

ISSN 2334-6590
UDK 57 (051)

Biologia Serbica

Book of Abstracts
Belgrade BioInformatics Conference 2018

Volume 40 - No. 1
(Special Edition)
2018



Department of Biology and Ecology
Faculty of Sciences
University of Novi Sad

Content

INVITED SPEAKERS	20
VLADIK AVETISOV Intrinsic metric of sparse random ensembles	20
VLADIMIR BABENKO*, ROMAN BABENKO, AND NATALIA KUDRYAVTSEVA Brain regions transcriptome analysis in mouse chronic stress model	21
BOJANA BANOVIĆ ĐERI, DRAGANA DUDIĆ, AND VESNA PAJIĆ Bioinformatics in plant genetics from molecular biologists point of view	22
ALEX BATEMAN Pfam: 20 years of classifying protein repeat families	23
JAN BAUMBACH Network-based disease classification and de novo endophenotyping	24
VLADIMIR BRUSIC Classification of blood cells by applying pattern recognition techniques to single cell gene expression data	25
ANDREA CORNO, CLAUDIO VERNIERI AND ANDREA CILIBERTO Cells proliferating under constant checkpoint activation: adaptation, refractory state and memory	26
ALEXANDRE G. DE BREVERN Analysis of allosteric effect of pathologic variants at the light of local protein conformations	27
BRANKO DRAGOVICH p-Adic Genetic Code and Bioinformation	28
THEMIS EXARCHOS, VASILIKI POTSIKA, MICHALIS MANTZARIS, DIMITRIOS I. FOTIADIS New concepts for the stratification of patients with carotid artery disease: Multiscale modelling and big data analytics	29
ELENA FIMMEL On Dichotomy Classes and Bijections of the Genetic Code	30
OXANA V. GALZITSKAYA, GEORGII S. NOVIKOV, NIKITA V. DOVIDCHENKO, MIKHAIL YU LOBANOV Influence of homo-repeats on the aggregation properties of proteins from 122 proteomes and codon usage in DNA	31
MIKHAIL S. GELFAND From computer to a test tube. How comparative genomics informs molecular biology	32
TOMASZ GRZYBOWSKI, BORIS A. MALYARCHUK, NATASA KOVACEVIC-GRUJICIC, MILENA STEVANOVIC, THE NEXT CONSORTIUM IGenetic portrait of Central- and Eastern European populations	33
RALF HOFESTÄDT PNlib-Shell: Modeling and simulation of biological networks based on Petri nets	34
ZDRAVKA IVANOVA, EVELINA DASKALOVA, GERGANA ZAHMANOVA, ELENA APOSTOLOVA, GALINA YAHUBYAN, IVAN MINKOV AND VESSELIN BAEV Sequencing and annotation of resurrection plant <i>Haberlea rhodopensis</i> cp and mt genomes	35
NATAŠA KOVAČEVIĆ-GRUJIČIĆ, SLOBODAN DAVIDOVIĆ, BORIS MALYARCHUK, JELENA ALEKSIĆ, TOMASZ GRZYBOWSKI, MIROSLAVA DERENKO, ANDREY LITVINOV AND MILENA STEVANOVIC Insights into the mitochondrial gene pool of Serbian population: phylogenetic and phylogeographic analysis	36
SERGEI KOZYREV Biology is a constructive physics	37
HIROSHI MAMITSUKA Data-Integrative Machine Learning for Bioinformatics	38

MATTEO MARSILI Relevance	39
ALEKSANDAR MILOSAVLJEVIC ClinGen Allele and Evidence Registries catalyze the emergence of an open ecosystem of data and knowledge about genetic variants in humans	40
NENAD MITIĆ Disorder predictors precision and accuracy - a computer science view	41
ALEXANDRE V. MOROZOV Biophysical Models of Chromatin Plasticity and Nucleosome Dynamics	42
YURIY L. ORLOV, ANATOLY O. BRAGIN, ANTON V. TSUKANOV, VLADIMIR N. BABENKO Analysis of Differential Alternative Splicing and Gene Networks by RNA-seq Data in Brain Areas of Laboratory Rats	43
HONG-YU OU Identification of type II toxin-antitoxin loci in bacterial genomes	44
NARIS POJSKIC, SAMIM KONJICIJA, DINKO OSMANKOVIC, SEMIR DORIC Digital reconstruction of partial DNA profiles of human skeletal remains	45
NATASA PRZULJ Mining the Integrated Connectedness of Biomedical Systems	46
PREDRAG RADIVOJAC Beyond Patterns: Deep Understanding of Biology with Machine Learning	47
ROST BURKHARD Implications of dark proteome for precision medicine	48
DUŠANKA SAVIĆ-PAVIĆEVIĆ, JOVAN PEŠOVIĆ, STOJAN PERIĆ, MILOŠ BRKUŠANIN, GORAN BRAJUŠKOVIĆ, VIDOSAVA RAKOČEVIĆ-STOJANOVIĆ Identifying modifiers of somatic instability and age at onset in myotonic dystrophy type 1 by modeling genetic data	49
SERGEY N. VOLKOV The Mechanisms of DNA Genetic Information Deactivation in Ion Cancer Therapy	50
SERGEY V. PETOUKHOV, VITALY I. SVIRIN The New Wide Class of Symmetries in Long DNA-Texts.Elements of Quantum-Information Genetics	51
MAJA STANOJEVIC Use of phylogenetics in the study of viral genomes	52
STARCEVIC A., ZUCKO J., DAMIR O., DIMINIC J. AND CINDRIC M. Semantic Ion Vectors - deep learning applied to mass spectrometry	53
ROBERT ŠKET, TADEJ DEBEVEC, SUSANNE KUBLIK, MICHAEL SCHLOTTER, ANNE SCHOELLER, BOŠTJAN MUROVEC, MATEVŽ LIKAR, KATARINA VOGEL MIKUŠ, DAMJAN MAKUC, KLEMEN PEČNIK, JANEZ PLAVEC, IGOR MEKJAVIĆ, OLA EIKEN, ZALA PREVORŠEK, MARIUS VITAL, JENNA CHANDLER, JAMES M. TIEDJE, BLAŽ STRES The rare layers of significance	54
LUTZ STRÜNGMANN, ELENA FIMMEL, CHRISTIAN MICHEL, FRANCOIS PIROT AND JEAN-SÉBASTIEN SERENI Circular codes in the genetic information	56
DAVID J. STUDHOLME Comparative genomics of a recently emerging epidemic on banana in Sub-Saharan Africa	57
BOSILJKA TADIĆ AND MIROSLAV ANDJELKOVIĆ Why Human Brain Networks are Hyperbolic?	58

