DEPARTMENT OF MATHEMATICS

Head of Department:
Doc. Štefan Varga, PhD

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Full Professors:
Vladimír Kvasnička, PhD, DSc

Associate Professors:
Vladimír Baláž, PhD; Anna Kolesárová, PhD; Jiří Pospíchal, DSc; Michal Šabo, PhD; Štefan Varga, PhD

Assistant Professors :
Jozef Antoni, PhD; Július Bánki, PhD; Štefan Boor, MSc; Ivan Garaj, PhD; Viera Grusková, PhD; Eva Hainzlová, MSc; Vladimír Haluška, PhD; Ľubomíra Horanská, PhD; Milan Jasem, PhD;

PhD Students:
Štefan Babinec, Ing., Jozef Babjak, Ing., Peter Grančič, Ing., Peter Sarkoci, Ing., Dagmar Zelisková, Ing.

II. TEACHING AND RESEARCH LABORATORIES

A. Teaching laboratories:

Laboratory equipped by personal computers for the Basics of Computer Science

B. Research laboratories:

III. TEACHING

A. Undergraduate Study:

1. semester (Bc)	Calculus I	3/3/0	Baláž, Horanská, Jasem, Kolesárová, Šabo
	Calculus I (external study)	2/2/0	Grusková, Kvasnička
2. semester (Bc)	Calculus II	4/4/0	Baláž, Grusková, Horanská, Jasem, Kolesárová, Šabo
	Calculus II (external study)	2/2/0	Boor, Grusková
	Basics of Computer Science	1/0/2	Antoni, Babjak, Bánki, Boor, Heinzlová
	Basics of Computer Science	1/0/1	Antoni, Bánki, Boor,

	(external study)		Heinzlová
5. semester (Bc)	Calculus III	2/0/2	Antoni, Boor, Garaj, Varga
	Calculus III (external study)	1/0/1	Garaj
1. semester (MSc	Discrete mathematics	2/1/0	Kolesárová
	Programming and algorithms	2/0/1	Pospíchal
	Numerical mathematics	2/0/1	Šabo
	Computer architecture	2/0/1	Antoni
	Laboratory of specialization	2/0/1	Babinec, Sarkoci
2. semester (MSc	Artificial intelligence in chemistry	2/0/1	Kvasnička
	Statistics	2/0/1	Varga
	Laboratory of specialization II	0/0/6	Babinec, Sarkoci
3. semester (MSc	Database systems	2/0/1	Antoni
	Laboratory of specialization	0/0/10	Babjak, Grančič
	Financial mathematics	2/0/0	Horanská

IV. CURRENT RESEARCH PROJECTS

A. Mathematical vague information processing and its applications

VEGA GRANT No. 1/0085/03 (Anna Kolesárová)

Quantification of uncertainty related to the vagueness of studied objects. Extension of the theory of aggregation operators, new construction methods for aggregation operators, in particular, construction of stable aggregation operators, clarifying their structure and uniqueness. Ordinal aggregation operators for aggregation of data of qualitative nature. The study of possible applications of different types of aggregation operators in inference process in fuzzy logic and construction of new operators for this purpose. Fuzzy preference modelling and decision making. Mixed fuzzy-stochastic models.

Project duration: from **01/01/2003** to **31/12/2005**

B. COST ACTION 274/2 : Theory and Applications of Relational Structures as Knowledge Instruments (TARSKI)

Project EU ISTC (Anna Kolesárová)

The main objective of the Action COST 274 is to advance the understanding and use of relational structures in applicable object domains. The researchers of FCHFT STU are involved in the working group WG3 for the development of non-invasive scaling methods for the prediction of relational data and comparing, and possibly, integrating, a nominal scaling approach with numerical methods such as fuzzy relations, etc. The aim is also the improvement of methods and procedures for gaining information from everyday relational situations such as, e.g., preference models.

