Systems Research Group

1st Sept 2020 --- present

A review of the last (almost) five years

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https://dse.in.tum.de/

May 2025

Chair's mission

Mission statement:

To excel in "systems research"!

Impact statement:

We seek impact through
people, teaching, research publications, and open-source projects

Team

Chair consists of **27** members

- **1** Professor
- **5** Post-doctoral researchers
- **15** PhD students
- **1** Research engineers
- **2** Administrative staff
- **3** Adjunct faculty members

Full list of staff members

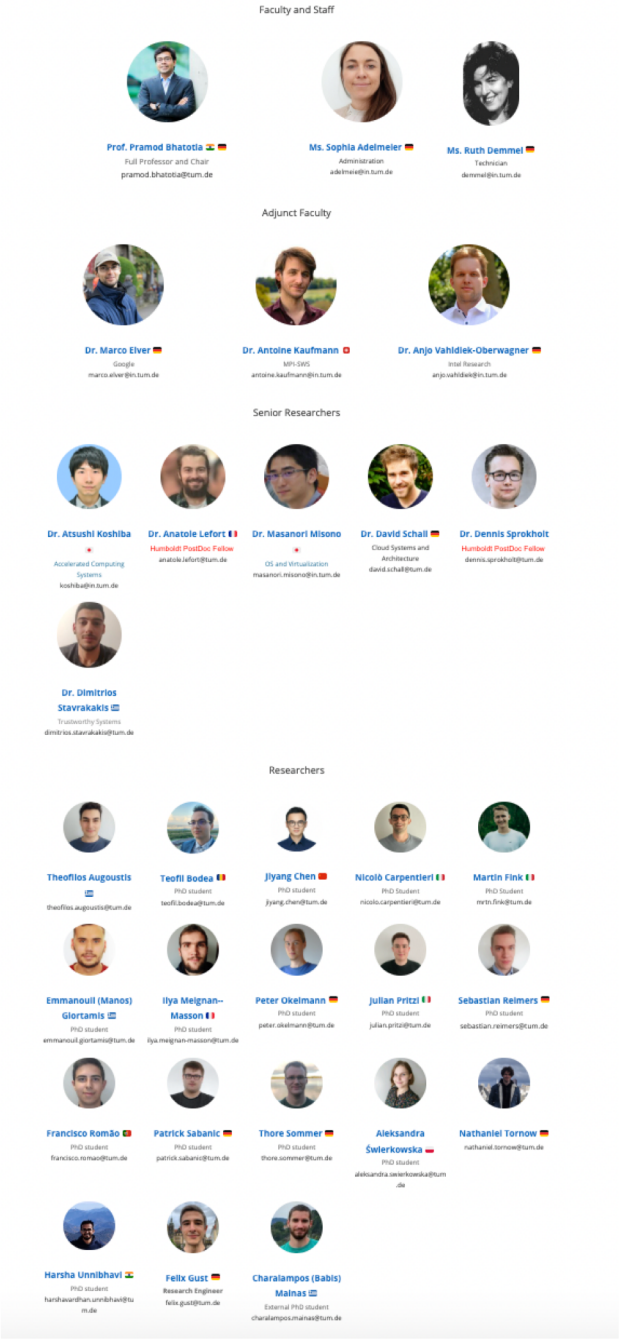
- https://dse.in.tum.de/team/

Diversity

- **14** different nationalities

Alumni

- **4 Post-docs** (Profs at RWTH Aachen & Cambridge, Oracle Labs and Huawei Research)
- **6 PhDs** (Microsoft Research, Intel Labs -> Amazon, Huawei Research, NOKIA Bell Labs, Entrepreneur -- NixOS)



(Third-party) Research funding

Government organizations

- **German** (DFG, BMBF, Bayern, DAAD, NFDI)
- **UK** (EPSRC, GCHQ/NCSC, Alan Turing Institute)
- **EU** (ERC, EU H2020)

