Wojciech Wideł

Website ⋄ https://wwidel.github.io

EDUCATION

Ph.D. in Computer Science December 2019
INSA Rennes, IRISA, France
Title of dissertation: *Formal modeling and quantitative analysis of security using attack–defense trees*
Supervisors: Prof. Gildas Avoine and Dr Barbara Kordy

Ph.D. in Mathematics (with distinction) April 2017
AGH University of Science and Technology, Kraków, Poland
Title of dissertation: *Heavy subgraphs and pancyclicity*
Supervisor: Prof. A. Paweł Wojda

M.Sc. in Mathematics July 2014
AGH University of Science and Technology, Kraków, Poland
Major: Mathematics in Computer Science
Title of thesis: *Maximum independent set problem in graphs*
Supervisor: Prof. Ingo Schiermeyer

In my master thesis I described and compared selected heuristics for the maximum independent set problem. I have also proposed a genetic algorithm, inspired by existing genetic algorithms for the travelling salesman problem, for the maximal independent set problem.

Technische Universität Bergakademie Freiberg, Freiberg, Germany April - July 2014
I spent the spring semester 2013/2014 at the Department of Discrete Mathematics and Algebra within the Erasmus program. I followed the course *Selected topics in algorithmic graph theory*, took German classes and prepared my master thesis.

B.Sc. in Mathematics July 2012
AGH University of Science and Technology, Kraków, Poland
Title of thesis: *Duże układy równań liniowych z macierzą symetryczną* (*Large symmetric systems of linear equations*)
Supervisor: Dr Bogusław Bożek

SELECTED SKILLS

- Python – I have more than 5 years of experience with Python programming in academic setting. I am using Python mostly for implementing prototype tools demonstrating applicability of algorithms that I and my collaborators have developed. Among packages I have used over the years are *numpy*, *networkx*, *pandas* and *scikit-learn*. I have also created a stand-alone tool, equipped with a GUI, for analysis of security using attack–defense trees.
- SQL – I have recently taken an SQLite course on Coursera (*SQL for Data Science*). I am now practicing on HackerRank.
- LaTeX 2_ε – I have used it for writing a number of scientific publications as well as two Ph.D. theses.

PROFESSIONAL EXPERIENCE

KTH Royal Institute of Technology October 2019 – November 2020
Postdoctoral researcher *Stockholm, Sweden*

- As a member of the Division of Network and Systems Engineering, I worked on threat modelling and development of methods for analysis of threat models, in particular in the context of information and communications technology infrastructures. Among the techniques used in our analysis methods were genetic algorithms and mixed integer programming.
- I was involved in the SOCCRATES project, funded by the European Union's Horizon 2020 Research and Innovation program. I was responsible for theoretical design and development of a prototype implementation of the so-called *CoA Generator* – one of the components of the cybersecurity monitoring platform developed in the project.

IRISA, INSA Rennes November 2016 – October 2019
Doctoral researcher *Rennes, France*

- As a member of the Embedded Security and Cryptography (EMSEC) team at the Institut de Recherche en Informatique et Systèmes Aléatoires (IRISA), I carried out research on formal foundations of the *attack–defense tree* modelling framework for security, and on related methods for quantitative evaluation of security.

AGH University of Science and Technology October 2014 – November 2016
Doctoral researcher *Kraków, Poland*

- As a member of the Department of Discrete Mathematics at the Faculty of Applied Mathematics, I carried out research resulting in a number of new sufficient conditions for Hamiltonicity and pancyclicity of simple graphs.

RECENT COURSES AND TRAININGS

Neural networks and deep learning September 2020
Coursera

In this course the fundamentals of artificial neural networks were covered, as well as some aspects of using neural networks in Python. I am currently expanding both my knowledge and practical skills by reading *Python Machine Learning* by Raschka and Mirjalili, and by solving challenges on Kaggle.

Machine learning August 2020
Coursera

The course requiring approximately 60 hours of work, given by Andrew Ng from Stanford University, covered some of the fundamentals of machine learning. Among the covered topics was solving classification problems (using logistic regression, neural networks and support vector machines), creation of linear regression models, and the problem of anomaly detection.

Discrete Optimization February 2020
Coursera

The course requiring approximately 100 hours of work, given by Pascal Van Hentenryck from The University of Melbourne, covered topics such as constraint programming, local search, linear programming and mixed integer programming. Various optimization techniques were explained, and the knowledge obtained was tested with series of challenging programming assignments. The assignments required developing and implementing fast methods producing high quality solutions to difficult instances of difficult problems, including the travelling salesman problem, the facility location problem and the vehicle routing problem.

ACADEMIC DUTIES

Program committees

Member of the PC of The 7th International Workshop on Graphical Models for Security (GraMSec 2020).

Reviewing activities

I have served as an external reviewer for the following:

Journals: Ars Combinatoria, Discussiones Mathematicae Graph Theory, International Journal of Information Security, Frontiers of mathematics in China, Opuscula Mathematica.