Project duration: from **06/2001** to **06/2005**

C. Echo state neural networks

VEGA GRANT No. 1/1047/04 (Jiří Pospíchal)

The goal of the project is the study of a modern approach to recurrent neural networks, which is exceptionally suitable both for a time series prediction, as well as for modeling of cognitive processes in artificial neural systems. Neural network in this aproach includes a block of neurons with a recurrent architecture, which is randomly generated and the weight coefficient of its connections are fixed during the learning stage of the network. The input activities incoming to the neural network will be mpped onto a rich dynamic structure of activities of hidden neurons, which are used as an input to the layer of output neurons. The learning of this network consists in adjusting of weight coefficients between hidden neurons and output neurons. Weight coefficients between the hidden and the input neurons and in-between hidden neurons are randomly generated and do not change during the learning stage. Current research emphasis is on evolutionary improvement of networks bringing more robustness to the quality of predictions.

Project duration: from **01/01/2004** to **31/12/2006**

D. Artificial chemistry and molecular evolution

VEGA GRANT No. 1/0062/03 (Vladimír Kvasnička)

Biotic and abiotic molecular systems with kinetics determined by Eigen's replicator system are studied by methods of artificial chemistry. Molecules are represented by strings of tokens over a finite alphabet. These molecules are capable of a physical process called "folding" (an analogy with biomacromolecules RNA). Each molecule is evaluated by a fitness on the basis of its particular folding. Molecules are placed in a chemical-reaction system, where they take part in a reproduction process (with probabilities proportional to their fitness) consisting in a simple copying accompanied by mutations. Such a simple reaction system corresponds to biomacromolecular systems that are capable of Darwinian evolution on molecular level. A goal of evolution specified in this way is an emergency of strings with required folding (required phenotype or a goal phenotype). The present in-silico approach offers a conceptual and notional machinery for a deeper theoretical interpretation and description of molecular Darwinian evolution.

Project duration: from **01/01/2003** to **31/12/2005**

V. CURRENT EDUCATION PROJECTS

A. Mathematics on-line: An internet course

KEGA GRANT No. 3/100603 (Jana Dobrakovová/ Anna Kolesárová)

The aim of the project is to propose and create the framework for a dynamical mathematical electronic education using XML documents, with respect to new pedagogical methods. The electronic net course will be addressed to the students of all faculties at STU in the first year of their study.

Project duration: from **01/01/2003** to **31/12/2005**

VI. COOPERATION

A. Cooperation in Slovakia

Institution	Type of cooperation	Responsible person	Duration
SjF STU Bratislava	New trends in teaching mathematics	RNDr. V. Záhonová, PhD., Mgr. M. Kováčová, PhD.	2004
SvF STU Bratislava	COST TARSKI 274 cooperation	Prof. Mesiar	2002-2005

B. International Cooperation

Institution	Type of cooperation	Responsible person	Duration
FFP UO, Opava	Organization of a seminar on Artificial Life and Cognition	Prof. RNDr. J. Kelemen, DrSc.	1.5.2000-
University of Alcalá de Henares, Madrid	COST 274 TARSKI cooperation	Prof. Enriqueta Muel	2002-2005
J. Kepler University, Linz	CEEPUS cooperation	Prof. E.P. Klement	2003-2005
Universita di Lecce, Italy	Scientific cooperation in Statistics	Prof. C. Sempi, Dr. F. Durante	2004-2005
Univ. J. Monnet, St. Etienne	Scientific cooperation (prog. Štefánik)	Prof. G. Grekos	2004

C. Membership in Domestic Organizations and Societies

Name	Organisation or Society	Position	Valid date
Kvasnička Vladimír	Slovak Academic Society	member	zakladajúci člen, 1997
Kvasnička Vladimír	Slovak Artificial Intelligence Society	chairmann	29.8.2000-
-Kvasnička Vladimír	Slovak Computer Science Society	member	1.1.1996-
Kvasnička Vladimír	Slovak Society for Mathematicions and Physicists	member	1980-1992

