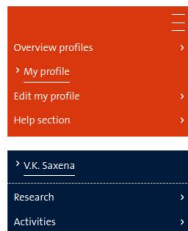# Connecting Illegal Vendors on Darknet Markets: Responsible Authorship Attribution to Link and Connect Online Cybercrimes

NL | EN   Log out

V.K. Saxena

Introduction

I'm a machine learning enthusiast, in the final year of my Ph.D. at Maastricht University's Law & Tech lab, Netherlands, focusing on research in Natural Language Processing and Computer Vision. My work concentrates on exploring multimodal representational learning techniques for authorship identification tasks, to link and connect illegal vendors by analyzing patterns in writing and photmetric styles on online market advertisements.

Expertise

- Areas: Machine Learning, Natural Language Processing, Computer Vision, Multimodal Representational Learning, Classification, Information Retrieval, Explainable AI.
- Skills: Python, PyTorch/Lightning, Keras, Scikit-Learn, Pandas, Numpy.
- Experience: Researcher, Lecturer, Supervisor, Author, Reviewer, Software/R&D Engineer, Consultant

Career history

- R&D Human Trafficking Intern - Bashpole Softwares, Inc. (June 2022 - May 2023)
- Research Assistant - German Research Centre for Artificial Intelligence (Oct 2018- Oct 2020)
- Research Assistant - Hasso Plattner Institute (Apr 2018 - Sep 2018)
- R&D Consultant - Footloose Labs (Apr 2017 - Oct 2017)
- Assistant System Engineer - Tata Consultancy Services (Apr 2016 - Aug 2017)
- Senior R&D Engineer - Wingfotech Excellence (Nov 2015 - Feb 2016)
- Trainee - Ellora Edu Ventures, India (August 2012 - February 2015)
- Intern - Remote Sensing Application Centre, India (June 2014 to July 2014)
- Trainee - Hewlett Packard, India (June 2013 - July 2013)
- Intern - Robosapiens Technology Pvt. limited, India (June 2012 - July 2012)

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PhD

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Aurelia Tamo - Larrieux (A.)

Dr. Aurelia Tamò-Larrieux is an Assistant Professor for Privacy, Security, and Computational Law at Maastricht University. She has a background in law and economics and is specialized in research at the intersection of law and digital technologies with a particular focus on privacy, data protection, design approaches for privacy-friendly technologies, transparency of automated decision-making, automatically processable regulation, and trust in automation. Aurelia's scientific publications on those subjects are open access and she has presented her research at numerous international conferences.

During her doctoral research, which was funded by the Swiss National Science Foundation, Aurelia analyzed the application of the concept of data protection by design and default in an Internet of Things environment. Her research "Designing for Privacy and Its Legal Framework" was published by Springer and won the Issekutz and SIAF award.

Aurelia is an active member of the research community, acts as a Principal Investigator on research projects related to encoding legal norms, organizes workshops and conferences on topics ranging from ethical, legal, and social implications of social robots to the creation of privacy-friendly and trustworthy technologies, is a member of the Social Responsibility Working Group at the H2020 Cost Action 19121 GoodBrother, and founded academic initiatives to connect young researchers and provide a platform to present their research on a podcast series. She was a visiting scholar at the Institute of Pervasive Computing at ETH Zurich, the Berkman Klein Center for Internet & Society at Harvard University, and the Institute of Computer Science at the University of St. Gallen. Furthermore, Aurelia has taught various classes on privacy and data protection at the University of Zurich, University of St. Gallen, and Mykolas Romeris University.

Before her appointment to Maastricht University, she was an International Postdoctoral Fellow at the University of St. Gallen (FAA-HSG) researching trust in automation and the impact of automatically processable regulation. She was also a postdoc at the Center for Information Technology, Society, and Law (ITSL-UZH) and Digital Society Initiative (DSI-UZH) both at the University of Zurich where she co-created LegalTech to automatically evaluate the data protection requirements of research projects.

