

# Sim-Am 2023 Technical Programme

**Tuesday, 25/07/2023**

Tue, 25/07/2023 18:00 - 20:30

**Pre-registration and Welcome Reception**

Conference Venue

Wednesday, 26/07/2023

Wed, 26/07/2023 08:00 - 08:50

**Registration and Check in**

Wed, 26/07/2023 08:55 - 09:10

**Opening ceremony**

Wed, 26/07/2023 09:10 - 10:30

**- Plenary Lectures - Michele Chiumenti and Guglielmo Vastola**

Lecture Hall

Chaired by: Prof. Ernst Rank (Technical University of Munich)

Qualification of DED metal Additive Manufacturing by numerical simulation and AI-based monitoring

**M. Chiumenti\***, A. Molotnikov, T. Herzog, C. Moreira, M. Caicedo, M. Cervera

Design Digital Twins Enable Sustainable Manufacturing in Powder-bed Fusion and Directed Energy Deposition Additive Manufacturing Processes

J. Mikula, R. Laskowski, R. Ahluwalia, Y. Zeng, L. Dai, W. Ding, K. Bai, R. Hariharaputran, **G. Vastola\***, Y. Zhang

Wed, 26/07/2023 10:30 - 11:00

**Coffee Break**

Conference Venue

Wed, 26/07/2023 11:00 - 13:10

**IS09 - - Modelling, Simulation and Optimization of Functional Materials and Structures for Advanced Additive Manufacturing I**

Lecture Hall

Chaired by: Dr. Eujin Pei (Brunel University London)

Design and Simulation of Functionally Graded TPMS Structures for Additive Manufacturing of Thermo-fluidic Applications **Keynote**

**K. Park\***, S. Oh

Multi-material Metal Additive Manufacturing: Computational Modeling and Experimental Validation

**Y. Zhang\***, W. Yan

Experimental Validation of Computationally Designed, 4D Printed Shape-Morphing Structures

**A. Walker\***, K. Shea

Influence of process parameters on geometric and elasto-visco-plastic material properties in vat photopolymerization

**I. Valizadeh\***, O. Weeger

Thermo-Viscoelastic Laminate-Based FE Modelling of Fused Filament Fabrication Direct 4D Printing

**J. Chapuis\***, K. Shea

Control-Structure Integrated Design of Thermoelastic Structures using Mechanical Metamaterials: Application to Optical Benches on Satellites

**E. Buchmann\***, I. Prestes, F. Möller, B. Musil, E. Jäggle, P. Höfer

Design and Biofabrication of Polyether-ether ketone/Carboxymethyl Cellulose Scaffolds and the Deposition of Bioactive Glass for Bone Tissue Engineering

S. Ahmed, A. Mughal, S. Haider Gillani, N. ul Ain, A. Wadood, **M. Bodaghi\***, M. Rehman

Wed, 26/07/2023 11:00 - 13:10

**IS08 - - Microstructure Evolution of Alloys During Additive Manufacturing**

Jupiter

Chaired by: Prof. Carolin Körner (Friedrich-Alexander-Universität)

Modeling the Evolution of Grain Texture in Laser-Based Powder Bed Fusion Manufactured Alloy 625

**C. Andersson\***, A. Lundbäck

Cellular Automata Simulation of Fully Equiaxed Microstructure Formation in Scalmalloy® during Additive Manufacturing with Adjustable Ring Mode Laser

**M. Mohebbi\***, V. Ploshikhin

SAMPLE3D: A Versatile Numerical Tool for Investigating Texture and Grain Structure of Materials Processed by PBF Processes

Z. Yang, Y. Kuesters, R. Logvinov, **M. Markl\***, C. Körner

Sensitivity Analysis of Materials Properties in Multi-Physics Modelling of Electron Beam Melting **Keynote**

**E. Granhed\***, A. Snis

Simulation of Solid State Precipitation in Additively Manufactured Metals

**E. Kablivan\***, N. Barschkett

Part-Scale Simulation of Ti-6Al-4V Microstructure Evolution during Laser Powder Bed Fusion (LPBF) Process

