

DR. FRANK BREITINGER

6800 Feldkirch (Austria)

Citizenship: German

EDUCATION

PhD - Computer Sciences

March 2011 - June 2014

Technical University Darmstadt

- Emphasis on Cyber Forensics and Cybersecurity.
- Member of da/sec - biometrics and internet-security research group.
- Member of Center for Advanced Security Research Darmstadt (CASED).

MSc. - Computer Sciences

March 2009 - February 2011

University of Applied Sciences Darmstadt

- Emphasis on Cyber Forensics and Cybersecurity.

BSc. - Computer Sciences

October 2005 - February 2009

University of Applied Sciences Mannheim

- Emphasis on Software Development.
- Practical semester at the University of Maryland (USA). Sept. 2007 to Mar. 2008.
- Thesis at sobedi GmbH Mannheim with a focus on software development. Aug. 2008 to Feb. 2009.

WORK EXPERIENCE

University of Liechtenstein

Juni 2019 - present

Assistant Professor (non-tenure track)

Vaduz, Liechtenstein

Hilti Chair for Data and Application Security

- Developing and teaching multiple course in cybersecurity and information systems development.
- Responsible for the Competence Center in cybersecurity and digital innovation.

University of New Haven

September 2014 - August 2019

Assistant Professor (tenure track)

West Haven, CT, USA

Co-Director of the Cyber Forensics Research and Education Laboratory

- Developing and teaching multiple course in cybersecurity and digital forensics.
- Applying to various research funding agencies.
- Member of the Faculty Senate and engineering LLC advisor.
- Coach of the University Hacking Team.
- Started developing the PhD in Engineering / Applied Sciences.
- Student recruitment during open houses, accepted students days and other events.

University of Applied Sciences Darmstadt

March 2011 - March 2014

Research Assistant

Darmstadt, Germany

- Research in cybersecurity and digital forensics.
- Teaching and supporting classes cybersecurity.
- Sponsored by the FIDELITY Grant - Working on the indexing problem of similarity digests (a.k.a. fingerprints) for the European passport.

National Institute of Standards and Technology (NIST)

October 2013 - December 2013

NIST, Visiting Researcher

Gaithersburg, MD, USA

- Developed Special Publication 800-168 named Approximate Matching: Definition and Terminology.

IT-fuer-jedermann.de

Self-Employed

September 2009 - August 2014

Beerfelden, Germany

- Security assessment and maintenance of the IT-Infrastructure for companies.
- Webdesign, Internet/Network, Consultation, Education and Sale.
- Designed and implemented several web pages based on Wordpress and PHP.

DEVELOPMENT AND OTHER ACTIVITIES*

1. 2017: **Research Fellowship** (two weeks) at Brno university of technology with the NES@FIT - Networked and embedded systems research group. Supported researchers on various projects as well as gave presentations.
2. 2017: Helped organizing the **National Workshop on Redefining Cyber Forensics (NWRFCF)**, two days) in Hartford (CT) which was NSF sponsored. A blue-ribbon panel to stimulate the needed intellectual exchange of ideas and discussions on the future of cyber forensics.
3. 2016: **Master Teacher Seminar** (two days) with Dr. Harvey Brightman, sponsored by the College of Business at the University of New Haven.
4. 2016: **KEEN ICE Workshop** (three days) featuring activities and presentations covering the important aspects of Entrepreneurially Minded Learning (EML), Active and Collaborative Learning (ACL), and Problem/Project Based Learning (PBL) and how to integrate them into your own courses. Details [here](#).

*Some selected activities.

AWARDS & HONORS

1. 2019: Best Paper Award for *Understanding the effects of removing common blocks on Approximate Matching scores under different scenarios for digital forensic investigations*, Simpósio Brasileiro em Segurança da Informação e de Sistemas Computacionais, Sao Paula, Brazil.
2. 2018: Best Paper Award for *If I Had a Million Cryptos: Cryptowallet Application Analysis and A Trojan Proof-of-Concept*, International Conference on Digital Forensics and Cyber Crime, New Orleans, United States.
3. 2018: Student hacking team received Forth place in the northeast qualifiers of the Collegiate Penetration Testing Competition (CPTC) at the University of Pennsylvania.
4. 2017: University Research Scholar – (the scholar receives a partial teaching workload release for 3 academic years + a modest budget).
5. 2017: Best Paper award for *Expediting MRSB-v2 Approximate Matching with Hierarchical Bloom Filter Trees*, International Conference on Digital Forensics and Cyber Crime, Prague, Czech Republic.
6. 2017: Student hacking team received Second place at CyberSEED, University of Connecticut.
7. 2017: Student hacking team received Third place in the northeast qualifiers of the Collegiate Penetration Testing Competition (CPTC) at the University of Pennsylvania.
8. 2016: Merit Award – University of New Haven (in recognition of individual strong performance, and support of students in experiential education opportunities, as well as to acknowledge the overall contribution).

