

Bernhard Korte



Academic career

1967	PhD in Mathematics, University of Bonn
1971	Habilitation, University of Bonn
1971	Professor, University of Regensburg
1971 - 1973	Professor, University of Bielefeld (charter dean)
Since 1972	Professor, University of Bonn
Since 1987	Director, Research Institute for Discrete Mathematics, University of Bonn
	Guest professorship at Stanford, Cornell, Waterloo, MIT, Yale, Rome, Pisa, Barcelona, PUC Rio de Janeiro, Rutgers's.

Honours

1985	Distinguished senior fellow, Rutgers Center for Operations Research, New Brunswick, NJ, USA
1986	Grande Ufficiale dell' Ordine al Merito della Repubblica Italiana
1987	Honorary doctorate, Université degli Studi di Roma, La Sapienza, Italy
1988	Honorary professor of Applied Mathematics, Academia Sinica, Beijing, China
1988	Professor honorário da Universidade, Ponteficia Universidade Católica, Rio de Janeiro, Brasil
1989	Ordinary member of the North-Rhine-Westphalian Academy of Sciences
1990	Alexander-v.-Humboldt-Research-Prize (France: Prix Alexander de Humboldt)
1991	Fellow of the Institute of Combinatorics and Applications, Canada
1993	Order of Merits of the State of North-Rhine-Westphalia
1996	State Prize of North-Rhine-Westphalia
1996	Member of Leopoldina (German National Academy of Sciences)
2002	Grand Cross of the Order of Merits of the Federal Republic of Germany
2002	Member of acatech (German Academy of Technology)
2005	Hahn Prize of the University of Tübingen

Offers

Several offers from universities in Germany and North America.

Invited Lectures

Several invited lectures at different SIAM conferences
GAMM annual meeting
NATO Research Institutes
DMV annual meeting
International Math. Progr. Symposia
EURO
ORSA/TIMS (INFORMS) meetings

Research Projects and Activities

Long-term cooperation project "Combinatorial Optimization and Chip Design" with IBM, USA and Magma Design Automation, USA, jointly with Jens Vygen, since 1986
Several projects of the European Commission within the framework of PROCOPE, ESPRIT, Human Capital and Mobility, DONET (Discrete Optimization Network)
Co-director and German Coordinator, since 1988

Research profile

The application of combinatorial optimization to chip design is still an extremely challenging field to which I have devoted my research during the last 20 years. By applying methods of discrete mathematics new theoretical insights into combinatorial structures are generated. Moreover highly complex chips can only be designed by our methods, the so-called BonnTools. More than 1,000 most complex microprocessors and ASICs (application specific integrated circuits) have been designed by BonnTools. It is very satisfying to learn that these designs are only possible by using our mathematics and that by this, billions of Dollars we saved.

Of course, I will continue my research in the area of combinatorial optimization, especially the most successful application of combinatorial optimization in chip design. Here we are faced with many new and highly complex problems. It is a fact that by now billions of transistors and kilometers of nets have to be packed on a square centimeter of silicon; we have to re-design many of our algorithms. While it was formerly possible to deal with design goals and objective functions separately and consecutively, we have now to attack different objectives simultaneously. Timing, packing density, buffering, transistor sizing, vt-optimization, power consumption, noise and routing have to be integrated in a new and common framework. This is a great challenge for our future work. In leading edge chip design only a few picoseconds matters in timing matter to get a feasible design. In order to be successful we have to develop new theoretical results and algorithms, especially new approximation results, which will then lead to an overall improvement of our BonnTools.

Editorships

- Acta Mathematicae Applicatae Sinica
- Advances in Applied Mathematics
- Annals of Operations Research
- Combinatorica
- Chinese Journal of Operations Research
- Discrete Applied Mathematics
- Discrete Optimization
- IEICE Transactions on Fundamentals of Electronics
- Communications and Computer Science (Japan, Overseas Advisor)
- Japan Journal of Applied Mathematics
- Mathematical Programming
- Ser. A, Mathematical Systems in Economics
- Matemática Aplicada e Computacional
- Methods of Operations Research
- Operations Research Spektrum
- Optimization, Mathematische Operationsforschung
- Zeitschrift für Operations Research

Selected publications

- [1] Bernhard Korte and Jens Vygen. *Combinatorial optimization*, volume 21 of *Algorithms and Combinatorics*. Springer, Heidelberg, fifth edition, 2012. Theory and algorithms.
- [2] Stephan Held, Bernhard Korte, Dieter Rautenbach, and Jens Vygen. Combinatorial optimization in vlsi design. In V. Chvátal, editor, *Combinatorial Optimization: Methods and Applications*, pages 33–96. IOS Press, Amsterdam, 2011.
- [3] Bernhard Korte and Jens Vygen. Combinatorial problems in chip design. In *Building bridges*, volume 19 of *Bolyai Soc. Math. Stud.*, pages 333–368. Springer, Berlin, 2008.
- [4] Christoph Albrecht, Bernhard Korte, Jürgen Schietke, and Jens Vygen. Maximum mean weight cycle in a digraph and minimizing cycle time of a logic chip. *Discrete Appl. Math.*, 123(1-3):103–127, 2002. Workshop on Discrete Optimization, DO'99 (Piscataway, NJ).
- [5] Bernhard Korte, László Lovász, and Rainer Schrader. *Greedoids*, volume 4 of *Algorithms and Combinatorics*. Springer-Verlag, Berlin, 1991.
- [6] Bernhard Korte, Hans Jürgen Prömel, and Angelika Steger. Steiner trees in vlsi-layout. In *Paths, flows, and VLSI-layout (Bonn, 1988)*, volume 9 of *Algorithms Combin.*, pages 185–214. Springer, Berlin, 1990.

- [7] Bernhard Korte and L'aszl'o Lov'asz. Polyhedral results for antimatroids. In *Combinatorial Mathematics: Proceedings of the Third International Conference (New York, 1985)*, volume 555 of *Ann. New York Acad. Sci.*, pages 283–295. New York Acad. Sci., New York, 1989.
- [8] Bernhard Korte and L'aszl'o Lov'asz. Noninterval greedoids and the transposition property. *Discrete Math.*, 59(3):297–314, 1986.
- [9] Anders Björner, Bernhard Korte, and L'aszl'o Lov'asz. Homotopy properties of greedoids. *Adv. in Appl. Math.*, 6(4):447–494, 1985.
- [10] Bernhard Korte and L'aszl'o Lov'asz. Polymatroid greedoids. *J. Combin. Theory Ser. B*, 38(1):41–72, 1985.