**Y. Yang\***, F. van Keulen, C. Ayas

Wed, 26/07/2023 11:00 - 13:10

Saturn

### IS11 - - Simulating Additive Manufacturing of Polymers - A Multi-physics and Multi-scale Challenge

Chaired by: Mr. Dominic Soldner (Friedrich-Alexander-Universität)

Mechanics and modelling of additively manufactured layered photopolymerized polymers

**R. Brighenti\***, M. Cosma

Fast Photopolymerization Simulation using the Laplace Transform Finite Element Method

**N. Sanchez Martinez\***, O. van der Sluis, J. Remmers

Simulation of FFF printing using thermoviscoelasticity to predict subsequent 4D effects

**C. Mittermeier\***, J. Kiendl

Numerical and Experimental Investigation of Residual Stresses in the Fused Filament Fabrication Process

**M. Lukhi\***, C. Mittermeier, J. Kiendl

Prediction of process windows for PBF-LB/P using dimensionless characteristic numbers

**C. Bierwisch\***, S. Mohseni-Mofidi, M. Grünewald, J. Rudloff, M. Bastian

Thermo-Mechanical Modeling and Simulation of Powder-Bed based Additive Manufacturing of Polymers

**D. Soldner\***, P. Steinmann, J. Mergheim

Wed, 26/07/2023 11:00 - 13:10

Taurus

### IS05 - - Digital Twins for Additive Manufacturing

Chaired by: Prof. Tor Dokken (SINTEF Digital)

Digital Twin Challenges in Additive Manufacturing

**T. Dokken\***

A distributed framework for the digitalization of Additive Manufacturing

**R. Lopardo Dominguez\***, S. Muñios Landin, R. Mendez Rial, L. Alonso Ferreira, F. Vidal Vilariño

Reduced Order Model with Domain Mapping for Temperature Field Simulation of Wire Arc Additive Manufacturing

**D. Strobl\***, A. Robens-Radermacher, C. Ghnatios, A. Pittner, M. Rethmeier, J. Unger

Self-design Manufacturing Paradigm: Application to a Vibration Absorber

**J. Paixao\***, E. Foltête, E. Sadoulet-Reboul, G. Chevallier, S. Cogan

From process digital twins to part digital twins in additive manufacturing

**O. Barrowclough\***, A. Berzins, S. Briseid, G. Muntingh

Wed, 26/07/2023 13:15 - 14:10

Conference Venue

### Lunch Time

Wed, 26/07/2023 14:20 - 15:00

Lecture Hall

### Plenary Lecture - Sjoerd Van der Veen

Chaired by: Prof. Ferdinando Auricchio (University of Pavia)

AM simulation in industry: what is preventing us from taking the next step?

**S. Van der Veen\***

Wed, 26/07/2023 15:00 - 15:30

Conference Venue

### Coffee Break

Wed, 26/07/2023 15:30 - 17:50

Lecture Hall

### IS09 - - Modelling, Simulation and Optimization of Functional Materials and Structures for Advanced Additive Manufacturing II

Chaired by: Dr. Eujin Pei (Brunel University London)

Axial compressive response of lattice-cored sandwich tubes fabricated via powder bed fusion 3D printing

**K. Ushijima\***, H. Yamada, W. Cantwell

Inelastic finite deformation beam modelling and simulation of additively manufactured lattice structures

**O. Weeger\***, I. Valizadeh, Y. Mistry, D. Bhate

Thermomechanical Behavior of 3D-printed Liquid Crystal Elastomer

Y. Chen, W. Li, S. Zhao, **Y. Huo\***

Numerical Investigation of Vibration Properties of Chiral Structures with Artificial Structural Anisotropy

**S. Noguchi\***, K. Ushijima

The Effect of Geometrical Imperfections on the Mechanical Properties of Lattice Structures Produced by the Powder Bed Fusion (PBF) Process

**K. Hamasaki\***, K. Ushijima

Tailoring and one-dimensional modelling the stress-free two-way shape-memory effect in photo-crosslinked poly(caprolactone)-based systems

**S. Pandini\***, G. Scalet, N. Inverardi, C. Pasini, M. Toselli, M. Messori, F. Auricchio

Design of Graphical Symbols for Shape Transformations of 4D Printed Parts

**E. Pei\***, C. Leung

Wed, 26/07/2023 15:30 - 17:50

Jupiter

## IS03 - - Computational Design for Additive Manufacturing

Chaired by: Dr. Can Ayas (Delft University of Technology)