Kvasnička Vladimír	Scientific Commity of FCHPT STU	member	1.9.2002-
Kvasnička Vladimír	Scientific Commity of FIIT STU	member	1.10.2003-
Kvasnička Vladimír	Joint Commission for PhD study in Applied Informatics	member	1.1.1998-
Kvasnička Vladimír	Joint Commission for PhD study in Artificial Intelligence	member	1.1.2000-
Šabo Michal	Joint Commission for PhD study in Applied Mathematics	member	1.1.1998-
Kvasnička Vladimír	Commission for defence of DrSc. dissertations in Chemical Physics	member	1.1.1998-
Garaj Ivan	Technical commission TK71 Applications of statistical methods in quality control	member	1.1.2003
Garaj Ivan	Committee of Slovak Statistical and Demographic Society	member	1.1.2000
Kolesárová Anna	Slovak Society for Mathematiciants and Physicists	member	1974-
Kolesárová Anna	Editorial Board of Tatra Mountains Math. Publ.	member	1998
Šabo Michal	Slovak Society for Mathematicians and Physicists	member	1968-
Pospíchal Jiří	Slovak Computer Science Society	member	1.1.1996-
Pospíchal Jiří	Slovak Artificial Science Society	member	29.8.2000-
Antoni Jozef	Slovak Society for Mathematicians and Physicists	member	1968-
Baláž Vladimír	Slovak Society for Mathematicians and Physicists	member	1978-
Jasem Milan	Slovak Society for Mathematicians and Physicists	member	1978-
Varga Štefan	Slovak Society for Mathematicians and Physicists	member	1968-
Horanská Ľubomíra	Slovak Society for Mathematicians and Physicists	member	1993-

D. Membership in International Organisations and Societies

Name	Organisation or Society	Position	Valid date
Kvasnička Vladimír	MATCH Communications in Mathematical Chemistry	member of advis	1.1.1998-

Kvasnička Vladimír	Neural Network World	member of advis	1.1.2001-
Kvasnička Vladimír	Croatica Chimica Acta	member of advis	1.1.2002-
Kolesárová Anna	European Society for Fuzzy Logic and Technology (EUSFLAT)	member	1998-
Šabo Michal	European Society for Fuzzy Logic and Technology (EUSFLAT)	member	1998-
Šabo Michal	SEFI - Mathematical Working Group	member	1994-
Pospíchal Jiří	EURO Working group on fuzzy sets (EUROFUSE) (http://allserv.rug.ac.be/~bdebaets/members.html#SlovakRepublic)	member	1999-

E. Visitors from abroad

F. Visits of Staff Members and Postgraduate Students in Foreign Institutions

Name	Organisation / Institution / Conference	State	Date / Duration
Kolesárová Anna	Széchenyi István University, Gyor	Hungary	15.6. - 2.7. 2004
Kolesárová Anna	J. Kepler University , Linz	Austria	2. – 20. 2. 2004
Kolesárová Anna	COST Action 274 Meeting, Techn. Univ. of Tampere	Finland	9. – 13. 6. 2004
Kolesárová Anna	2nd Int. Conf. on Soft Methods in Probability and Statistics, University of Oviedo	Spain	2. – 4. 9. 2004
Kolesárová Anna	Int. Conf. 8th Fuzzy Days in Dortmund	Germany	30. 9. – 3. 10. 2004
Vladimír Baláž	University J. Monnet , Saint-Etienne	France	16. 6 . – 14.7. 2004
Milan Jasem	Int. Conf. Summer School on general algebra and ordered sets	Czech Republik	5. – 11. 9. 2004
Vladimír Baláž	University J. Monnet, Saint Etienne	France	27. 6. – 6. 10. 2004
Babinec Štefan	4.ČS-S Seminár: Kognice a umělý život IV.	Czech Republik	26. – 30.5. 2004
Babjak Jozef	4.ČS-S Seminár: Kognice a umělý život IV.	Czech Republik	26. – 30.5. 2004
Babjak Jozef	Int. Conference Mendel'2004, University Brno	Czech Republik	16. 6. – 18. 6. 2004

VII. THESES AND DISSERTATIONS

A. Graduate Theses (Bc Degree) for state examinations after three years of study

Name	Title of Thesis	Supervisor
Kovalčík Boris	Fuzzy modelling and fuzzy control of chemical processes	Kolesárová Anna
Kráľ Matúš	Optimization methods and their application in chemistry	Boor Štefan
Pigoš Ján	Predictions in non-parametric regression models	Varga Štefan

