

ALESIA CHERNIKOVA

Postdoctoral Research Associate, Northeastern University, Boston, USA

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SUMMARY

Trustworthy AI: uncertainty quantification, adversarial robustness, generalization theory, mechanistic interpretability, cybersecurity.

CORE STRENGTHS

- **Uncertainty Quantification and Adversarial Robustness in Message-Passing Neural Networks (MPNNs):** developed an analytic uncertainty propagation framework for MPNNs and derived probabilistic certified adversarial robustness radii for node classification. [NeurIPS 2025 workshop: NPGML.]
- **MPNNs Generalization bound under node feature uncertainty:** introduced a covering number-based generalization bound for MPNNs with uncertain node features, leveraging geometry of the Wasserstein subspace associated with the sample space. [Under submission.]
- **AI security in safety-critical domains:** created an optimization-based evasion attacks framework that preserves feature dependencies, enabling realistic attacks and robustness evaluation in constrained domains such as cybersecurity and healthcare; introduced adversarial attacks against deep neural networks for steering angle prediction in self-driving cars. [ACM TOPS 2022, IEEE S&P 2019 workshop: SafeThings.]
- **Scalable security graph analytics:** built scalable algorithms for tracing AWS cloud activity as a heterogeneous graph and developed methodology for lateral movement detection using Bayesian statistics and network science perspectives. [AWS internal conference 2021.]

EDUCATION

Northeastern University, Boston, USA

Doctor of Philosophy in Computer Science

Advisor: Prof. Alina Oprea

Thesis: “Cyber networks resilience against adversarial attacks”.

09/2017 — 04/2024

GPA: 3.9/4.00

Belarusian State University, Minsk, Belarus

Bachelor of Science in Applied Mathematics

Advisor: Prof. Vladimir Malugin

Thesis: “Development of risk management algorithms based on derivatives contracts”.

09/2009 — 06/2014

GPA: 3.8/4.00

ACADEMIC EXPERIENCE

Northeastern University, RADLAB, DK-Lab

Postdoctoral Research Associate

Boston, USA

05/2024 — Present

- Developed a framework to quantify uncertainty in Message Passing Neural Networks (MPNNs), derived probabilistic certified adversarial robustness radii of MPNNs for the node classification task, and introduced a novel covering number-based generalization bound for the node classification task in MPNNs under uncertainty in node features.
- Design automatic circuit extraction from the attribution graphs to reason about the mechanistic interpretability of Large Language Models.
- Develop novel deep learning architectures based on the geometry of derandomized hyperbolic graphs to improve efficiency and generalization.

Northeastern University, NDS2 Lab

Research Assistant

Boston, USA

09/2017 — 04/2024

- Introduced a new compartmental model of epidemiology to represent self-propagating malware (SPM) propagation in networks using real-world WannaCry traces. Rigorously studied the characteristics of the SPM propagation process under the homogeneous mixing assumption and on arbitrary networks.
- Designed new defense algorithms leveraging graph theory and extensively tested the behavior of existing defense techniques to improve the network robustness of large enterprise networks in the face of SPM.
- Developed a novel optimization-based framework for evasion attack algorithms that preserve possible feature dependencies to evaluate the robustness of deep learning models in constrained environments such as cybersecurity or healthcare. Evaluated the success of existing defense algorithms against the proposed attack methodology.
- Demonstrated first evasion attacks against classification and regression deep learning models in the domain of self-driving cars.

Amazon Web Services (AWS)*Research Scientist Intern*

Boston, USA

05/2020 — 08/2020, 05/2021 — 09/2021

- Created a scalable algorithm for tracing the activity in the AWS cloud represented as a heterogeneous graph to allow further research based on AWS cloud activity data.
- Developed the methodology for lateral movement detection in the AWS cloud environment using Bayesian statistics and network science perspectives.

Belarusian State University (BSU)*Undergraduate Research Assistant*

Minsk, Belarus

01/2012 — 12/2013

- Participated in a research project to create the methodology for estimating credit rankings of enterprises using clustering and factor analysis.
- Independently achieved and managed the results of the credit rankings estimation project for the building enterprise section.
- Collaborated in developing the package for automated calculation of credit scores based on the proposed credit rankings evaluation methodology.
- Developed novel methodologies for hedging strategies using futures and interest-rate swap contracts.