ALESSANDRO TREVES, DAVIDE SPALLA, EUGENIO URDAPILLETA, FEDERICO STELLA AND ZEYNEP KAYA On the representation of continuous spaces in the mammalian brain	59
MARCOS GIL-GARCIA, NATHALIA VAREJÃO, MICHAL JAMROZ, ALEKSANDER KURIATA, MARTA DIAZ-CABALLERO, JARA LASCORZ, SUSANNA NAVARRO, DAVID REVERTER, SEBASTIAN KMIECIK AND SALVADOR VENTURA Combining structural aggregation propensity and stability predictions to re-design protein solubility	60
JOSE M. G. VILAR Inference and prediction in molecular biological systems	61
MAJA KUZMAN, ANAMARIA ELEK, AND KRISTIAN VLAHOVIČEK Predicting Disease from Gut Microbiota Codon Usage Profiles	62
BRANKA ZUKIC AND SONJA PAVLOVIC Bioinformatics strategy for rare disease diagnostics in the era of next-generation sequencing	63
ORAL PRESENTATIONS	64
BOJANA ANDJELKOVIC CIRKOVIC, NENAD FILIPOVIC Prediction of Pharmacological Treatment for Patients with Coronary Artery Disease	64
ROMAN BABENKO FTO haplotyping underlines high obesity risk for European populations	65
A. S. BATOVA, A. N. BUGAY AND E. B. DUSHANOV Effect of mutant NMDA receptors on oscillations in a model of hippocampus	66
SANJA BRDAR, TATJANA LONČAR-TURUKALO, VLADIMIR CRNOJEVIĆ AND BLAŽ STRES Clustering and classification of human microbiome data: evaluating impact of different settings in bioinformatics workflows	67
ANA I CASAS, ANNE-SOPHIE HERARD, THIERRY DELZESCAUX, JAVIER EGEE, HARALD HHW SCHMIDT 3D reconstruction of cerebral reactive oxygen species formation as a gold standard for future in vivo molecular imaging approaches	68
Z. CHERVONTSEVA, E. KHODZHAeva, I. PONAMAREVA, M.S. GELFAND, A.A. MIRONOV The role of mRNA secondary structure in the control of translation and mRNA degradation in E. coli	69
RADOSLAV DAVIDOVIĆ, BRANISLAVA GEMOVIĆ, NEVENA VELJKOVIĆ, VLADIMIR PEROVIĆ DiNGO: stand-alone application for GO and HPO term enrichment	70
SEÇİL DEMIRKOL, ANDREAS LINDLER, STEVEN CARBERRY, ALI OSMAY GÜRE AND JOCHEN PREHN Characterization of novel risk predictors in colorectal cancer	71
AURELIA FLORIAN, JELENA IVIC, ALINA PAUNA*, MIHAI STOICESCU Reduction method for reaction-diffusion equations from biology	72
STEFAN GRAOVAC, ANDJELA RODIĆ, MARKO DJORDJEVIĆ Investigating interplay of intracellular regulation and population dynamics in a bacterial restriction-modification system ..	73
JELENA GUZINA, WEI-HUA CHEN, TAMARA STANKOVIC, MAGDALENA DJORDJEVIC, EVGENY ZDOBNOV, MARKO DJORDJEVIC Predicting CRISPR/Cas associated small RNAs and their role in bacterial virulence	74
VELIBOR ISAILOVIC, IGOR SAVELJIC, THEMIS EXARCHOS, OBERDAN PARODI AND NENAD FILIPOVIC Numerical simulation of stent deployment procedure in patient specific coronary artery	75
ANDRZEJ JARYNOWSKI, VITALY BELIK Modelling Hospital Infection Spread in the Polish Regional Healthcare Network	76
TIM KACPROWSKI, SABINE AMELING, GEORG HOMUTH, MAIK PIETZNER, JULIA MAYERLE, JENS-PETER KÜHN, AND UWE VÖLKER	

