ECCOMAS Thematic Conference

AGH

XXVIII Conference on Computer Methods in Materials Technology

KomPlasTech 2023

PROGRAMME / LIST OF PARTICIPANTS

CONFERENCE PROGRAMME

LIST OF PARTICIPANTS

March 5–8, 2023, Zakopane, Poland

International Scientific Committee

Tudor BALAN	Ecole Nationale Supérieure d'Arts et Métiers, Paris, France
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Wacław KUŚ	Silesian University of Technology, Gliwice, Poland
Jari LARKIOLA	University of Oulu, Finland
Maciej PASZYŃSKI	AGH University of Science and Technology, Kraków, Poland
Ulrich PRAHL	TU-Bergakademie Freiberg, Germany
Stefanie REESE	RWTH Aachen University, Germany
Jerzy ROJEK	IPPT PAN, Warszawa, Poland
Norbert SCZYGIOL	Częstochowa University of Technology, Poland
Jan SLADEK	Slovak Academy of Sciences, Bratislava, Slovakia
Christof SOMMITSCH	Graz University of Technology, Austria
Bartek WIERZBA	Łukasiewicz Reasearch Network – Warsaw Institute of Technologies, Poland
Bradley WYNNE	University of Strathclyde, Glasgow, UK

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Łukasz RAUCH
AGH University of Science and Technology, Kraków, Poland

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AGH University of Science and Technology, Kraków, Poland

Local Organizer

Fundacja Studentów i Absolwentów
Akademii Górniczo-Hutniczej w Krakowie
ACADEMICA

Partner

Department of Applied Computer Science and Modelling
Faculty of Metals Engineering and Industrial Computer Science
AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

AGH

Supporting Organisations

European Community on Computational Methods
in Applied Sciences
ECCOMAS

Metal Forming Section, Metallurgy Committee
POLISH ACADEMY OF SCIENCES

Centre of Computer Technology in Metallurgy
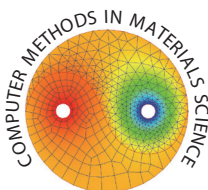and Materials Science
CEKOMAT

Polish Association for Computational Mechanics

Venue

Nosalowy Dwór
Oswalda Balzera 21d, Zakopane, Poland

Journal

http://www.cmms.agh.edu.pl/

Sunday, 5th March

17:00–19:00   Registration, *Main Hall*
18:00–21:00   Reception, *Grand Restaurant*

Monday, 6th March

8:45–9:00   Conference Welcome, *Room Rysy 1–3*
9:00–10:20   Plenary lectures, *Room Rysy, page 11*
10:20–10:40   Coffee break
10:40–12:40   Morning lectures in two rooms:
                    Diffusion and phase transformation modelling, *Room Rysy 1–3, page 12*
                    Advanced steels and composites, *Room Rysy 4, page 13*
12:40–12:45   Conference Photo, *In front of Nosalowy Dwór Hotel*
12:45–13:40   Lunch, *Grand Restaurant*
13:40–15:40   I Afternoon lectures in two rooms:
                    Digital innovations for modern industry, *Room Rysy 1–3, page 14*
                    Artificial Intelligence and Machine Learning in Materials
                    and Manufacturing Processes, *Room Rysy 4, page 15*
15:40–16:00   Coffee break
16:00–18:00   II Afternoon lectures in two rooms:
                    Advanced numerical simulations for long product manufacturing,
                    Room Rysy 1–3, page 16
                    Advanced numerical algorithms and solvers, *Room Rysy 4, page 17*
19:00   Regional evening, *Regionalna Restaurant*

Tuesday, 7th March

8:30–13:00   Winter sports *(Skiing / Sleigh ride)*
13:00–14:00   Lunch, *Grand Restaurant*
14:00–14:40   Plenary lecture, *Room Rysy 1–3, page 11*
14:40–16:40   I Afternoon lectures in two rooms:
           Cyber-physical solutions fo steel casting and rolling mills, *Room Rysy 1–3, page 18*
           Artificial Intelligence and Machine Learning in Materials
           and Manufacturing Processes, *Room Rysy 4, page 19*
16:40–17:00   Coffee break
17:00–18:20   II Afternoon lectures in two rooms:
           Advanced numerical simulations for long product manufacturing, *Room Rysy 1–3, page 20*
           Artificial intelligence and soft computing in non-destructive material investigation
           and quality assessment, *Room Rysy 4, page 21*
20:00   Conference dinner, *Room Gerlach 1–2*

