Zöbelein Carolin

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Independent mathematical scientist

In short

Current project: Hunting for graduate studies in mathematics ☺

Research motivation: Designing of a new kind of censorship free, access to knowledge warranty, privacy and anonymity preserving internet by a Mathematical Computer Science approach for Distributed Network Structures & Protocols as well as Algorithms, Combinatorics & Optimization.

Areas of work:
Mathematics
Algorithms, Combinatorics, Optimization, Mathematical & Theoretical Computer Science, Number Theory, Algebra, Cryptography, Graph Theory, Geometry

Computer Science
Theoretical Computer Science, Distributed Network Structures & Protocols, Online privacy & anonymity, Online traffic obfuscation and ways for circumventing blocking and censorship, Reverse engineering, Computer forensics, Cryptography, Social engineering

Numbers:
- Research time: ≈ 3.5 years as independent research scientist, 3.25 years of student projects
- Projects: 2 large and several small as independent research scientist, 4 student projects
- Grants & Fellowships: 2, Total: 19 100 EUR
- Awards: 1
- Reviewer jobs: 2
- Exhibitions: 2
- Organized events: >1
- Teaching experience: ≈ 16 years
- Coding experience: ≈ 19 years
- Spoken languages: 7

Websites:
`https://research.carolin-zoebelein.de/`
`https://art.carolin-zoebelein.de/`
`https://blog.carolin-zoebelein.de/`

Practical experience

Current

Primary work

- **Independent mathematical scientist** **Remote, Germany**
  Freelancer, Primary: Researcher, Secondary: Adviser and contractor *Since 2016/11*
  Focus on Mathematical Computer Science of Distributed Network Structures & Protocols as well as Theoretical Computer Science like Algorithms, Combinatorics & Optimization, and Number Theory, with the aim of designing a new kind of censorship free, access to knowledge warranty, privacy and anonymity preserving internet
  Participating in Open Innovation and Open Research Challenges
  `https://research.carolin-zoebelein.de`

Secondary work

- **Artist** **Remote, Germany**
  Freelancer *Since 2015/05*
  Connection and integration of scientific phenomena into artwork, as well as artwork about mathematics, online privacy and anonymity, digital security and human rights
  `https://art.carolin-zoebelein.de`

- **Consulting** **Remote, Germany**
  Freelancer, For cross-subsidization *Since 2017/07*
  `https://consulting.carolin-zoebelein.de`

- **Tor Project** **Remote**
  Volunteering *Since 2016/05*
  `https://www.torproject.org/`

Former

- **Infineon Technologies AG München** **Germany**
  Student research project, Information Security - Cyber Defence Center *2018/11 - 2019/05*
  Topic: *Evading detection and treatment*, Machine learning based malware detection
  Analysing of characteristics usable for detection improvements in existing company protection system of different kinds of malware, Investigation in different possible strategies, Elaboration of a machine learning based solution

- **Friedrich-Alexander-University Erlangen-Nürnberg, Department for Mathematics** **Germany**
  Student assistant, IT-Support *2016/04 - 2016/09*

- **Siemens AG Forchheim** **Germany**
  Working student, Computer Tomography development *2015/03 - 2015/09*
  Data analysis programming for research: Revision of existing numerical analysing scripts for accuracy improvements of CT X-ray tubes
  Coding language: Matlab

- **Friedrich-Alexander-University Erlangen-Nürnberg** **Germany**
  Teaching assistant *2012/10 - 2016/09*
  Tutor for exercise lessons and practical courses in physics and mathematics for undergraduate and graduate level, Involvement in revision of exercise, homework and exam problems as well as in marking of homework and exams

- **High-Octane Motorsports e.V., University Erlangen-Nürnberg** **Germany**
  Student member, Society in terms of the competition Formula Student *2012/10 - 2013/07*
  Implementation of mathematical tire design models according to Pacejka, Hans B.. Comparison of models with collected data of current racing car and deriving information for vehicle dynamics improvements
  Coding language: Matlab

- **University medical centre Erlangen, ENT-hospital, Phoniatry and pedaudiology** — **Germany**
  Research assistant, Group: Fluid physical principles of the human vocalisation — *2011/01 - 2012/03*
  Development and revision of simulation and data analysis programs for research: Simulation of human vocal folds oscillations, Revision and implementation of camera calibration software for recording of vocal folds oscillations of animals, DFG Research Group FOR 894
  Coding languages: C/C++, C#, Python

- **Independent** — **Germany**
  Volunteering — *2004/03 - 2016/03*
  Unpaid private lessons for socially disadvantaged pupils

Education

Studies

- **Friedrich-Alexander-University Erlangen-Nürnberg** — **Germany**
  Bachelor of Science Computer Science, Paused — *2017/10 - 2019/03*
  Major interests: Cryptography, IT-Security, Theoretical Computer Science