9. 2015: FBTI Award of Excellence – Fachbereichstag Informatik for my dissertation in Computer Science at a German Universities of Applied Science.
10. 2015: Best Paper award for *How Cuckoo Filter Can Improve Existing Approximate Matching Techniques*, International Conference on Digital Forensics and Cyber Crime, Seoul, Korea.
11. 2015: Siew-Sngiem Best Poster Award for *Towards Bloom Filter-based Indexing of Iris Biometric Data*, International Conference on Biometrics, Phuket, Thailand.
12. 2014: Best paper award for *File Detection On Network Traffic Using Approximate Matching*, International Conference on Digital Forensics and Cyber Crime, New Haven (CT), United States.
13. 2013: Best paper award for *Evaluating Detection Error Trade-offs for Byte-wise Approximate Matching Algorithms*, International Conference on Digital Forensics and Cyber Crime, Moscow, Russia.

FUNDING

Section lists only successful applications.

1. 2020: Source European Economic Area (EEA), Title: Advancing human performance in cybersecurity, PI: Agne Brilingaite, Laima Ambrozaityte, Linas Buauskas, Co-PIs: Frank Breitingger, Stefan Suetterlin, Ricardo G. Lugo, Benjamin J. Knox, Ginta Majore, Olaf Maennel, Ausrius Juozapavicius, Amount: ~\$1,100,000 (€999,131) – submitted.
2. 2020: Source AIBA / ERASMUS KA2, Title: Alliance for developing, teaching and training Digital Forensics and Incident Response students and practitioners (# 2020-1-LI01-KA203-000185), PI: Frank Breitingger, Co-PIs: Holger Morgenstern, Ondrej Rysavy, John Sheppard, Amount: ~ \$300,000 (€273,280) – funded.
3. 2019: Source NSA / NSF, Title: University of New Haven’s Cyber Agent Academy (Student camp), PI: Ibrahim Baggili, Co-PIs: Frank Breitingger, Liberty Page, Amount: \$80,000 – funded.
4. 2018: Source: University of New Haven, Title: Cryptowallet Application Analysis, PI: Frank Breitingger, Amount: \$3,250 – funded.
5. 2018: Source NSA / NSF, Title: University of New Haven’s Cyber Agent Academy (Student camp), PI: Ibrahim Baggili, Co-PIs: Frank Breitingger, Liberty Page, Amount: \$64,099 – funded.
6. 2017: Source: Davis Educational Foundation, Title: Development of the ‘CyberWorld’ Common Course at the University of New Haven, PI: Frank Breitingger, Co-PIs: Kristen Przyborski, Ronald Harichandran, Ibrahim Baggili, Guy-Serge Emmanuel, Glenn McGee Amount \$103,125 (\$167,418 including cost sharing) – funded.
7. 2017: Source: NSF, Title: Exploring cybersecurity & forensics of Virtual Reality systems and their impact on cybersecurity education, PI: Ibrahim Baggili, Co-PI: Frank Breitingger, Amount \$179,409 – funded.
8. 2017: Source: University of New Haven, Title: Availability of Datasets for digital forensics - and what is missing, PI: Frank Breitingger, Amount: \$3,250 – funded.
9. 2017: Source NSA / NSF, Title: University of New Haven’s Cyber Agent Academy (Student camp), PI: Ibrahim Baggili, Co-PIs: Frank Breitingger, Liberty Page, Amount: \$53,029 – funded.
10. 2016: Source: NSF, Title: National Workshop on Redefining Cyber Forensics (NWRFCF), PI: Ibrahim Baggili, Co-PI: Frank Breitingger, Amount: \$49,995 – funded.
11. 2016: Source: University of New Haven, Title: A survey to enhance adult education in cyber security, PI: Frank Breitingger, Amount: \$3,250 – funded.

12. 2014: Source: Purdue University sub-award through Department of Homeland Security, Title: Artifact Genome Project, PI: Ibrahim Baggili, Co-PIs: Frank Breitingner, Ted Markowitz, Amount: \$140,000 – funded.

PUBLICATIONS & PRESENTATIONS

Books

1. Frank Breitingner and Ibrahim Baggili, eds. *Digital Forensics and Cyber Crime: 10th International EAI Conference, ICDF2C 2018, New Orleans, LA, USA, September 10–12, 2018, Proceedings*. Vol. 259. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering. Springer International Publishing, Dec. 30, 2018. ISBN: 978-3-030-05486-1.
2. Joshua I. James and Frank Breitingner, eds. *Digital Forensics and Cyber Crime: 7th International Conference, ICDF2C 2015, Seoul, South Korea, October 6-8, 2015, Revised Selected Papers*. Vol. 157. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering. Springer, Oct. 8, 2015. ISBN: 978-3-319-25511-8.

Book Chapters

1. Joseph Ricci, Ibrahim Baggili, and Frank Breitingner. “Watch What You Wear: Smartwatches and Sluggish Security”. In: *Managing Security Issues and the Hidden Dangers of Wearable Technologies*. Ed. by Andrew Marrington, Don Kerr, and John Gammack. IGI Global, Sept. 1, 2016, p. 47.

