Welcome to

Timo Berthold
TU Berlin, FICO, MODAL

Ambros Gleixner
HTW Berlin, ZIB

Milena Petkovic
IKZ Berlin, ZIB

Thorsten Koch
TU Berlin, ZIB

CO@Work Program

Week 1: Methodology

- Today: Introduction & History
- Tuesday: LP & Modelling
- Wednesday: MIP Solving
- Thursday: Advanced Math. Optimization
- Friday: Interactive Optimization & Learning

Week 2: Applications

- Monday: Applied ML & Optimization
- Tuesday: Excursion
- Wednesday: Energy Networks
- Thursday: Traffic Optimization
- Friday: Industry Day

Saturday: Vehicle Routing & Starting the Computational Challenge

→ Each day has a different flavor: New day, new chance!

Week 1: Methodology

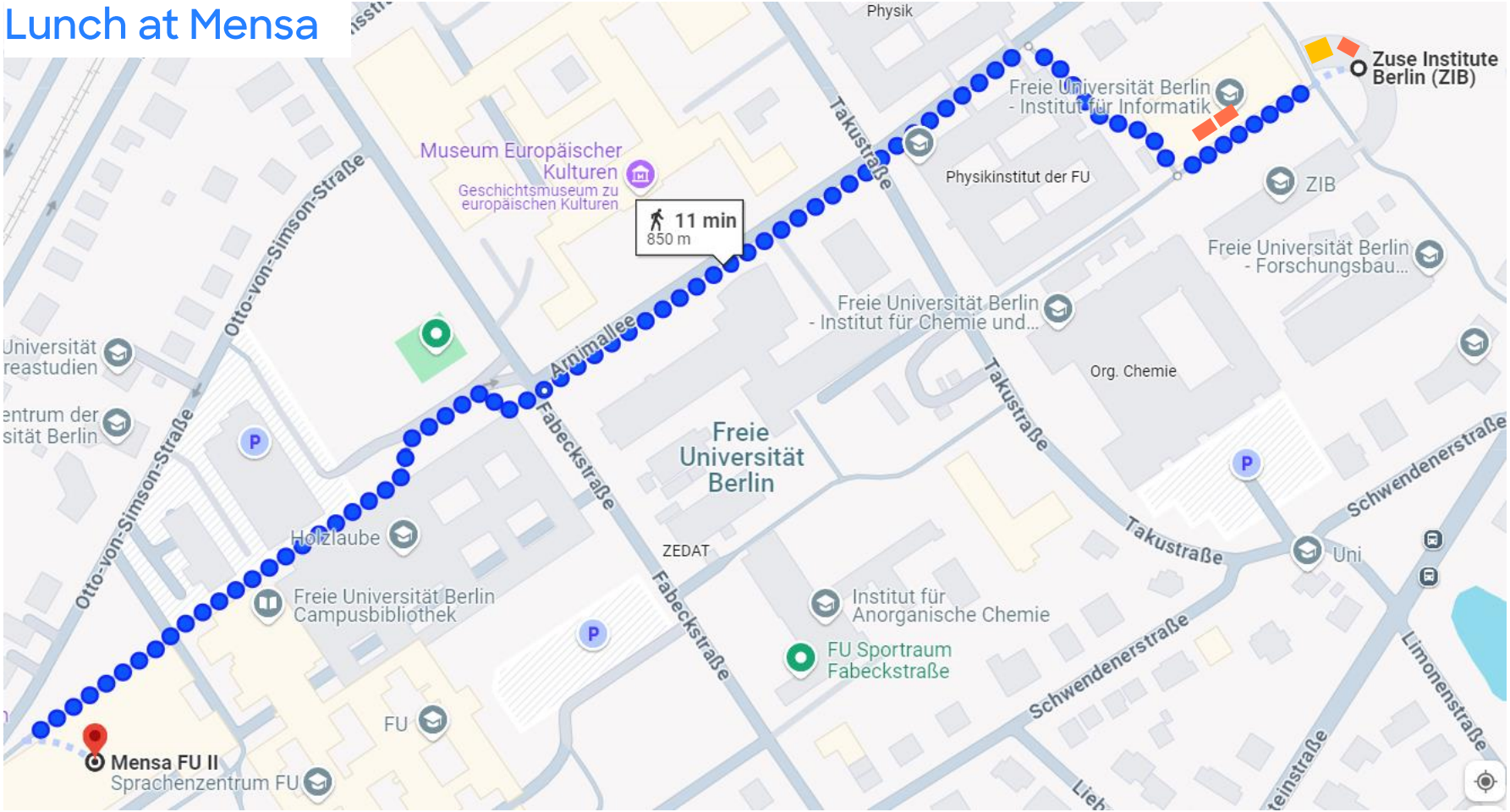
	Tuesday, 17.09.2024	Fundamentals of Linear Programming and Modelling
9:15	Ambros Gleixner	Linear Programming & Polyhedral Theory
10:00	Julian Hall	High Performance Computational Techniques for the Simplex Method
11:15	Joachim Dahl	Linear Programming: Barrier and First Order Methods
12:00	Ambros Gleixner	Aspects of MIP Modelling
14:15 -17:45	Bruno Vieira	Tutorial: Basics of MIP Modelling