Staff
Staff
Aurelia Tamo - Larrieux (A.)
Research

Aurelia Tamo - Larrieux (A.)
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Introduction to Authorship Attribution and Darknet Markets

Responsible guidelines for Authorship Attribution

Hands-on Session 1: Getting started, data analysis and pre-processing, and stylometric analysis

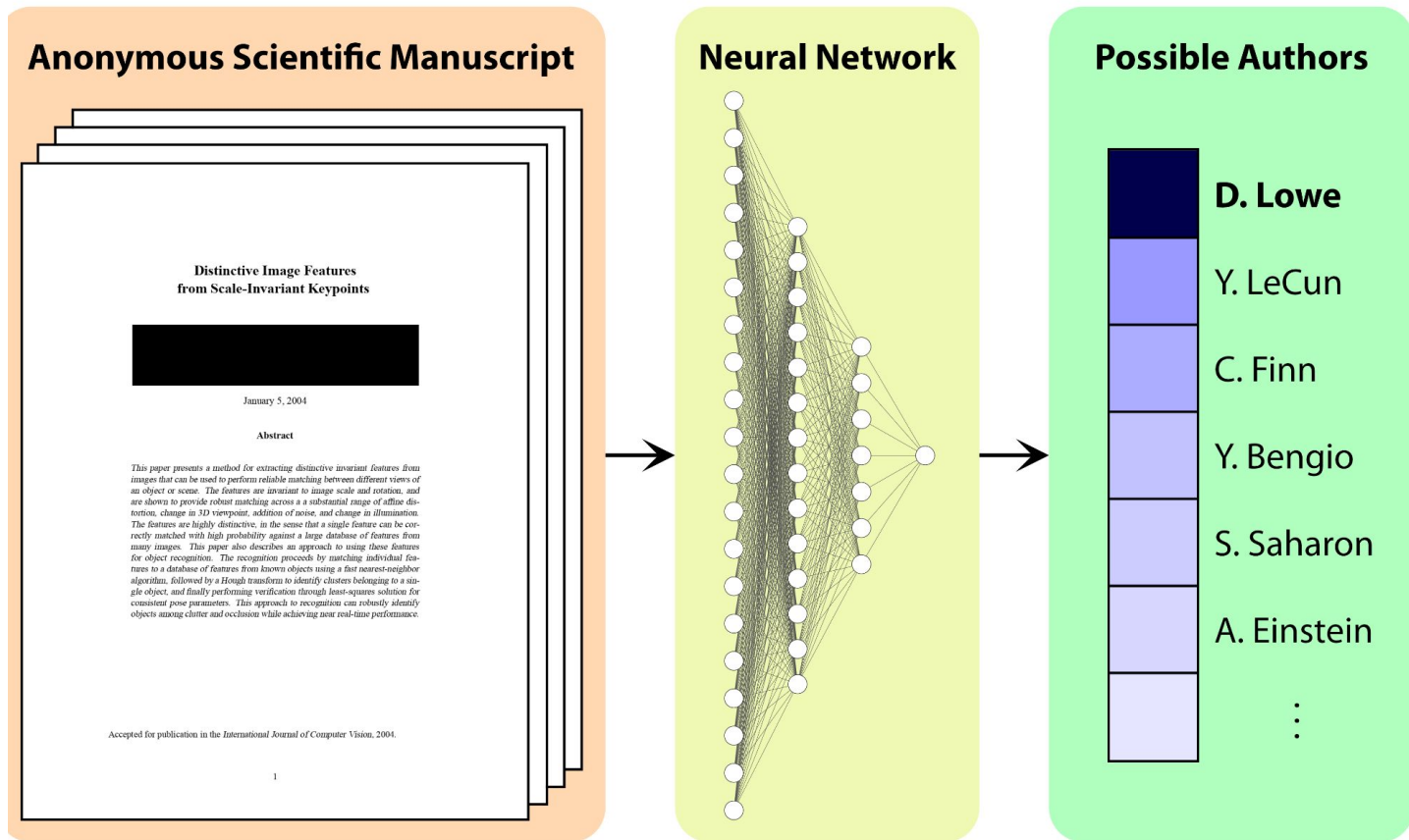Hands-on session 2: Authorship Identification through Statistical algorithms and traditional Neural Networks