- **Friedrich-Alexander-University Erlangen-Nürnberg** — **Germany**
  Master of Science Physics, Aborted — *2013/04 - 2016/09*

- **Friedrich-Alexander-University Erlangen-Nürnberg** — **Germany**
  Bachelor of Science Physics, 2013/09 — *2008/10 - 2013/09*
  Bachelor thesis: *Dirac-Observablen in der Kosmologie* (Dirac observables in cosmology)
  Chair for Theoretical Physics III: Institute for Quantum Gravity, Supervisor: Prof. Dr. Kristina Giesel
  Major interests: Quantum Gravity, Mathematical Physics, Influence of Number Theory on Physics

School education

- **Peter-Vischer-School Nürnberg** — **Germany**
  Department Gymnasium, Mathematic, natural scientific focus — *2004/09 - 2008/06*
  Abitur 2008/06 (University entrance qualification)

- **Peter-Vischer-School Nürnberg** — **Germany**
  Department Realschule, Mathematic, natural scientific, technical focus — *2000/09 - 2004/07*
  School leaving certificate 2004/07

- **Ludwig-Uhland-School Nürnberg** — **Germany**
  Department Hauptschule — *1998/09 - 2000/07*

Training courses

- **Friedrich-Alexander-University Erlangen-Nürnberg** — **Germany**
  Training center for academic teaching (FBZHL) — *2017/11*
  Didactics for tutors of the Faculty of Engineering - Basic course II

- **Friedrich-Alexander-University Erlangen-Nürnberg** — **Germany**
  Training center for academic teaching (FBZHL) — *2017/10*
  Cross-cultural sensitization for tutors

Projects

Research

- **Combsee**
  Mathematical & Theoretical Computer Science research and design work. — *Since 2019/12*
  Theoretical research and implementation of a decentralized, privacy preserving, search engine.
  Former: *Decentralized privacy preserving search by mathematical design*
  Id: project_0055
  Related Funding: NGI Zero Discovery (Id: funding_0003)

Combsee Search: `https://www.combsee.org/`
Project info: `https://research.carolin-zoebelein.de/Projects/2019/Combsee.html`

- **MfDN-Protocol**
  Mathematical & Theoretical Computer Science research and design work. *Since 2019/12*
  A mathematical forced decentralized network protocol.
  Id: project_0058

  Project info: `https://research.carolin-zoebelein.de/Projects/2019/MfDN-Protocol.html`

Art

- **#Hashtag**
  Digital art short film series *Since 2019/08*
  Making fully computer generated short films related to hashtags.
  Id: project_0056art

Grants & Fellowships

- **NGI Zero Discovery** **Netherlands, EU**
  NLnet Foundation *Since 2019/12*
  Grant, 12 months, 19 100 EUR, Related project: project_0055

  NLnet manages the NGI0 Discovery Fund, a fund dedicated to search technologies which creates an open, trustworthy and reliable internet for all. The fund was established with financial support from the European Commission's Next Generation Internet programme, under the aegis of DG Communications Networks, Content and Technology.

  NLnet Discovery: `https://nlnet.nl/discovery/`
  Next Generation Internet: `https://www.ngi.eu/`
  Funding info:
  `https://research.carolin-zoebelein.de/Funding/2019/NGI-Zero-Search-and-Discovery-Fund.html`

- **Private Donors** **Worldwide**
  Financial support from private donors *Since 2018*

- **YOLANTE** **Germany**
  Siemens AG *2013*
  Mentorship program for female students, Mentee

Awards

- ***Mädchen für Technik Preis*** **(Girls for Technology award)** **Germany**
  Siemens AG *2005/07*
  Pupil award for extraordinary achievements in mathematical, natural scientifical and technical subjects

Reviewer

- Member of the PoPETs 2021 artifact review committee
- Member of the PoPETs 2020 artifact review committee

Contributions

- **Neuropil**
  IoT open source secure data exchange layer *2019/12 - 2020/02*
  Neuropil is a dynamic, decentralized and fully automated open source solution for the secure exchange of data between IoT devices and applications, by pi-lar GmbH.
  Kind of contribution: Bloom filter improvements for data distribution within the network
  `https://www.neuropil.org/`

- **Privacy-Preserving Statistics with Privcount in Tor (Shamir version)**
  Tor protocol specification proposal *2017/12*
  PrivCount is a privacy-preserving way to collect aggregate statistics about the Tor network without exposing the statistics from any single Tor relay, by Nick Mathewson, Tim Wilson-Brown and Aaron Johnson.
  Kind of contribution: Analysis of design questions for implementation
  `https://gitweb.torproject.org/torspec.git/tree/proposals/288-privcount-with-shamir.txt`

- **Tor Project support material**
  Tor user support and Tor Browser Manual *2016*
  Tor Project offers support material for users and node operators on their websites. The Tor Browser Manual gives a step-by-step introduction into the correct usage of Tor Browser. The support page offers general information about a wide range of most demand topics.
  Kind of contribution: Review of Tor Browser Manual and writing of content parts of the support page
  `https://tb-manual.torproject.org/`
  `https://support.torproject.org/`

Publications

You can find a complete up-to-date list of my public work on my website `https://research.carolin-zoebelein.de/public.html`.

