

The banner features a background of overlapping translucent triangles in shades of green and grey. On the left side, there is a stylized illustration of a factory building with a green roof and white walls. The text is centered in a large, white, sans-serif font.

# International Conference on Progress in Digital and Physical Manufacturing

## **ProDPM'19**

# **Conference Programme**

Henrique Almeida, Joel Vasco, Anabela Marto, Carlos Capela, Dino Freitas, Flávio Craveiro, Helena Bártolo, Luís Coelho, Mário Correia, Milena Vieira, Rui Rúben

### **Editors**

### **Progress in Digital and Physical Manufacturing**

ProDPM'19 – International Conference on Progress in Digital and Physical Manufacturing

2-4, October, 2019

Leiria, Portugal

## Preface

The “Progress in Digital and Physical Manufacturing” book contains keynotes and papers presented at the first International Conference on Progress in Digital and Physical Manufacturing (ProDPM'19), organized by the School of Technology and Management (ESTG) of the Polytechnic Institute of Leiria (IPLEiria), from the 2nd to the 4th of October 2019.

This international conference aims to provide a major international forum for the scientific exchange of multi-disciplinary and inter-organisational aspects performed by academics, researchers and industrial partners in order to exchange ideas in the field of digital and physical manufacturing and related areas. It represents a significant contribution to the current advances in industrial digital and physical manufacturing issues as it contains topical research in this field.

The ProDPM'19 conference expects to foster networking and collaboration among participants to advance the knowledge and identify major trends in the field. The conference addresses to industrial challenges focused on current market demands and actual technological trends, such as mass customization, new business and industrial models or predictive engineering. Its contribution in science and technology developments leads to more suitable, effective and efficient products, materials and processes, generating added-value for the Industry and promoting the awareness of the role and importance of the digital and physical manufacturing development in the society.

This book is, therefore, an essential reading for all of those working on digital and physical manufacturing, promoting better links between the academia and the industry. The conference papers will cover a wide range of important topics like additive manufacturing, biomanufacturing, advanced and smart manufacturing technologies, rapid tooling, micro-fabrication, virtual environments, simulation and 3D CAD and data acquisition, materials and collaborative design.

We are deeply grateful to the keynote speakers, authors, participants, reviewers, the International Scientific Committee, Session chairs, student helpers and Administrative assistants, for contributing to the success of this conference.

Conference Co-chairs,  
Henrique Almeida & Joel Vasco

## Conference Committees

### Conference Co-chairs:

Henrique de Amorim Almeida  
Mechanical Engineering Department, School of Technology  
and Management, Polytechnic Institute of Leiria  
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and Management, Polytechnic Institute of Leiria  
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### Organising Committee:

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Terry Wohlers, Wohlers Associates, USA  
Tugrul Ozel, Rutgers University, USA

## Acknowledgments and Sponsors

The editors and conference co-chairs wish to acknowledge for the support and sponsorship given in the organisation of the *ProDPM'19 – International Conference on Progress in Digital and Physical Manufacturing*:

### Main Sponsors:



### Event Sponsors:



### Institutional Sponsors:



## Invited Lectures

The conference had the privilege of including in the scientific program the following world renown speakers:

### **Alain Bernard, École Centrale de Nantes, France**

Prof. Alain Bernard, 1960, graduated in 1982, PhD in 1989, was Associate-Professor, from 1990 to 1996 in Centrale Paris. In 1996, he got a Full Professor position in University Nancy I, in the “Integrated Design and Manufacturing” team, and moved to Centrale Nantes in 2001 where he was Dean for Research (2007-2012). He is researcher in Digital Sciences Laboratory (LS2N-UMR CNRS 6004) in the “Systems Engineering” (IS3P) team. Recent research topics are KBE applied to computer-aided decision making systems for additive manufacturing. He is Vice-President of the French Additive Manufacturing Association (AFPR), CIRP Fellow and Member of the French National Academy of Technologies.

### **Bruno Romero, HP Inc.**

Bruno Romero is the Iberia 3D Printing Applications Engineer of HP’s 3D Printing Jet Fusion Business. This position includes supporting Spain and Portugal sales team and transferring HP’s 3D Printing knowledge to partners and customers. Main team is based in Barcelona, Spain. Bruno joined HP in 2017 in the 3D Printing Sales organization and Applications Development team. In this position he is connected to Business Development, Sales, Marketing and R&D teams but also to the WW Applications Development team.



### **Carlos Mogueira, TRUMPF, Portugal**

He has been employee at TRUMPF Portugal since 2015 as a sales engineer responsible for Laser Division in Aerospace, Automotive and Metalworking sectors. He graduated in Mechatronic Engineering from Universidade de Évora and has gained experience in Laser Technology and Systems in Portuguese and Spanish industries during more than 10 years.