Journal Articles (peer-reviewed)

1. Tina Wu, Frank Breitingner, and Stephen O’Shaughnessy. “Digital forensic tools: Recent advances and enhancing the status quo”. *Forensic Science International: Digital Investigation* 34 (Aug. 14, 2020), p. 300999. ISSN: 2666-2817.
2. David Palmbach and Frank Breitingner. “Artifacts for detecting timestamp manipulation in NTFS on Windows and their reliability”. *Forensic Science International: Digital Investigation* 32 (June 4, 2020), p. 300920. ISSN: 2666-2817.
3. Johannes Schneider and Frank Breitingner. “AI Forensics: Did the Artificial Intelligence System Do It? Why?” *arXiv preprint arXiv:2005.13635* (May 27, 2020).
4. Vitor Hugo Galhardo Moia, Frank Breitingner, and Marco Aurélio Amaral Henriques. “The impact of excluding common blocks for approximate matching”. *Computers & Security* 89 (Nov. 28, 2019), p. 101676. ISSN: 0167-4048.
5. Frank Breitingner, Ryan Tully-Doyle, and Courtney Hassenfeldt. “A survey on smartphone user’s security choices, awareness and education”. *Computers & Security* 88 (Oct. 11, 2019), p. 101647. ISSN: 0167-4048.
6. Peter Casey, Rebecca Lindsay-Decusati, Ibrahim Baggili, and Frank Breitingner. “Inception: Virtual Space in Memory Space in Real Space – Memory Forensics of Immersive Virtual Reality with the HTC Vive”. *Digital Investigation* 29 (July 14, 2019), S13–S21. ISSN: 1742-2876.
7. Kristen Przyborski, Frank Breitingner, Lauren Beck, and Ronald S Harichandran. ““CyberWorld” as a Theme for a University-wide First-year Common Course”. *2019 ASEE Annual Conference & Exposition (Presented at Cyber Technology)* (June 18, 2019).
8. Lorenz Liebler, Patrick Schmitt, Harald Baier, and Frank Breitingner. “On efficiency of artifact lookup strategies in digital forensics”. *Digital Investigation* 28 (Apr. 24, 2019), S116–S125. ISSN: 1742-2876.
9. Joseph Ricci, Ibrahim Baggili, and Frank Breitingner. “Blockchain-Based Distributed Cloud Storage Digital Forensics: Where’s the Beef?” *IEEE Security & Privacy* 17.1 (Jan. 1, 2019), pp. 34–42. ISSN: 1540-7993.

10. Mark Debinski, Frank Breitingner, and Parvathy Mohan. "Timeline2GUI: A Log2Timeline CSV parser and training scenarios". *Digital Investigation* 28 (Dec. 31, 2018), pp. 34–43. ISSN: 1742-2876.
11. Cinthya Grajeda, Laura Sanchez, Ibrahim Baggili, Devon Clark, and Frank Breitingner. "Experience constructing the Artifact Genome Project (AGP): Managing the domain's knowledge one artifact at a time". *Digital Investigation* 26 (July 15, 2018), S47–S58. ISSN: 1742-2876.
12. Joseph Ricci, Frank Breitingner, and Ibrahim Baggili. "Survey results on adults and cybersecurity education". *Education and Information Technologies* (July 11, 2018), pp. 1–19. ISSN: 1360-2357.
13. Devon R. Clark, Christopher Meffert, Ibrahim Baggili, and Frank Breitingner. "DROP (DRone Open source Parser) your drone: Forensic analysis of the DJI Phantom III". *Digital Investigation* 22, Supplement (Aug. 5, 2017), S3–S14. ISSN: 1742-2876.
14. George Denton, Filip Karpisek, Frank Breitingner, and Ibrahim Baggili. "Leveraging the SRTP protocol for over-the-network memory acquisition of a GE Fanuc Series 90-30". *Digital Investigation* 22, Supplement (Aug. 5, 2017), S26–S38. ISSN: 1742-2876.
15. Cinthya Grajeda, Frank Breitingner, and Ibrahim Baggili. "Availability of datasets for digital forensics – And what is missing". *Digital Investigation* 22, Supplement (Aug. 5, 2017), S94–S105. ISSN: 1742-2876.
16. Xiaolu Zhang, Ibrahim Baggili, and Frank Breitingner. "Breaking into the vault: privacy, security and forensic analysis of android vault applications". *Computers & Security* 70 (Aug. 2, 2017), pp. 516–531. ISSN: 0167-4048.
17. Jason Moore, Ibrahim Baggili, and Frank Breitingner. "Find Me If You Can: Mobile GPS Mapping Applications Forensics Analysis & SNAVP The Open Source, Modular, Extensible Parser". *Journal of Digital Forensics, Security and Law (JDFSL)* 12.1 (June 13, 2017), p. 7.
18. Vikram S. Harichandran, Frank Breitingner, and Ibrahim Baggili. "Byte-wise Approximate Matching: The Good, The Bad, and The Unknown". *Journal of Digital Forensics, Security and Law* 11.2 (Dec. 26, 2016), pp. 59–78.
19. Samer Al-khateeb, Kevin J. Conlan, Nitin Agarwal, Ibrahim Baggili, and Frank Breitingner. "Exploring Deviant Hacker Networks (DHN) On Social Media Platforms". *Journal of Digital Forensics, Security and Law* 11.2 (Dec. 26, 2016), pp. 7–20.
20. Doowon Jeong, Frank Breitingner, Hari Kang, and Sangjin Lee. "Towards Syntactic Approximate Matching-A Pre-Processing Experiment". *The Journal of Digital Forensics, Security and Law: JDFSL* 11.2 (Dec. 26, 2016), pp. 97–110.
21. Kevin Conlan, Ibrahim Baggili, and Frank Breitingner. "Anti-forensics: Furthering digital forensic science through a new extended, granular taxonomy". *Digital Investigation* 18 (Aug. 7, 2016), pp. 66–75. ISSN: 1742-2876.
22. Vikram S. Harichandran, Daniel Walnycky, Ibrahim Baggili, and Frank Breitingner. "CuFA: A more formal definition for digital forensic artifacts". *Digital Investigation* 18 (Aug. 7, 2016), pp. 125–137. ISSN: 1742-2876.
23. Christopher S. Meffert, Ibrahim Baggili, and Frank Breitingner. "Deleting collected digital evidence by exploiting a widely adopted hardware write blocker". *Digital Investigation* 18 (Aug. 7, 2016), pp. 87–96. ISSN: 1742-2876.
24. Xiaolu Zhang, Frank Breitingner, and Ibrahim Baggili. "Rapid Android Parser for Investigating DEX files (RAPID)". *Digital Investigation* 17 (Mar. 25, 2016), pp. 28–39. ISSN: 1742-2876.