Proposals

[1] ZÖBELEIN, Carolin: *BlueTransience*. `https://github.com/Samdney/proposal-bluetransience`. Version: 2020. – A Bluetooth based, short memory, social media mobile network app. Status: Just an idea

Preprint

[1] ZÖBELEIN, Carolin: *About the proof of the Collatz conjecture*. `https://arxiv.org/abs/1303.2073`. Version: 2013

Thesis

[1] ZÖBELEIN, Carolin: *Dirac Observablen in der Kosmologie*. 2013

Notes

A list of my public notes is available on my website `https://research.carolin-zoebelein.de/public.html#Notes`.

Apps

- **Cool Down**
  Health & Fitness *v01: 2018/09/09*
  Includes advertising, Coding language: Java
  App for your mental health which wants to help you to conquer bad emotional times.
  `https://play.google.com/store/apps/details?id=com.pertpony.cooldown`

- **Catchy Balls**
  Casual Game *v01: 2018/06/04*
  Includes In-App purchases, Coding language: Java
  Catch all the balls which have the shown color and get points.
  `https://play.google.com/store/apps/details?id=com.pertpony.catchyballs`

Exhibitions

- **'Concept' - International Exhibition on Conceptual Art** **Korea**
  Group exhibition *2016/05/06 - 2016/05/29*
  CICA Museum, 196-30, Samdo-ro, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea 415-843
  Artworks: Photo with title *'I was here'*, Photo with title *'Signing'*
  `https://cicamuseum.com/concept-2016-5-6-29`
  `https://cicamuseum.com/wp-content/uploads/2016/05/Concept_catalog.pdf`

- **#TwitterArtExhibit: NYC - 2016** **USA**
  Group exhibition *2016/03/31 - 2016/04/21*
  Trygve Lie Gallery, 317 E 52nd St., New York, NY 10022
  Artwork: Postcard (Acrylic paint) with title *'All is public - No secrets'*
  `http://twitterartexhibit.org`

Organized Meetups & Workshops

- **Online privacy & anonymity**
  Workshops & Coachings about online privacy and anonymity tools *Since 2018*
  Offline and online, EU countries, On demand

- **Why you should study Number Theory!** **Germany**
  Meetup, A friendly together for talking about Number Theory studies with coffee and tea. *2018/10*
  Friedrich-Alexander-University Erlangen-Nürnberg, Department for Mathematics

Teaching

Non academic

- Offline and remote teaching about online anonymity, privacy and encryption tools
- Private lessons for pupils of fifth year and above, from all kinds of Bavarian school types.
  Subjects: Mathematics, Physics, Chemistry, Technology, Computer Science, French, Spanish

Bachelor courses (Tutor)

- Mathematics for engineers 1 & 2
- Experimental physics for natural scientists 1 & 2
- Experimental physics for engineers 1 & 2
- Experimental physics 5: Nuclear and particle physics
- Theoretical physics 4: Statistical physics
- Practical basis courses 1 in physics for physicists part 1 & 2
- Practical courses in physics for engineers

Master courses (Tutor)

- Advanced experimental physics: Particle and astroparticle physics
- Advanced theoretical physics: Advanced quantum mechanics

Skills

Technical

Coding: C, C++, C#, Java, LabView, NASM, Perl, PHP, Python, Rust

Mobile Dev.: Android apps (Java)

Debugging: gdb, pdb, Valgrind

Database: MySQL, PostgreSQL, SQLite

Math: GNU PSPP, GNU Octave, Maple, Matlab, R, SageMath, Scilab

Virtualization: Docker, KVM, QEMU, VirtualBox
Cloud Comp.: AWS, Docker Cloud, Microsoft Azure
Networking: Ettercap, netcat, netstat, nmap, scapy, tcpdump, traceroute, Wireshark, ...
WebServer: Apache HTTP Server, nginx
Monitoring: Munin, Nagios, Zabbix
SCM: Puppet
VC: Git, SVN
Writing & Office: LaTeX, LibreOffice
CAD - Basics: Solid Edge, Pro/ENGINEER Wildfire

Languages

First: German
Good: English
Basics: Modern Standard Arabic, Standard Chinese, French, Spanish, Swahili
A few words: German Sign Language, Hausa, Modern Hebrew, Italian, Japanese, Kinyarwanda, Russian, Standard Tibetan

Free time activities

- Every kind of language (spoken, coding, math, ...)
- Hanging around on irc

October 18, 2020