Industry research awards

- Microsoft Research, Arm, Huawei, Amazon, Google Research, Intel Research

Non-profit foundations

- ~~Volkswagen Foundation Award~~
- Humboldt Henriette Herz Scouting Award

Teaching

(2x) Lectures

EIST (BSc)
Distributed Systems (MSc)
2500+ exams

(5x) Practical Labs

250+ students for
Praktium per year

(4x) Seminars

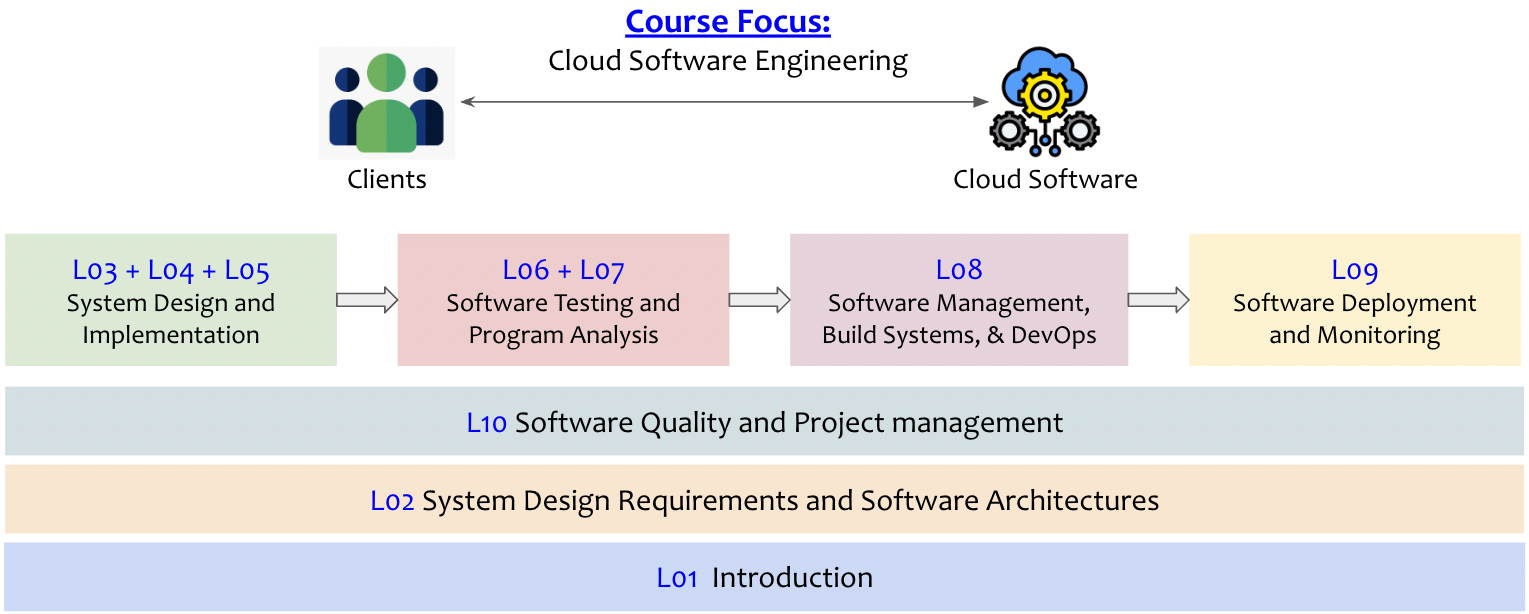
50+ students for
seminars per year

Thesis

100+ BSc/MSc students advised for
thesis, IDP, and Guided Research

EIST – First-year compulsory course

- All modern software systems are designed and deployed in the cloud
  - Redesigned the course to meet the requirements of software industry



Lecture

NEW Curriculum

"Cloud" software engineering

Tutorials

60+ Programming assignments for all topics covered in the lectures

Exams

~2,100 Exams**!**

Practical labs and seminars (300+ students annually)

Lab A: Systems programming
https://github.com/ls1-sys-prog-course

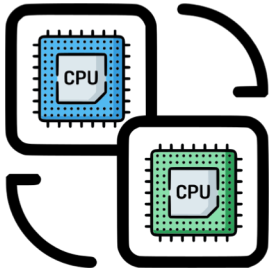
Lab B: Advanced systems programming
https://github.com/ls1-adv-sys-prog-course/docs

Lab C: Distributed systems lab
https://github.com/TUM-DSE/cloud-lab

Lab D: Cloud software engineering lab
https://dse.in.tum.de/teaching/cloud-lab-25/

Lab E: Systems lab
https://github.com/TUM-DSE/sys-lab

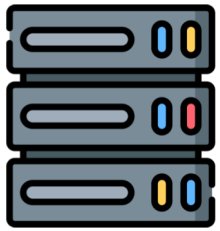
Active research areas



Weak memory architectures/memory model

--- Binary translation for strong-on-weak architectures: x86 -> Arm/RISC-V [PLDI'22] [ASPLOS'23]

--- Linux kernel memory model [Linux Plumbers'24]

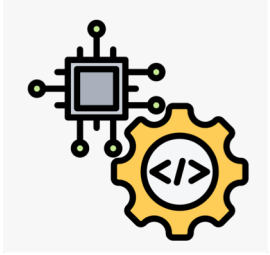


OS/Virtualization: Lightweight, secure, and reliable

--- Virtual machines [EuroSys'22]

--- Unikernels [SoCC'24]

--- Secure LibOS [CCS'24]



Hardware-SW co-design

--- HW/OS for secure accelerators

--- Trusted NIC architecture [ASPLOS'25]

--- Trusted disaggregated systems [ApSys'25]

Active research areas

Accelerated systems

--- OS for (heterogenous) FPGAs
--- I/O support for FPGAs [USENIX ATC'24]
--- Serverless support for FPGAs [HPDC '25]

intel OPTANE PERSISTENT MEMORY CXL Compute Express Link

Emerging memory technologies

--- Persistent memory [EuroSys'22] [DSN'24] [SIGMOD'24]
--- CXL-based systems
--- CXL hardware controllers