25. Vikram S. Harichandran, Frank Breitingger, Ibrahim Baggili, and Andrew Marrington. “A cyber forensics needs analysis survey: Revisiting the domain’s needs a decade later”. *Computers & Security* 57 (Nov. 10, 2015), pp. 1–13. ISSN: 0167-4048.
26. Filip Karpisek, Ibrahim Baggili, and Frank Breitingger. “WhatsApp network forensics: Decrypting and understanding the WhatsApp call signaling messages”. *Digital Investigation* 15 (Oct. 10, 2015), pp. 110–118. ISSN: 1742-2876.
27. Daniel Walnycky, Ibrahim Baggili, Andrew Marrington, Jason Moore, and Frank Breitingger. “Network and device forensic analysis of Android social-messaging applications”. *Digital Investigation* 14, Supplement 1 (Aug. 9, 2015). The Proceedings of the Fifteenth Annual DFRWS Conference, pp. 77–84. ISSN: 1742-2876.
28. Christian Rathgeb, Frank Breitingger, Christoph Busch, and Harald Baier. “On application of bloom filters to iris biometrics”. *IET Biometrics* 3.4 (Dec. 18, 2014), pp. 207–218. ISSN: 2047-4938.
29. Frank Breitingger, Christian Rathgeb, and Harald Baier. “An Efficient Similarity Digests Database Lookup - A Logarithmic Divide & Conquer Approach”. *Journal of Digital Forensics, Security and Law (JDFSL)* 9.2 (Sept. 1, 2014), pp. 155–166.
30. Frank Breitingger, Georgios Stivaktakis, and Harald Baier. “FRASH: A Framework to Test Algorithms of Similarity Hashing”. *Digit. Investig.* 10 (Aug. 3, 2014), S50–S58. ISSN: 1742-2876.
31. Frank Breitingger, Georgios Stivaktakis, and Vassil Roussev. “Evaluating Detection Error Trade-offs for Byte-wise Approximate Matching Algorithms”. *Digital Investigation* 11.2 (June 8, 2014). **Best Paper Award**, pp. 81–89. ISSN: 1742-2876.
32. Frank Breitingger and Ibrahim Baggili. “File Detection On Network Traffic Using Approximate Matching”. *Journal of Digital Forensics, Security and Law (JDFSL)* 9.2 (May 22, 2014). **Best Paper Award**, pp. 23–36.
33. Frank Breitingger, Harald Baier, and Douglas White. “On the database lookup problem of approximate matching”. *Digital Investigation* 11, Supplement 1.0 (Mar. 13, 2014). Proceedings of the First Annual DFRWS Europe, S1–S9. ISSN: 1742-2876.
34. Frank Breitingger and Vassil Roussev. “Automated evaluation of approximate matching algorithms on real data”. *Digital Investigation* 11, Supplement 1.0 (Mar. 13, 2014). Proceedings of the First Annual DFRWS Europe, S10–S17. ISSN: 1742-2876.

Conference Proceedings (peer-reviewed)

1. Vitor Hugo Galhardo Moia, Frank Breitingger, and Marco Aurélio Amaral Henriques. “Understanding the effects of removing common blocks on Approximate Matching scores under different scenarios for digital forensic investigations”. In: *XIX Brazilian Symposium on information and computational systems security*. **Best Paper Award**. Brazilian Computer Society (SBC) SÃŁ o Paulo-SP, Brazil. Sept. 5, 2019.
2. Tina Wu, Frank Breitingger, and Ibrahim Baggili. “IoT Ignorance is Digital Forensics Research Bliss: A Survey to Understand IoT Forensics Definitions, Challenges and Future Research Directions”. In: *Proceedings of the 14th International Conference on Availability, Reliability and Security*. ARES ’19. Canterbury, CA, United Kingdom: ACM, Aug. 25, 2019, 46:1–46:15. ISBN: 978-1-4503-7164-3.
3. Trevor Haigh, Frank Breitingger, and Ibrahim Baggili. “If I Had a Million Cryptos: Cryptowallet Application Analysis and a Trojan Proof-of-Concept”. In: *Digital Forensics and Cyber Crime*. Ed. by Frank Breitingger and Ibrahim Baggili. **Best Paper Award**. Cham: Springer International Publishing, Dec. 30, 2018, pp. 45–65. ISBN: 978-3-030-05487-8.

