

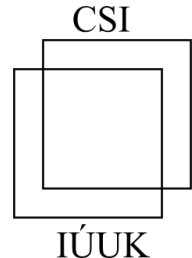
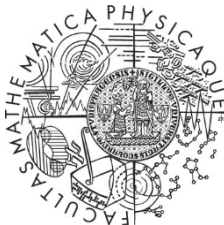
# Annual projects

presented by Jan Hubička

Department of Applied Mathematics

(KAM) and

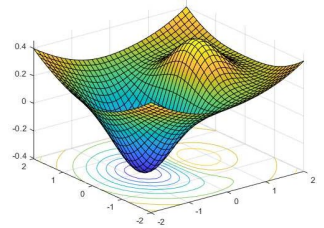
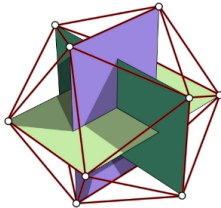
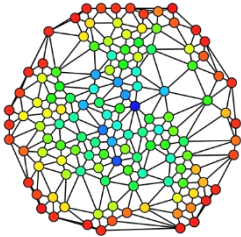
Informatics Institute Charles University (IÚUK)



O  
n'you

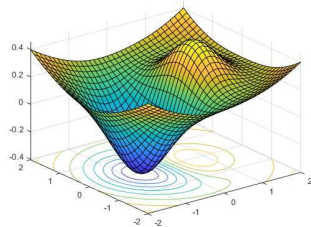
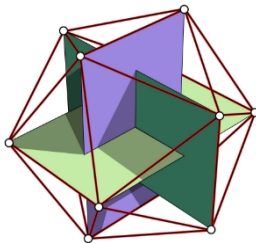
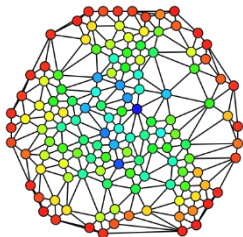
# O n'you

- We deal with discrete mathematics, geometry, theoretical computer science, operational research and optimization.



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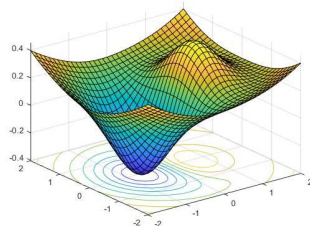
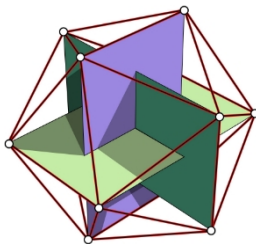
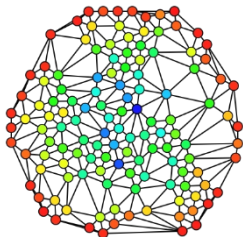
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- Pages of departments:
  - WHERE TO: <http://kam.mff.cuni.cz/>
  - IU'UK: <http://iuuk.mff.cuni.cz/>

# O n'you

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- Pages of departments:
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  - IU'UK: <http://iuuk.mff.cuni.cz/>
- We offer year-long projects, bachelor's thesis and other activities.

Jarní  
School

# Jarní School

- For our students we organize the traditional **Spring School**.



**Spring  
School 2024**

The logo features a stylized black line drawing of a spring above the text "Spring School 2024". The spring is curved, resembling a rainbow or a smile.

# Jarní School

- For our students we organize the traditional **Spring School**.



- Participation includes lectures, presentations and trips, see

<http://kam.mff.cuni.cz/~spring/2024>



# Research experience for undergraduates (REU)<sup>1</sup>

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<sup>1</sup>This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 823748 (project acronym: CoSP).

# Research experience for undergraduates (REU)<sup>1</sup>

- We offer the opportunity to participate in the REU

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# Research experience for undergraduates (REU)<sup>1</sup>

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pro



- Each year, a selected group of students may travel to the USA for two months to participate in research at **Rutgers University**.