Hands-on session 3: Authorship Identification through Transformers-based models
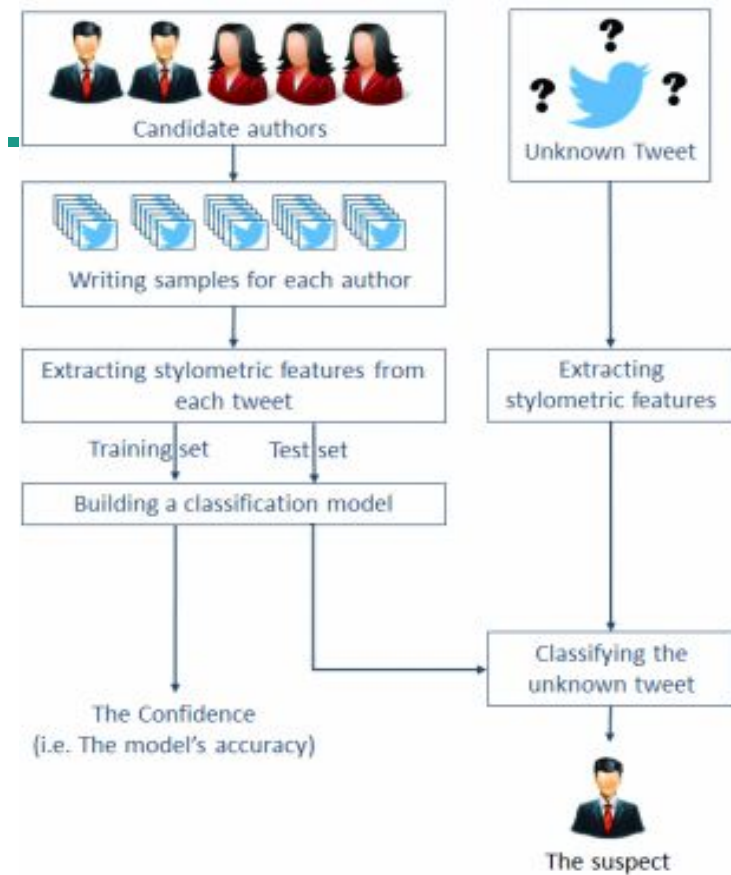
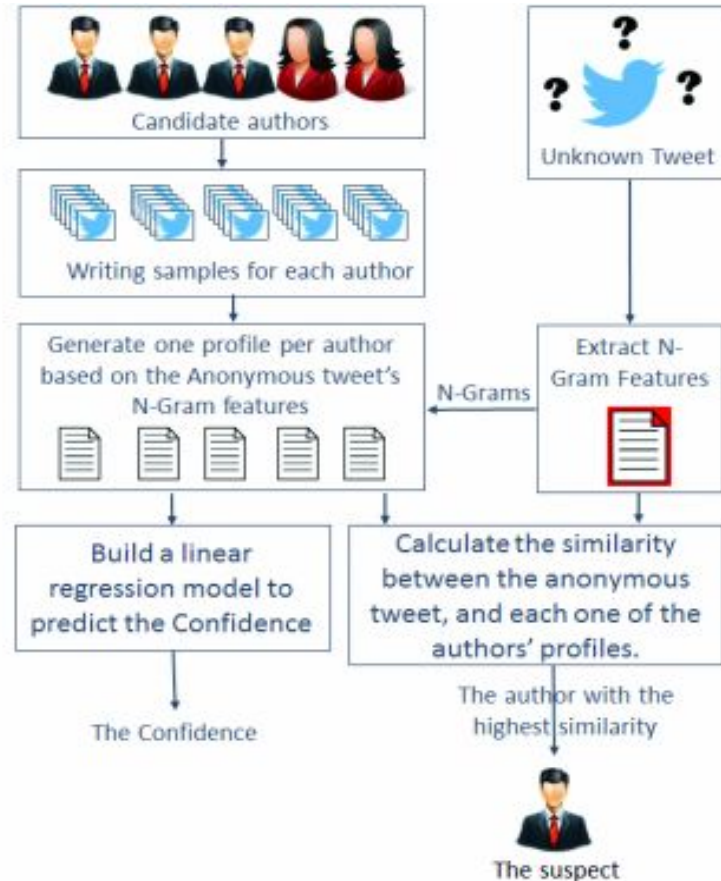Hands-on session 4: Authorship Verification as retrieval task