Stress-based Design of Gridshells for Wire-and-Arc Additive Manufacturing with Overhang Constraints Keynote

**M. Bruggi\***, V. Laghi, T. Trombetti

Optimized Topology and Material Paths for Extrusion-Based Additive Manufacturing of Fiber-Reinforced Composites

**V. Murugan\***, B. Musil, P. Höfer

A Combined Topology and Parametric Optimization Including Build Preparation for Additive Manufacturing

**E. Kuci\***, A. François, N. Poletz, J. Bournot

Additive Manufacturing Process-Aware Topology Optimization Using Deep Learning Surrogate Model-Based Constraint Functions

**P. Vulimiri\***, A. To

Fluid Flow-Based Topology Optimization of Internal Channels of a LPBF-Manufactured Calibrator Side Lath

**F. Gallego-Bordallo\***, H. Erdelyi, W. Six, I. Marco, B. Van Hooreweder

Multi-Scale Topology Optimization of Bodies with TPMS-based Lattice Structures and Mortar Contact Interfaces

**N. Strömberg\***

A Peridynamics Framework for Laser Powder Bed Fusion

**M. Zverlov\***, F. Fritz, S. Adami, N. Adams, M. Gee

Wed, 26/07/2023 15:30 - 17:50

Saturn

## IS06 - - Simulation and Experimental Validation of Metal Additive Manufacturing Processes on Part-scale I

Chaired by: Prof. Christoph Meier (Technical University of Munich)

A Novel Physics-Based and Data-Supported Microstructure Model for Part-Scale Simulation of Laser Powder Bed Fusion

**C. Meier\***, J. Nitzler, N. Hodge, W. Wall

Substrate design to avert stress accretion in additive manufacturing: Numerical and experimental predictions

**X. LU\***, M. Chiumenti, M. Cervera, X. Lin

Intrusive versus non-intrusive parametric Model Order Reduction to a Selective Laser Melting heat transfer simulation

**M. ben yahmed\***, F. Naets

A Highly Efficient Computational Model for Fast Scan-Resolved Simulations of Metal Additive Manufacturing Processes on the Scale of Real Parts

**S. Proell\***, P. Munch, M. Kronbichler, W. Wall, C. Meier

Macroscopic thermomechanical modeling of DED additive manufacturing: coupling Inherent strain rate method and POD-Galerkin-based model reduction

**J. KEUMO TEMATIO\***, M. BELLET, D. RYCKELYNCK, Y. ZHANG

Thermal and Mechanical calibration of multi-material DED AM process simulations on part-scale

**J. Vroon\***, A. van der Eems, W. van den Brink

Wed, 26/07/2023 15:30 - 17:50

Taurus

## IS02 - - Benchmarking AM Simulations Through Physical Measurements I

Chaired by: Prof. Brandon Lane (NIST)

High-fidelity Modeling of Additive Manufacturing: Process, Microstructure, and Property Keynote

**W. Yan\***

Providing a Rigorous Benchmark Measurement Foundation for the AM Modelling Community

**L. Levine\***, B. Lane, T. Phan, M. Stoudt, M. Williams

The ExaAM Challenge Problem: Additive Manufacturing Modeling Guided by Experiment

**J. Belak\***, M. Bement

Metal 3D Builds and In-situ Measurements for the 2022 Additive Manufacturing Benchmark Challenges

**B. Lane\***, H. Yeung, D. Deisenroth, S. Mekhontsev, L. Levine, T. Phan

Overview of PBF-L Inconel 625 Mechanical Measurement Datasets from AM Bench 2022

**N. Hrabe\***, R. Carson, D. Pagan, S. Habib, J. Weaver, J. Benzing, L. Liew, N. Moser, O. Kafka, N. Derimow

Voxel Scale Data and Machine Learning Predictions for Vat Photopolymerization Additive Manufacturing

**J. Killgore\***

Thursday, 27/07/2023

Thu, 27/07/2023 08:30 - 09:50

Lecture Hall

**Plenary Lectures - Massimo Carraturo and Carolin Körner**

Chaired by: Prof. Michele Chiumenti (CIMNE/UPC, Spain)