B. Graduate Theses (MS Degree) for state examinations after five years of study

Name	Title of Thesis	Supervisor
Drahoš Miroslav	A dependence of efficiency of fuzzy control on applied inference method	Šabo Michal
Grančič Peter	An application of genetic programming for prediction of physico- chemical molecular properties	Pospíchal Jiří
Kováčová Katarína	An application of genetic algorithm to design of molecules with required typological indices	Pospíchal Jiří
Paulovič Michal	Molecular evolution in silico	Kvasnička Vladimír
Zelisková Dagmar	An evolutionary algorithm for reconstruction of DNA molecules	Kvasnička Vladimír

C. Dissertations (PhD)

D. Dissertations (DSc)

E. Habilitation Theses

F. Inauguration Theses

Books, Chapters in monographs

[1] Garaj, I., Janiga, I.: Two sided tolerance limits of normal distributions with unknown means and unknown common variability. Vydavateľstvo STU v Bratislave, 218 strán, ISBN 80-227-2019-4.
[2] Kolesárová, A., Kováčová, M.: Fuzzy Sets and Their Applications. Vydavateľstvo STU v Bratislave, 2004, 160 strán. ISBN 80-227-2036-4.
[3] Kolesárová, A., Kováčová, M., Záhonová, V.: Mathematics I Vydavateľstvo STU v Bratislave, 2004, 152 strán. ISBN 80-227-2083-6.

CC publications

[1] Kolesárová, A., Mordelová, J., Muel, E.E.: Kernel aggregation operators and their marginals. Fuzzy Sets and Systems 142 (2004) 35-50.

Publications registered in CA, FSTA and other ISI databases

[1] Jasem, M.: Surface modification of polyester reinforced materials by plasma polymerization Math. Slovaca 54 (2004) 225-228.

Other publications

[1] Garaj, I., Janiga, I., Cisko, P.: Estimation of minimum detectable value by using linear calibration with constant deviation. Forum Metricum Slovacum VIII, Bratslava 2004, pp. 68-75, ISBN 80-88946-23-9.
[2] Garaj, I., Janiga, I., Cisko, P.: Estimation of minimum detectable value by using linear calibration with standard deviation linearly dependent on net state variable. Forum Metricum Slovacum VIII, Bratslava 2004, pp. 60-67, ISBN 80-88946-23-9.
[3] Garaj, I., Janiga, I.: Two sided tolerance limits of normal distributions with unknown means and unknown common variability. Forum Metricum Slovacum VIII, Bratslava 2004, pp. 51-59, ISBN 80-88946-23-9.

Lectures and posters

[1] Babjak, J.*: A biological model optimized by new strategies of SOMA. In: Medz. konf. ISCAM' 2004- bez zborníka. Abstracts ISCAM' 2004, Bratislava, 2004.(Pr)
[2] Jasem, M *.: Study of plasma modification properties of PET reinforcing materials In: Medz. konf. Summer School on General Algebra and Ordered Sets 2004, Jesenníky,Česko, september 2004 - bez zborníka. (Pr)
[3] Kolesárová, A.*, Mordelová, J. : Quasi-copulas as a class of 1-Lipschitz aggregation operators. In: Medz. konf. FSTA' 2004- bez zborníka. Abstracts FSTA'2004, Lipt. Ján, Február 2004, p. 73. (Pr)
[4] Šabo M. *, Strežo P.: On some constructions of fuzzy preference structures. In: Medz. konf. FSTA' 2004- bez zborníka. Abstracts FSTA'2004, Lipt. Ján, Február 2004, p. 96. (Pr)

