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MATHEMATICAL MODELLING IN BIOMEDICINE

Scientific program
of International Conference

Moscow, Russia, September 30 – October 4, 2019

Organized by: RUDN University, Russia,
Marchuk Institute of Numerical Mathematics RAS, Russia,
University of Heidelberg, Germany,
University of Lyon, France.

International Conference Mathematical Modelling in Biomedicine

Program Committee:

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N. Sadekov, F. Syomin, A. Tokarev, D. Grebennikov, M. Kuznetsov,
R. Savinkov.

Monday, September 30

8:30–10:00 **Registration + Coffee break**

Conference Hall

10:00–10:30 **Opening ceremony**

Plenary lectures

10:30–11:15 F. I. Ataullakhanov, “Mathematical problems of blood coagulation”

11:20–12:05 A. V. Panfilov, “Nonlinear waves and cardiac arrhythmias”

12:05–14:00 **Lunch time**

Parallel sessions

14:00–16:00 Cardiac modelling (Lecture room 2); Physiology and modelling (Room 103)

16:00–16:30 **Coffee break**

16:30–18:30 Cardiac modelling (Lecture room 2); Physiology and modelling (Room 103)

Lecture room 2, 2th Floor

Cardiac modelling

- 14:00–14:30 S. Khamzin, A. Dokuchaev, O. Solovyova, “Population modeling approach to study age-related effects on the excitation-contraction coupling in human cardiomyocytes”
- 14:30–15:00 T. Nesterova, D. Shmarko, K. Ushenin, O. Solovyova, “On age-related ionic remodeling and repolarization abnormalities in population of cardiomyocyte models”
- 15:00–15:30 A. Bazhutina, N. Balakina-Vikulova, L. Katsnelson, O. Solovyova, “Modeling electrotonic interaction between mechanically active cardiomyocyte and cardiac fibroblasts”
- 15:30–16:00 V. Kislukhin, E. Kislukhina, “Variation of heart rate intervals (R-R) as stochastic process. Analysis of mechanisms for sinus arrhythmia”
- 16:00–16:30 **Coffee break**
- 16:30–17:00 A. K. Tsaturyan, “Molecular mechanics of regulation of muscle contraction: experiments, modelling and application to heart diseases”
- 17:00–17:30 M. Lafci Büyükkahraman, G.K. Sabine, H.V. Kojouharov, B.M. Chen-Charpentier, S.R. McMahan, J. Liao, “Mathematical modeling and stability analysis of left ventricular remodeling post-myocardial infarction”
- 17:30–18:00 F. A. Syomin, A. R. Khabibullina, A. Sh. Osepyan, A. K. Tsaturyan, “Numerical analysis of the effects of the left ventricle geometry on heart performance in health and disease”
- 18:00–18:30 M. Sysoev, “Model of volume change in the left heart ventricle”

Room 103, 1th Floor

Physiology and modelling

- 14:00–14:30 B. Kugener, “Sudden Infant Death Syndrome: a multifactorial disease”
- 14:30–15:00 M. P. Dyakovich, V. A. Pankov, V. S. Rukavishnikov, “Modeling of hand-arm vibration syndrome occurrence”
- 15:00–15:30 V. Zubkov, “Mathematical model of kidney development”
- 16:00–16:30 **Coffee break**
- 16:30–17:00 N. E. Kosykh, E. A. Levkova, S. Z. Savin, R. I. Sepiashvili, “Method of virtual information modeling of living system”
- 17:00–17:30 M. L. Blagonravov, “Chronobiological data: is our mathematical apparatus sufficient for proper analysis?”
- 17:30–18:00 D. V. Ermakova, M. A. Morozova, “Prediction of the ”structure – property” correlation for chelated zinc compounds”
- 18:00–18:30 L. Tine, “An in vitro mathematical model for Alzheimer’s disease”

Tuesday, October 1

Conference Hall

Plenary lectures

- 9:30–10:15 C. Dumontet, “Immunotherapy: a paradigm-changing evolution in cancer therapy”
- 10:20–11:05 F. Dell’Isola, “On mechanically driven biological stimulus for bone remodeling as a diffusive phenomenon”
- 11:05–11:30 **Coffee break**

