UNIVERSITÄT
TRIER

7. Creative Mathematical Sciences Communication

October 7 – 10, 2024

University of Trier

Welcome to CMSC 2024 in Trier!

Dear participants,

it is with great pleasure that we welcome you to the seventh edition of the *Creative Mathematical Sciences Communication*, hosted at the University of Trier. This event brings together a vibrant community of educators, researchers, and practitioners from around the world to explore and exchange ideas on one of the most essential topics in today's educational landscape: how to foster computational thinking, both with and, perhaps most intriguingly, without the use of computers.

As digital literacy becomes increasingly central to modern education, our goal with this conference is to shine a light on the creative and diverse approaches that encourage computational thinking in educational contexts. These methods not only broaden accessibility of Computer Science concepts but also offer unique opportunities to engage learners. By focusing on hands-on activities, puzzles, games, and other tangible experiences, we open up new pathways for understanding algorithms, logic, and problem-solving in a manner that is as engaging as it is educational.

The event will conclude with a special joint workshop day**,** where we invite both researchers and practitioners — active teachers and the next generation of computer science educators — to join us. This day offers a unique hands-on platform for collaboration and exchange, allowing participants to deepen their understanding of how unplugged activities can transform learning environments. This interactive format fosters the practical application of ideas and methods, ensuring that theoretical insights are linked with real-world classroom experiences.

We extend our deepest gratitude to all participants, speakers, and collaborators who have contributed to making this conference a reality. Your presence is a testament to the growing momentum of the "Unplugged" movement. We look forward to fruitful discussions and the exchange of knowledge that will continue to drive this field forward.

Welcome to Trier, and enjoy the conference!

Warm regards,
The Conference Chairs

Accepted Papers

T. Bell, H. Hickman: Why Teach About Binary Numbers?

G. Bulanchuk, O. Bulanchuk, O. Piatykop, V. Ilkevych: Distance Teaching of Mathematical and Computer Disciplines During the War in Ukraine

J. Hromkovic, R. Lacher: Teaching Tangible Division Algorithms or Going from Concrete to Abstractions in Math Education by the Genetic Socratic Method

R. Jacob, F. Silvestri: Unplugging Dijkstra's Algorithm as a Mechanical Device

H. Kaarto, J. Bilbao, A. Pears, V. Dagienė, J. Kilpi, Zs. Pluhár, Y. Gülbahar, M.-J. Laakso: BeLLE: Detecting National Differences in Computational Thinking and Computer Science Through an International Challenge

S. Laplante, L. Perez, S. Tissot, L. Vettier: QuBobs Teaching Kits to Explain Quantum Computing

L. Lehner, M. Landman: Unplugged Decision Tree Learning – A Learning Activity for Machine Learning Education in K-12

M. Löffler: The Algorithm Experience at Primary Schools: An Experience Report

M. Müller, B. Weißing, P. Lütscher: Solid Geometry Modeling: 3D Printing Is Not Always the Best Option

M. Ren, L. Nitschke, P. Perekietka: From Caesar Shifts to Kid-Enigma. The CS Unplugged-like Path in the MuMa Science Centre

V. Shah, R Ramanujam: Curricular Choices for Computational Thinking in Large Scale Low Resource Environments

M. Sysło: Mathematical versus Computational Thinking with a Computer in the Background

S. Szeider: Large and Parallel Human Sorting Networks

J. Thakkar, M. Jain: Computational Thinking based STEM Art Exhibits

R. Thamburaj, K. Desikachari, G. Thomas Durairaj: Tactile Kolam Patterns – Communicating Art and Mathematics to Students with Vision Impairments

Congratulations to all the authors whose papers have been accepted for presentation and publication!

