Combining Textual and Visual Features to Identify Anomalous User-generated Content

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1. Problem

Nowadays many websites allow users to post their own content.

- It exposes the platform to a wide number of possible threats e.g. fake, low quality or malicious user-generated content may damage the credibility of the website.
- Our GOAL: automatically identifying fake or low quality user-generated content.

We apply anomaly detection to a novel task: discovering fake or suspicious descriptions of commercial products.

2. Solution

- To infer the key features describing the behavioral traits of expert users.
- To combine textual descriptors with visual information extracted from the media resources associated with each product description.
- The joint use of textual and visual features helps in obtaining a robust detection model, that automatically reports whenever a newly generated description is anomaluos.

3. Method

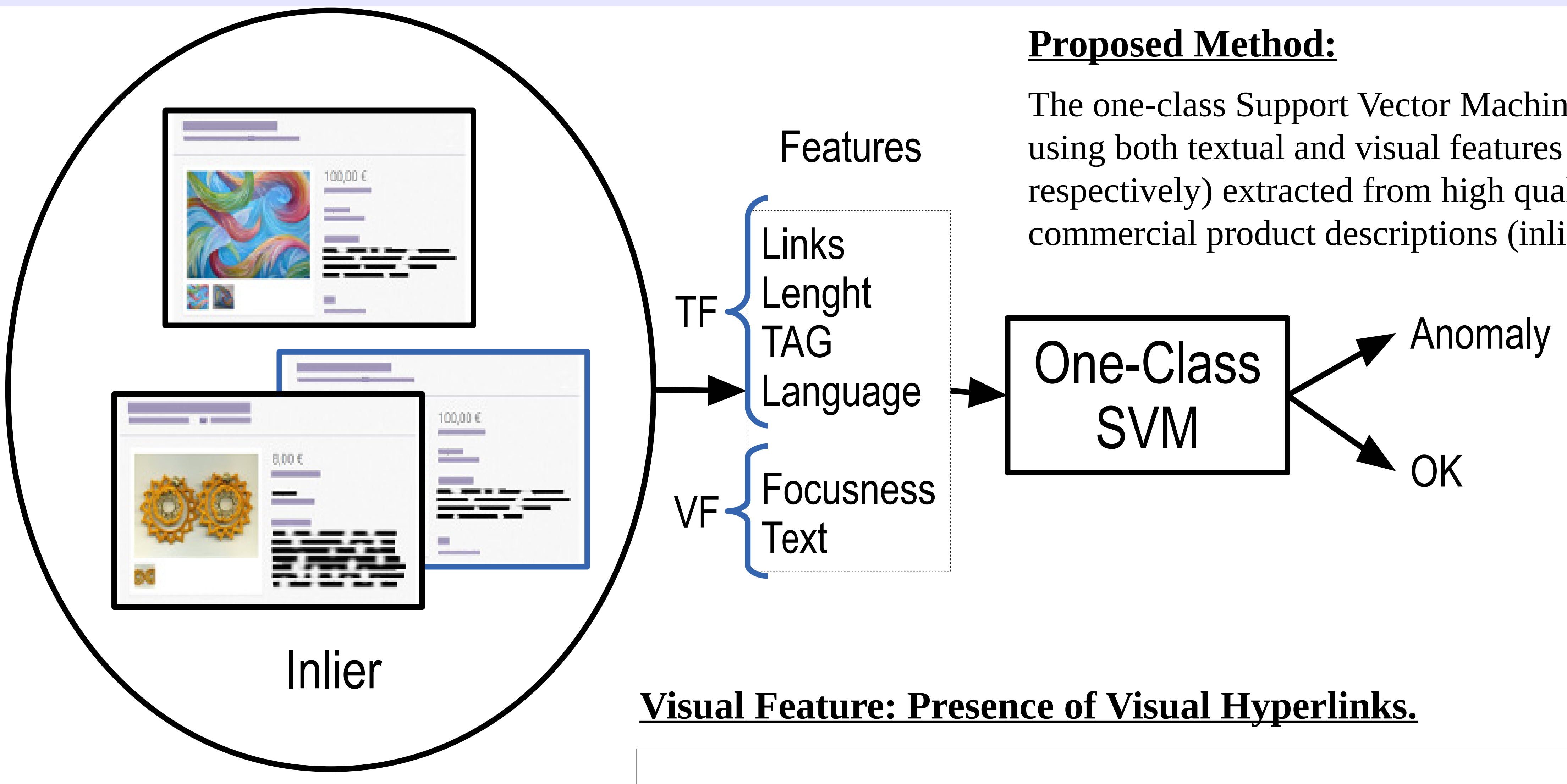
Textual Features:

Description Length.
Length of the description in terms of number of text characters.

Description Language.
Descriptions should always be written using the platform main idiom.

Description Keywords.
Index of consistency of the textual information provided by users.

Presence of Hyperlinks.
Presence of email addresses and website URLs.



Proposed Method:

The one-class Support Vector Machine model is trained using both textual and visual features (TF and VF respectively) extracted from high quality genuine commercial product descriptions (inliers).

Visual Feature: Focusness

Variance of Laplacian, is the operator that determines whether an image is focused or unfocused.

Focused.

Unfocused.

Visual Feature: Presence of Visual Hyperlinks.

- Tesseract detects whether an image contains text.
- Regex based rules determine whether it represents a hyperlink/email address or not.

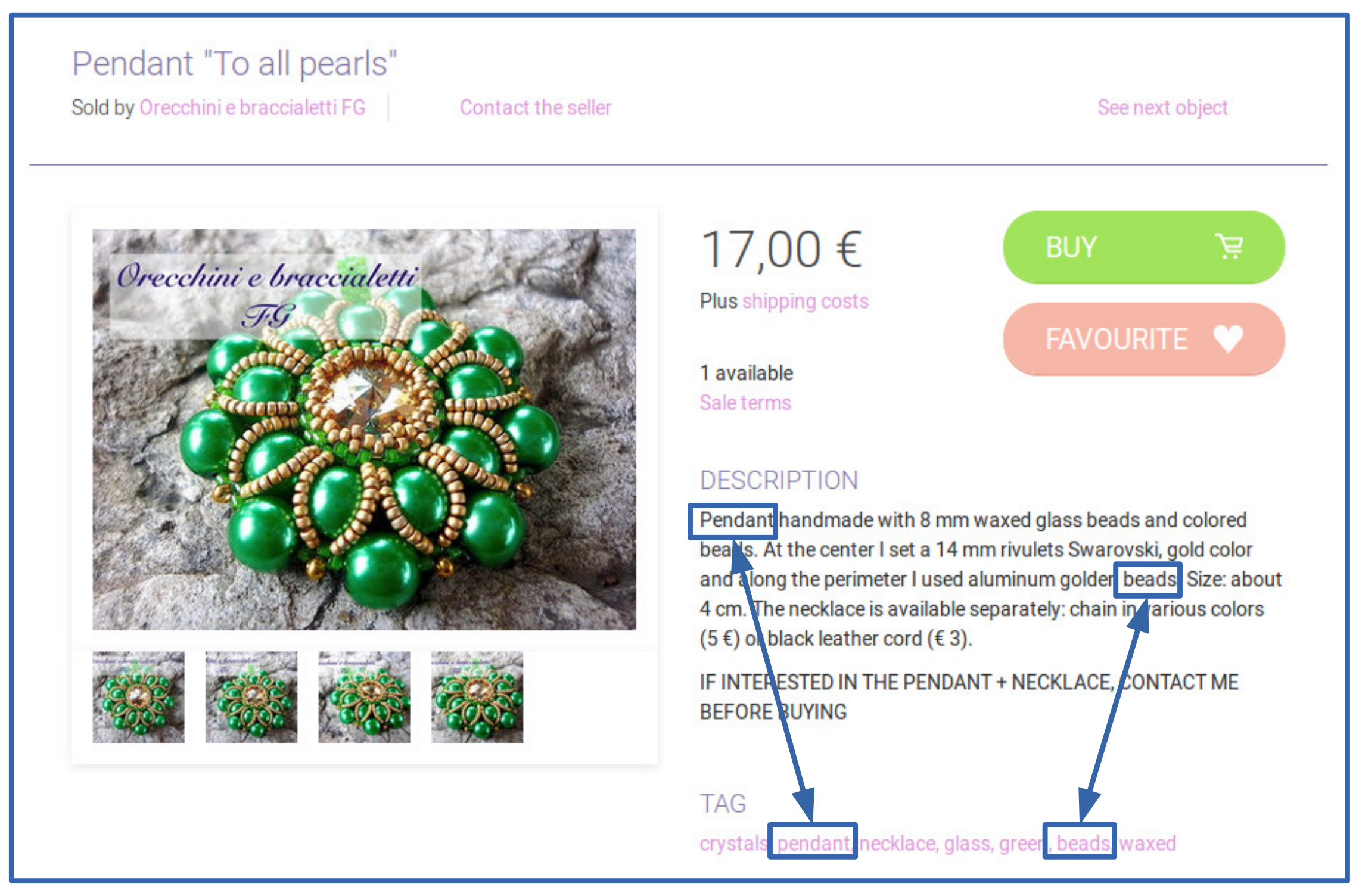
Allowed Text.