Circulating miRNAs as Potential Liver-Related Biomarkers	77
KOSVYRA A., MARAMIS C., CHOUVARDA I.	
Developing an Integrated Genomic Profile for Cancer Patients Utilizing NGS Data	78
TIMOTHY KRAUSE AND JOSHUA R. HERR	
Establishing Benchmark Criteria for Single Chromosome Bacterial Genome Assembly	79
MANUELA LAUTIZI, TIM KACPROWSKI, PAOLO TIERI, JAN BAUMBACH, MARKUS LIST	
Extracting survival-relevant subnetworks from multi-scale omics data with KeyPathwayMiner	80
OLGA LAZAREVA, SIMON J. LARSEN, PAOLO TIERI, JAN BAUMBACH AND TIM KACPROWSKI	
Network-constrained bi-clustering of patients and multi-scale omics data	81
MARKUS LIST, AZIM DEHGHANI AMIRABAD, STEPHAN LAGGAI, SONJA KESSLER, CHRISTINA SCHULTHEISS, DENNIS KOSTKA, ALEXANDRA K. KIEMER, MARCEL H. SCHULZ	
Genome-wide endogenous RNA networks highlight novel biomarkers in cancer	82
IRENA MARJANOVIĆ, JELENA PERIĆ, BOJANA STANIĆ, NADJA PEJANOVIĆ, BOJANA LUČIĆ, TATJANA KOSTIĆ, NATAŠA TOŠIĆ, MAJA STOJILJKOVIĆ, TEODORA KARAN DJURAŠEVIĆ, MILENA TODOROVIĆ BALINT, NADA SUVAJDŽIĆ VUKOVIĆ, DRAGANA JANIĆ, GORAN RAKOCEVIĆ, MILOŠ POPOVIĆ, AND SONJA PAVLOVIĆ	
Bioinformatics pipeline used for Next Generation Sequencing analysis of predictive markers in hematological malignancies	83
NIKOLA MILOŠEVIĆ, ROB HERNANDEY, CASSIE GREGSON AND GORAN NENADIĆ	
Information extraction from tables: case studies on extracting demographic information from tables in clinical trial literature and drug-drug interactions from tables in drug labels	84
ALEKSANDAR MILOVANOVIĆ, IGOR SAVELJIC, THEMIS EXARCHOS, OBERDAN PARODI AND NENAD FILIPOVIĆ	
Numerical approach for determination of virtual functional assessment index in coronary arteries	85
NATAŠA Ž. MIŠIĆ	
Arithmetical Regularities Inside the Standard Genetic Code as a Clue for the Investigation of Natural Biocomputing	86
MILOŠ NIKOLIĆ, ARGYRIS PAPANTONIS, AND ALVARO RADA-IGLESIAS	
GARLIC: A Bioinformatic Toolkit for Etiologically Connecting Diseases and Cell Type-Specific Regulatory Maps	87
DAMIR OROS, MARINA ČEPRNJA, JURICA ŽUČKO, ENA MELVAN, MARIO CINDRIĆ, AMELA HOZIĆ, JASENKA ŠKRLIN-ŠUBIĆ AND ANTONIO STARČEVIĆ	
MALDI-TOF/TOF and diagnosis of bacterial UTIs	88
DANIJELA PAUNOVIĆ, MILICA BOGDANOVIĆ, SLAĐANA TODOROVIĆ, ANA SIMONOVIĆ AND MILAN DRAGIĆEVIĆ	
ragp: An R toolbox for mining plant Hydroxyproline rich glycoproteins	89
VLADIMIR PEROVIC, RADOSLAV DAVIDOVIC, BRANISLAVA GEMOVIC, NEVEN SUMONJA, NEVENA VELJKOVIC	
Prediction of Human Phenotype Ontology Terms For Intrinsically Disordered Proteins	90
MILOS RADOVIC AND NENAD FILIPOVIC	
Application of Machine Learning Algorithms to Detect Coronary Artery Disease using Genomic Data	91
ANDJELA RODIC, BOJANA BLAGOJEVIC, MAGDALENA DJORDJEVIC, KONSTANTIN SEVERINOV, MARKO DJORDJEVIC	
Investigating the role of key features in CRISPR-Cas system regulation	92
VLADIMIR SIMIC, MILJAN MILOSEVIC, BOGDAN MILICEVIC AND MILOS KOJIC	
Application of multiscale smeared finite element model for modelling of mass transport in capillary systems and biological tissue	93
N. VILOR-TEJEDOR*, MA. IKRAM, J. SUNYER, HH ADAMS, JR. GONZALEZ	
Independent Multifactorial Association algorithm to assess genetic and neuroimaging features associated with neurodevelopmental domains	94