Applications of Immersed Boundary Methods for Laser Powder Bed Fusion Additive Manufacturing

**M. Carraturo\***

Challenges and opportunities in process and microstructure simulation for additive manufacturing

**C. Körner\***

Thu, 27/07/2023 09:50 - 10:20

Conference Venue

**Coffee Break**

Thu, 27/07/2023 10:20 - 12:30

Lecture Hall

**AM Process Simulation I**

High-Throughput Numerical Investigation of Process Parameter-Melt Pool Relationships in Electron Beam Powder Bed Fusion

**J. Böhm\***, C. Breuning, M. Markl, C. Körner

Influence of powder characteristics on the melt pool shape and part quality in metal LPBF processes

**R. Avila\***, O. Stryzhyboroda, C. Huang, Y. Bami, J. Jakumeit

Metal additive manufacturing melt pool modeling based on a novel FEM-based multi-physics model including melting and evaporation

**M. Schreter-Fleischhacker\***, N. Much, P. Munch, M. Kronbichler, W. Wall, C. Meier

Mathematically consistent representation of interface fluxes for finite-element-based melt pool modeling in metal additive manufacturing

**N. Much\***, M. Schreter, P. Munch, M. Kronbichler, W. Wall, C. Meier

Phase-field study of rapid solidification during additive manufacturing of CMSX-4

**M. Uddagiri\***, I. Steinbach

KISSAM 3D Simulation of Powder Bed Fusion Process with Adaptive Mesh Refinement at the Mesoscale

A. Zakirov, **S. Belousov\***, M. Bogdanova, I. Iskandarova, B. Korneev, A. Perepelkina, B. Potapkin

Thu, 27/07/2023 10:20 - 12:30

Saturn

**IS06 - - Simulation and Experimental Validation of Metal Additive Manufacturing Processes on Part-scale II**

Chaired by: Prof. Christoph Meier (Technical University of Munich)

A Combined Inherent Strain and Phase Transformation Model for the Modeling and Simulation of LPBF Additive Manufacturing Processes

**T. Bartel\***, I. Noll, A. Menzel

Simulation based build up strategies for additive manufacturing of Ti6Al4V alloy by Laser Beam Wire-Directed Energy Deposition (WDED-LB) process

**M. Salgueiro\***, E. Vaamonde, P. Rey, R. Arias

Process Optimization with Thermal Finite Element Simulations for Wire Arc Additive Manufacturing

**J. Tröger\***, S. Hartmann, K. Treutler, A. Potschka, R. Kancharakuntla, V. Wesling

Finite element simulation of anisotropic sintering; implementation, experimental validation, and industrial exploitation

**H. Hernandez\***, C. Friebel, L. Tejada, D. Auzene

Additive Manufacturing Process Simulation of Soft Ferromagnetic Material FeSi-6.5%

**A. Francois\***, E. Kuci, N. Poletz, T. Kairet, O. Rigo

Residual Stress Modelling in Laser-Based Powder Bed Fusion using a Fluid Mechanical Analogy Model

**C. Zenz\***, A. Otto, M. Buttazzoni, R. Bielak, C. Durán Oscuez, S. Mosbah

Thu, 27/07/2023 10:20 - 12:30

Jupiter

**IS14 - - Advanced Methods and Innovative Technologies for the Optimal Design of Structures and Materials I**

Chaired by: Dr. Nicola Ferro (Politecnico di Milano)

Controlling Local Material Properties in Wire-Arc Additive Manufacturing through Topology Optimization and Process Simulation

**Keynote**

V. Mishra, C. Ayas, **M. Langelaar\***

Optimal design of structures considering 3D printing overhang constraint through anisotropic perimeter

**J. Torres\***, A. Ferrer, F. Otero

Reaction Diffusion Equation Based Topology Optimization Method for Aesthetic Design

K. Wano, **K. Furuta\***, T. Kondoh, K. Izui, S. Nishiwaki

Body-Fitted Polygonal Meshes for Topology Optimization

P. Antonietti, **N. Ferro\***, S. Micheletti, N. Parolini, S. Perotto, M. Verani

Thu, 27/07/2023 10:20 - 12:30

Taurus

## IS02 - - Benchmarking AM Simulations Through Physical Measurements II

Chaired by: Prof. Brandon Lane (NIST)