Not Allowed Text.

4. Results

Train Dataset

We gather a dataset composed of 41635 documents from a website specialized on selling handmade products. Each insertion is user-generated and composed of a textual description, a set of keywords or tags and one or more images representing the item. In our experiments, 80% of the high quality genuine documents are used for training, while the remaining 20% are used for testing.



Pendant "To all pearls"
Sold by Orecchini e braccialetti FG | Contact the seller | See next object

17,00 €
Plus shipping costs
1 available
Sale terms

DESCRIPTION
Pendant handmade with 8 mm waxed glass beads and colored beads. At the center I set a 14 mm rivulets Swarovski, gold color and along the perimeter I used aluminum golden beads Size: about 4 cm. The necklace is available separately: chain in various colors (5 €) or black leather cord (€ 3).

IF INTERESTED IN THE PENDANT + NECKLACE, CONTACT ME BEFORE BUYING

TAG
crystals, pendant, necklace, glass, green, beads, waxed

Overall accuracies

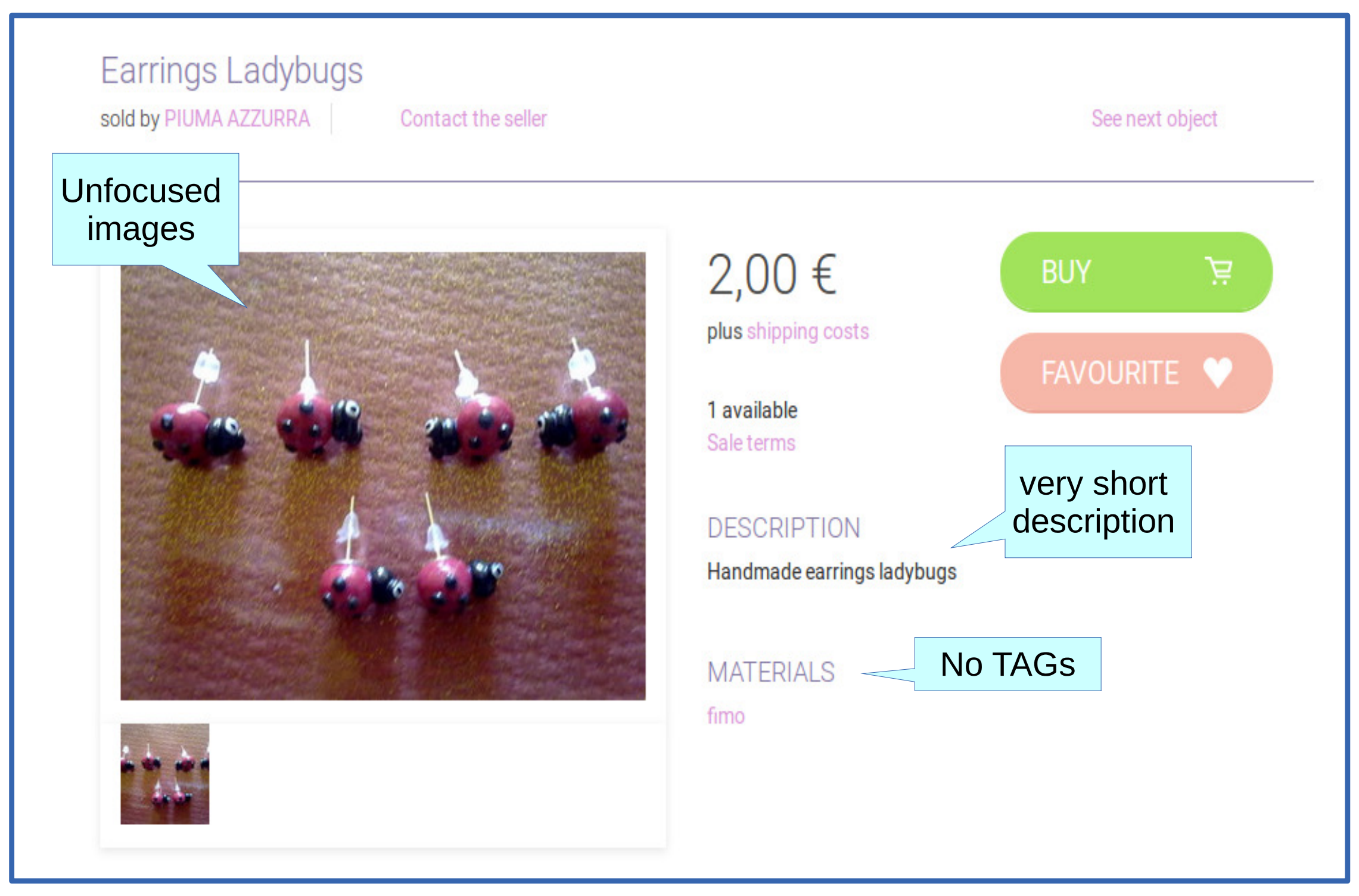