Wednesday, 8th March

9:00–9:40   Plenary lecture, *Room Rysy 1–3, page 11*
9:40–10:00   Coffee break
10:00–12:00   Morning lectures:
           Applications of Artificial Intelligence and advanced numerical simulations
           in modern processes, *Room Rysy 1–3, page 22*
12:00–12:10   Conference closing
12:10–13:00   Lunch, *Grand Restaurant*

Plenary speakers

Shubhabrata Datta,
SRM Institute of Science and Technology,
Kattankulathur, Tamil Nadu, India

Dr. Shubhabrata Datta, presently Research Professor in the Department of Mechanical Engineering, and Coordinator of Centre for Composites and Advanced Materials at SRM Institute of Science and Technology, Kattan-kulathur, Tamil Nadu, did his Bachelors, Masters and PhD in Engineering from Indian Institute of Engineering Science and Technology, Shibpur, India (previously known as B.E. College Shibpur) in the field of Metallurgical and Materials Engineering. Prof. Datta has 32 years of teaching and research experience. His research interest is in the domain of materials informatics, composites and biomaterials. Prof. Datta has published more than 170 research papers in journals and peer-reviewed conference proceedings, with one authored and three edited books. Fifteen of his graduate students have been conferred with PhD degree. He was bestowed with the Exchange Scientist Award from Royal Academy of Engineering, UK and worked in the University of Sheffield, UK. He also worked Dept of Materials Science and Engineering, Helsinki University of Technology, Finland, Dept of Materials Science and Engineering, Iowa State University, Ames, USA and Heat Engineering Lab, Dept of Chemical Engineering, Åbo Akademi University, Finland as Visiting Scientist. He is a Fellow of Institution of Engineers (India), Associate Editor, Journal of the Institution of Engineers (India): Series D, and editorial board member of several international journals. Prof. Datta has featured in the list of „World Ranking of Top 2% Scientists" in 2021 database (Published by Stanford University & Elsevier).

Łukasz Madej,
AGH University of Science and Technology,
Krakow, Poland

Łukasz Madej is a full professor and the head of the Industrial Digitalization and Multiscale Modelling Division at the Faculty of Metal Engineering and Industrial Computer Science at AGH University. His research focuses on the development of modern numerical solutions for the industry and, in particular full-field multiscale modelling models for materials science. He is a member of various scientific organisations, e.g., the Polish Association of Computational Mechanics or several Committees of the Polish Academy of Sciences. In 2022 he was elected as a Fellow of the CIRP - The International Academy for Production Engineering. Since 2020 he is also a member of the Board of Directors of the ESAFORM. At the same time, he is editor-in-chief of Computer Methods in Materials Science journal and a member of editorial boards in various academic journals, e.g. Steel Research International, International Journal of Material Forming, Journal of Materials Processing Technology or Production Engineering. He is the author and co-author of more than 250 published works, including 5 books. Besides scientific activities, he is also active in the Polish Forging Association, where he holds the position of vice-president, in the EUROFORGE as an Executive Board member and in the AMDS ArcelorMittal Poland as a metal forming expert.

Albert Oliver Serra,
Institute of Intelligent Systems
and Numeric Applications in Engineering,
The University of Las Palmas de Gran Canaria, Spain

Dr Albert Oliver Serra is an associate professor at the University Institute of Intelligent Systems and Numeric Applications in Engineering, at The University of Las Palmas de Gran Canaria, Spain. His research interest is the application of the finite element method in environmental problems, and particularly in the simulation of air quality and wind fields at the microscale level. He is also working on the generation of tetrahedral adapted meshes for these problems. Plenary talk will be on a new methodology for solving air pollution problems over a complex terrain. The main contribution of the work is the construction of a parallel system to model the air quality in the local scale, and specially in zones with a complex orography. This system consists of the following parts that are described briefly.