4. Robert Schmicker, Frank Breitingner, and Ibrahim Baggili. “AndroParse - An Android Feature Extraction Framework and Dataset”. In: *Digital Forensics and Cyber Crime*. Ed. by Frank Breitingner and Ibrahim Baggili. Cham: Springer International Publishing, Dec. 30, 2018, pp. 66–88. ISBN: 978-3-030-05487-8.
5. Laoise Luciano, Ibrahim Baggili, Mateusz Topor, Peter Casey, and Frank Breitingner. “Digital Forensics in the Next Five Years”. In: *Proceedings of the 13th International Conference on Availability, Reliability and Security*. ARES 2018. Hamburg, Germany: ACM, Aug. 30, 2018, 46:1–46:14. ISBN: 978-1-4503-6448-5.
6. Lorenz Liebler and Frank Breitingner. “mrsh-mem: Approximate Matching on Raw Memory Dumps”. In: *2018 11th International Conference on IT Security Incident Management IT Forensics (IMF)*. May 9, 2018, pp. 47–64.
7. Brandon Knieriem, Xiaolu Zhang, Philip Levine, Frank Breitingner, and Ibrahim Baggili. “An Overview of the Usage of Default Passwords”. In: *Digital Forensics and Cyber Crime*. Ed. by Petr Matoušek and Martin Schmiedecker. Cham: Springer International Publishing, Jan. 6, 2018, pp. 195–203. ISBN: 978-3-319-73697-6.
8. David Lillis, Frank Breitingner, and Mark Scanlon. “Expediting MRSH-v2 Approximate Matching with Hierarchical Bloom Filter Trees”. In: *Digital Forensics and Cyber Crime*. Ed. by Petr Matoušek and Martin Schmiedecker. **Best Paper Award**. Cham: Springer International Publishing, Jan. 6, 2018, pp. 144–157. ISBN: 978-3-319-73697-6.
9. Christopher Meffert, Devon Clark, Ibrahim Baggili, and Frank Breitingner. “Forensic State Acquisition from Internet of Things (FSAIoT): A General Framework and Practical Approach for IoT Forensics Through IoT Device State Acquisition”. In: *Proceedings of the 12th International Conference on Availability, Reliability and Security*. ARES ’17. Reggio Calabria, Italy: ACM, Sept. 1, 2017, 56:1–56:11. ISBN: 978-1-4503-5257-4.
10. Vikas Gupta and Frank Breitingner. “How Cuckoo Filter Can Improve Existing Approximate Matching Techniques”. English. In: *Digital Forensics and Cyber Crime*. Ed. by Joshua I. James and Frank Breitingner. Vol. 157. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering. **Best Paper Award**. Springer International Publishing, Dec. 25, 2015, pp. 39–52. ISBN: 978-3-319-25511-8.
11. Ibrahim Baggili, Jeff Oduru, Kyle Anthony, Frank Breitingner, and Glenn McGee. “Watch What You Wear: Preliminary Forensic Analysis of Smart Watches”. In: *Availability, Reliability and Security (ARES), 2015 10th International Conference on*. Aug. 27, 2015, pp. 303–311.
12. Christian Rathgeb, Frank Breitingner, Harald Baier, and Christoph Busch. “Towards Bloom filter-based indexing of iris biometric data”. In: *Biometrics (ICB), 2015 International Conference on*. **Siew-Sngiem Best Poster Award**. IEEE. May 22, 2015, pp. 422–429.
13. Gurjar Satyendra, Ibrahim Baggili, Frank Breitingner, and Alice Fischer. “An empirical comparison of widely adopted hash functions in digital forensics: does the programming language and operating system make a difference?” In: *Proceedings of the Conference on Digital Forensics, Security and Law*. May 19, 2015, pp. 57–68.
14. Ibrahim Baggili and Frank Breitingner. “Data Sources for Advancing Cyber Forensics: What the Social World Has to Offer”. In: *AAAI Spring Symposium Series*. Mar. 12, 2015.
15. Frank Breitingner et al. “Towards a Process Model for Hash Functions in Digital Forensics”. English. In: *Digital Forensics and Cyber Crime*. Ed. by Pavel Gladyshev, Andrew Marrington, and Ibrahim Baggili. Vol. 132. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering. Springer International Publishing, Dec. 23, 2014, pp. 170–186. ISBN: 978-3-319-14288-3.