In our experiments, we divide the 8327 positive test documents into 8 equal splits, and we build 8 different test sets by adding each split to the set of anomalous documents. Each test set is composed of 1040 positive and 1000 anomalous documents. The goodness of the proposed system at detecting anomalous commercial product descriptions was measured.

	Anomalies	Correct
Identified as anomalous	858	94
Identified as correct	142	946

Accuracy	0.88
Precision	0.90
Recall	0.85
F-measure	0.88

Anomalous Dataset

The set of possible anomalous descriptions has been articially built by randomly injecting dierent kinds of anomalies into high quality genuine user-generated documents, trying to cover a large set of possible anomalous behaviors. We articially create a total of 1000 negative documents.



Earrings Ladybugs
sold by PIUMA AZZURRA | Contact the seller | See next object

2,00 €
plus shipping costs
1 available
Sale terms

DESCRIPTION
Handmade earrings ladybugs

MATERIALS
fimo

Detection rate

To evaluate the capability of the proposed method at detecting different types of anomalies. The detection rate has been calculated for each type of anomalous content considered.

Anomalies	Detection Rate
Anomalous length	39%
Anomalous language	79%
Missing/wrong *tags*	43%
Presence of hyperlinks	99%
Unfocused images	97%
Images containing hyperlinks	98%
$\geq$ 2 random anomalies	97%
Average	78%