1) Adaptive three-dimensional mesh generation – We propose two different strategies to discretize domains defined over complex terrains including several stack geometries, with a minimal user intervention and low computational cost.
2) Mass-consistent wind field computation – The mass-consistent model obtains an ambient wind field that takes into account the complex orography.
3) Plume rise – The local mesh refinement along the streamlines of the injection of the emission into the ambient wind allows to simulate the influence of the plume initial rise and its development near the emitter.
4) Convection-diffusion-reaction equation – An stabilized finite element method is proposed to solve the equation obtaining the values of concentration for all the pollutants in the whole three-dimensional domain.
5) Multimesh adaptive scheme – To improve the solution an h-adaptation is used. The proposed methodology uses the necessary mesh resolution to consider the main effects of the physical phenomena that are involved in air pollution process.

Eirik Valseth,
Oden Institute for Computational Engineering
and Sciences,
The University of Texas at Austin, US

Eirik Valseth is a research associate in Professor Clint Dawson´s Computational Hydraulics Group in the Oden Institute for Computational Engineering and Sciences at The University of Texas at Austin. Eirik has extensive experience in the application, development, and implementation of stable finite element methods for challenging partial differential equations originating in engineering and science. Since joining the Computational Hydraulics Group in 2020, Eirik has lead projects on the development of novel shallow water equation solvers, modeling tools and techniques for compound flooding, and the development of new finite element model for the operational forecasting hurricane storm surge and compound floods on the Texas Coast. Currently, Eirik is PI and Co-PI for several multi--institution externally funded research projects in the Computational Hydraulics Group and has been awarded multiple large computing grants from the Texas Advanced Computing Center for the Frontera supercomputer. In 2022, he was awarded the prestigious Marie Sklodowska-Curie grant and worked at The University of Oslo and Simula Research Laboratory in Oslo, Norway before starting a permanent position as an Associate Professor of Scientific Computing at the Norwegian University of Life Science.

Plenary lectures

Monday

Chairman: Wacław Kuś

9:00   Stable Finite Element Methods and Engineering Applications
        Eirik Valseth

9:40   Full-field modelling of recrystallisation – a symbiosis
        of experimental and numerical investigations
        Łukasz Madej

Tuesday

Chairman: Maciej Paszyński

14:00   Parallel system for modeling air pollution problems
        over a complex terrain
        Albert Oliver Serra

Wednesday

Chairman: Danuta Szeliga

9:20   Computational Intelligence based design of Biomaterials
        Shubhabrata Datta

QR codes lead to pdf files containing extended abstracts. Applications capable to read QR codes can be found in Google Play (for Android) or Apple App Store (for IOS).

Diffusion and phase transformation modelling

Monday morning – Room Rysy 1–3

Chairman: Monika Pernach

10:40   The modelling of the diffusion process, review
             Bartek Wierzba

11:00   Prediction of bainite formation during hot deformation processes
             using a macro-scale Finite Element Analysis
             Missam Irani, Towhid Faraji Shovay,
             Grzegorz Korpala, Ulrich Prahl

11:20   Pressure influence during gas quenching
             on mechanical properties of gears
             Artur Wojtyczka, Bartosz Iżowski,
             Kamil Dychtoń, Ryszard Filip

11:40   Fast model of phase transformations
             for cooling of Pyroware 53 steel
             Łukasz Rauch, Władysław Zalecki,
             Bogdan Garbarz, Krzysztof Raga,
             Krzysztof Bzowski, Maciej Pietrzyk

12:00   Accounting for random character of nucleation
             in modelling of phase transformations in steels
             Łukasz Poloczek, Roman Kuziak,
             Jakub Foryś, Danuta Szeliga, Maciej Pietrzyk

12:20   Modelling of phase transformations in steels
             accounting for a stochastic character
             of the austenite grain size after hot forming
             Natalia Czyżewska, Jan Kusiak,
             Piotr Oprocha, Maciej Pietrzyk,
             Paweł Przybyłowicz, Danuta Szeliga

Advanced steels and composites

Chairman: Łukasz Madej

10:40   Thermomecanical processing of nano-bainitic steels
          in robot cell
        Ulrich Prahl, Grzegorz Korpała,
        M. Pulawski, R. Rechenberg