<sup>1</sup>This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 823748 (project acronym: CoSP).

Students'  
achievements:

# Students' achievements

- Our students are very successful in all competitions.



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- Awards at the **SVOC** competition in recent years:
  - **2019**: 1st place in category M5-6 (**M. Konečn'y**),
  - **2018**: 1st place in category M6 (**V. B**),
  - **2017**: 1st place in category M6 (**M. Skotnica**),
  - **2016**: 1st place in M6 (**J. Sosnovec**) and M7 (**P. Zeman**),
  - **2015**: 1st place in M3 category (**J. Bok**),
  - **2014**: 1st place in M7 category (**P. Vesel'y**),
  - **2012**: 1st place in the category M6 (**P. Klav'ik**) and M7 (**M. Balko**),
  - **2011**: 1st place in M6 category (**M. Balko**),
  - **2010**: 1st place in category M6 (**Z. Safernov'a**).

# Students' achievements:

# Students'

## achievements

- Our students also receive the Dean's Prizes (T. Cířek, M. Černý, 2022, M. Konečný, 2018), the Rector's Prize (M. Poljak, 2020) and the Josef Hlávka Prize (M. Konečný, 2023).



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## Novinky.cz

Novinky.cz • Internet a PC • Češi vytvořili umělou inteligenci, která drtí v ... Podružky: Hardware • Software • Testy • Hry a herní systémy • Mobil

### Češi vytvořili umělou inteligenci, která drtí v pokeru jednoho hráče za druhým

3. 3. 2017, 15:44 - mlf, Novinky

Facebook Twitter

Vědci z Matematicko-fyzikální fakulty Univerzity Karlovy a Fakulty elektrotechnické ČVUT v Praze pracovali několik posledních měsíců na vývoji umělé inteligence, jejímž hlavním úkolem bude stát se špičkou v karetní hře Poker Texas Hold'em. A to se skutečně podařilo, program porazil hned několik profesionálních hráčů.



# Managers and their projects (KAM)



Milan

<http://kam.mff.cuni.cz/~hladik>

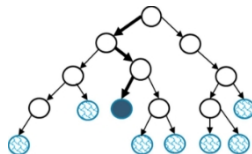
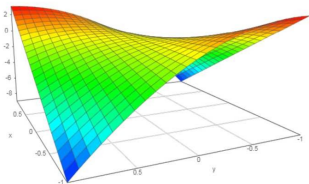
Hladík

- **Box image in bilinear and quadratic display**
  - This picture can be easily estimated by evaluating the interval arithmetic, but the result may be significantly overestimated. The aim of this study is to improve these basic estimates.
- **Testing of copositivity using branch & bound**
  - A matrix  $A$  is copositive if  $x^T Ax$  is uncorrelated for all uncorrelated vectors  $x$ . In general, it is NP-hard to know whether a given matrix is copositive. The aim of the study would be to implement the method branch & bound to test the copositivity of the matrix.
- Many other projects and works can be found on personal pages.



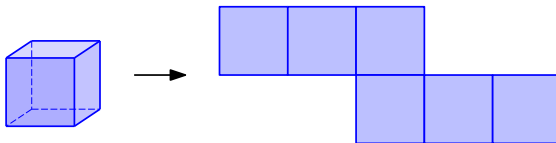
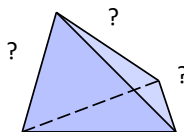
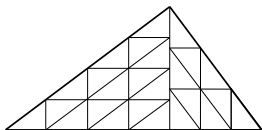
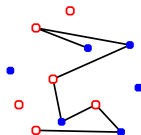
Milan  
Hlad'ik

<http://kam.mff.cuni.cz/~hladik>



Discrete geometry, graph drawing, combinatorics.

- The topics are **theoretically** oriented; the project would be followed by a theoretical bachelor's degree.