- Morning lectures here in the lecture hall.
  - Coffee break 10:45-11:15 in the ZIB foyer
  - Lunch break 12:45-14:15 in the FU mensa
- Tutorials start in the lecture hall: be back on time and bring your laptop!!!
  - Three additional smaller rooms for tutorial work: ZIB 2006, FU 005, FU 006.
  - Coffee break 15:45-16:15

Rooms


LH
2006
Zuse Institute Berlin (ZIB)
1 min
45 m
Freie Universität Berlin - Institut für Informatik
006
005
ZIB

Lunch at Mensa



Lunch at Mensa

About 60 seats reserved, but can sit anywhere

- Can only pay with your MensaCard:
  - Pre-charged with 5€, re-charge with cash
  - Second price counts
  - Each side dish charged separately
  - Can request receipt at the counter
  - Please return to us on last day.

Week 1: Methodology

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- Get started with installation instructions for the first tutorials at https://github.com/mmghannam/co-work2024

Week 1: Methodology

	Wednesday, 18.09.2024	Fundamentals of Mixed Integer Programming
9:15	Timo Berthold	MIP Solving: Branch-and-Bound
10:00	Timo Berthold	MIP Solving: Cutting Planes
11:15	Timo Berthold	MIP Solving: Primal Heuristics
12:00	Timo Berthold	MIP Solving: Presolving
14:15 -17:45	Bruno Vieira, Mohammed Ghannam, Joao Dionisio	Tutorial: Advanced MIP Modelling

- Group photo right bevor lunch: outside of ZIB.

Week 1: Methodology

	Thursday, 19.09.2024	Advanced Mathematical Optimization
9:15	Ksenia Bestuzheva	Global Optimization of Mixed-Integer Nonlinear Programs
10:00	Marc Pfetsch	Solving Mixed-Integer Semidefinite Programs
11:15	Ambros Gleixner	Numerics in LP & MIP Solvers
12:00	Marco Lübbecke	Branch-and-Price Crash Course
14:15 -17:45	Mohammed Ghannam, Joao Dionisio	Tutorial: Implementing Branch-and-Price

Week 1: Methodology

	Friday, 20.09.2024	Interactive Optimization and Learning
9:15	Grégoire Montavon	Explainable AI, Learning Objectives, and the Clever Hans Effect
10:00	Jannis Kurtz	Deep Learning in Robust Optimization
11:15	Nicole Megow	Learning-Augmented Algorithms for Scheduling
12:00	Christoph Spiegel	The Role of Machine Learning for Mathematics
14:15	Berkant Turan	Tutorial: Hands-on Machine Learning
16:15-17:45	Mathieu Besancon	Tutorial: Hands-on Frank-Wolfe
19:15		Conference Dinner: meet at base of Berlin TV Tower

Conference Dinner

© Foto: Torsten Fritsche/Die Lichtisten

- Highlight: great view and already paid for!
  - Double-check your badge for the meal option!
  - Leave with us from ZIB at 18:15 or
  - Meet 19:15 at the base of the TV tower: be there on time!
    - public transport to S+U Alexanderplatz

Saturday: Starting the Computational Challenge!

	Saturday, 21.09.2024	Vehicle Routing
10:00	Eduardo Uchoa	Exact Algorithms for Vehicle Routing: advances, challenges, and perspectives
10:45	Kai Hoppmann-Baum	"Excuse me, Sir, we ordered 31 minutes ago!" - How to address time delays in food delivery
11:15	Thorsten Koch	Stochastic Local Search Heuristics
11:45	Lunch	
12:45 -15:00	Milena Petkovic	Computational Challenge Day 1

- No coffee break: BYO!
- We plan to organize light lunch: announcement will follow.

Optimize the Future of Delivery: Delivery Hero's VRPPD Challenge

A unique opportunity to tackle a Vehicle Routing Problem with Pickup and Delivery arising in the real world.

The Vehicle Rotting Problem? Well, let's hope not!

- We're solving the VRPPD—figuring out how to deliver items efficiently without the food going bad!
- Think you can conquer the chaos and keep the pizza fresh? Let's see what you've got!