11:00   Modelling of temperature change
          during deformation of TWIP steel
        Magdalena Barbara Jabłońska, Katarzyna Jasiak,
        Karolina Kowalczyk, Marek Tkocz, Zbigniew Gronostajski

11:20   Numerical modelling of the TWIP-steel crash-box impact test
        Marek Tkocz, Krystian Wencel,
        Magdalena Barbara Jabłońska, Zbigniew Gronostajski

11:40   The effect of model parameters on the onset
          of necking in FEM simulation of the dynamic tensile test
        Marek Tkocz, Michał Kostka,
        Julia Wojtasik, Karolina Kowalczyk,
        Magdalena Barbara Jabłońska, Zbigniew Gronostajski

12:00   The gradient theory for a dynamic analysis of interface crack
          between two dissimilar dielectric materials
        Jan Sladek, Vladimir Sladek,
        Maryan Hrytsyna, Slavomir Hrcek

12:20   Determining strains and stresses in composite
          based on FBG measurements
        Wacław Kuś, Waldemar Mucha,
        Iyasu Tafese Jiregna

Alloys, multibody and fluids modelling

Monday afternoon I – Room Rysy 1–3

Chairman: Krzysztof Muszka

13:40   Molecular dynamics simulations
         of the interdiffusion at -Al$_2$O$_3$/AlSi12 interface
         Masoud Tahani, Eligiusz Postek,
         Tomasz Sadowski

14:00   Development and validation of the crystal plasticity model
         for AA6082 aluminum alloy during hot deformation
         Oleksandr Lypchanskyi, ChenChun Chiu,
         Faisal Qayyum, Grzegorz Korpala, Ulrich Prahl

14:20   Computer modelling of the ablation casting process
         and prediction of strength properties of AC-42000 castings
         Marcin Małysza, Sabina Puzio,
         Katarzyna Major-Gabryś, Mirosław Głowacki,
         Dorota Wilk-Kołodziejczyk, Jadwiga Kamińska

14:40   Yarn modelling in multibody environment
         Maximilian Krentzien,
         Michael Beitelschmidt

15:00   Powder bed operations in the model
         of selective laser melting process
         Dmytro Svyetlichnyy, Dominika Matuszyk

15:20   Parametrization of Sieverts' law for gaseous hydrogen solubility
         using electrochemical experiments – a feasibility study
         Andreas Drexler, Jonathan Nietzke,
         Josef Domitner, Klemens Mraczek,
         Christof Sommitsch, Thomas Böllinghaus

Artificial Intelligence and Machine Learning in Materials and Manufacturing Processes

Monday afternoon I – Room Rysy 4

Chairman: Nirupam Chakraborti

13:40   Evolutionary multi-objective optimization of truss topology
for additively manufactured components
Petr David, Tomáš Mareš, Nirupam Chakraborti

14:00   Dome Shape Optimization of Composite Pressure Vessels Using
Data-Driven Evolutionary Algorithms
Dominik Vondráček, Zdeněk Padovec,
Tomáš Mareš, Nirupam Chakraborti

14:20   Nucleation of dislocation loop in TWIP steel:
Assessing the meta-atom framework
Sweta Kumari, Amlan Dutta

14:40   Surrogate model assisted design optimization
of composite bone plates for selective stress shielding
Raja Dhason, Sandipan Roy,
Shubhabrata Datta

15:00   Determination of modelling parameters for finite element analysis
of electric-assisted deformation using genetic algorithm approach
Jai Tiwari, Bashista Kumar Mahanta,
Hariharan Krishnaswamy, Sivasrinivasu Devadula,
Murugaiyan Amirthalingam

15:20   Investigating the role of hard plate hot forging process
on the tensile deformation behaviour
of a novel Mg-4Zn-0.5Ca-0.8Mn alloy
employing visco-plastic self-consistent modelling
Darothi Bairagi, Rahul Rakshit,
Manas Paliwal, Sumantra Mandal

