



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

## Scientific stay TU Dresden, Germany

Jan Outrata

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# Place

- Technical University Dresden, Germany – 1828, “excellence university”, 36 500 students, 15 faculties, 5 schools, largest in Saxony
- Institute of Algebra, Department of Mathematics, Faculty of Science, School of Mathematics and Natural Sciences



Figure: Side entrance to the building of Institute of Algebra at TU Dresden

# Place

- Technical University Dresden, Germany – 1828, “excellence university”, 36 500 students, 15 faculties, 5 schools, largest in Saxony
  - Institute of Algebra, Department of Mathematics, Faculty of Science, School of Mathematics and Natural Sciences
  - research areas: foundations and applications of algebra, in particular general algebra, theory of ordered sets and lattices and graph theory
- function and relation systems and formal concept analysis (FCA): FCA basics (main theorem, Ganter’s NextClosure algorithm, book Ganter B., Wille R.: Formal Concept Analysis. Mathematical Foundations. Springer, Berlin, 1999), application of FCA in data analysis and (conceptual) knowledge processing
- at present 11 people (from that 4 professors) and 5 PhD students (1 under supervision also from other university)



- + colleagues (S. E. Schmidt, Ch. Zschalig) and PhD students (D. Borchmann, C. Glodeanu, A. Revenko, T. Schlemmer) at the institute
- research: application of FCA (besides further development of FCA theory), utilization of FCA with fuzzy attributes, drawing concept lattices, development of attribute exploration method, interconnection between FCA and rough sets etc.
- collaboration with people at UP in Olomouc, NRU HSE, Moscow (S. O. Kuznetsov), UBP Clermont-Ferrand (L. Nourine), TU Darmstadt (R. Wille) and other

# Stay run

- consultations of methods of drawing (concept) lattices developed at Dept. Computer Science, Palacky University (adaptation and extension of geometrical method developed by R. Wille at TU Darmstadt) and at their institute (attribute additive method and nested diagrams) and of possibilities of improving and focusing of the methods, with prof. Ganter
- consultations of algorithms for computing formal concepts and concept lattice, with A. Revenko (PhD student), and of factor analysis using FCA (with fuzzy attributes), with C. Glodeanu (PhD student)
- leisure discussions over various related topics with further colleagues and PhD students (D. Borchmann, S. Kerkhoff, M. Behrisch)
- study of dissertation theses of former PhD students B. Koester, on web information mining using FCA, and Ch. Zschalig, on drawing planar diagrams of lattices

# Talks

## *Computing formal concepts by attribute sorting*

- on scientific seminar “International Seminar”  
([http://tu-dresden.de/die\\_tu\\_dresden/fakultaeten/fakultaet\\_mathematik\\_und\\_naturwissenschaften/fachrichtung\\_mathematik/institute/algebra/veranstaltungen](http://tu-dresden.de/die_tu_dresden/fakultaeten/fakultaet_mathematik_und_naturwissenschaften/fachrichtung_mathematik/institute/algebra/veranstaltungen))
- idea of Ganter: in case of (completely) distributive concept lattice the possibility of improvement of the presented algorithm by other attribute sortings, “tailored” to input data
  - characterization of (completely) distributive concept lattices in the book Ganter B., Wille R.: Formal Concept Analysis. Mathematical Foundations (Theorem 40)
- discussion of utilization of attribute sorting idea used in the algorithm for the so-called clarification of formal context, with T. Schlemmer (PhD student)

# Contacts

- establishing new contacts and discussions of possibilities of scientific collaboration with group of prof. Ganter: C. Glodeanu, A. Revenko, T. Schlemmer, Ch. Zschalig a others
- discussion of current research and establishment and deepening of collaboration (drawing lattices, factor analysis), topics for further research (algorithms)

# Conclusion

- the stay highly fulfilled its purpose
- possibilities of new scientific collaboration with one of the main centers in the area of formal concept analysis (FCA)
- given a talk on scientific seminar



**Figure:** Fotos from a trip to Saxon Switherland, on left foto prof. Ganter (on the left), dr. Outrata (second from the left), doc. Krupka (second from the right) and C. Glodeanu (on the right), and from the scientific seminar, on right foto dr. Outrata.

# Erlebnisland Mathematik Dresden

Math Adventure Land Dresden, <http://www.erlebnisland-mathematik.de>

- trvalá interaktivní výstava
- matematika zábavnou formou
- přes 100 experimentů
- Katedra matematiky TU + muzeum Technische Sammlungen Dresden