GORAN VINTERHALTER, JOVANA KOVAČEVIĆ, GORDANA PAVLOVIĆ-LAŽETIĆ Bioinformatics analysis of correlation between protein function and intrinsic disorder	95
NEVEN SUMONJA, ANA VUKOVIC, NIKOLA NONKOVIC, BRANISLAVA GEMOVIC, ZORANA NIKOLIC, DUSANKA SAVIC-PAVICEVIC, NEVENA VELJKOVIC, GORAN BRAJUSKOVIC*, VLADIMIR PEROVIC Higher-order genetic interactions in prostate cancer and benign prostatic hyperplasia	96
BRIJESH SINGH YADAV, DANIEL CHAMOVITZ, AND SHIRI FRELICH Characterization of cellular metabolic response in abiotic stress-induced growth in Arabidopsis thaliana utilizing data mining	97
POSTER PRESENTATIONS	98
JELENA M. ANDRIĆ, IVANA M. STANKOVIĆ, AND SNEŽANA D. ZARIC Binding of metal ions and water molecules to nucleic bases	98
MILOŠ ANIĆ AND NENAD FILIPOVIĆ Neural Networks Implemented on Aorta with Abdominal Aneurism	99
EDINA AVDOVIĆ, DEJAN MILENKOVIĆ, JASMINA M. DIMITRIĆ MARKOVIĆ, SREĆKO R. TRIFUNOVIĆ, AND ZORAN MARKOVIĆ Molecular docking study on the interaction of human procalcitonin with 3-(1-(2-mercaptoethylamino)ethylidene)- chroman-2,4-dione	100
MILAN BJELICA, NADICA MILJKOVIĆ, AND MIRJANA SIMIĆ-PEJOVIĆ Unobtrusive Human Activity Recognition	101
BOJANA BLAGOJEVIĆ, MAGDALENA DJORDJEVIĆ, AND MARKO DJORDJEVIĆ Defining dynamical property observables which ensure efficient restriction-modification systems establishment in bacterial host	102
SLOBODAN DAVIDOVIĆ, BORIS MALYARCHUK, JELENA M. ALEKSIĆ, MIROSLAVA DERENKO, ANDREY LITVINOV, MILENA STEVANOVIĆ AND NATAŠA KOVAČEVIĆ-GRUJIĆIĆ Phylogenetic analysis of putative Balkan specific mtDNA lineages	103
SMILJANA DJOROVIC, ALEKSANDAR MILOSAVLJEVIC, LAZAR VELICKI AND NENAD FILIPOVIC Parametric Modelling and Computational Examination of Bicuspid Aortic Valve	104
TIJANA DJUKIĆ, IGOR SAVELJIĆ, AND NENAD FILIPOVIĆ Parallelization of software for stent deployment inside artery	105
DRAGIĆEVIĆ JELENA, STANOJEVIĆ NIKOLA Review of (effective) data collection methods for data-driven personalized medicine	106
ILEKTRA FEROUKA, TIJANA ŠUŠTERŠIĆ, MARKO ŽIVANOVIĆ AND NENAD FILIPOVIĆ Discrete simulation of electrospinning jet's evolution	107
GEMOVIĆ BRANISLAVA, DAVIDOVIĆ RADOŠLAV, ŠUMONJA NEVEN, PEROVIĆ VLADIMIR, AND VELJKOVIĆ NEVENA Function Annotation Algorithm Based on Sequence Spectral Features: Evaluation on Human Transcription Factors	108
MILANA GRBIĆ, SAVKA JANKOVIĆ, DRAGAN MATIĆ AND GORDANA PAVLOVIĆ-LAŽETIĆ Conditional Random Fields based approach for classification of the reactants in some metabolic reactions	109
ANA JELOVIĆ, NENAD MITIĆ, AND MILOŠ BELJANSKI RepeatPlus - program for finding repeats in nucleic acids and proteins	110
IVAN JOVANOVIĆ, TAMARA DJURIĆ, MAJA ŽIVKOVIĆ, MILICA DEKLEVA, NATAŠA MARKOVIĆ NIKOLIĆ AND ALEKSANDRA STANKOVIĆ Subtle transcriptomic signals in circulation after myocardial infarction might indicate the ventricular remodeling outcome	111
NATALIJA KATIĆ, NADICA MILJKOVIĆ, AND ALEKSANDRA MARJANOVIĆ	

Motor Imagery Classification using H2O Machine Learning Platform	112
NIKOLA KOTUR, BILJANA STANKOVIĆ, VLADIMIR GAŠIĆ, BRANKA ZUKIĆ, KRISTEL KLAASSEN, SANJA SRZENTIĆ, KSENIJA VUČIĆEVIĆ, SONJA PAVLOVIĆ	
Population pharmacogenomic aspect of glucocorticoids response in Serbian population	113
TAMARA KRSMANOVIĆ, KATICA JANKOVIĆ, DRAGANA MITIĆ POTKRAJAC, ROBERT B. RUSSELL, GORDANA APIĆ	
Risk prediction of bladder cancer progression from gene expression data	114
TATJANA LONČAR-TURUKALO, NINA MALJKOVIĆ, SOFIJA PANTOVIĆ, AND SANJA BRDAR	
Improving Clustering Performance in Microbiome Studies	115
MALJKOVIĆ MIRJANA M, MITIĆ NENAD S, AND BELJANSKI MILOŠ V	
Analysis of Amino Acid Interactions Based on Geometric Distances	116
SAŠA N. MALKOV, NENAD S. MITIĆ, GORDANA PAVLOVIĆ-LAŽETIĆ, JOVANA J. KOVAČEVIĆ, MILOŠ V. BELJANSKI, AND MIRJANA D. PAVLOVIĆ	
Correlation of intrinsically disordered protein regions content with environmental characteristic in Archaea and Bacteria ..	117
ULFETA MAROVAC NENAD MITIĆ AND MILOŠ BELJANSKI	
Classification of proteins into COG categories based on n-gram patterns	118
SUDHEER MENON, KEIKO OZATO, AND NINOSLAV MARINA	
In silico identification of Transcription End Sites in Human Genome	119
ŽIKO MILANOVIĆ, JELENA ĐOROVIĆ ^{2*} , ZORAN MARKOVIĆ ³ , ANA AMIĆ ⁴ AND SVETLANA JEREMIĆ	
Inactivation of free radical species with selected triazoles	120
BOGDAN MILICEVIC, MILJAN MILOSEVIC, VLADIMIR SIMIC AND MILOS KOJIC	
Muscle model with net of fibers used for modelling cell migration	121
DALIBOR NIKOLIC, DEJAN KRSMANOVIC, NENAD FILIPOVIC	
Geometry Optimization of Nitinol Stent Design based on FEA Topology Optimisation	122
MILICA NIKOLIC, TIJANA SUSTERSIC, IGOR SAVELJIC, NIHAL ENGIN VRANA, AND NENAD FILIPOVIC	
Modelling of Monocytes Behaviour inside the Bioreactor	123
DINKO OSMANKOVIĆ, SEMIR DORIĆ , LUKIĆ-BILELA LADA AND NARIS POJSKIĆ	
PalFin: A Software Tool to Identify Specific Palindrome Motifs in mtDNA	124
MIRJANA D. PAVLOVIĆ, ANA M. JELOVIĆ, DAVORKA R. JANDRLIĆ, AND NENAD S. MITIĆ	
Positional Biases of the Experimentally Characterized T-cell Epitopes	125
NENAD B. POPOVIĆ, NADICA MILJKOVIĆ, AND VELJKO PAPIĆ	
Video-based extraction of movement artifacts in electrogastrography signal	126
IGOR SAVELJIC, THEMIS EXARCHOS, OBERDAN PARODI AND NENAD FILIPOVIC	
3D Simulation of Inflammatory Process in Coronary Arteries	127
MILAN SENCANSKI, MILKA VRECL, NEVENA VELJKOVIC, SANJA GLISIC	
Combined in silico and experimental approach to identify the peptide mimetic of the nanobody that stabilize functional conformational state of the beta2 adrenergic receptor (β2AR)	128
NEVEN ŠUMONJA, NEVENA VELJKOVIĆ AND VLADIMIR PEROVIĆ	
Exploring the usefulness of graph properties in protein protein interaction predictions	129
TIJANA ŠUŠTERŠIĆ, LILIANA LIVERANI, ALDO R. BOCCACCINI, SLOBODAN SAVIĆ ¹ AND NENAD FILIPOVIĆ	
Numerical simulation of electrospinning using PAK and ANSYS software	130
NEMANJA TASIĆ, SRĐAN TASIĆ AND IRENA TASIĆ	
Application of bioinformatics in the identification of autohtonous bacterial strains of Vranjska Banja thermal springs based on different methods	131