Results and Insights from the 2022 Asynchronous AM-Bench Challenge: Absorption and Melt Pool Dynamics Keynote

**B. Simonds\***

Validating High-Fidelity Computational Modeling of Metal Laser Powder Bed Fusion Additive Manufacturing Process with NIST AM Bench 2022

**W. Liu\***, A. Amin, Y. Li, S. Saha, S. Mojumder, H. Li

3-Dimensional Microstructure Characterization of Laser Powder Bed Fusion IN625 and IN718

**E. Schwalbach\***, M. Chapman, M. Shah, M. Uchic, L. Levine, N. Hrabec, O. Kafka, N. Moser, J. Belak

Model validation by measurement of the directional distribution of reflected laser power in powder bed fusion metal additive manufacturing

**D. Deisenroth\***

Fully Coupled Phase Field-Crystal Plasticity Finite Element Modelling of Microstructure Evolution and Mechanical Behaviour in Laser Powder Bed Fusion Process

**X. Sun\***, Y. Ju, L. Wang, H. Chia, D. Hu, W. Yan

Thu, 27/07/2023 12:30 - 13:30

Conference Venue

## Lunch Time

Thu, 27/07/2023 13:40 - 15:50

Lecture Hall

## AM Process Simulation II

Numerical Modeling of the Phase Transformation and Morphology Evolution of Polyamide 12 in Laser Powder Bed Fusion Process at Particle Scale

**Z. Xu\***, L. Freire, N. Billon, Y. Zhang, J. Bouvard

The Role of Powder Dynamics in Metal Additive Manufacturing

**P. Praegla\***, R. Weissbach, S. Fuchs, A. Hart, W. Wall, C. Meier

Numerical Investigation of the Balling Defect in Laser Powder Bed Fusion

**C. Zöller\***, N. Adams, S. Adami

Thu, 27/07/2023 13:40 - 15:50

Jupiter

## IS14 - - Advanced Methods and Innovative Technologies for the Optimal Design of Structures and Materials II

Chaired by: Dr. Nicola Ferro (Politecnico di Milano)

On Two-Scale Topology Optimization for AM Keynote

**D. Hoemberg\***

Topology optimization of heterogeneous infill coated structures with the SERA method

**A. Garaigordobil\***, J. Postigo, R. Ansola, J. Canales

Full scale aircraft structural optimization for electric flight concepts

**W. vd Brink\***, T. Koenis

A Proteomic Analysis of Highly Consumable Chitosan with 3D Printing in BeWo cell line

**H. Jin\***, Z. Wang, Y. Zhang

Topology optimization for the design of three-dimensional fluid and thermal-fluid devices

**S. Nishiwaki\***, H. Li, T. Kondoh, K. Furuta, K. Izui

Thu, 27/07/2023 13:40 - 15:50

Taurus

## IS15 - - Optimization: Modelling, Methods and Application I

Chaired by: Dr. Kai-Uwe Bletzinger (Technische Universität München, Germany)

Industrial Challenges in Geometry Optimization for Additive Manufacturing Keynote

S. Bosch, P. Kistorz, A. Geiser, **J. Pauli\***

Shape Shifting Inflatable Structures using Turing Pattern Designs and Gray-scale Digital Light Processing

**M. Tanaka\***, M. Montgomery, L. Yue, Y. Wei, Y. Song, T. Nomura, J. Qi

Closed-walled topology optimization of an additively manufactured motor bracket for an unmanned cargo aerial vehicle

**J. Rieser\***

A Filter-Based Framework for Efficient Design and Optimization of Structures with Applications in Additive Manufacturing for Construction

**R. Najjan Asl\***, R. Wüchner, K. Bletzinger

Thu, 27/07/2023 13:40 - 15:50

Saturn

## IS06 - - Simulation and Experimental Validation of Metal Additive Manufacturing Processes on Part-scale III

Chaired by: Prof. Christoph Meier (Technical University of Munich)

Immersed space-time hp-finite elements for heat evolution in laser powder bed fusion