Parallel sessions

- 11:30–12:30 Cancer (Lecture room 2); Immunology (Room 103)
- 12:30–14:00 **Lunch time**

Parallel sessions

- 14:00–16:00 Cancer (Lecture room 2); Biomolecular modelling (Room 103)
- 16:00–16:30 **Coffee break**
- 16:30–17:30 Cardiac modelling (Lecture room 2); Biomolecular modelling (Room 103)
- 17:30–18:30 Visit to the RUDN Medical Institute

Lecture room 2, 2th Floor

Cancer

- 11:30–12:00 M. Chaudhary, A. Bratus, “Optimal protocol for the mathematical model of the DC and anti-PD-L1 injections effects on a tumor”
- 12:00–12:30 P. Das, P. Das, “A dynamics on Michealis-Menten kinetics based tumor-immune interactions”
- 12:30–14:00 **Lunch time**
- 14:00–14:30 M. B. Kuznetsov, A. V. Kolobov, “Investigation of solid tumor progression with account of proliferation-migration dichotomy via Darwinian mathematical model”
- 14:30–15:00 A. V. Kolobov, M. B. Kuznetsov, “Optimization of radiotherapy fractionalization for improvement of efficiency of combined anti-tumor therapy by means of mathematical modeling”
- 15:00–15:30 I. Azarov, Yu. Kosinsky, V. Voronova, L. Chu, S. I. S. Sitnikova, S. Dovedi, K. Peskov, G. Helminger, “Using Quantitative Systems Pharmacology modeling to predict response and resistance of immune checkpoint inhibitors (ICI) in murine syngeneic tumors”
- 15:30–16:00 A. Smirnova, B. Shulgin, Yu. Kosinsky, K. Peskov, “Using Bayesian model-based meta-analysis for studying safety of PD-1 and CTLA-4 inhibitors monotherapies and their combination”
- 16:00–16:30 **Coffee break**

Cardiac modelling

- 16:30–17:00 K. Ushenin, “Transformation of extracellular potential to transmembrane potential using deep neural networks”
- 17:00–17:30 S. Khamzin, A. Dokuchaev, O. Solovyova, “Automated fast ECG modeling approach”

Room 103, 1th Floor

Immunology

- 11:30–12:00 M. Yu. Khristichenko, Yu. M. Nechepurenko, E. V. Sklyarova, D. S. Grebennikov, G. A. Bocharov, “Computation of steady states of virus infection models”
- 12:00–12:30 F. Bautista, “Mathematical modeling of bacterial resistance to antibiotics”
- 12:30–14:00 **Lunch time**

Biomolecular modelling

- 14:00–14:30 N. B. Gudimchuk, V. A. Fedorov, P. S. Orekhov, E. G. Kholina, A. A. Zhmurov, F. I. Ataulakhanov, I. B. Kovalenko, “Molecular dynamics modeling of tubulin protofilaments”
- 14:30–15:00 G. A. Armeev, G. A. Komarova, A. K. Shaytan, “Integrative modeling of nucleosomes and their complexes”
- 15:00–15:30 P. S. Orekhov, M. E. Bozdaganyan, K. V. Shaitan, “Formation of lipodiscs stabilized by amphiphilic copolymers: Molecular dynamics simulations”
- 15:30–16:00 V. A. Fedorov, S. S. Khrushchev, D. M. Ustinin, I. B. Kovalenko, G. Yu. Riznichenko, A. B. Rubin, “The electron-transport protein-protein complex formation of plastocyanin and cytochrome *f* of higher plants, green alga and cyanobacteria”
- 16:00–16:30 **Coffee break**
- 16:30–17:00 V. Balakshina, I. Gonchar, F. Ataulakhanov, “Mechanism of Ndc80 protein and microtubule interaction based on the force spectroscopy data”
- 17:00–17:30 I. B. Kovalenko, P. S. Orekhov, V. D. Dreval, E. G. Kholina, V. A. Fedorov, N. B. Gudimchuk, “Comparison of the conformational mobility of GTP- and GDP-bound tubulin using the molecular dynamics method”