JOVANKA TRIFUNOVIC Determination of hTERT promoter methylation status using methylation specific PCR	132
ANA VULOVIC, DANKO MILASINOVIC, DRAGAN SEKULIC AND NENAD FILIPOVIC Numerical Simulation of Blood Flow and Plaque Progression in Right Femoral Artery Bypass Patient-Specific Case	133
KSENIJA ZELIC MIHAJLOVIC, ARSO VUKICEVIC, PETAR MILOVANOVIC, MARIJA ĐURIĆ, NENAD FILIPOVIC Development of anatomically correct human mandible finite element model from CT-scans.....	134
MARKO ŽIVANOVIĆ AND NENAD FILIPOVIĆ Optimization of Electrochemical Parameters for Detection of microRNA: Computer Simulation and Experimental Study	135
BRANKA ZUKIC, BILJANA STANKOVIC, NIKOLA KOTUR, VLADIMIR GASIC, KRISTEL KLAASSEN, KSENIJA VUKICEVIC, GEORGE PATRINOS, AND SONJA PAVLOVIC FINDbase: worldwide database for clinically relevant genomic variation allele frequencies.....	136

International Advisory Committee

Prof. Vladik Avetisov, The Semenov Institute of Chemical Physics, Russian Academy of Sciences, Moscow, Russia
 Prof. Vladimir Brusic, Li Dak Sum Chair Professor of Computer Science, University of Nottingham Ningbo, China
 Prof. Radu Constantinescu, Department of Physics, University of Craiova, Romania
 Prof. Oxana Galzitskaya, Institute of Protein Research, Russian Academy of Sciences, Moscow, Russia
 Prof. Nikolay A. Kolchanov, Institute of Cytology and Genetics, Novosibirsk, Russia
 Prof. Sergei Kozyrev, Department of Mathematical Physics, Steklov Mathematical Institute, Moscow, Russia
 Prof. Yuri Manin, Max Planck Institute for Mathematics, Bonn, Germany
 Prof. Matteo Marsili, Quantitative Life Sciences Department, International Centre for Theoretical Physics, Trieste, Italy
 Prof. Zoran Obradovic, Computer and Information Sciences Department, Temple University, Pennsylvania, USA
 Dr Zoran Ognjanovic, Mathematical Institute, Serbian Academy of Sciences and Arts, Belgrade, Serbia
 Prof. Sergey Petoukhov, Mechanical Engineering Research Institute, Russian Academy of Sciences, Moscow, Russia
 Prof. Natasa Przulj, Department of Computer Science, University College London, UK
 Prof. Paul Sorba, Laboratory of Theoretical Physics and CNRS, Annecy, France
 Prof. Bosiljka Tadic, Department of Theoretical Physics, Jozef Stefan Institute, Ljubljana, Slovenia
 Prof. Vladimir Uverski, Department of Molecular Medicine, University of South Florida, USA
 Prof. Sergey Volkov, Bogolyubov Institute for Theoretical Physics, National Academy of Sciences, Kiev, Ukraine

International Program Committee

Dr Bojana Banovic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Belgrade, Serbia
 Prof. Jan Baumbach, Technical University of Munich, Germany
 Dr Milos Beljanski, Institute of General and Physical Chemistry, University of Belgrade, Serbia
 Sanja Brdar, Institute BioSense, Novi Sad, Serbia
 Prof. Alexandre de Brevern, University Paris Diderot, Sorbonne Paris Cite, France
 Prof. Marko Djordjevic, Faculty of Biology, University of Belgrade, Serbia
 Prof. Branko Dragovich, Mathematical Institute, Serbian Academy of Sciences and Arts, Belgrade, Serbia
 Dr Valentina Djordjevic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Belgrade, Serbia
 Prof. Dragan Matic, Faculty of Sciences, Department of Mathematics and Informatics, University of Banja Luka, Bosnia and Herzegovina
 Prof. Nenad Mitic, Faculty of Mathematics, University of Belgrade, Serbia
 Dr Ivana Moric, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Belgrade, Serbia
 Prof. Gordana Pavlovic-Lazetic, Faculty of Mathematics, University of Belgrade, Serbia
 Dr Ana Simonovic, Institute for Biological Research "Siniša Stanković", University of Belgrade, Serbia
 Prof. Antonio Starcevic, Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia
 Prof. Alessandro Treves, International School for Advanced Studies, Trieste, Italy
 Dr Nevena Veljkovic, Vinča Institute of Nuclear Sciences, University of Belgrade, Serbia
 Prof. Igor V. Volovich, Department of Mathematical Physics, Steklov Mathematical Institute, Russian Academy of Sciences, Moscow, Russia
 Prof. Evgeny Zdobnov, Swiss Institute of Bioinformatics, Switzerland