Digital innovations for modern industry

Monday afternoon II – Room Rysy 1–3

Chairman: Grzegorz Korpala

16:00   Virtual and Augmented Reality Applications in Manufacturing
of Precision Assembly Systems
        Tomasz Dębiński, Danuta Szeliga, Marcin Hojny

16:20   Modelling of roller levelling of sheets using
machine learning algorithms
        Łukasz Sztangret, Danuta Szeliga

16:40   FEM model of Beverage Can Manufacturing Process
        Przemysław Wędrychowicz

17:00   Automation and robotisation of forging processes –
challenge or necessity. An innovative solution
for robotised forging process based on the experience of Schraner
        Tatiana Szymańska, Łukasz Dutkiewicz

17:20   Optimisation of production and quality improvement with compu-
tational fluid dynamics in the steelmaking industry
        Monika Zielińska, Hongliang Yang,
        Łukasz Madej, Łukasz Malinowski

17:40   Socio-cognitive Flock-based Optimization
        Krzysztof Czech, Aleksandra Urbańczyk,
        Marek Kisiel-Dorohinicki, Aleksander Byrski

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Rozwoju Regionalnego

Advanced numerical algorithms and solvers

Chairman: Krzysztof Bzowski

16:00   Automatic stabilization of difficult isogeometric analysis simulations
with Deep Neural Networks
Tomasz Służalec, Maciej Paszyński

16:20   Hierarchical matrices acceleration of GMRES solver
in four-dimensional Finite Element Method computations
Mateusz Dobija, Anna Paszyńska, Marcin Łoś, Maciej Paszyński

16:40   Physics Informed Neural Networks for wave propagation problems
Paweł Maczuga, Maciej Paszyński

17:00   Concurrent algorithms for integrating three-dimensional B-spline
functions into machines with shared memory such as GPU
Maciej Woźniak, Anna Janina Szyszka

17:20   Towards Open Science with Multi-Cloud Computing using Onedata
*Michał Orzechowski, Michał Wrzeszcz, Bartosz Kryza,
Łukasz Dutka, Renata G. Słota, Jacek Kitowski*

17:40   Evaluation of the hardware counters for neighbours' selection
algorithms in the random cellular automata grain growth model
Mateusz Sitko, Kacper Pawlikowski, Łukasz Madej

Cyber-physical solutions for steel casting and rolling mills

Tuesday afternoon I – Room Rysy 1–3

Chairman: Ulrich Prahl

14:40   Development of an innovative hybrid cyber-physical system,
enabling integrated management of the steelmaking technology
Łukasz Rauch, Michał Piwowarczyk

15:00   Cyber-physical system for integrated management of steel
and rolling mills – architecture and implementation details
*Krzysztof Bzowski, Monika Pernach,
Piotr Hajder, Krzysztof Regulski*

15:20   Hot-rolling production planning
and melt shop sequencing problems
*Krzysztof Regulski, Łukasz Rauch, Krzysztof Bzowski,
Piotr Hajder, Andrzej Opaliński, Monika Pernach,
Michał Piwowarczyk*

15:40   Feasibility of knowledge graphs as a tool for data storage
in production planning systems
Maciej Krzywda, Krzysztof Regulski, Łukasz Rauch

16:00   Application of Finite Element Method based simulations and
metamodeling techniques for prediction of liquid steel cooling rate
in main ladles
*Monika Pernach, Michał Piwowarczyk,
Łukasz Sztangret, Łukasz Rauch*

16:20   Environment monitoring and sensor layers data integration
in the production process of the electrosteel plant
*Andrzej Opaliński, Piotr Hajder, Monika Pernach,
Łukasz Sztangret, Krzysztof Regulski,
Krzysztof Bzowski, Łukasz Rauch*

Artificial Intelligence and Machine Learning in Materials and Manufacturing Processes

Tuesday afternoon I – Room Rysy 4

Chairman: Nirupam Chakraborti

14:40   Evolutionary Algorithms in Robot Calibration
         Pavel Bastl, Nirupam Chakraborti,
         Michael Valášek

15:00   Multi-objective optimization of distillation operation
         using a hybrid of evolutionary algorithm and neural network
         Ataklti Kahsay Wolday, Manojkumar Ramteke