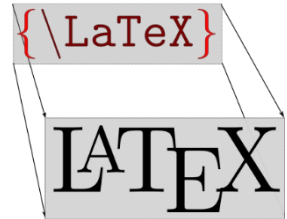


- Specific topics are available on the pages.

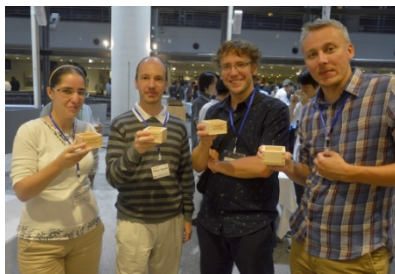
# Martin Mareš

<https://mj.ucw.cz/>

- Graph algorithms and data structures
- Linux and computers
- Text typesetting (TeX, ePUB)
- Drawing maps and working with geodata
- Tools for software development

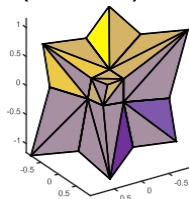


Head of the annual project: Elif  
Garajova  
Milan Hlad'ik  
David Hartman



The group of interval methods offers annual projects in the field of interval analysis, linear algebra and optimization with non-precision (interval) data.

$$\begin{bmatrix} 5 & [1, 2] & 1 \\ [1, 2] & 5 & [0, 2] \\ [1, 4] & [0, 2] & 5 \end{bmatrix} x = \begin{bmatrix} [-2, 2] \\ [-2, 2] \\ [-2, 2] \end{bmatrix}$$





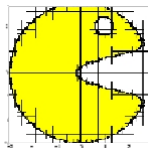
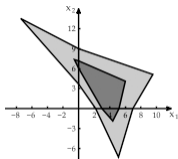
# Interval project budgets

## Interval matrices and their properties

- Regularity, number of eigenvalues, special matrix classes, . . . **Interval systems of linear equations**
- Methods for the determination of interval systems, linear systems with parametric dependences of coefficients, . . .

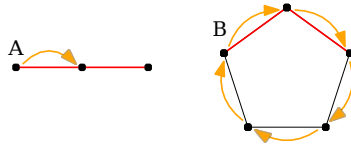
## Interval optimization and game theory

- Solving optimization problems with interval data, visualization of the set of optimal solutions, . . . .

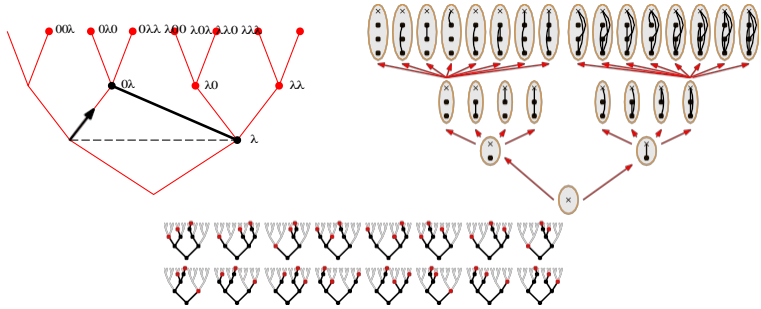


→ <https://kam.mff.cuni.cz/gim/>

- Study of symmetries of structures



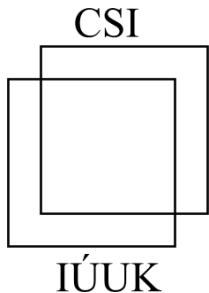
- Structural Ramsey Theory



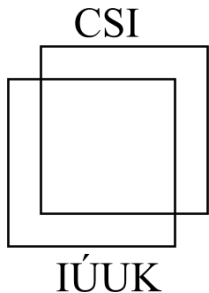
# Leaders and their projects (IUUK)



- There are also opportunities for projects on the peace.
- If you choose a project from the KAM through IU'UK, please contact your supervisor by e-mail.
- Contacts can be found on the pages of the departments:
  - WHERE TO: <http://kam.mff.cuni.cz/>
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Thank you for your

attention.