OPEN COMMUNITY FOR RESEARCH

Collocated at OCX 26 OPEN COMMUNITY EXPERIENCE

UniTime Overview:
From Research to Practice

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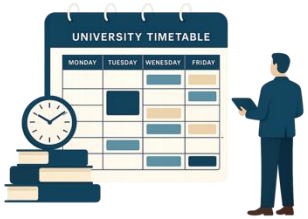
Education Timetabling

Process of assigning events in time and space

- Hard optimization problem
- Research since the 80s
- Mostly at departmental level, many differences

Why is it needed?

- Students get the courses they need
- Manage resources more effectively
- Make the process easier to manage
- Good timetables that are fair
- What-if scenarios
- Adapt to a change



UniTime

Started as a research project in 2001

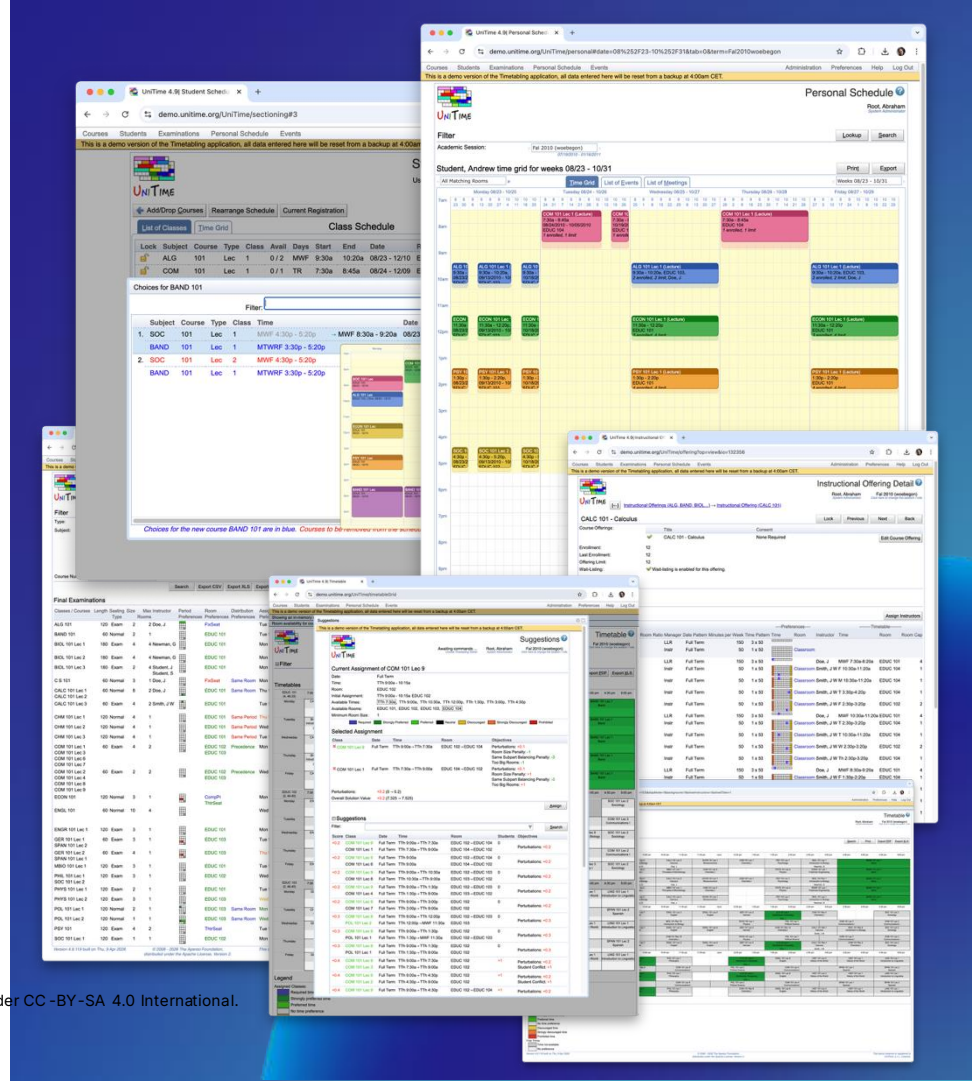
- Cooperation between Purdue University and Masaryk University
- Large-lecture room timetable at Purdue

Became open-source in 2007
Joined the Apereo Foundation in 2015

Enterprise system for many timetabling needs of a university

Introducing UniTime

- Comprehensive academic scheduling solution
- Five components
  - Schedule of classes
  - Individual student schedules
  - Teaching assistant assignments
  - Examination schedule
  - Additional (course-related) events
- Open-source, web-based, written in Java
- Distributed data entry and/or timetabling
- Using state of the art optimization algorithms
- Used by 100+ institutions around the world