System software for quantum computing

--- Quantum Virtual Machine [PLDI'25]
--- Quantum Operating System [OSDI'25]
--- Weaver: Quantum Compiler [CGO'25]
--- Quantum Orchestrator

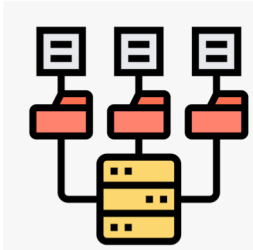
Active research areas

Confidential computing

--- CVMs Explained [SIGMETRICS'25]
--- Confidential serverless computing
--- Policy compliance systems [SIGMOD'22]
--- I/O stacks [EuroSys'21]

Compiler-assisted systems

--- Safe JIT compilers/WebAssembly [CGO'25]
--- Binary size reduction [CGO'22]
--- Compiler-assisted memory management [PACT'24]



Distributed systems

--- Distributed transactions [DSN'23]
--- Consensus + replication [VLDB'25]
--- Hardware-assisted replication protocols
--- Shared logs [SYSTOR'24] [HPDC'23]

Research outcomes

25+ Top publications: ASPLOS, PLDI, SIGMETRICS, SoCC, USENIX ATC, DSN, CCS, SIGMOD, VLDB, NSDI, OSDI, SOSP, MICRO, CGO, HPDC, EuroSys, Middleware, Supercomputing

Scientific leadership:

General chair: EuroSys 2021, SOSP 2026, HotOS 2027
Program chair: SYSTOR 2025, Middleware 2023, ICDCS 2018
Editorial board: Communications of ACM (CACM)
Program committee: Various top venues

People impact:

At least one internship (for all PhD students): Top research labs (Google, Microsoft, Huawei, Intel, Bell Labs, etc)

Job placement: Professorships (Aachen and Cambridge), Researcher (Huawei, Microsoft, Intel Labs, Amazon, Bell Labs, Oracle Labs), and Entrepreneur (NixOS)

Recognitions

Microsoft Research

Faculty Research Award

Google Research

(2x) Faculty Research Award

Alexander von Humboldt Stiftung/Foundation

Henriette Herz Scout Award

erc European Research Council

Starting Grant

NVIDIA

intel

HUAWEI

arm Research

Research grant awards

8 award papers

EUROSYS ACM SIGOPS IN EUROPE

EuroSys Liedtke 2023

DSN 2024

DSN Rising Star 2024

The Alan Turing Institute

Turing Fellow 2017

Young Researcher Awards

Affiliations

The Alan Turing Institute

RESEARCH INSTITUTE FOR SECURE HARDWARE & EMBEDDED SYSTEMS

Munich Data Science Institute (MDSI)
TU Munich

MIRMI
An Integrative Research Institute of TUM

[UK association]

[Interdisciplinary centers @ TUM]

6G-life

Munich Quantum Valley

relAI
Konrad Zuse School of Excellence in Reliable AI

CDTM CENTER FOR DIGITAL TECHNOLOGY AND MANAGEMENT

TUM VENTURE LABS

[Collaborative projects @ TUM]

[Entrepreneurship eco-system @ TUM]

nfdi Nationale Forschungsdaten Infrastruktur

SPP 2377
DISRUPTIVE MEMORY TECHNOLOGIES
DFG PRIORITY PROGRAM 2377

RESILIENT WORLDS

[DFG funded projects]

Hardware resources

All servers/hardware resources are publicly listed, and self-managed:

https://github.com/TUM-DSE/doctor-cluster-config/tree/master/docs/hosts

We primarily support four architectures:

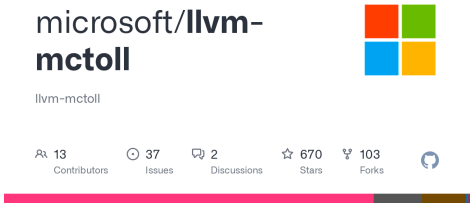
Open-source impact (2020 --)

All projects are publicly available:

- https://dse.in.tum.de/publications/

NixOS

Maintainer of Linux distribution



Microsoft's Binary lifting tool

arm

Arm memory model

QEMU

QEMU binary translator

Unikraft

Unikraft unikernel OS shell

Linux memory model

LLVM sanitizer

intel

Intel PMDK

docker

The Cntr project

intel SGX Tool

Intel SGX-LKL

First chair retreat (2021)

Department of Computer Science, TUM

Interested in joining us?

- Life of a PhD student
  - To pursue impactful research projects
  - Actively publish papers in top systems conferences
  - Publish your code in open source and build a community
  - Participate in teaching lectures, labs, and seminars
  - Supervise BSc/MSc projects (build a community/team around your research projects)
  - Travel the world, yes paid by your advisor!
  - Enjoy happy and healthy life in Munich and the Alps!
- Benefits
  - TVL-13 (100%) salary, around 60,000 Euros salary
  - Pension and health insurance contributions
  - State-of-the-art office spaces, research infrastructure, and a top university
  - Fully sponsored conference trips
- Please contact Prof. Bhatotia
  - pramod.bhatotia@cit.tum.de