Limitations, Future Work, and Conclusion

What is Authorship Attribution (AA)? How does it apply to NLP?

Authorship Identification vs Authorship Verification

(a) Instance-based authorship attribution.

(b) Profile-based authorship attribution.

Dark Web and Darknet Markets

Dark Web Content

A study by *Gareth Owen of Portsmouth University* discovered that content on the Dark Web was dominated by:

Illegal pornography, black markets, hacking groups and botnet operations (those commonly associated with spam, fraud and malicious attacks).

Hidden Services on the Dark Web (January 2015)

- Drugs
- Fraud / Counterfeit
- Black Market Sites
- Bitcoin
- Whistleblowing
- Hacking
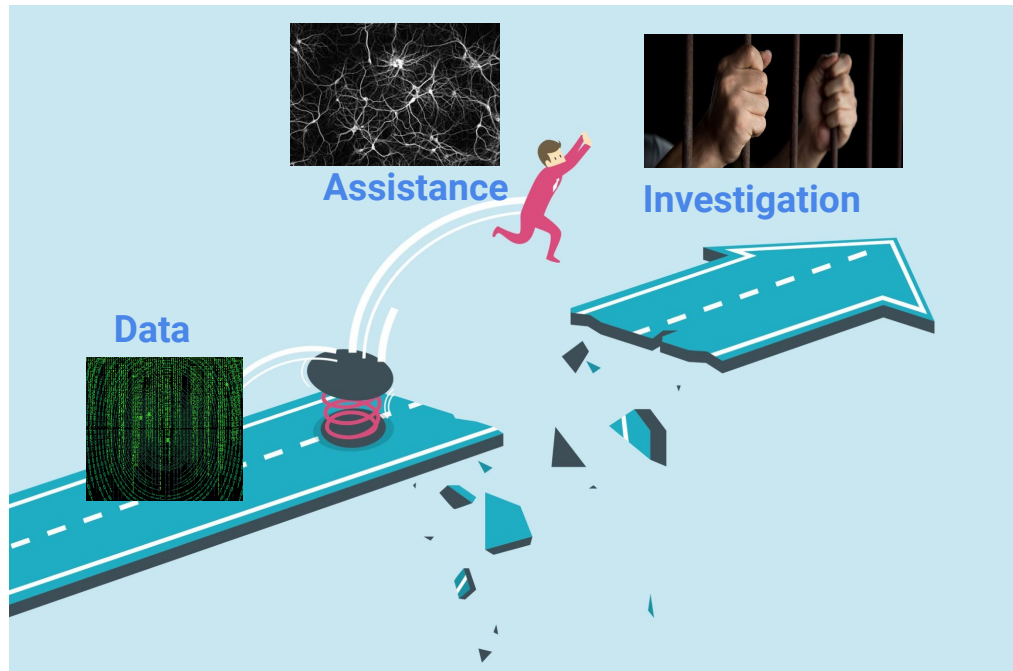- Pornography
- Blogs
- Abuse
- Other / Not Indexed