16. Frank Breitinger, Christian Winter, York Yannikos, Tobias Fink, and Michael Seefried. "Using Approximate Matching to Reduce the Volume of Digital Data". English. In: *Advances in Digital Forensics X*. Ed. by Gilbert Peterson and Sujeet Shenoj. Vol. 433. IFIP Advances in Information and Communication Technology. Springer Berlin Heidelberg, Jan. 1, 2014, pp. 149–163. ISBN: 978-3-662-44951-6.
17. Frank Breitinger, Georg Ziroff, Steffen Lange, and Harald Baier. "Similarity Hashing Based on Levenshtein Distances". English. In: *Advances in Digital Forensics X*. Ed. by Gilbert Peterson and Sujeet Shenoj. Vol. 433. IFIP Advances in Information and Communication Technology. Springer Berlin Heidelberg, Jan. 1, 2014, pp. 133–147. ISBN: 978-3-662-44951-6.
18. Frank Breitinger and Harald Baier. "Similarity Preserving Hashing: Eligible Properties and a New Algorithm MRSH-v2". English. In: *Digital Forensics and Cyber Crime*. Ed. by Marcus Rogers and Kathryn C. Seigfried-Spellar. Vol. 114. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering. Springer Berlin Heidelberg, Nov. 1, 2013, pp. 167–182. ISBN: 978-3-642-39890-2.
19. Christian Rathgeb, Frank Breitinger, and Christoph Busch. "Alignment-free cancelable iris biometric templates based on adaptive bloom filters". In: *Biometrics (ICB), 2013 International Conference on*. Sept. 30, 2013, pp. 1–8.
20. Frank Breitinger, Knut Astebøl, Harald Baier, and Christoph Busch. "mvHash-B - A New Approach for Similarity Preserving Hashing". In: *IT Security Incident Management and IT Forensics (IMF), 2013 Seventh International Conference on*. July 25, 2013, pp. 33–44.
21. Frank Breitinger and Kaloyan Petrov. "Reducing the Time Required for Hashing Operations". English. In: *Advances in Digital Forensics IX*. Ed. by Gilbert Peterson and Sujeet Shenoj. Vol. 410. IFIP Advances in Information and Communication Technology. Springer Berlin Heidelberg, Jan. 1, 2013, pp. 101–117. ISBN: 978-3-642-41147-2.
22. Frank Breitinger and Harald Baier. "Performance Issues About Context-Triggered Piecewise Hashing". English. In: *Digital Forensics and Cyber Crime*. Ed. by Pavel Gladyshev and Marcus K. Rogers. Vol. 88. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering. Springer Berlin Heidelberg, Dec. 1, 2012, pp. 141–155. ISBN: 978-3-642-35514-1.
23. Frank Breitinger and Harald Baier. "Properties of a similarity preserving hash function and their realization in sdhash". In: *Information Security for South Africa (ISSA)*. Oct. 4, 2012, pp. 1–8.
24. Frank Breitinger, Harald Baier, and Jesse Beckingham. "Security and implementation analysis of the similarity digest sdhash". In: *First International Baltic Conference on Network Security & Forensics (NeSeFo)*. Aug. 1, 2012.
25. Frank Breitinger and Harald Baier. "A fuzzy hashing approach based on random sequences and hamming distance". In: *Proceedings of the Conference on Digital Forensics, Security and Law*. May 1, 2012, pp. 89–100.
26. Harald Baier and Frank Breitinger. "Security Aspects of Piecewise Hashing in Computer Forensics". In: *IT Security Incident Management and IT Forensics (IMF), 2011 Sixth International Conference on*. June 17, 2011, pp. 21–36.
27. Frank Breitinger and Claudia Nickel. "User Survey on Phone Security and Usage". In: *BIOSIG*. Ed. by Arslan Brömme and Christoph Busch. Vol. 164. LNI. GI, June 1, 2010, pp. 139–144. ISBN: 978-3-88579-258-1.

Other major Publications

1. Frank Breitinger. "On the utility of bitwise approximate matching in computer science with a special focus on digital forensics investigations". PhD thesis. Technical University Darmstadt, June 30, 2014.
2. Frank Breitinger, Barbara Guttman, Michael McCarrin, Vassil Roussev, and Douglas White. *Approximate Matching: Definition and Terminology*. Special Publication 800-168. National Institute of Standards and Technologies, May 1, 2014.
3. Frank Breitinger. "Security Aspects of fuzzy hashing". MA thesis. University of Applied Sciences Darmstadt, Mar. 1, 2011.

Workshops, Presentations and Invited Talks

*This section does not include conference presentations.