Conferences: ICTAC 2020, PoEM 2020, DBSec 2019, ESORICS 2018, GraMSec 2018, FPS 2017.

Students supervision

Venkata Ramakrishna Chivukula — KTH Royal Institute of Technology, 2020
Thesis: *Detecting Cybersecurity Anti-Patterns in System Architecture Models*, co-supervised with Per Eliasson.

OptiTool – how to secure your system in an optimal way, — INSA Rennes, 2018 – 2019
One year project executed by the 4th year computer science students, co-supervised with Barbara Kordy. The goal of the project was to create an easy-to-use tool for security analysis using attack-defense trees.

Nicolas Huette — École Polytechnique (X), 2018
Project: *Linear programming on attack–defense trees*, co-supervised with Barbara Kordy.

Angèle Bossuat — University Rennes 1, 2017
Thesis: *Attack–defense trees for computer security: formal modeling of preventive and reactive countermeasures*, co-supervised with Barbara Kordy.

Teaching

At KTH Royal Institute of Technology (2020):
· *EH1010 Elektroprojekt (Project Management)*, course responsible.

At AGH University of Science and Technology (2014 – 2016):
· *Calculus*, exercise sessions, 1st year of bachelor, 88 hours.
· *Extremal Combinatorics*, exercise sessions, 2nd year of master, 15 hours.
· *Introduction to Discrete Mathematics and Logics*, exercise sessions, 1st year of bachelor, 90 hours.
· *Linear Algebra and Geometry*, exercise sessions, 1st year of bachelor, 40 hours.

Other responsibilities

I co-organised the 25th Workshop On Graph Theory "3in1", held at Dosłońce, Poland, on 16-19 November 2016.

OUTSIDE INTERESTS

History, chess, climbing, boxing.

PUBLICATIONS

In peer-reviewed international journals

[1] Wojciech Wideł, Mathias Ekstedt, and Preetam Mukherjee. Selection of cybersecurity countermeasures using Meta Attack Language and probabilistic attack graphs. (Submitted).

[2] Wojciech Wideł, Simon Hacks, Mathias Ekstedt, Pontus Johnson, and Robert Lagerström. The Meta Attack Language – A Formal Description. (Submitted).

[3] Wojciech Wideł. On implicit degree-type conditions for hamiltonicity in implicit claw-f-heavy graphs. *Ars Combinatoria*. (To appear).

[4] Ligong Wang, Wojciech Wideł, and Wei Zheng. On implicit heavy subgraphs and hamiltonicity of 2-connected graphs. *Discussiones Mathematicae Graph Theory*, 41(1):167–181, 2021.

[5] Wojciech Wideł, Maxime Audinot, Barbara Fila, and Sophie Pinchinat. Beyond 2014: Formal Methods for Attack Tree–based Security Modeling. *ACM Computing Surveys*, 52(4):75:1–75:36, August 2019.

[6] Wojciech Wideł. Fan's condition on induced subgraphs for circumference and pancyclicity. *Opuscula Mathematica*, 37(4):617–639, 2017.

[7] Wojciech Wideł. A triple of heavy subgraphs ensuring pancyclity of 2-connected graphs. *Discussiones Mathematicae Graph Theory*, 37(2):477–500, 2017.

[8] Wojciech Wideł. A Fan-type heavy triple of subgraphs for pancyclicity of 2-connected graphs. *Discrete Mathematics*, 340(7):1639–1644, 2017.

[9] Wojciech Wideł. Clique-heavy subgraphs and pancyclicity of 2-connected graphs. *Information Processing Letters*, 117:6–9, 2017.

[10] Wojciech Wideł. A Fan-type heavy pair of subgraphs for pancyclicity of 2-connected graphs. *Discussiones Mathematicae Graph Theory*, 36(1):173–184, 2016.

In peer-reviewed international conferences

[11] Barbara Fila and Wojciech Wideł. Exploiting attack-defense trees to find an optimal set of countermeasures. In *Computer Security Foundations (CSF)*, pages 395–410. IEEE, 2020.

[12] Barbara Fila and Wojciech Wideł. Attack–defense trees for abusing optical power meters: A case study and the OSEAD tool experience report. In *Graphical Security Modeling (GraMSec)*, volume 11720 of *LNCS*, pages 95–125. Springer, 2019.

[13] Barbara Fila and Wojciech Wideł. Efficient attack–defense tree analysis using Pareto attribute domains. In *Computer Security Foundations (CSF)*, pages 200–215. IEEE, 2019.

[14] Barbara Kordy and Wojciech Wideł. On Quantitative Analysis of Attack–Defense Trees with Repeated Labels. In *Principles of Security and Trust (POST)*, volume 10804 of *LNCS*, pages 325–346. Springer, 2018.

[15] Barbara Kordy and Wojciech Wideł. How Well Can I Secure My System? In *Integrated Formal Methods (iFM)*, volume 10510 of *LNCS*, pages 332–347. Springer, 2017.