Schedule Monday, 07. Oct

University of Trier, Universitätsring 1, Building A

For map see pages 9/10

08:15 *08:45*	**Registration, Foyer of building A**
08:45 *09:00*	**Organization, Room A8**
09:00 *09:10*	**Welcoming, Room A8** *Prof. Dr. Eva Eckkrammer*
09:10 *10:10*	**Keynote, Room A8** Games That Cannot Go On Forever – Authentic Participation in Research is the Main Issue for Kids (virtual) *Michael Fellows*
10:10 *10:40*	**Coffee Break**
10:40 *12:10*	**Paper Session, Room A8** 1. Unplugging Dijkstra's Algorithm as a Mechanical Device *Jacob, Silvestri* 2. Unplugged Decision Tree Learning – A Learning Activity for Machine Learning Education in K—12 *Lehner, Landman* 3. Tactile Kolam Patterns – Communicating Art and Mathematics to Students with Vision Impairments *Thamburaj, Desikachari, Durairaj*
12:10 *13:30*	**Lunch**
13:30 *15:00*	**Paper Session, Room A8** 1. QuBobs Teaching Kits to Explain Quantum Computing *Laplante, Perez, Tissot, Vettier* 2. Solid Geometry Modeling: 3D Printing is Not Always the Best Option *Müller, Weißing, Wütscher* 3. The Algorithm Experience at Primary Schools: An Experience Report
15:00 *15:30*	**Coffee Break**
15:30 *17:00*	**Poster & Demo Session, Room A7** - The Mathematics of JigSaw Lamps - Variations of A-Puzzle-A-Day: Polyhex and Polyomino Fitting Puzzle - String Art - IT in the Teaching of Mathematics in Ukraine Under Martial Law - Turtle Stitch Embroidery to Think With - Computer Science Meets the Natural Sciences: Conditions for Successfully Teaching Computer Science Infused Natural Science Classes in Schools - Unplugged Decision Tree Learning – Experience the Learning Activity for ML Education in K-12 - Making Self-Similarity Accessible to School-Aged Students - Jumping Kangaroos

Schedule Tuesday, 08. Oct

University of Trier, Universitätsring 1, Building A

09:00 *10:30*	**Paper Session, Room A8** 1. Curricular Choices for Computational Thinking in Large Scale Low Resource Environments *Shah, Ramanujam* 2. Why Teach about Binary Numbers? *Bell, Hickman* 3. Distance Teaching of Mathematical and Computer Disciplines During the War in Ukraine *Bulanchuk, Bulanchuk, Piatykop, Ilkevych*
10:30 *11:00*	**Coffee Break**
11:00 *12:30*	**Paper Session, Room A8** *1.* Mathematical Versus Computational Thinking with a Computer in the Background *Sysło* 2. Computational Thinking based STEM Art Exhibits *Thakkar, Jain* 3. BeLLE: Detecting National Differences in Computational Thinking and Computer Science Through an International Challenge *Kaarto, Bilbao, Pears, Dagiene, Kilpi, Parviainen, Pluhár, Gülbahar, Laakso*
12:30 *14:00*	**Lunch**
14:00 *16:00*	**Excursion**: Walking Tour “2000 Years in 2000 Steps”
16:00 *18:00*	**Excursion**: Visit Germany’s Oldest Wine Cellar
18:00 *20:00*	**Conference Dinner**

Schedule Wednesday, 09. Oct

University of Trier, Universitätsring 1, Building A

09:00 *10:00*	**Keynote, Room A8** Solving Bebras-like Tasks: Approaches for Concept Building *Valentina Dagiene*
10:00 *10:30*	**Coffee Break**
10:30 *12:00*	**Paper Session, Room A8** 1. From Ceasar Shifts to Kid-Enigma. The CS Unplugged-like Path in the MuMa Science Center *Ren Nitschke, Perekietka* 2. Teaching Tangible Division Algorithms or Going from Concrete to Abstraction in Math Education by the Genetic Socratic Method *Hromkovic, Lacher* 3. Large and Parallel Human Sorting Networks *Szeider*
12:00 *13:30*	**Lunch**
13:30 *15:00*	Workshop preparation (TTI: Trierer Tag des Informatikunterrichts [Teachers' Day]) „Informatics without Computers? CS Unplugged“
15:00 *15:30*	**Coffee Break**
15:30 *16:30*	Workshop preparation (TTI) „Informatics without Computers? CS Unplugged“
16:30 *17:00*	Workshop presentation (TTI) „Informatics without Computers? CS Unplugged“