**P. Kopp\***, E. Rank, V. Calo, S. Kollmannsberger

Validation of multiple aspects of a holistic PBF-LB/M modelling and simulation chain at particle scale

**B. Dietemann\***, T. Najuch, A. Butz, C. Bierwisch

Simulation of the laser metal deposition process using meshfree methods

**X. Tang\***, C. Weißenfels, P. Wriggers

Stretch and Stress Distributions in Arterial Wall with Residual Stress Based on Riemannian Stress-Free Configuration

**K. Takamizawa\***

Thu, 27/07/2023 15:50 - 16:10

Conference Venue

## Coffee Break

Thu, 27/07/2023 16:10 - 17:40

Lecture Hall

## IS01 - - Additive Manufacturing in Construction

Chaired by: Prof. Martin Geier (IRMB - TU Braunschweig)

Particle Finite Element Method for the Accurate and Computationally Efficient Simulation of 3D Concrete Printing

**G. Rizzieri\***, L. Ferrara, M. Cremonesi

Incremental Viscoelasticity for 3D Concrete Printing: Finite Strain Modeling and Parametric Studies

**B. Nedjar\***, Z. Awada, J. Torrenti

The lattice Boltzmann method as a tool for the modelling of concrete based additive manufacturing

**M. Geier\***, K. Kutscher

Finite Cell Method for simulating the behavior of additively manufactured building components based on Fabrication Information Models

**O. Oztoprak\***, M. Slepicka, A. Aninger, S. Kollmannsberger, E. Rank, A. Borrmann

Thu, 27/07/2023 16:10 - 17:40

Taurus

## IS15 - - Optimization: Modelling, Methods and Application II

Chaired by: Dr. Kai-Uwe Bletzinger (Technische Universität München, Germany)

Optimal Path Planning for LPBF as an Equality Generalized Traveling Salesperson Problem

**A. Lew\***, E. Darve, G. Wang

Simulation-Based Process Optimization Towards Homogeneous Ti6Al4V L-PBF Components

**T. Koenis\***, M. Montero-Sistiaga, M. De Smit, E. Amsterdam

Feedforward Control of Transient Effects in Electron Beam Powder Bed Fusion

**C. Breuning\***, J. Böhm, M. Markl, C. Körner

Computer-based design of optimal laser intensity profiles for L-PBF/M: verification and validation

V. Holla, P. Kopp, J. Gruenewald, P. Praegla, C. Meier, K. Wudy, **S. Kollmannsberger\***

Thu, 27/07/2023 16:10 - 17:40

Saturn

## IS10 - - Physically-based Part-scale Simulation

Chaired by: Prof. Michael F. Zaeh

Temperature-based Trajectory Optimization with Mixed-integer Programming for Layered Geometries in WAAM

**J. Schmidt\***, A. Fügenschuh

Mixed-Integer Approach to the Optimization of Trajectories in Laser Powder Bed Fusion Additive Manufacturing

**J. Beisegel\***, M. Bambach, J. Buhl, A. Fügenschuh, R. Israr

Modelling Tools and Use for Digital Quality Control in Wire-Based DED AM

J. Ding, Y. Sun, X. Chen, A. Haghghi, S. Williams, **W. suder\***

Physically-based Part-scale Simulation

**Keynote**

**M. Zaeh\***

Thu, 27/07/2023 19:30 - 22:30

Augustiner-Keller Restaurant

## Conference Dinner

Friday, 28/07/2023

Fri, 28/07/2023 09:10 - 10:30

Lecture Hall

**Plenary Lectures - Laura de Lorenzis and Wing Kam Liu**

Chaired by: Dr. Stefan Kollmannsberger (Technische Universität München)

Simulating extrusion-based additive manufacturing with Floating Isogeometric Analysis (FLIGA)

H. Hille, . Kumar, **L. De Lorenzis** \*

Convolution Hierarchical Deep Learning Neural Network (C-HiDeNN)-AI: From Topological Optimization to Additive Manufactured Materials

**W. Liu** \*

Fri, 28/07/2023 10:30 - 11:00

Conference Venue

**Coffee Break**

Fri, 28/07/2023 11:00 - 13:10

Lecture Hall

**AM Process Simulation III**

A numerical framework for evaluation of the sintering degree and thermal conductivity during a PBF-EB process