1. Pavel Laskov and Frank Breitinger. *Blockchain-Technologien und deren Anwendungen im öffentlichen Sektor*. Workshop Liechtensteinische Landesverwaltung. Vaduz, Liechtenstein. Feb. 2020.
2. Frank Breitinger. *IT-Sicherheit im Finanzsektor*. 7. Sorgfaltspflichttag Liechtenstein. Schaan, Liechtenstein. Oct. 2019.
3. Trevor Haigh and Frank Breitinger. *Android Forensics and Reverse Engineering*. Workshop at the Digital Forensics Research Conference (DFRWS). Providence, Rhode Island. July 2018.
4. Frank Breitinger. *State-of-the-art in Cyber Forensics: Now & Tomorrow*. Presentation at KAIST. Daejeon, South Korea. Aug. 2017.
5. Frank Breitinger and Ibrahim Baggili. *Five Presentations including IoT, Drones, Similarity matching, mobile applications and PLCs*. National Training on Crime Scene Management in cases of terrorism related offences organized by **United Nations Office on Drugs and Crime (UNODC)**. Amman, Jordan. Jan. 2017.
6. Frank Breitinger. *Reducing data for forensic investigations using approximate matching*. Presentation at University New Haven. Feb. 2014.
7. Barbara Guttman, Frank Breitinger, Simson Garfinkel, Jesse Kornblum, and Clay Shields. *Approximate Matching of Digital Artifacts*. Panel discussion at 13th Digital Forensics Research Conference (DFRWS13). Monterey, California. Aug. 2013.
8. Frank Breitinger. *Similarity Preserving Hashing*. Presentation at 8. GI SIG SIDAR Graduate Workshop on Reactive Security (SPRING). Feb. 2013.
9. Frank Breitinger. *Similarity Preserving Hashing*. Presentation at CAST Workshop - Forensik und Internetkriminalitaet. Darmstadt, Germany. Dec. 2012.
10. Frank Breitinger and Harald Baier. *Security Aspects of Piecewise Hashing in Computer Forensics*. Abstract and Presentation at 6. GI SIG SIDAR Graduate Workshop on Reactive Security (SPRING). Mar. 2011.

UNIVERSITY SERVICE

University of New Haven

- 09/2018 - 05/2019: Advisor for the Engineering Living Learning Community (LLC).
- 08/2017 - 05/2019: Member of the Academic Committee on Student Life.
- 05/2016 - 05/2019: Member of the University of New Haven Faculty Senate.

PROFESSIONAL / PUBLIC SERVICE

Advisory Committee Members

- 11/2017 - 07/2018: Member of the Advisory Committee for Project Lead the Way (PLTW) Cyber-security.

Steering Committee Member

- 2018 - 2019: International Conference on Digital Forensics & Cyber Crime (ICDF2C).

Board Member

- 2016 - today: Digital Investigation (DI).
- 2014 - 2019: Journal of Digital Forensics, Security and Law (JDFSL).

Chair positions

- 2020: *Workshop Co-Chair* for the Digital Forensics Research Conference (DFRWS) 2020, Oxford, UK.
- 2018: *Technical Program Chair* for the 10th International Conference on Digital Forensics & Cyber Crime, New Orleans, US.
- 2016: *General Co-Chair* for the International Conference on Digital Forensics & Cyber Crime, Manhattan, US.
- 2015: *Technical Program Chair* for the 7th International Conference on Digital Forensics & Cyber Crime, Seoul, South Korea.
- 2014: *Technical Program Chair* for the 6th International Conference on Digital Forensics & Cyber Crime, New Haven (CT), US.

Program Committee Member

Current:

- 2016 - today: Digital Investigations (DI, Journal)
- 2015 - today: International Conference on Availability, Reliability and (ARES) (WSDF workshop).
- 2015 - today: Systematic Approaches to Digital Forensic Engineering (SADFE).
- 2014 - today: Digital Forensics Research Conference (DFRWS US).
- 2014 - today: Digital Forensics Research Conference Europe (DFRWS EU).
- 2014 - today: International Conference on Digital Forensics (IFIP WG 11.9).

Past:

- 2013 - 2019: International Conference on Digital Forensics & Cyber Crime (ICDF2C).
- 2015 - 2017: Conference on Digital Forensics, Security and Law (ADFSL).

Reviewer for Articles in

- 2018-2020: Computers & Security.
- 2019: IEEE Access - The Multidisciplinary Open Access Journal.
- 2018: IEEE Transactions on Dependable and Secure Computing.
- 2018: Journal of Forensic Sciences.
- 2017: IEEE Security & Privacy (magazine).
- 2017: IEEE Transactions on Information Forensics and Security.
- 2017: Indian Journal of Science and Technology.
- 2017: Journal of Information Security and Applications.
- 2017: Information Systems.
- 2016: ACM Computing Surveys.
- 2015: Digital Investigation.
- 2015: Journal of Information Technology.

TEACHING EXPERIENCES

Bern University of Applied Sciences (adjunct)

- Cyber Investigation Fundamentals (graduate)

University of Liechtenstein

- Information Systems Development (graduate)
- System Analysis and Design (undergraduate)
- Data and Application Security (lab, graduate).

University of New Haven

- Introduction to Network Security (graduate & undergraduate).
- Introduction to Scripting / Python (graduate & undergraduate).
- Reverse Engineering (Android / ARM) (graduate & undergraduate).
- Ethical Hacking (graduate & undergraduate).
- Topics in Cyber Security and Forensics (graduate & undergraduate).
- Introduction to Computer Security (graduate & undergraduate).
- Software Project Analysis and Design (graduate & undergraduate).
- Object oriented Design and Analysis (graduate & undergraduate).
- Senior Software Project (undergraduate).
- Life on Earth - CyberWorld (undergraduate (freshman)).

University of Applied Sciences Darmstadt

- Selected Topics of IT-Security (graduate).
- IT-security seminar on Internet Security and Similarity Hashing (graduate).
- Theory-Seminar about Aspects of Fuzzy Hashing* (graduate) - Teaching assistant.
- Cryptography* (graduate) - Teaching assistant.
- Computer Forensics* (graduate) - Teaching assistant.