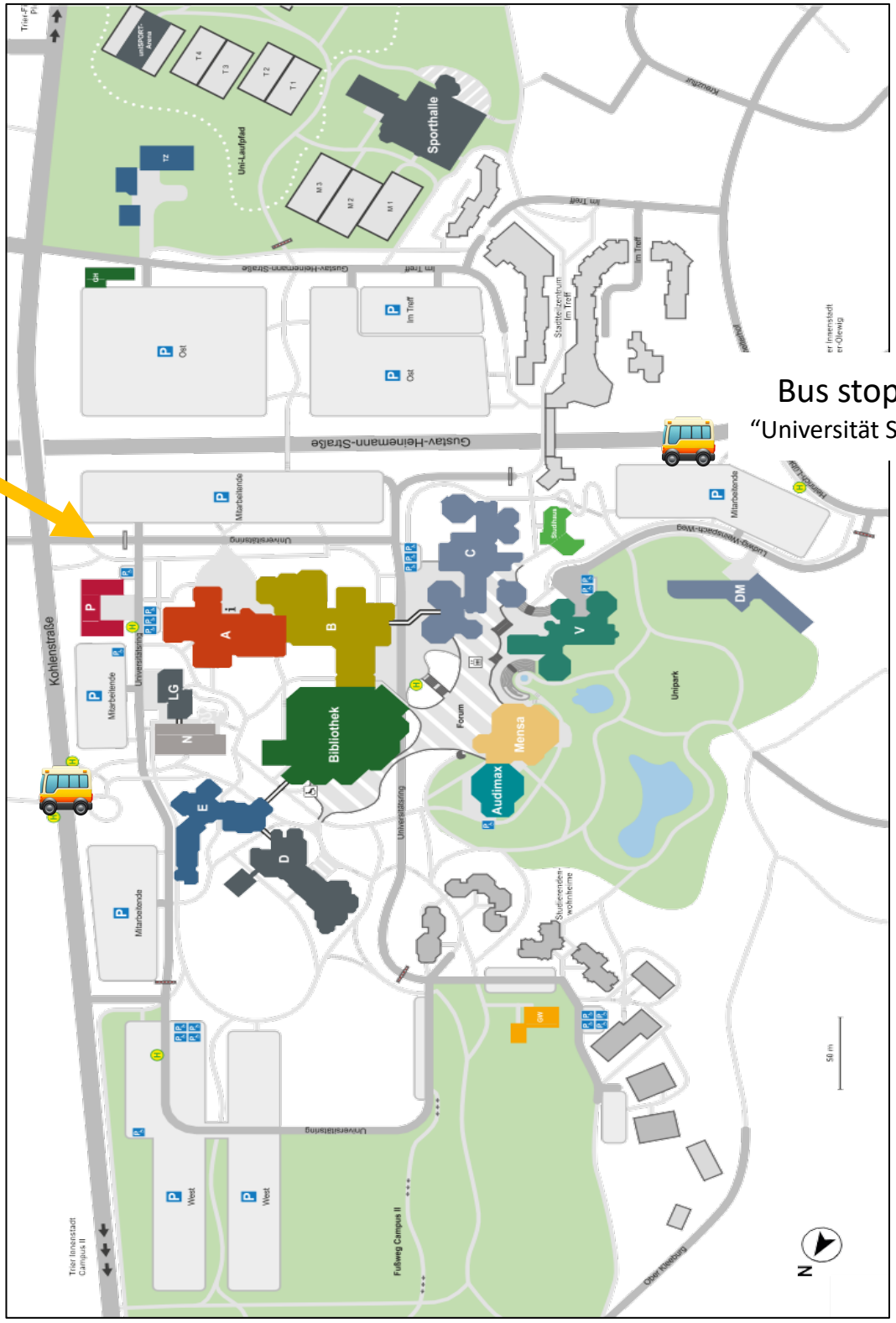
Schedule Thursday, 10. Oct

University of Trier, Universitätsring 1, Building A

09:15 10:00	**Registration (for teachers), Foyer Building A**
10:00 10:10	**Welcoming, Room A8**
10:10 10:30	**Keynote, Room A8** (*J. Staub*)
10:30 12:00	**Workshop Session, Room** 1. Jumping Kangaroos (Room A6) *B. Stephenson, Guildford Young College, Australia* 2. Decision Tree Learning – eine ML-Methode «unplugged» im Unterricht einsetzen (Room A7) *M. Landmann & L. Lehner, TU Wien, Austria* 3. Datensicherheit von Antike bis zu den Public-Key-Kryptosystemen (Room A11) *J. Hromkovic & R. Lacher, ETH Zürich, Schweiz* 4. Informatics without Computers? CS Unplugged! (Room A12) *TBD*
12:00 13:00	**Lunch**
13:00 14:00	**Panel Discussion, Room** (*Ministries of Education Rheinland-Pfalz & Luxembourg*)
14:00 15:30	**Workshop Session, Room** 1. Sphynx Tiles (Room A6) (*M. Skoss, Centralian Senior College, Australia*) 2. Künstliche Intelligenz und Kunst (Room A7) *Ch. Stammet, Universität Luxemburg* 3. Ein allgemeines Problemlöseschema?! (Room A11) *J. Gallenbacher, JGU Mainz* 4. Informatics without Computers? CS Unplugged! (Room A12) *TBD*
15:30 16:00	**Coffee Break**
16:00 17:30	**Workshop Session, Room** 1. Programmieren mit Anfängern: Ein Spiralcurriculum (Room A6) *J. Staub, Universität Trier* 2. Informatische Frühförderung mit Dynamischen Labyrithen (Room A7) *I. Schwank & Team, Universität zu Köln* 3. Bebras – a Way to Introduce Informatics Concepts to Students at School (Room A11) *V. Dagiene, University of Vilnius, Littauen* 4. Informatics without Computers? CS Unplugged! (Room A12) *TBD*

Campus plan

Campus 1



Room plan

Building A

Frequently Asked Questions

Where is the conference venue?

The conference will take place at the University of Trier, Campus 1:

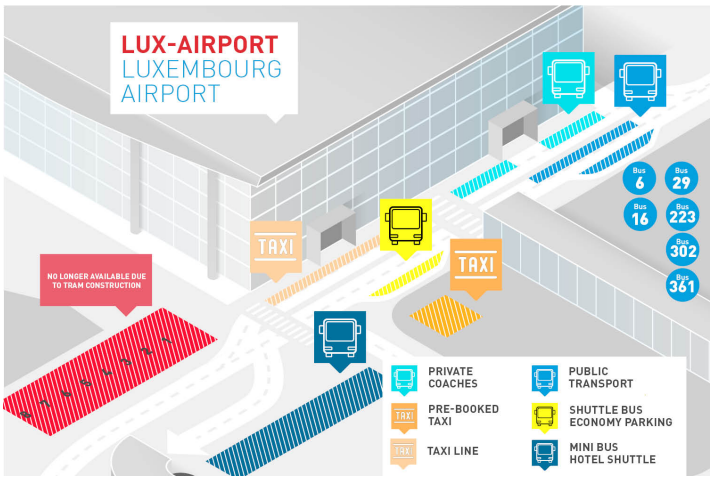
University of Trier
Building A
Universitätsring 1
54296 Trier, Germany

How to get from the airport to trier?

