig 7: Admin Portal (Approved feedbacks)

Impact

- ***11% of websites contained dark patterns causing a total of ₹ 15 Crores worth losses.***
- ***Users are 40% more likely to make unintended purchase on these sites employing dark patterns.***
- ***Identifying 10+ dark patterns significantly reducing the losses.***

User friendly **Privacy** **Admin Portal** **Reports Fake reviews** **User Education**

ADMIN

FAKE

https://github.com/kr-2003/DPBH-2024*

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Dark Patterns Buster

Hackathon 2023

Abstract

Our innovative browser extension employs a variety of methodologies to combat dark patterns in e-commerce. Leveraging native processing, machine learning, and crowd-sourced feedback, our solution detects and exposes the deceptive Dark Patterns.

The plugin extracts the website content to generate a score. If the score for a particular pattern exceeds a threshold, we notify the user about the occurrence of the dark pattern on that specific site. Moreover, we provide a platform for users to report suspicious behavior, and an Admin portal to ensure accuracy and reliability.

With a focus on user privacy and seamless integration across all browsers, Nyaya Drishti empowers consumers to navigate online platforms with confidence, illuminating hidden costs and preserving transparency in the digital marketplace. Our understanding and study suggest that this approach is practical and can impact the e-commerce shopping experience, benefiting many users significantly.

Team Members

Anirudha Bhagwat

Browser Extension, Integration with crowdsource portal

Amit Makkad

Machine Learning model development

Gaurav Jain

Browser Extension and Model Integration

Purav Biyani

Crowdsource portal frontend and backend

Abhinav Kumar

Browser Extension , Algorithm and scraper development,

Impact Assessment & Conclusion

Based on our analysis, we found that approximately 11% of websites contain dark patterns, resulting in an estimated total loss of ₹ 15 Crores. These dark patterns significantly impact users, making them 40% more likely to make unintended purchases on these deceptive sites. By identifying and addressing over 10 dark patterns, we aim to mitigate these losses and create a safer online environment for users. Our efforts in identifying these patterns are crucial in safeguarding users from deceptive practices and promoting ethical online behavior.

Solution Highlights

- Modified DFS based approach for basket sneaking and drip pricing
- Implemented regex in browser for false urgency
- Counting popups in user session for nagging
- Applied ml model for confirm shaming and subscription traps
- Crowd source monitoring for other dark patterns
- Fake reviews detection using finetuned bert model
- Bounding box for highlighting dark patterns
- Low Latency as lightweight models are used