TEACHING EXPERIENCE

Northeastern University*Invited Lectures for CS 7332: Machine Learning with Graphs*

Boston, USA

09/2024 — 12/2024, 09/2025 — 12/2025

- Designed and held lectures for graduate-level course in Graph Machine Learning.

Northeastern University*Teaching Assistant for CS4100: Artificial Intelligence*

Boston, USA

09/2022 — 12/2022, 09/2023 — 12/2023, 01/2024 — 04/2024

- Designed and held lectures for undergraduate and graduate students.
- Held weekly office hours to answer questions, provide support, and review course material with students.
- Graded assignments, exams, and research projects.
- Assisted professor with homework and exam preparation, proctored the exams.
- Advised students regarding research projects.

PROFESSIONAL EXPERIENCE

IBA Group*Senior Software Engineer*

Minsk, Belarus

11/2013 — 07/2017

- Participated in the development of a large-scale IBM GSAR web portal and maintained its performance.
- Assisted the software architect with the efficiency and usability improvement of the portal.

PUBLICATIONS

Robustness and Generalization in Uncertainty-Aware Message Passing Neural Networks. Under submission

A. Chernikova, M. Laber, N. Sabhahit, T. Eliassi-Rad

Uncertainty-Aware Message Passing Neural Networks. New Perspectives in Advancing Graph Machine Learning,

A. Chernikova, M. Laber, N. Sabhahit, T. Eliassi-Rad

NeurIPS 2025

Modeling Self-Propagating Malware with Epidemiological Models.

Applied Network Science 2023

A. Chernikova, N. Gozzi, S. Boboila, N. Perra, T. Eliassi-Rad, and A. Oprea.

Cyber Network Resilience against Self-Propagating Malware Attacks.

ESORICS 2022

A. Chernikova, N. Gozzi, S. Boboila, N. Perra, P. Angadi, J. Loughner, M. Wilden, T. Eliassi-Rad, and A. Oprea.

Fence: Feasible Evasion Attacks on Neural Networks in Constrained Environments.

ACM TOPS 2022

A. Chernikova and A. Oprea.

Are Self-Driving Cars Secure?

SafeThings IEEE S&P 2019

Evasion Attacks against Deep Neural Networks for Steering Angle Prediction.

A. Chernikova, A. Oprea, C. Nita-Rotaru and BG. Kim

Hedging Algorithms Based on Interest-rate Swaps.

BSU Conference 2013

A. Chernikova and V. Malugin.

AWARDS

IAIFI Summer School Best Project Award

2025

IEEE S&P and GREPSEC Travel Grant

2019

Khoury College of Computer Science Fellowship

2017 — 2018

National Bank of the Republic of Belarus Merit Scholarship
Belarusian State University Excellence Merit Scholarship

2013 — 2014
2012 — 2014

TALKS

Uncertainty-Aware Message Passing Neural Networks.	NPGML, NeurIPS, 2025
Circuit Tracing in Large Language Models.	Network Science Institute, 2025
Modeling Self-propagating Malware with Compartmental Models of Epidemiology.	JMM, 2025
Cybernetwork Resilience against Self-Propagating Malware Attacks.	Network Science Institute, 2024
Cybernetwork Resilience against Self-Propagating Malware Attacks.	DoD SERDP Workshop, 2024
Towards Resilient Cybernetworks against Adversarial Attacks.	Amazon Web Services, 2023
Cybernetwork Resilience against Self-Propagating Malware Attacks.	ESORICS, 2022
Feasible Evasion Attacks in Constrained Environments.	CRA Seminar, 2022
Graph-based Statistical Detection of Anomalous Role Assumption Events.	Amazon Web Services, 2020
Feasible Evasion Attacks on Neural Networks in Constrained Environments.	ARL Meeting, 2020
Evasion Attacks against Deep Neural Networks for Steering Angle Prediction.	SafeThings IEEE S&P, 2019

SERVICE

Reviewer	ACM TOPS, IEEE Transactions on Privacy
Technical Program Committee	AISTATS'26, IEEE S&P'26, IEEE S&P'25, IEEE MILCOM AI for Cyber'23

SKILLS

- **Programming:** Python, Java, Scala, Javascript, C/C++
- **Frameworks and Libraries:** JAX, PyTorch, Tensorflow, Keras, Spark