

Carolyn Zöbelein

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RESEARCH & WORK

Independent mathematical scientist

Primary: Researcher, Secondary: Adviser and freelance contractor

Since 2016/11

Remote, Germany

Ronin Institute

Research Scholar, <http://ronininstitute.org/>

Since 2021/03

Remote, USA

- 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: \approx 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: \approx 16 years


Coding experience: \approx 19 years


Spoken languages: 7


MORE INFORMATION


 <https://github.com/SamdneY>

 https://arxiv.org/a/zoebelein_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

Freelancer

Since 2015/05

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

Freelancer, For cross-subsidization

Since 2017/07

Remote, Germany

- <https://consulting.carolin-zoebelein.de>

Tor Project

Volunteering

Since 2016/05

Remote

- <https://www.torproject.org/>

FORMER EXPERIENCES

Infineon Technologies AG München <i>Student research project, Information Security - Cyber Defence Center</i> <ul style="list-style-type: none">• Topic: <i>Evading detection and treatment</i>, 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	2018/11 - 2019/05 Germany
Friedrich-Alexander-University Erlangen-Nürnberg, Department for Mathematics <i>Student assistant, IT-Support</i>	2016/04 - 2016/09 Germany
Siemens AG Forchheim <i>Working student, Computer Tomography development</i> <ul style="list-style-type: none">• Data analysis programming for research: Revision of existing numerical analysing scripts for accuracy improvements of CT X-ray tubes• Coding language: Matlab	2015/03 - 2015/09 Germany
Friedrich-Alexander-University Erlangen-Nürnberg <i>Teaching assistant</i> <ul style="list-style-type: none">• 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	2012/10 - 2016/09 Germany
High-Octane Motorsports e.V., University Erlangen-Nürnberg <i>Student member, Society in terms of the competition Formula Student</i> <ul style="list-style-type: none">• 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	2012/10 - 2013/07 Germany
University medical centre Erlangen, ENT-hospital, Phoniatriy and pedaudiology <i>Research assistant, Group: Fluid physical principles of the human vocalisation</i> <ul style="list-style-type: none">• 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	2011/01 - 2012/03 Germany
Independent <i>Volunteering</i> <ul style="list-style-type: none">• Unpaid private lessons for socially disadvantaged pupils	2004/03 - 2016/03 Germany

STUDIES

Friedrich-Alexander-University Erlangen-Nürnberg <i>Bachelor of Science Computer Science, Paused</i> <ul style="list-style-type: none">• Major interests: Cryptography, IT-Security, Theoretical Computer Science	2017/10 - 2019/03 Germany
Friedrich-Alexander-University Erlangen-Nürnberg <i>Master of Science Physics, Aborted</i>	2013/04 - 2016/09 Germany
Friedrich-Alexander-University Erlangen-Nürnberg <i>Bachelor of Science Physics, 2013/09</i> <ul style="list-style-type: none">• Bachelor thesis: <i>Dirac-Observablen in der Kosmologie</i> (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	2008/10 - 2013/09 Germany

SCHOOL EDUCATION

Peter-Vischer-School Nürnberg <i>Department Gymnasium, Mathematic, natural scientific focus</i> <ul style="list-style-type: none">• Abitur 2008/06 (University entrance qualification)	2004/09 - 2008/06 Germany
Peter-Vischer-School Nürnberg <i>Department Realschule, Mathematic, natural scientific, technical focus</i> <ul style="list-style-type: none">• School leaving certificate 2004/07	2000/09 - 2004/07 Germany
Ludwig-Uhland-School Nürnberg <i>Department Hauptschule</i>	1998/09 - 2000/07 Germany

TRAINING COURSES

Friedrich-Alexander-University Erlangen-Nürnberg <i>Training center for academic teaching (FBZHL)</i> <ul style="list-style-type: none">• Didactics for tutors of the Faculty of Engineering - Basic course II	2017/11 Germany
Friedrich-Alexander-University Erlangen-Nürnberg <i>Training center for academic teaching (FBZHL)</i> <ul style="list-style-type: none">• Cross-cultural sensitization for tutors	2017/10 Germany

BIBLIOGRAPHY

Current highlights:

Carolin Zöbelein. Dynamical decomposition by clique separators on hypergraphs. 2021. Preprint.
Carolin Zöbelein. Primitive data structures for the 3SUM and k-SUM problem. 2021. Preprint.

For a complete, up to date, list of my work, go to ...

🔗 <https://research.carolin-zoebelein.de/public.html#Bibliography>

📄 <https://research.carolin-zoebelein.de/files/bibliography.pdf>

PROJECTS

Research

Currently, my research work and the belonging website are under reorganization. For getting a better up to date impression, please visit my website: 🔗 <https://research.carolin-zoebelein.de/projects.html>

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-zoebele.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 scientific 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: L^AT_EX, 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

April 12, 2021