**G. Rizza**\*, P. Antonioni, M. Viccica, D. Bruson, L. Iuliano, M. Galati

A Robust and Efficient Contact Formulation Dedicated to Simulations of the Extrusion Process in Fused Filament Fabrication

**T. Duong**\*, J. Kiendl

Effect of Residual Stresses on the Mechanical Properties of TPMS Lattice Structures Manufactured Using 316L Stainless Steel

**H. Mafari**\*, H. Kruse, E. Escobar, A. Matei, J. Schleifenbaum

Improvement of the mechanical characteristics of large-scale extruded components through temperature field modification

**D. Leubecher**\*, S. Brier, P. Vitale, B. Musil, P. Höfer

Process Analysis of Temperature and Eigenstrains in Stiffening Ribs Printed on a Multi Curved Structure with a Robot-based Extrusion Process

**F. Winkelmann**\*, R. Hein, H. Baid, A. Cantarutti

Thermal Process Modelling of Multi-laser Laser Powder Bed Fusion (LPBF)

Y. Yang, **C. Ayas**\*

Fri, 28/07/2023 11:00 - 13:10

Jupiter

**IS04 - - Data-driven Simulation for AM I**

Chaired by: Prof. Henning Wessels (TU Braunschweig)

Scientific Machine Learning for Affordable High-Fidelity Simulations of Metal Additive Manufacturing **Keynote**

**E. Hosseini**\*, P. Gh Ghanbari, J. Tang

Towards neuronal network enhanced finite element simulations in additive manufacturing

**C. Behrens**\*, V. Ploshikhin

A data-driven framework for supporting experts with explainable process-structure linkages in metal additive manufacturing

**M. Ackermann**\*, C. Haase

GAN Enables Microstructure Monitoring for Additive Manufacturing of Complex Structures

**H. Wessels**\*, A. Henkes, L. Herrmann, S. Kollmannsberger

Data-driven and Physics-based Modelling to Predict Process Behaviour and Deposit Geometry for Friction Surfacing under Different Environmental Conditions

**F. Bock**\*, Z. Kallien, N. Huber, B. Klusemann

Property Tailoring using Powder Bed Fusion: Simulation-based and Data-driven Techniques

**Y. Yang**\*, B. Lin, B. Xu

Fri, 28/07/2023 11:00 - 13:10

Saturn

**AM Material Modeling**

Experimental investigations and numerical modelling of the relation between mesostructure layout and macroscopic mechanical properties of FFF-printed materials **Keynote**

**J. Kiendl**\*

Modeling the Damage Behavior of FFF Printed Structures under Tensile Loading

**J. Mader**\*, S. Seibel, J. Kiendl

Curvilinear Coordinate-Based Approach for Simulation of Anisotropic Behaviour in Additively Manufactured Structures

**B. Musil**\*, V. Murugan, P. Höfer

Influence of Microstructure on Mechanical Properties of Additively Manufactured Aluminum

**E. Bonnaud**\*, D. Lindell, N. Holländer Pettersson, J. Hagström

Microstructure characterization and crystal plasticity modeling of Ti-6Al-4V processed by Laser Powder Bed Fusion (LPBF)

**V. Blümer**\*, S. Naseem, C. Soyarslan, T. van den Boogaard



Fri, 28/07/2023 11:00 - 13:10

Taurus

## IS07 - - Multi-physics and Multi-scale Modelling Approaches in Additive Manufacturing I

Chaired by: Mr. Navid Aminnia (University of Luxembourg)

Multiphysics modelling strategies in metal based additive manufacturing processes with focus on deposition and part scale **Keynote**

M. Bayat, J. Hattel\*

Influence of additively manufactured seal lip surface on hydrodynamic gap flow

T. Lankenau\*, M. Graf

Modeling of Mass Transfer of Oxygen and its Influence on Molten Pool Dynamics During Additive Manufacturing

H. Chia\*, Y. Zhang, L. Wang, W. Yan

Numerical investigation of multi-layer multi-track cold spray additive manufacturing with an improved SPH method