Start: Saturday, September 21, 2024

- Participants will be randomly assigned to teams of 4 (or 3).
- Attendance on Saturday is mandatory to be assigned to a team and to participate: Challenge participation is required to take the exam.
- The winners will be announced during the closing session.

Sunday: Relax! *

"Dall-e, please draw an image of how to spend a relaxing Sunday in Berlin."

* ≈ Try to find a easier-to-optimize superset of your feasible region by leaving out some particularly hard constraints.

Week 2: Applications

	Monday, 23.09.2024	Applied Machine Learning and Optimization
9:15	Andrea Lodi	ML-augmented Branch and Bound for MILP
10:00	Timo Berthold	Machine Learning inside MIP solvers
11:15	Jan Kronqvist	Building upon MIP and non-smooth optimization to learn robust deep neural networks
12:00	Ruth Misener	Optimal decision-making problems with trained surrogate models embedded
14:15-17:45	Milena Petkovic	Computational Challenge Day 2

Week 2: Excursion Tuesday!

- Check your badge for which tour you are assigned to
- Rule 1: Do. Not. Lose. Your. Group.
  - Train tickets, factory tour, etc. are organized.
- Rule 2: Bring some form of ID (passport, driver's license,…)
  - For Tesla: fill in online registration!!!
- Excursion 1: Volkswagen in Wolfsburg
  - Via ICE train. Meet 8:10 at S+U Hauptbahnhof on the platform. Don't be late!!!
  - Guides are Timo, Thorsten, Matea, and Fritz.
  - Arrive back in Berlin 19:30
- Excursion 2: Tesla Gigafactory in Grünheide
  - Via S-Bahn. Meet 9:45 at S+U Alexanderplatz. Don't be late!!!
  - Guides are Ambros, João, Mo, and Gioni.
  - Head back to Berlin 15:30

Week 2: Applications

	Wednesday, 25.09.2024	Energy Systems
9:15	Milena Petkovic	From Energy Systems to Material Science: Optimization as a Common Denominator for a Sustainable Future
10:00	Inci Yüksel-Ergün	Data Preprocessing and Data Quality Assessment for Energy System Optimization
11:15	Jaap Pedersen	Quota Steiner Tree Problem and its Application on Wind Farm Planning
12:00	Stephanie Riedmüller	Multi-objective design and operation optimization for district heating networks
14:15-17:45	Milena Petkovic	Computational Challenge Day 3

Week 2: Applications

	Thursday, 26.09.2024	Traffic and Logistics
9:15	Ralf Borndörfer	Design of Public Transit Systems
10:00	Niels Lindner	Periodic timetable optimization in public transport
11:15	Daniel Rehfeldt	Optimizing vehicle and crew schedules in public transport
12:00	Daniel Roth	Using airline planning software to plan ICU personnel
14:15-17:45	Milena Petkovic	Computational Challenge Day 4

Week 2: Industry Friday!

	Friday, 27.09.2024	Industry Day
9:15	Zsolt Csizmádia	Amazon: optimising the journey of a package. Examples of optimisation and machine learning applications
9:45	Adele Goutes	How to set optimal prices during a sales event steered by humans?
10:15	Jakob Witzig	SAP Supply Chain Optimization
11:15	Anna Thünen, Jennifer Uebbing	Optimization in practice: from long to short, from planning to operation of (power) grids
11:45	Felix Hennings	Dimension Local Energy Hubs to Reduce Grid Congestion
12:15	Petra Bauer	Mathematical Optimization @ Siemens
14:15	Tim Januschowski	If Optimization is one part of the practical puzzle, what are the others?
14:45	Justine Broihan	Mastering the Optimization Pipeline: A Consultant's Perspective
15:15		Networking with Industry
16:15	Pawel Lichocki	Combinatorial Optimization at Google: tools, solvers, and applications
16:45	Matthias Miltenberger	Gurobi OptiMods - Painless Optimization Templates


YES!
Is this relevant for the exam?

Exam details

- October 7, 2024: 3 pm to 5 pm CET
- Indicate plan to participate and student ID here at registration desk
- In-person exam (mandatory for TU students, advised for other Berlin students):
  - TU Mathematik-Gebäude, MA004 (ground floor)
  - Registration: NOT via Moses…use form sheet „Anmeldung zur Prüfung“, available at the registration desk here at the summer school (and before exam)
- Online exam:
  - PDF will be made available for download when the in-person exam starts.
  - Electronic submission of answers in PDF, JPG, or PNG format by 4.59.59 pm at the latest!
  - Zoom meeting for questions, errata
  - details on submission and Zoom link will follow
- Both exam variants are “open-book”; use your laptop, bring printouts if you want

Let the show begin ...

Martin Grötschel

Optimization and OR

A Sketch of Historical Developments