Carolin Zöbelein

Josephsplatz 8, 90403 Nürnberg, Germany
+49.160 / 3482513 | contact@carolin-zoebelein.de
PGP key: D4A7 35E8 D47F 801F 2CF6 2BA7 927A FD3C DE47 E13B

Work & Research

Independent mathematical scientist Since 2016/11

Freelancer, Primary: Researcher, Secondary: Adviser and contractor *Remote, Germany*

- 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`

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

Current highlights:

Project: Distributed Networks on Mathematical Geometries
Project: Mathematical Analysis of Online Network Protocols
Grant: NGI Zero Discovery, 19 100 EUR, European Commission's Next Generation Internet programme

Related background:

Tor Project, Volunteer, Privacy-Preserving Statistics with Privcount in Tor
Infineon Technologies AG, Cyber Defence Center, Research Student Project
Neuropil, IoT open source secure data exchange layer, Bloom filter design
Member of the PoPETs artifact review committee
Strong Technical Skills

Research work: ≈ 3.5 years | Student research work: 3.25 years | Projects: 4 large & several small | Student Projects: 4 | 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

More Information

`https://github.com/Samdney`
`https://arxiv.org/a/zobelein_c_1.html`
`https://twitter.com/SamdneyTweet`
`https://research.carolin-zoebelein.de`
`https://art.carolin-zoebelein.de`
`https://blog.carolin-zoebelein.de`

Secondary work

Artist Since 2015/05

Freelancer *Remote, Germany*

- 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 Since 2017/07

Freelancer, For cross-subsidization *Remote, Germany*

- `https://consulting.carolin-zoebelein.de`

Tor Project Since 2016/05

Volunteering *Remote*

- `https://www.torproject.org/`

Former Experiences

Infineon Technologies AG München 2018/11 - 2019/05
Student research project, Information Security - Cyber Defence Center *Germany*

- 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 2016/04 - 2016/09
Student assistant, IT-Support *Germany*

Siemens AG Forchheim 2015/03 - 2015/09
Working student, Computer Tomography development *Germany*

- 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 2012/10 - 2016/09
Teaching assistant *Germany*

- 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 2012/10 - 2013/07
Student member, Society in terms of the competition Formula Student *Germany*

- 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 2011/01 - 2012/03
Research assistant, Group: Fluid physical principles of the human vocalisation *Germany*

- 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 2004/03 - 2016/03
Volunteering *Germany*

- Unpaid private lessons for socially disadvantaged pupils

Studies

Friedrich-Alexander-University Erlangen-Nürnberg 2017/10 - 2019/03
Bachelor of Science Computer Science, Paused *Germany*

- Major interests: Cryptography, IT-Security, Theoretical Computer Science

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

Friedrich-Alexander-University Erlangen-Nürnberg 2008/10 - 2013/09
Bachelor of Science Physics, 2013/09 *Germany*

- 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 2004/09 - 2008/06
Department Gymnasium, Mathematic, natural scientific focus *Germany*

- Abitur 2008/06 (University entrance qualification)

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

- School leaving certificate 2004/07

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

Training courses

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

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

Projects

Research

Distributed Networks on Mathematical Geometries Since 2020/05
Mathematical & Theoretical Computer Science research and design work.
- Development of distributed network property mapping on mathematical geometries.
- Project info: `https://research.carolin-zoebelein.de/Projects/2020/Distributed-Networks-on-Mathematical-Geometries.html`

Mathematical Analysis of Online Network Protocols Since 2020/05
Mathematical & Theoretical Computer Science research and design work.
- By the approach of mathematical computer science, we set a mathematical analysis description of online network protocols like TCP or SMTP.
- Project info: `https://research.carolin-zoebelein.de/Projects/2020/Mathematical-Analysis-of-Online-Network-Protocols.html`

Combsee Since 2019/12
Mathematical & Theoretical Computer Science research and design work.
- Theoretical research and implementation of a decentralized, privacy preserving, search engine.
- Former: *Decentralized privacy preserving search by mathematical design*
- Related Funding: NGI Zero Discovery
- Combsee Search: `https://www.combsee.org/`
  Project info: `https://research.carolin-zoebelein.de/Projects/2019/Combsee.html`

MfDN-Protocol Since 2019/12
Mathematical & Theoretical Computer Science research and design work.
- A mathematical forced decentralized network protocol.
- Project info: `https://research.carolin-zoebelein.de/Projects/2019/MfDN-Protocol.html`

Art

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

Grants & Fellowships

NGI Zero Discovery | *Grant, 19 100 EUR, NLnet Foundation, Netherlands, EU* Since 2019/12
- 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.
- `https://nlnet.nl/discovery/`
  `https://www.ngi.eu/`
  `https://cordis.europa.eu/project/id/825322/`
  `https://research.carolin-zoebelein.de/Funding/2019/NGI-Zero-Search-and-Discovery-Fund.html`

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

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

Awards

Mädchen für Technik Preis (Girls for Technology award) | *Siemens AG, Germany* 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 | *Tor protocol specification proposal* 2017/12
(Shamir version)

- PrivCount is a differential privacy 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/`

Software

Cool Down | *Health & Fitness* | *Android app, Java* v01: 2018/09/09

- Includes advertising
- 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* | *Android app, Java* v01: 2018/06/04

- Includes In-App purchases
- 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 2016/05/06 - 2016/05/29
Group exhibition *Korea*

- 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 2016/03/31 - 2016/04/21
Group exhibition *USA*

- 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 Since 2018
Offline and online, EU countries, On demand

- Workshops & Coachings about online privacy and anonymity tools

Why you should study Number Theory! 2018/10
Friedrich-Alexander-University Erlangen-Nürnberg, Department for Mathematics *Germany*

- Meetup, A friendly together for talking about Number Theory studies with coffee and tea

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

Soft Skills

Grant Writing | Pitching | Funding Acquisition | Crowdfunding | Academic Writing | Project Management | Speaker | Teaching | Cross-Cultural Experienced | Strong Interdisciplinary | Abstract Thinking | High Creativity | Thinking Out of the Box | Helpful | Friendly | Passion Driven

Technical Skills

Coding: C, C++, C#, Java, LabView, NASM, Perl, PHP, Python, Rust, Shell Scripting
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
OS: Linux, BSD, Windows
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

Publications

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

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

Proposal

[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

Notes

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

January 2, 2021