From Luxembourg:

Luxembourg offers free public transportation, including trams, buses, and trains. There are two convenient options to reach Trier:

- **Bus 29**: This bus runs from the Airport to Luxembourg's main train station, where two direct trains to Trier depart every hour. Train tickets (5 EUR) can be purchased from the conductor.
- **Bus 302**: Running Monday to Friday from 12:30 PM to 8:30 PM, this bus travels once an hour directly from the Airport to Trier's main station. Tickets (3 EUR) can be bought from the driver.



From Frankfurt:

Frankfurt is one of the world's most connected airports. There are two common routes to reach Trier:

- **Via Idar-Oberstein**: Take the RE3 train from Frankfurt Airport to Idar-Oberstein, then switch to bus 800, which will take you directly to Trier main station.
- **Via Koblenz**: Take the RE2 train from Frankfurt Airport to Koblenz, then transfer to the RE1 train to Trier.

Please note: Tickets should be purchased in advance via www.bahn.de. For regional trains and buses, tickets are not linked to specific departures and can be used on any connection for the selected travel date.

What if my arrival time falls outside regular bus hours?

For transportation at any time of day, **Portazon** offers a Smart-Shuttle service that provides convenient, point-to-point transport. A valid travel ticket is required, and the service can be booked for an additional fee of 2.50 EUR. This option is ideal for late arrivals or early departures. For more information, visit www.portazon.de.

How do I get from my hotel to the university?

All CMSC participants will receive a travel pass for the entire conference period at the registration desk on Monday morning. This pass grants free access to the entire VRT public transport network, including all buses and trains. All busses to and from the university (bus stops “Universität”, ”Universität Süd”) are listed on the following page.

How to Contact the Organizers?

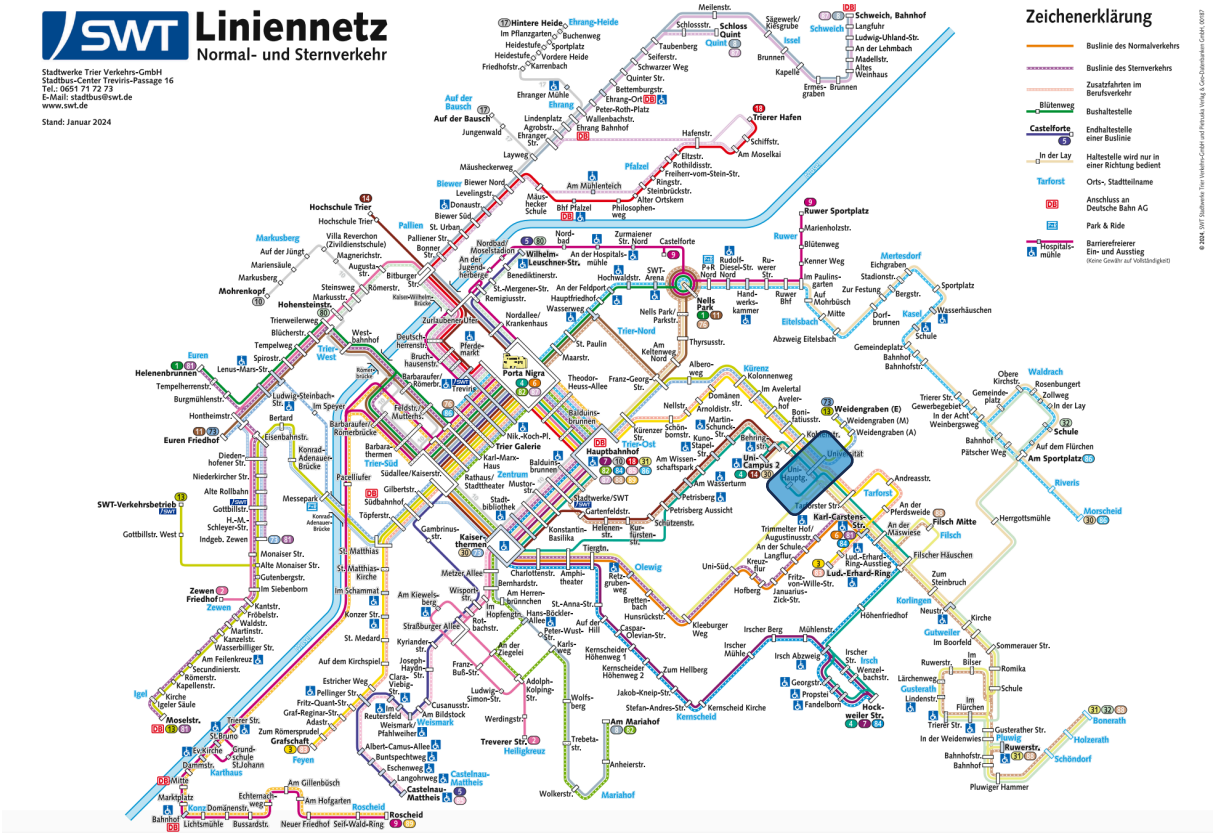
If you get lost or need assistance in case of an emergency, please contact the organizers using the following information:

Jacqueline Staub
staub@uni-trier.de
+4917695280522

Sabine Laros
laros@uni-trier.de
+496512013822

Esther Stürmer
stuermer@uni-trier.de
+496512012848

How to reach the University by public transport



Busses to the University

Daytime

- Bus Line 3 (Direction Filsch/L.-Erhard-Ring), every 15 minutes
- Bus Line 4 (Direction Irsch), every 30 minutes
- Bus Line 6 (Direction Tarforst), every 20 minutes
- Bus Line 13 (Direction Weidengraben), every 15 minutes
- Bus Line 14 (Direction Uni Mensa), every 15 minutes
- Bus Line 31 (Direction Pluwig/Bonerath), every 30 minutes
- Bus Line 230 (Direction Kell), every hour

Early Morning/ Late Evening

- Bus Line 81 (Direction Tarforst), every 30 minutes
- Bus Line 83 (Direction Tarforst), every 30 minutes
- Bus Line 88 (Direction Tarforst), every 30 minutes

Schedule

For more details, we recommend using the VRT journey planner:
https://www.vrt-info.de/fahrplanauskunft


Das heutige Trier
Modern Trier
HEILIG-KREUZ
ST. MATTHIAS
EUREN
MOSEL
Hauptbahnhof
Südbahnhof
Amphitheater
Circus
St. Agritius
St. Maximin
St. Paulin
Porta Nigra
Städt. Museum / Simeonstift
Dom
Liebfrauenkirche
Basilika
Kurfürstl. Palais
Rheinisches Landesmuseum
Kaiserthermen
Stadtbibliothek
Hauptmarkt
St. Gangolf
Kornmarkt
Thermen am Forum
Viehmarktplatz
Europahalle
Stadttheater
Synagoge
Barbarathermen
Römerbrücke
Tempel am Moselufer
St. Irminen
St. Matthias
Tempelbezirk im Altbachtal
Tempel am Herrenbrünnchen
Weimarer Allee
Ostallee
Südallee
Kaiserstraße
Saarstraße
Christophstraße
Theodor Heuss Allee
Nordallee
Simeonstraße
Fleischstraße
Brotstraße
Luxemburger Straße
Aachener Straße
St.-Barbara-Ufer
Krahnenufer
Katharinenufer
Konrad-Adenauer-Brücke
Kaiser-Wilhelm-Brücke
Campingplatz
0 50 100 150 200 250 m
Tourist Information
Anlagen
Verborgenes
Verlauf röm. Stadtmauer
in Richtung ...
Radweg
Bahnlinie, Bahngelände
Haupt-, Einbahnstraßen
Fußgängerzone
Verkehrsberuhigter Bereich
Öffentliche Bebauung
Grünflächen, Ufer (Allee)
Krankenhaus
Kirche, Friedhof
Campingplatz
Tourist Information
Sights
Hidden Things
Course of the Roman City Wall
Direction ...
Cycle Track
Train Line, Railway Property
Main Street, One-Way Street
Pedestrian Precinct
Low-traffic Zone
Public Planning
Green Area, River Bank (Alley)
Hospital
Church, Cemetary
Campground
© H & S Virtuelle Welten GmbH Trier, 2003
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Plan des römischen Trier um 400 n.Chr.