Local Organizing Committee

Dr Bojana Banovic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Belgrade, Serbia
Dr Milos Beljanski, Institute of General and Physical Chemistry, University of Belgrade, Serbia
Prof. Branko Dragovich, Mathematical Institute, Serbian Academy of Sciences and Arts, Belgrade, Serbia
Dr Lidija Djokic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Serbia
Dr Valentina Djordjevic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Belgrade, Serbia
Prof. Marko Djordjevic, Faculty of Biology, University of Belgrade, Serbia
Jelena Guzina, Faculty of Biology, University of Belgrade, Serbia
Dr Nikola Kotur, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Serbia
Dr Jovana Kovacevic, Faculty of Mathematics, University of Belgrade, Serbia
Dr Natasa Kovacevic-Grujicic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Serbia
Dr Jelena Kusic Tisma, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Serbia
Prof. Sasa Malkov, Faculty of Mathematics, University of Belgrade, Serbia
Mirjana Maljkovic, Faculty of Mathematics, University of Belgrade, Serbia
Prof. Nenad Mitic, Faculty of Mathematics, University of Belgrade, Serbia
Dr Ivana Moric, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Belgrade, Serbia
Prof. Gordana Pavlovic-Lazetic, Faculty of Mathematics, University of Belgrade, Serbia
Prof. Zeljko Popovic, Faculty of Sciences, University of Novi Sad, Serbia
Dr Jelena Samardzic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Serbia
Dr Biljana Stankovic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Serbia
Dr Branko Tomic, Institute of Molecular Genetics and Genetic Engineering, University of Belgrade, Serbia
Dr Nevena Veljkovic, Vinča Institute of Nuclear Sciences, University of Belgrade, Serbia

P7

Numerical simulation of electrospinning using PAK and ANSYS software

Tijana Šušteršič^{1,2,3*}, Liliana Liverani⁴, Aldo R. Boccaccini⁴, Slobodan Savić¹ and Nenad Filipović^{1,2,3}

¹ Faculty of Engineering (FINK), University of Kragujevac, Sestre Janjic 6, Kragujevac, Serbia

² Bioengineering Research and Development Center (BioIRC), Prvoslava Stojanovica 6, Kragujevac, Serbia

³ Steinbeis Advanced Risk Technologies Institute doo Kragujevac (SARTIK), Kneza Milosa 25, Kragujevac, Serbia

⁴ Institute of Biomaterials, Department of Materials Science and Engineering, University of Erlangen-Nuremberg, Cauerstr. 6, Erlangen, Germany

Abstract:

During the process of electrospinning, polymer solution is accelerated from a capillary orifice of the syringe under the influence of electric field, and the liquid jet is injected in the air that travels towards the grounded plate. Consequently, it is crucial to simulate the electrospinning process including the interaction of electric field and polymer. The motivation for this research was to analyze the effects of different solution, process and ambient parameters without the necessity to perform the experiments each time. Additionally, validated simulations in PAK software, developed at the University of Kragujevac, would create possibilities to include additional modifications and parameters that influence the process of electrospinning.

The simulations were performed using the Finite Element Method (FEM) based on geometry values obtained from commercially available EC-CLI device (IME Technologies, Geldrop, The Netherlands). Electrospinning parameters used in the experiment were adopted for simulation - 21G needle type; voltage pairs 15kV applied on the nozzle and 0kV on the collector; 0.8 ml/h flow rate. Material properties for 10wt% PVA solution were adopted from the literature values, as they could not be determined experimentally at this point. Laminar flow was assumed and simulation included flow field and electric field interaction.

The simulation results in PAK software show good agreement with commercially available software ANSYS and similar jet shapes were obtained during the simulations. Initial results also confirm the hypothesis that the jet shape during electrospinning can indicate whether setting of the chosen electrospinning parameters would result in good quality fibers. Future studies would include parameter modifications in order to examine jet shapes when optimal and non-optimal parameters are used. The ultimate goal is to provide users with stand-alone application for finding optimal parameters in electrospinning, which would reduce time-consuming process of performing experiments until relevant parameters are determined. The beneficial effect of such simulations could also be seen in reduced solution material consumption, maintenance costs etc.

Keywords:

electrospinning, PAK software, computational simulation, finite element method (FEM)

This work has been funded by MESTD, Republic of Serbia (project III41007 and 174028), European Project H2020 PANBioRA [grant number 760921-2] and KMM-VIN Research Fellowship 2017 (Call 9).