*I am more than comfortable with the material and could teach these courses without a long preparation time.

Additional

- Contributed to a 'letter of study' for an online lecture in *digital forensic*. 5 ECTS lecture for Master students including a practical (German).

STUDENTS ADVISING / HOSTED

Note, this section does not list any internships, senior design projects, independent studies or projects.

Master thesis

- 2020: Jan Huck - Ransomware countermeasures in Switzerland and Liechtenstein: A comparative analysis of companies' implemented ransomware strategies (06/2020)
- 2020: Julia Heppler - Application of Artificial Intelligence Approaches in Digital Forensics (11/2020)
- 2020: Engelbert Engelbert Lüchinger - Android malware analysis: A smart hybrid Android malware analysis framework (06/2020)
- 2017: Vikram Harichandran - Cyber forensics needs analysis and solutions entailing artifact formalization and approximate matching.
- 2016: Lorenz Liebler - Approximate matching for malware detection in memory.
- 2015: Tobias Huppertz - Indexing similarity hashes using Bloom filters.
- 2013: Vikas Gupta - File fragment detection on network traffic using similarity hashing.

- 2013: Simon Thurner - Methods for identification of encryption data and its application in digital forensics.
- 2012: Tim Völpel - Forensic-Chatlog-Parser.
- 2012: Knut Petter Åstebøl - mvHash - a new approach for fuzzy hashing.
- 2012: Jesse Beckingham - Security analysis of sdhash.

Bachelor thesis

- 2020: Florin Schädler - Einfluss von App-Berechtigungen auf nutzergenerierte App-Ratings und -Rezensionen
- 2012: Dario Cundari - Software tools for testing similarity preserving algorithms.
- 2012: Georg Ziroff - Approaches for similarity-preserving hashing.

Hosted guests

- 2019: Vitor Moia; University of Campinas, São Paulo, Brazil; research on PhD thesis (3 months).
- 2018: Patrick Schmitt; Technical University Darmstadt; research on master thesis (1 month).
- 2017: Dr. David Lillis; University College Dublin; research on a **Fulbright scholarship** (1 month).
- 2016: Lorenz Liebler; University of Applied Science Darmstadt; research on master thesis (1.5 month).

Hacking Team

- 2015-2018: Supervising hack@UNHcFREG
 - Some success: 3 times finalist for Collegiate Penetration Testing Competition (CPTC) Nationals; 2nd place at CyberSeed 201 (price money \$7,500); tied for 1st in TAMUCTF 2017.

MEDIA CONTRIBUTIONS

Note, this is not a complete list but some selected contributions.

Television

- FOX61: Staying save during Christmas shopping (Live on Good morning Connecticut) (Dec. 8, 2017).
- WTNH - News8: Keeping your kids safe on social media (Aug. 8, 2017).
- WTNH - News8: Social Media Security: Beware the urge to “over-share” (Feb. 6, 2017).
- WTNH - News8: Study: Banks have weak password handling (Mar. 1, 2016).
- FOX-CT: FBI director: Apple encryption dispute “hardest question” seen in government (Feb. 25, 2016).
- CBS Chicago: Is Your Smartwatch Safe From Hackers? (Feb. 9, 2016).
- WTNH - News8: Facebook threat sends schools named ‘Lincoln’ on high alert, including Meriden (Jan. 26, 2016).
- WTNH - News8: Things you should NOT buy online (Dec. 16, 2015).
- WTNH - News8: How to protect your identity from being stolen this holiday season (Dec. 2, 2015).
- WTNH - News8: Experts reveal how ISIS is using the dark web to stay undetected (Nov. 19, 2015).
- Local10: Researchers on smartwatch concerns (Dec. 16, 2015).
- Local10: Watch what you wear: Smartwatches vulnerable to attack (Aug. 3, 2015).
- FOX-CT: Thinking like ‘bad guys’ to protect the interwebs (Jun. 30, 2015).

Internet / Magazines

- Digital Gurdian: Insider vs. Outsider Data Security Threats: What’s the Greater Risk? (Apr. 6, 2018).

- PR Newswire and picked up by several others: University of New Haven Hacking Team Competes Nationally After Winning Regional, Connecticut Competitions (Oct. 31, 2017).
- Hartford Courant: From Manchester Office, Digital Police Detectives Track Down Child-Porn Viewers (continued: Massachusetts Man Faces Glastonbury Voyeurism Charges (Oct. 13, 2016)).
- Bulletin of the Academy of Science and Engineering: Cybersecurity: Implications and Prevention What Can We Learn from the NIST Framework? (Sept. 1, 2016).
- Digital Guardian: Insider vs. Outsider Data Security Threats: What's the Greater Risk? (Jul. 26, 2016).
- Company Dime: Sabre's Silence On Security 'Incident' Isn't Unusual, But It's Still Making Travel Managers Nervous (Sept. 3, 2015).
- CNET: Samsung, LG smartwatches give up personal data to researchers (Jun. 10, 2015).

MORE INFORMATION

More information and auxiliary documents can be found at

- <http://www.FBreitinger.de>
- <https://www.linkedin.com/pub/frank-breitinger/87/65/496>
- <http://www.unhcfreg.com>