15:20   Multiscale modelling to study the evolution of texture
         and associated deformation mechanism
         during single point incremental forming
         Rahul Rakshit, Sushanta Kumar Panda,
         Sumantra Mandal

15:40   Optimization, Design and Modelling with Genetic Algorithms:
         Tracing Trends in Selected Applications since Year 1989
         Wojciech Paszkowicz

16:00   Optimization of spring steel flat bar rolling
         using advanced meshless solution and genetic algorithm
         Miha Kovačič, Umut Hanoglu,
         Robert Vertnik, Aljaž Zupanc, Božidar Šarler

16:20   Core structure analysis of dislocations in TWIP steel
         under the Meta-atom framework: An assessment
         Sri Sadgun Reddy Pulagam, Amlan Dutta

Advanced numerical simulations for long product manufacturing

Tuesday afternoon II – Room Rysy 1–3

Chairman: Volker Diegelmann

17:00   Long-product quality optimization
through enhancement and utilisation
of residual stress minimizing process strategies
*Volker Diegelmann, Hagen Krambeer,
Andreas Wolff*

17:20   Numerical model for fast predicting of residual stresses
in hot rolled profiles
*Andrij Milenin, Roman Kuziak,
Szczepan Witek, Łukasz Rauch,
Ivan Milenin, Krzysztof Bzowski,
Maciej Pietrzyk*

17:40   Selected aspects of modelling the process
of forming nickel superalloys sheets and tubes
Monika Hyrcza-Michalska

18:00   Spot-resistant welding process of profiled wire
for precise filtration screens – experiments and modelling
*Marcin Kwiecień, Mateusz Kopyściański,
Krzysztof Muszka, Janusz Majta*

Artificial Intelligence and soft computing in non-destructive material investigation and quality assessment

Tuesday afternoon II – Room Rysy 4

Chairman: Łukasz Rauch

17:00 Development of nondestructive online investigation system with software controlling high frequency induction welding machine on the basis of an analysis of linear weld mechanical properties
*Krzysztof Tyka, Robert Chrzan,
Dariusz Zduleczny, Piotr Czaja,
Marcin Cempura*

17:20 Distributed system for monitoring of welding processes and prediction of final products quality
*Krzysztof Regulski, Łukasz Rauch,
Krzysztof Bzowski, Piotr Hajder,
Monika Pernach, Jan Kusiak*

17:40 Model of heat transfer in High Frequency Welding – numerical approach and laboratory investigation
*Ivan Milenin, Monika Pernach,
Łukasz Rauch, Bogdan Pawłowski,
Dorota Tyrała*

18:00 Linear welding power prediction measurement-based models
*Krzysztof Bzowski, Łukasz Rauch,
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Applications of Artificial Intelligence and advanced numerical simulations in modern processes

Wednesday morning – Room Rysy 1–3

Chairman: Maciej Paszyński

10:00   Characterization of steel microstructure using artificial intelligence
         Grzegorz Korpała, R. Rostami,
         J. Schneider, M. Corcoran,
         Ulrich Prahl

10:20   Application of ANN models to profile deformations analysis
in RTH process
         Hanna Sadłowska, Andrzej Kochański

10:40   Electrical and thermal analysis for the copper removal process
in an electric furnace
         Radosław Zybała, Sławomir Golak,
         Tomasz Sak, Piotr Madej

11:00   The true stress–strain curve evaluation in post-necking phase
of tensile test using DIC and numerical simulation
         Sławomir Świłło, Robert Cacko

11:20   Computer aided design of rotary forming technology
with laser beam material heating
         Barbara Mrzygłód, Izabela Olejarczyk-Wożeńska, Marcin
         Hojny, Tomasz Dębiński, Przemysław Marynowski

11:40   Experimental and numerical investigation of extrudate swell
of Polylactic Acid (PLA) via Material Extrusion (MEX) additive
manufacturing process
         Hong Wang, Abel Cherouat,
         Alexandre Gilbin, Thierry Barriere

List of Participants

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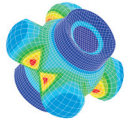radoslaw.zybala@imn.lukasiewicz.gov.pl