*Corresponding author, e-mail: tijanas@kg.ac.rs

INDEX

A

A.A. Mironov 69
 Aldo R. Boccaccini 130
 Aleksandar Milosavljevic 40, 104
 Aleksandar Milovanović 85
 Aleksander Kuriata 60
 Aleksandra Marjanović 112
 Aleksandra Stanković 111
 Alessandro Treves 59
 Alexandra K. Kiemer 82
 Alexandre G. de Brevern 27
 Alexandre V. Morozov 42
 Alex Bateman 23
 Alina Pauna 72
 Alvaro Rada-Iglesias 87
 Amela Hozić 88
 Ana Amić 120
 Ana I Casas 68
 Ana Jelovic 110
 Anamaria Elek 62
 Ana M. Jelović 125
 Ana Simonović 89
 Anatoly O. Bragin 43
 Ana Vukovic 96
 Ana Vulovic 133
 A. N. Bugay 66
 Andjela Rodic 92
 Andjela Rodić 73
 Andrea Ciliberto 26
 Andrea Corno 26
 Andreas Lindler 71
 Andrey Litvinov 36, 103
 Andrzej Jarynowski 76
 Anne Schoeller 54
 Anne-Sophie Herard 68
 Antonio Starčević 88
 Anton V. Tsukanov 43
 Argyris Papantonis 87
 Arso Vukicevic 134
 A. S. Batova 66
 Aurelia Florian 72
 Azim Dehghani Amirabad 82

B

Beljanski Miloš V 116
 Biljana Stankovic 136

Biljana Stanković 113
 Blaž Stres 54, 67
 Bogdan Milicevic 93, 121
 Bojana Andjelkovic Cirkovic 64
 Bojana Banović Đeri 22
 Bojana Blagojevic 92, 102
 Bojana Lučić 83
 Bojana Stanić 83
 Boris A. Malyarchuk 33
 Boris Malyarchuk 36, 103
 Boštjan Murovec 54
 Branislava Gemovic 90, 96
 Branislava Gemović 70
 Branka Zukic 63, 136
 Branka Zukić 113
 Branko Dragovich 28
 Brijesh Singh Yadav 97

C

Cassie Gregson 84
 Chouvarda I. 78
 Christian Michel 56
 Christina Schultheiß 82
 Cindric M. 53
 Claudio Vernieri 26

D

Dalibor Nikolic 122
 Damir O. 53
 Damir Oros 88
 Damjan Makuc 54
 Daniel Chamovitz 97
 Danijela Paunović 89
 Danko Milasinovic 133
 Davide Spalla 59
 David J. Studholme 57
 Davidović Radoslav 108
 David Reverter 60
 Davorka R. Jandrić 125
 Dejan Krsmanovic 122
 Dejan Milenković 100
 Dennis Kostka 82
 Diminic J. 53
 Dimitrios I. Fotiadis 29
 Dinko Osmankovic 45
 Dinko Osmanković 124
 Dragana Dudić 22
 Dragana Janić 83
 Dragana Mitić Potkrajac 114

Dragan Matić 109
 Dragan Sekulic 133
 Dragičević Jelena 106
 Dusanka Savic-Pavicevic 96
 Dušanka Savić-Pavičević 49

E

E. B. Dushanov 66
 Edina Avdović 100
 E. Khodzhaeva 69
 Elena Apostolova 35
 Elena Fimmel 30, 56
 Ena Melvan 88
 Eugenio Urdapilleta 59
 Evelina Daskalova 35
 Evgeny Zdobnov 74

F

Federico Stella 59
 Francois Pirot 56

G

Galina Yahubyan 35
 Gemović Branislava 108
 George Patrinos 136
 Georg Homuth 77
 Georgii S. Novikov 31
 Gergana Zahmanova 35
 Goran Brajuskovic 96
 Goran Brajušković 49
 Goran Nenadić 84
 Goran Rakočević 83
 Goran Vinterhalter 95
 Gordana Apić 114
 Gordana Pavlović-Lažetić 95, 109, 117

H

Harald HHW Schmidt 68
 HH Adams 94
 Hiroshi Mamitsuka 38
 Hong-Yu OU 44

I

Igor Mekjavić 54
 Igor Saveljic 75, 85, 105, 123, 127
 Ilektra Ferouka 107
 I. Ponamareva 69
 Irena Marjanović 83
 Irena Tasić 131

Ivana M. Stanković 98
Ivan Jovanović 111
Ivan Minkov 35

J

James M. Tiedje 54
Jan Baumbach 24, 80, 81
Janez Plavec 54
Jara Lascorz 60
Jasenska Škrilin-Šubić 88
Jasmina M. Dimitrić Marković 100
Javier Egea 68
Jean-Sébastien Sereni 56
Jelena Aleksić 36
Jelena Đorović 120
Jelena Guzina 74
Jelena Ivic 72
Jelena M. Aleksić 103
Jelena M. Andrić 21, 98
Jelena Perić 83
Jenna Chandler 54
Jens-Peter Kühn 77
Jose M. G. Vilar 61
Joshua R. Herr 79
Jovana J. Kovačević 117
Jovana Kovačević 95
Jovanka Trifunovic 132
Jovan Pešović 49
JR. Gonzalez 94
J. Sunyer 94
Julia Mayerle 77
Jurica Žučko 88

K

Katarina Vogel Mikuš 54
Katica Janković 114
Keiko Ozato 119
Klemen Pečnik 54
Konstantin Severinov 92
Kosvira A. 78
Kristel Klaassen 113, 136
Kristian Vlahoviček 62
Ksenija Vučićević 113
Ksenija Vukicevic 136
Ksenija Zelic Mihajlovic 134