Map of Roman Trier around AD 400

Die Stadt erreichte im 4.Jh. mit etwa 50 000 bis 60 000 Bewohnern ihre größte Einwohnerzahl. Der Plan zeigt die Stadt mit dem typischen quadratischen Straßennetz, aus dem sich die Großanlagen und öffentlichen Gebäude leicht erkennbar abheben. Die Lage der einzelnen Anlagen ist der folgenden Numerierung zu entnehmen.

1 Nördliches Gräberfeld (Nordfriedhof)
1A Coemeterialbau im Bereich von St. Maximin, St. Paulin liegt außerhalb des Planausschnittes
2 Nördliches Stadttor (Porta Nigra)
3 Triumphbogen in der Simeonstraße
4 Kirchenanlage mit Dom
5 Palastaula (Basilika)
6 Zirkusanlage
7 Amphitheater
8 Tempel am Herrenbrünnchen
9 Kaiserthermen (Kaiserpalast)
10 Tempelbezirk im Altbachtal
11 Forum
12 Vermuteter Victorinuspalast
13 Großer Wohnpalast
13a Hochschule?, Sportanlage?
14 Horrea
15 Asclepius-Tempel
16 Ehrenbogen am Bollwerk
17 Barbarathermen
18 Töpferbezirk
19 Südliches Stadttor („Porta Media")
20 Südliches Gräberfeld, St. Eucharius (später St. Matthias) liegt außerhalb des Planausschnittes
21 Ältere Moselbrücke (Pfahlrostbrücke)
22 Moselbrücke (heutige Römerbrücke)
23 Rundbau (Exedra) zur Pfahlrostbrückenanlage gehörend
24 Tempelbezirk mit Lenus-Mars-Tempel
25 Viehmarktthermen
26 Ruwerwasserleitung
27 Südöstliches Stadttor („Porta Alba")

In the 4th century, the city reached its greatest number of inhabitants with about 50,000 to 60,00 residents. The map shows the city with the typical squared-off network of streets, with the large structures and public buildings easily recognizable. The location of the individual structures is numbered as follows:

1 Northern cemetery
1A Cemetery building in the area of St. Maximin; St. Paulin is located outside the confines of the map
2 Northern city gate (Porta Nigra)
3 Triumphal arch in Simeon Street
4 Church complex with Cathedral
5 Imperial throne room and audience hall (Basilika)
6 Circus
7 Amphitheater
8 Temple at Herrenbrünnchen
9 Imperial Baths (Imperial palace)
10 Temple district in the Altbach Valley
11 Forum
12 Postulated palace of Victorinus
13 Large residential palace
13a Academy? sports ground?
14 Storehouses (horrea)
15 Aesculapius Temple
16 Arch at the Bollwerk
17 Barbara Baths
18 Potters' district
19 South city gate
20 South cemetery, St. Eucharius (later St. Matthias) is located outside the confines of the map
21 Older Moselle bridge (wooden pier bridge)
22 Moselle bridge (present Roman Bridge)
23 Circular structure (exedra) belonging to wooden pier bridge
24 Temple district with Lenus-Mars Temple
25 Forum Baths
26 Ruwer water conduit
27 Southeast city gate

Conference Website:
cmsc2024.uni-trier.de