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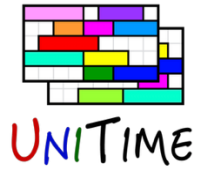
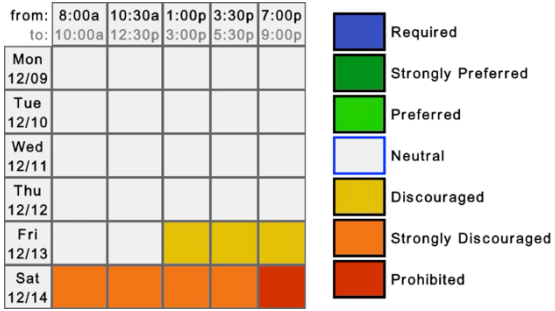
Example: Examination Timetabling

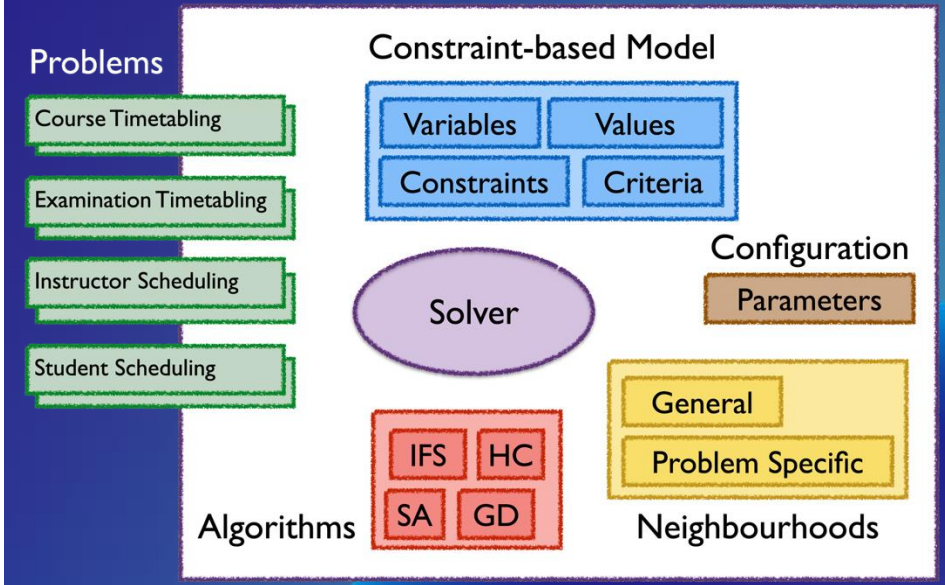


- Problem: assing examinations in periods and rooms
  - Available rooms, periods
  - Exams with associated students & instructors, seating type
- Constraints Constraints
  - Examination size ≤ room capacity
  - Period and room requirements
  - No two exams in a room at the same time and period
  - Student/instructor/room availability
- Objective: minimize student conflicts
  - Direct conflicts
  - More than two exams on a day
  - Back-to-back exams
- Other objectives
  - Instructor conflicts
  - Period and room preferences
  - Room splits, distances between rooms, large exams first, ...



UniTime Solver

- Constraint Satisfaction Optimization Problem (CSOP)
- Open-source and written in Java
- Local-search based with various heuristics and multiple algorithms available
- Conflict statistics to escape local optima
- Works well on large instances, though it cannot prove optimality
- Winner of two of three tracks of ITC 2007
- Best results on the ITC 2019, if limited by time & hardware



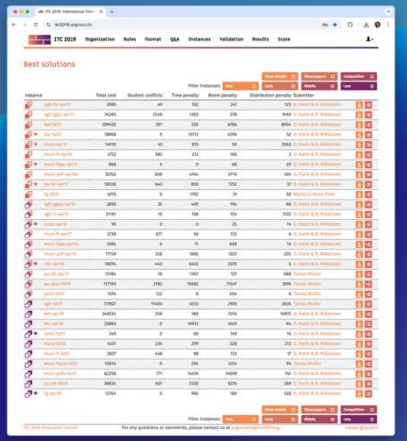
UniTime Research

- Started as a research project
- Published number of papers
- PATAT conference series
  - Next one in Nottingham in August 2026
- Co-organized ITC 2019
  - Benchmark datasets for further research
  - Validation & best know solutions repo

International Timetabling Competition 2019

- Course timetabling with student sectioning
- 30 problem instances of various sizes
- Real-world data from 10 institutions
- 750+ registrations
- 20+ solvers
- 5 finalists, one winner
- 20+ journal publications

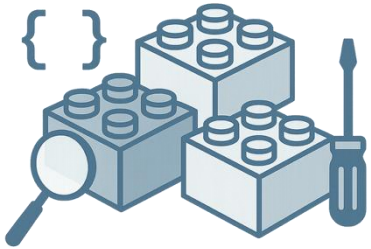
www.itc2019.org



How to contribute

- Timetabling research (check out itc2019.org)
- Student projects (proof of concept)
- Localization
- Integration
- Software development

github.com/UniTime



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Thank you

www.unitime.org