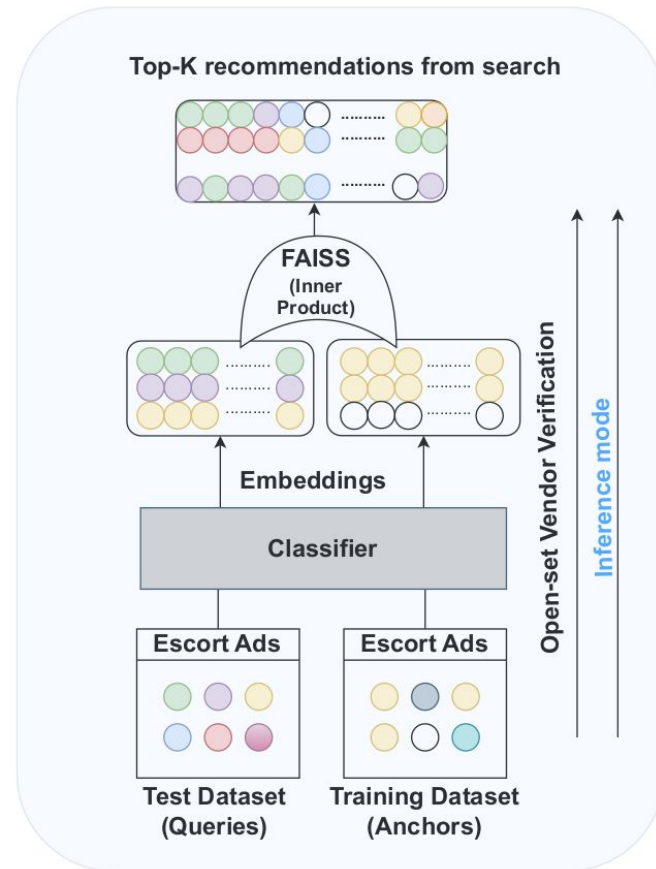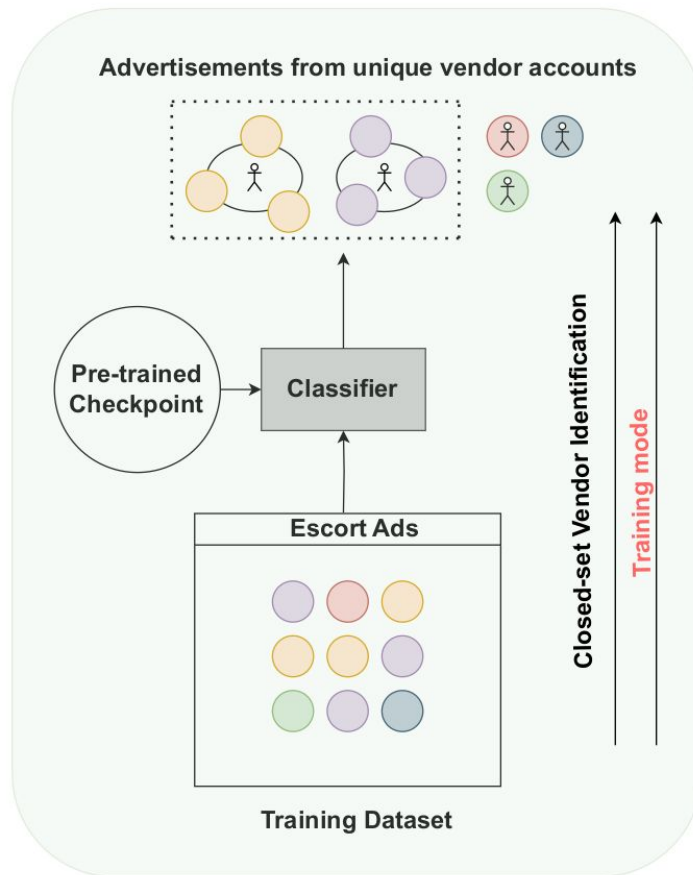SHUT IT DOWN!

WHOA CHILL OUT BRO

SETBACK

- Anonymity on the Dark Web
- Limited human resources
- Too much data to analyze
- Vendors creating aliases and appearing across different markets
  - Makes it difficult to estimate the scope and size of a market

Assistance

Investigation

Data

Vendor Migrants vs Vendor Aliases

VendorLink: An NLP approach for Identifying & Linking Vendor Migrants & Potential Aliases on Darknet Markets

IDTraffickers: An Authorship Attribution Dataset to link and connect Potential Human-Trafficking Operations on Text Escort Advertisements