Wednesday, October 2

Conference Hall

Plenary lectures

- 9:30–10:15 P. Maini, “Modelling collective cell migration in biology and medicine”
- 10:20–11:05 W. Jäger, “Mathematical modelling and simulation for improved diagnosis and therapy of sepsis”
- 11:05–11:30 **Coffee break**

Parallel sessions

- 11:30–12:30 Mathematical methods and analysis (Lecture room 2); Epidemiology (Room 103)
- 12:30–14:00 **Lunch time**

Lecture room 2, 2th Floor

Mathematical methods and analysis

- 11:30–12:00 A. Araujo, S. Barbeiro, M. Khaksar Ghalati, “Numerical solution of time-dependent Maxwell’s equations for modeling light scattering in human eye’s structures”
- 12:00–12:30 A. Demidov, “Minimizing variance and error itself in the problem of recovering the n-th derivative”
- 12:30–14:00 **Lunch time**

Room 103, 1th Floor

Epidemiology

- 11:30–12:00 V. N. Leonenko, S. V. Kovalchuk, “Analyzing spatial distribution of individuals predisposed to arterial hypertension in Saint Petersburg using synthetic populations”
- 12:00–12:30 K. O. Okosun, E. Bonyah, M. A. Khan, “The dynamics and effects of heavy alcohol consumption on the transmission of gonorrhoea with optimal control”
- 12:30–14:00 **Lunch time**

Thursday, October 3

Conference Hall

Plenary lectures

- 9:30–10:15 W. Wieland, “Stem cell-enriched lipoaspirate in regenerative medicine”
- 10:20–11:05 Yu. Vassilevski, “3D hemodynamics in time-dependent domains: are fluid-structure interaction simulations inevitable?”
- 11:05–11:30 **Coffee break**

Parallel sessions

- 11:30–12:30 Immunology (Lecture room 2); Epidemiology (Room 103)
- 12:30–14:00 **Lunch time**

Parallel sessions

- 14:00–16:00 Immunology (Lecture room 2); Mathematical methods and analysis (Room 103)
- 16:00–16:30 **Coffee break**
- 16:30–18:30 Immunology (Lecture room 2); Biological fluids (Room 103)
- 19:00–21:00 **Conference dinner**

Lecture room 2, 2th Floor

Immunology

- 11:30–12:00 M. Yu. Khristichenko, Yu. M. Nechepurenko, E. V. Sklyarova, D. S. Grebennikov, G. A. Bocharov, “Optimal disturbances of steady states of viral infection models”
- 12:00–12:30 K. K. Loginov, N. V. Pertsev, “Stochastic compartmental model of HIV-1 infection”
- 12:30–14:00 **Lunch time**
- 14:00–14:30 W. Garira, “Multiscale modelling of mosquito-borne infections”
- 14:30–15:00 D. Gromov, “Analysis of a multiple strain virus infection with within host mutations”
- 15:00–15:40 A. Bratus, I. Samokhin, S. Drozhzhin, T. Yakushkina, “Evolutionary adaptation of replicator systems and its application to the problem of treatment cells and bacterial disease”
- 15:40–16:00 C. Leon, V. Popov, V. Volpert, “Reaction-diffusion model of virus mutation”
- 16:00–16:30 **Coffee break**
- 16:30–17:00 I. Gainova, “Some mathematical models of HIV infection treatment strategies”
- 17:00–17:30 N. V. Pertsev, G. A. Bocharov, “Modeling of HIV-1 infection dynamics based on the compartment model”
- 17:30–18:00 D. Grebennikov, “Multiscale model of HIV transmission in lymphoid tissues”
- 18:00–18:30 R. Savinkov, “Data driven modelling the CD4+T-cells activation”