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Kraków, Poland
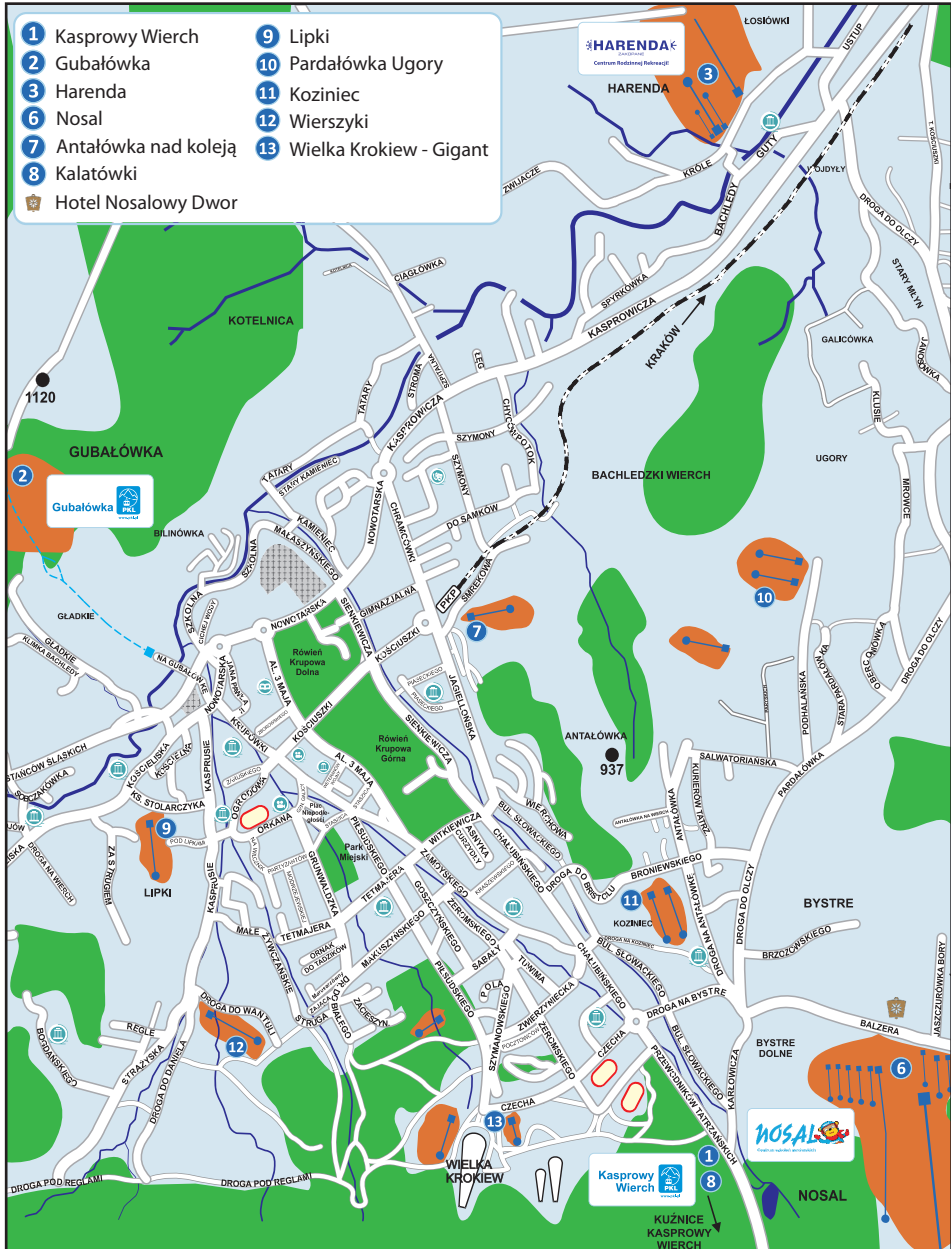www.esaform2023.agh.edu.pl

NUMIFORM 2023
June 25–29, 2023
Kraków, Poland
www.numiform2023.agh.edu.pl

Metal Forming 2024
September 15–18, 2024
Kraków, Poland
www.metalforming.agh.edu.pl

Maps of Zakopane

Source: www.zakopane.pl/o-nas/materialy-do-pobrania

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