### **Eujin Pei, Brunel University, UK**

Dr. Eujin Pei is the Director for Postgraduate Research and Programme Director for the BSc Product Design and BSc Product Design Engineering programmes at Brunel University London. He is a Chartered Engineer (CEng) and a Technological Product Designer (CTPD) with the Institution of Engineering Designers. He is the Convenor of the International Organization for Standardization ISO/TC261/WG4 committee that is responsible for Data Transfer and Design Standards for Additive Manufacturing; and Chair for the British Standards Institute BSI/AMT/008 for Additive Manufacturing. His research interest centres on Functionally Graded Additive Manufacturing and 4D Printing.

### **Igor Drstvensek, University of Maribor, Slovenia**

Prof. Dr. Igor Drstvensek is lecturer at University of Maribor, Faculty of Mechanical Engineering, where he is lecturing Production technologies and Maintenance. His research work in last 15 years is dedicated to Additive Manufacturing and especially to Medical Applications of Additive Manufacturing. He is the Head of the Additive Manufacturing Laboratory at the Faculty of Mechanical Engineering, University of Maribor.

In 2006 he has initiated the first implant production by use of layered technologies in Slovenia and in last 10 years conducted 30 projects of cranial and maxilofacial implant production that ended with successful implantation of 27 PMMA and 3 Ti64 implants, owning several patent applications.

### **Inma Vazquez, Stratasys**

Inma Vazquez is Channel Manager France and Iberia for Stratasys. She is one of the European women with more experience in additive manufacturing. Worked 11 years in 3DSystems, 2 years in HP division 3Dprinting and 4 years in Stratasys as Sales Manager. Speaks 6 languages and is an expert in introducing new products in several European markets focusing on applications to improve manufacturing processes in various industries.

### **Jaume Homs, HP Inc., Spain**

Jaume Homs is the Iberia Channel and Sales Manager of HP's 3D Multi Jet Fusion Business. This position includes Spanish and Portugal responsibility of channel recruitment, management and sales of HP's 3D Printing Multi Jet Fusion line of solutions. Main team is based in Barcelona, Spain. Jaume joined HP in 2002 in the R&D organization as a software engineer and project manager. Since then he has held different positions in R&D, Marketing, Sales and Business Management. Prior to his current position, Jaume was the Indigo Commercial Business Manager for Europe Middle East and Africa. Previously, he had a sales position in Iberia in the Indigo business and prior to that in the Designjet business. Jaume has a proven track overachieving all business goals.

Jaume holds a Master in Computer Science from Universitat Autònoma de Barcelona, a Master in IT Management and an Executive MBA by la Salle.

### **Joana de Medina, Stratasys**

Joana Mayeur de Medina is a Chemical Engineer with over 20 years' experience in technical sales and key account management. Born in Rio de Janeiro, Joana has moved to France in 2001 and has built a successful career growing businesses at different levels for companies such as ExxonMobil, Xerox, Canon, Experian and HP. In 2016, Joana has embraced the challenge of building up the 3D printing business for HP in France. Since 2018 at Stratasys, she is the Strategic Account Manager for France and Iberia, working actively with the main industries to develop and implement additive manufacturing solutions that will transform the Industry.

### **Marc Dimter, TRUMPF, Germany**

Marc Dimter has been an employee at TRUMPF as an industrial tooling manager for additive manufacturing. He graduated in Mechanical Engineering from the University of Stuttgart and specialised in laser material processing and machine tools. Since 1997 he has gained experience in the application of Laser Technology and Additive Manufacturing, and since 2004, has specialized on conformal cooling of mold inserts.

### **Omar Fergani, Siemens, Germany**

Dr. Fergani is a strategic software technology manager at Siemens digital industries software. His main focus is to deliver cutting edge software technology to industrialize additive

manufacturing (AM). Some of his topics of interest are print first time right processes, the closed loop solution to achieve the autonomous machines as well as the smart factory. Previously, he oversaw developing the first AM process simulation to complete Siemens digital twin offering. He is a holder of a Ph.D. in mechanical engineering and a double master's degree in manufacturing and materials from the Georgia Institute of Technology and the Norwegian University of Science and Technology.

He is selected as one of the Outstanding Young Manufacturing Engineer and was previously selected as 30 under 30, future leaders of manufacturing by the Society of Manufacturing Engineers.