Room 103, 1th Floor

Epidemiology

- 11:30–12:00 V. N. Leonenko, D. M. Danilenko, “Modeling the dynamics of population immunity to influenza in Russian cities”
- 12:00–12:30 D. Omale, “Mathematical modeling on the control of HIV/AIDS with campaign on vaccination and therapy”
- 12:30–14:00 **Lunch time**

Mathematical methods and analysis

- 14:00–14:30 M. Marion, “Pulses and waves for reaction-diffusion systems in blood coagulation”
- 14:30–15:00 F. Rihan, “Qualitative and quantitative features of delay differential equations in biosciences”
- 15:00–15:30 A. Tokarev, “Velocity-amplitude relationship in the Gray-Scott autowave model in isolated conditions”
- 15:30–16:00 V. Bezyaev, N. Sadekov, V. Volpert, “A model of chronic inflammation in atherosclerosis”
- 16:00–16:30 **Coffee break**

Biological fluids

- 16:30–17:00 G. Panasenko, R. Stavre, “Junction of 3D -1D models of a vessel with elastic wall”
- 17:00–17:30 E. Kislukhina, “Microcirculation factors for oxygen delivery”
- 17:30–18:00 A. Mozokhina, “Modeling of the transport function of lymphatic vessels”
- 18:00–18:30 I. L. Chernyavsky, A. Erlich, P. Pearce, G. A. Nye, P. Brownbil, R. P. Mayo, O. E. Jensen, “Geometry and physics of transport in complex microvascular networks”

Friday, October 4

Conference Hall

Plenary lectures

- 9:30–10:15 M. Adimy, “Mathematical modelling of hematopoiesis”
- 10:20–11:05 G. Bocharov, “Mathematical modelling in immunology”
- 11:05–11:30 **Coffee break**

Parallel sessions

- 11:30–12:30 Mathematical methods and analysis (Lecture room 2); Epidemiology (Room 103)
- 12:30–14:00 **Lunch time**

Parallel sessions

- 14:00–16:00 Mathematical methods and analysis (Lecture room 2); Blood coagulation (Room 103)
- 16:00–16:30 **Closing ceremony**

Lecture room 2, 2th Floor

Mathematical methods and analysis

- 11:30–12:00 B. Kazmierczak, S. Bialecki, T. Lipniacki, “Polarization of concave domains by traveling wave pinning”
- 12:00–12:30 P. Kumar, “Theoretical investigation of non-equilibrium bio-heat transfer during thermal therapy”
- 12:30–14:00 **Lunch time**
- 14:00–14:30 T. G. Bilesanmi, P. Oshanwusi, S. O. Abu, C. C. Olisekwe, B. T. Tambou, “Mathematical modeling: bridging the gap between concept and realization in synthetic biology”
- 14:30–15:00 I. Petrov, A. Vasyukov, K. Beklemysheva, A. Kazakov, “Numerical modeling of elastic waves in human body”
- 15:00–15:30 A. Sofronova, S. Gavrilov, O. Stepanov, K. Peskov, K. Zhudenzov, “Joint modelling for longitudinal tumor measurements and risk of death in non-small cell lung cancer”
- 15:30–16:00 E. B. Laneev, “Mathematical models of correction of thermograms for the study of human internal organs”

Room 103, 1th Floor

Epidemiology

- 11:30–12:00 S. Moyo, W Garira, “Data science application to environmental and biological systems effects on health: multiscale-multilevel modelling approach”
- 12:00–12:30 I. Petrova, D. Gromov, “Structural and sensitivity analysis of the model of tuberculosis”
- 12:30–14:00 **Lunch time**

Blood coagulation

- 14:00–14:30 A. V. Belyaev, Yu. K. Kushchenko, N. G. Tsu, M. A. Kaznacheev, “Coarse-grained computer simulations of primary hemostasis”
- 14:30–15:00 M. A. Kaznacheev, A. V. Belyaev, “Model of ligand-receptor adhesion for microparticles and ellipsoidal cells”
- 15:00–15:30 A. Bouchnita, “Multiscale modelling of platelet-fibrin thrombus growth in the flow”
- 15:30–16:00 N. Ratto, “A reduced model of blood coagulation cascade”

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