L

Lazar Velicki 104
Liliana Liverani 130

Lukić-Bilela Lada 124
Lutz Strümgmann 56

M

Magdalena Djordjevic 74, 92, 102
Maik Pietzner 77
MA. Ikram 94
Maja Kuzman 62
Maja Stanojevic 52
Maja Stojiljković 83
Maja Živković 111
Maljković Mirjana 116
Manuela Lautizi 80
Maramis C. 78
Marcel H. Schulz 82
Marcos Gil-Garcia 60
Marija Đurić 134
Marina Čepnja 88
Mario Cindri 88
Marius Vital 54
Marko Djordjevic 74, 92, 102
Marko Djordjević 73
Marko Živanović 107, 135
Markus List 80, 82
Marta Diaz-Caballero 60
Matevž Likar 54
Matteo Marsili 39
Michael Schloter 54
Michalis Mantzaris 29
Michal Jamroz 60
Mihai Stoicescu 72
Mikhail S. Gelfand 32
Mikhail Yu Lobanov 31
Milana Grbić 109
Milan Bjelica 101
Milan Dragičević 89
Milan Sencanski 128
Milena Stevanovic 33
Milena Stevanović 36, 103
Milena Todorović Balint 83
Milica Bogdanović 89
Milica Dekleva 111
Milica Nikolic 123
Miljan Milosevic 93, 121
Milka Vrecl 128
Milos Anic 20, 99
Miloš Beljanski 118
Milos Beljanski3 110
Miloš Brkušanin 49

Milos Kojic 93, 121
Miloš Nikolić 87
Miloš Popović 83
Milos Radovic 91
Miloš V. Beljanski 117
Mirjana D. Pavlović 117, 125
Mirjana Simić-Pejović 101
Miroslava Derenko 36, 103
Mitić Nenad S 116
M.S. Gelfand 69

N

Nada Suvajdžić Vuković 83
Nadica Miljković 101, 112, 126
Nadja Pejanović 83
Naris Pojskic 45
Naris Pojskić 124
Natalia Kudryavtseva 21
Natalija Katić 112
Natasa Kovacevic-Grujicic 33
Nataša Kovačević-Grujičić 36, 103
Natasa Przulj 46
Nataša Ž. Mišić 86
Nathalia Varejão 60
Nemanja Tasić 131
Nenad B. Popović 126
Nenad Filipovic 64, 75, 91, 99, 104, 105,
122, 123, 127, 133, 134
Nenad Filipović 85, 107, 130, 135
Nenad Mitic 110
Nenad Mitić 41, 118
Nenad S. Mitić 117, 125
Nevena Veljkovic 90, 96, 128
Nevena Veljković 70, 129
Neven Sumonja 90, 96
Neven Šumonja 129
Nihal Engin Vrana 123
Nikita V. Dovidchenko 31
Nikola Kotur 113, 136
Nikola Milošević 84
Nikola Nonkovic 96
Nina Maljković 115
Ninoslav Marina 119
N. Vilor-Tejedor 94

O

Oberdan Parodi 75, 85, 127
Ola Eiken 54

Olga Lazareva 81
Oxana V. Galzitskaya 31

P

Paolo Tieri 80, 81
Perović Vladimir 108
Petar Milovanovic 134
Predrag Radivojac 47

R

Radoslav Davidovic 90
Radoslav Davidović 70
Ralf Hofestädt 34
Robert B. Russell 114
Robert Šket 54
Rob Hernandey 84
Roman Babenko 21, 65
Rost Burkhard 48

S

Sabine Ameling 77
Salvador Ventura 60
Samim Konjicija 45
Sanja Brdar 67, 115
Sanja Glisic 128
Sanja Srzentić 113
Saša N. Malkov 117
Savka Janković 109
Sebastian Kmiec 60
Seçil Demirkol 71
Semir Doric 45
Semir Dorić 124
Sergei Kozyrev 37
Sergey N. Volkov 50
Sergey V. Petoukhov 51
Shiri Frelich 97
Simon J. Larsen 81
Slađana Todorović 89
Slobodan Davidović 36, 103
Slobodan Savić 130
Smiljana Djorovic 104
Snežana D. Zaric 98
Sofija Pantović 115
Sonja Kessler 82
Sonja Pavlovic 63, 136
Sonja Pavlović 83, 113
Srđan Tasić 131
Srećko R. Trifunović 100
Stanojević Nikola 106

Starcevic A. 53
Stefan Graovac 73
Stephan Laggai 82
Steven Carberry 71
Stojan Perić 2 49
Sudheer Menon 119
Šumonja Neven 108
Susanna Navarro 60
Susanne Kublik 54
Svetlana Jeremić 120

T

Tadej Debevec 54
Tamara Djurić 111
Tamara Krsmanović 114
Tamara Stankovic 74
Tatjana Kostić 83
Tatjana Lončar-Turukalo 67, 115
Teodora Karan Djurašević 83
Themis Exarchos 29, 75, 85, 127
Thierry Delzescaux 68
Tijana Djukic 105
Tijana Sustersic 123
Tijana Šušteršič 107, 130
Tim Kacprowski 77, 80, 81
Timothy Krause 79
Tomasz Grzybowski 33, 36

U

Ulfeta Marovac 118
Uwe Völker 77

V

Vasiliki Potsika 29
Velibor Isailovic 25
Veljko Papić 126
Veljković Nevena 108
Vesna Pajić 22
Vesselin Baev 35
Vidosava Rakočević-Stojanović 49
Vitaly Belik 76
Vitaly I. Svirin 51
Vladimir Brusic 25
Vladimir Crnojević 67
Vladimir Gasic 136
Vladimir Gašić 113
Vladimir N. Babenko 43
Vladimir Perovic 90, 96
Vladimir Perović 70, 129

Vladimir Simic 93, 121

W

Wei-Hua Chen 74

Y

Yuriy L. Orlov 43

Z

Zala Prevoršek 54
Z. Chervontseva 69
Zdravka Ivanova 35
Zeynep Kaya 59
Žiko Milanović 120
Zorana Nikolic 96
Zoran Marković 100, 120
Zucko J. 53