Text books

[1] Reháková, M., Vizárová, K.*, Jančiová, D., Valovičová, M., Varga, Š.: Preselection of historical books in the process of their stabilization. In: Proc. Int. Conf. Durability of paper and writing, Ljubljana, november 2004, pp. 47-48.(Pr)
[2] Babinec, Š., Pospíchal J.* : Optimization in Echo state neural networks by Metropolis algorithm. In: Proc. of 10th Internat. Conference on Soft Computing, Mendel'2004. VUT Brno Publishing, June 2004, pp. 155-160. ISBN 80-214-2676-4. (Pr)
[3] Janiga, I.*, Cisko, P., Garaj, I.: Minimum detectable value from the linear calibration. In: Zborník medz. Konf. Strojné inžinierstvo 2004, Bratislava, November 2004, pp. S1-52-S1-63. ISBN 80-227-2105-0. (Pr)
[4] Klement, E.P., Kolesárová, A. * : 1-Lipschitz aggregation operators, quasi-copulas and copulas with given diagonal section. In: Soft Methodology and Random Information Systems. Series Advanced in Soft Computing. Spriger, Berlin-Heidelberg, 2004, pp. 205-211. ISSN 1434-9922. (Pr)
[5] Klement, E.P., Kolesárová, A. * : 1-Lipschitz aggregation operators, quasi-copulas and copulas with given opposite diagonal section. In: Proc. of Int. Conference 8th Fuzzy Days, Dortmund, Nemecko, October 2004, 7pages, CD-ROM. (Pr)
[6] Kolesárová, A.*: A characterization and composition of quasi-copulas. In: Proc. 25th Linz Seminar on Fuzzy Set Theory - Mathematics of Fuzzy Systems. Linz, Austria, February 2004, pp. 83-90. (Pr)
[7] Babinec, Š.*, Pospíchal J. : Optimization in Echo state neural networks by Metropolis algorithm. In: Zborník čes.-slov seminára Kognice a umělý život, FPF SU Publishing, Opava, 2004, pp. 35-44. ISBN 80-7248-232-7. (Pr)
[8] Babjak, J.*, Palko M.: Simulator of colony of seaweeds tuned by optimizing algorithm SOMA. In: Zborník čes.-slov seminára Kognice a umělý život,, FPF SU Publishing, Opava, 2004, pp. 45-54. ISBN 80-7248-232-7. (Pr)
[9] Garaj, I.*, Janiga, I.: One sided tolerance factors of normal distribution with high reliability coefficient. In: Zborník 12. konf. Štatistickej spoločnosti Štatistika a integrácia, Bardejov, 2004, pp. 228-236. ISBN 80-88946-37-9. (Pr)
[10] Varga, Š.*: Classical regression models versus fuzzy regression models. In: Zborník konf. PRASTAN' 2004, Kočovce, máj 2004, pp. 109-115. ISBN 80-88946-36-0. (Pr)

[11] Varga, Š.*: Nonparametric regression and smoothing. In: Zborník konf. PRASTAN' 2004, Kočovce, máj 2004, pp. 105-108. ISBN 80-88946-36-0. (Pr)

Grants

[1] Kolesárová, A., Doc. RNDr. CSc. (hlavný riešiteľ : Dobrakovová J., Doc. RNDr. CSc., SjF STU), riešitelia na FCHPT: Kolesárová A., Doc. RNDr. CSc., Mathematics on line: Internet course. KEGA 3/100603 (FCHPT: 529)
[2] Kolesárová, A., Doc. RNDr. CSc., riešitelia na FCHPT: Šabo M., Doc.RNDr.CSC.; Varga Š., Doc.RNDr. CSc.; Sarkoci P., Ing. Mathematical vague information processing and its applications. VEGA 1/0085/03 (FCHPT: 992)
[3] Kolesárová, A., Doc. RNDr. CSc., riešitelia na FCHPT: Šabo M., Doc.RNDr.CSC.; Varga Š., Doc.RNDr. CSc.; Sarkoci P., Ing. TARSKI : Theory and Applications of Relational Structures as Knowledge Instruments. MVTP, COST 274 (FCHPT: 626)
[4] Kvasnička, V., Ing. DrSc., riešitelia na FCHPT: Baláž V., Doc.RNDr, CSc.; Sarkoci P., Ing; Babjak J., Ing; Boor Š., RNDr., Bánki J., RNDr. Ing. CSc. Artificial chemistry and molecular evolution in silico. Grant. VEGA 1/0062/03 (FCHPT 941)
[5] Pospíchal J., Doc.RNDr. DrSc., riešitelia na FCHPT: Šabo M., Doc.RNDr.CSC.; Varga Š., Doc.RNDr. CSc.; Baláž V., Doc.RNDr. CSc.; Babinec Š., Ing; Boor Š., RNDr., Sarkoci P., Ing. Echo state neural netwoks. Grant. VEGA 1/1047/04 (FCHPT: 979)