Z. Zhang\*, M. Afrasiabi, M. Bambach

Modeling of Molten Pool Dynamics in Additive Manufacturing with External Magnetic Fields

L. Wang\*, W. Yan

Fri, 28/07/2023 13:10 - 14:20

Conference Venue

## Lunch Time

Fri, 28/07/2023 14:20 - 16:30

Lecture Hall

## AM Process Simulation IV

High-fidelity Simulation of Laser Cladding Processes Using a Coupled DEM-SPH Approach

C. Lüthi\*, M. Afrasiabi, M. Bambach

A Sensitivity Study of Constitutive Model Types in Thermomechanical Simulation for Predicting Residual Stress and Distortion

P. Markovic\*, P. Gh Ghanbari, E. Mazza, E. Hosseini

A Discrete Element and Ray Tracing Framework for the Numerical Analysis of Powder Bed Based Additive Manufacturing Processes

B. Dorussen, J. Remmers\*, M. Geers

A parallel-in-time approach to high-fidelity part-scale simulation of metal additive manufacturing

M. Bement\*, J. Coleman

Parametric Study of Directed Energy Deposition Of Duplex Stainless Steels To Optimize Ferrite-Austenite Phase Ratio And Residual Stresses

D. Weisz-Patrault\*

Holistic modelling and simulation of the L-PBF process

L. Luberto\*, K. de Payrebrune

Fri, 28/07/2023 14:20 - 16:30

Jupiter

## IS04 - - Data-driven Simulation for AM II

Chaired by: Prof. Henning Wessels (TU Braunschweig)

Modeling and design of grayscale DLP printed voxel soft structures by hyperelastic Mooney-Rivlin constitutive model **Keynote**

D. Wang\*, M. Zhang

Integrating Physics-Informed Neural Networks with Cellular Automata for Microstructure Simulation of LPBF Hastelloy X

J. Tang\*, L. De Lorenzis, E. Hosseini

A Systematic Approach to Data-based Compensation of Form Deviations and Analysis of its Potential and Challenges in Series Production

P. Lechner\*, C. Hartmann

Temperature Prediction in Powder Bed Fusion Process using DeepONet

H. Safari\*, H. Wessels

Fri, 28/07/2023 14:20 - 16:30

Saturn

## AM Product Simulation and Innovative Applications

Computationally Efficient Beam Model Compensation Strategy for Lattice Structures Design **Keynote**

R. De Biasi\*, M. Benedetti

Model Reduction for Fast Computation in Additive Manufacturing: QuadWire Approach as an Extended 1D Model

L. Preumont\*, D. Weisz-Patrault, G. Allaire, P. Margerit

DIW theoretical-experimental framework to print multifunctional soft materials

S. Garzon-Hernandez\*, M. Lopez-Donaire, G. de Aranda-Izuzquiza, J. Crespo-Miguel, M. Fernandez-de la Torre, D. Velasco, D. Garcia-Gonzalez

Development of an In-Silico Approach for the Design of Extrusion-Based Bioprinting Process

F. Chirianni\*, G. Vairo, M. Marino

Computationally Efficient Simulations for in-situ Railway Repair Welding

B. Andersson\*, M. Ekh, L. Josefson

Fri, 28/07/2023 14:20 - 16:30

Taurus

## IS07 - - Multi-physics and Multi-scale Modelling Approaches in Additive Manufacturing II

Chaired by: Mr. Navid Aminnia (University of Luxembourg)

Crystal Plasticity Modeling Framework for Residual Stresses and Dislocation Dynamics in Additive Manufacturing **Keynote**

D. Hu\*, N. Grilli, W. Yan

Fast thermal analysis of complete PBF toolpaths with a semi-analytic method

D. Reznik\*, F. Heinrichsdorff, D. Kastsian, O. Theile

Multiscale Study of Functionally Graded Shell Lattices

M. Shojaee\*, I. Valizadeh, D. Klein, O. Weeger

Coupled CFD-DEM Approach for Modeling Melt Pool Dynamics and Solidification in Selective Laser Melting

N. Aminnia\*, A. Estupinan Donoso, B. Peters

Numerical model for the laser metal deposition additive manufacturing process: Multiphysics modeling and experimental validation

G. DALI\*