### **Paulo Bártolo, University of Manchester, UK**

Paulo Bártolo is Professor of Advanced Manufacturing and Head of the Manufacturing Group at the School of Mechanical, Aerospace and Civil Engineering, University of Manchester. He is the University's Industry 4.0 Academic Lead, team leader of the Industry 4.0 societal challenge at Digital Futures and sits on the Management Board of the EPSRC & MRC Centre for Doctoral Training in Regenerative Medicine. He is Professor at the Advanced Manufacturing Group at the Tecnológico de Monterrey, at Nanyang University, and member of CIAUD (at University of Lisbon). He is a Fellow of CIRP, advisor of the Brazilian Institute of Biofabrication and several UK and International Funding Agencies and received a commendation and public recognition from the Portuguese Government. He is the Founding Editor of Virtual and Physical Prototyping Journal and Editor-in-Chief of Biomanufacturing Reviews.

### **Terry Wohlers, Wohlers Associates Inc., USA**

Terry Wohlers is president of Wohlers Associates, Inc., an independent consulting firm he founded 32 years ago. He has authored more than 421 books, articles, and technical papers on product development and manufacturing and has given 155 keynote presentations on five continents. In 2004, Wohlers received an Honorary Doctoral Degree of Mechanical Engineering from Central University of Technology in Bloemfontein, South Africa.

In 2005, he became a Fellow of the Society of Manufacturing Engineers (SME). In 2016, he became an adjunct professor at RMIT University in Melbourne, Australia. For 24 years, Wohlers has been a principal author of the Wohlers Report, an annual worldwide publication focused on additive manufacturing and 3D printing.

### **Ulric Ljungblad, Freemelt**

Dr. Ulric Ljungblad is CEO and co-founder of Freemelt. After his PhD at University of Gothenburg, he worked for 10 years in the semiconductor industry. From 2006 he has been working in additive manufacturing focusing on systems development and innovation. He holds more than 20 patents. He co-founded Freemelt in 2017 aiming to launch an open source electron beam AM system to promote much faster development of processing parameters for new metal materials. He worked as R&D manager at Freemelt during the development of the Freemelt ONE system that was launched in 2018 and he became the CEO of Freemelt in 2019.

## Conference Programme

Wednesday – 2<sup>nd</sup> October 2019

8:15 9:00		Conference Registration
9:00 9:30	Main Auditorium	<b>Opening Session</b>
9:30 10:15	Main Auditorium	Chair: Henrique Almeida - Polytechnic of Leiria, Portugal Keynote: <b><i>“Programming 4D Printed Parts through Shape-Memory Polymers and Computer-Aided-Design”</i></b> Eujin Pei - Brunel University, UK
10:15 11:00		Keynote: <b><i>“Conformal Cooling – opportunities and what has to be considered when using this technology”</i></b> Marc Dimter - Trumpf, Germany
11:00 11:15		<b>Coffee Break</b>
11:15 13:00	Room 1	<b>Design</b> Chair: Jaume Homs - HP 3D Printing Iberia, Spain <i>Programming 4D Printed Parts Through Shape-Memory Polymers and Computer-Aided-Design</i> Eujin Pei, Giselle Hsiang Loh, Seokwoo Nam & Ezrin Faten Azhar <i>Improve Engineering Skills in Digital Manufacturing for New Products</i> António Ramos & Carlos Relvas <i>Geometry-based process adaption to fabricate parts with varying wall thickness by direct metal deposition</i> Daniel Eisenbarth, Fabian Soffel & Konrad Wegener <i>A probable next step for Sustainable Product Design</i> Maria M.J. Trompers

11:15 13:00	Room 2	<p><b>Advanced Manufacturing Technologies 1</b> Chair: Marc Dimter, TRUMPF, Germany</p> <p><i>Technological and economic comparison of additive manufacturing technologies for fabrication of polymer tools for injection molding</i> Achim Kampker, Bruno Alves &amp; Peter Ayvaz</p> <p><i>AM tooling for the mouldmaking industry</i> João Carreira, Joel Vasco &amp; Henrique Almeida</p> <p><i>Virtual Workstations Applied to the Mould Industry – A Case Study</i> Fabiana Guarda, Luís Marrazes &amp; Mário Afonso</p> <p><i>Integrating nature inspiration into Design for Additive Manufacturing: design challenges and future directions</i> Miguel Fernandez-Vicente, Sandeep K Samanthula &amp; Andrew Triantaphyllou</p>
11:15 13:00	Room 3	<p><b>CAD and 3D Data Acquisition Technologies</b> Chair: Mário Correia - Polytechnic of Leiria, Portugal</p> <p><i>3D printing: an innovative technology for customised shoe manufacturing</i> Tatjana Spahiu, Erald Piperi, Andrea Ehrmann, Henrique Almeida, Rita Ascenso &amp; Liliana Vitorino</p> <p><i>3D printed geometries on textile fabric for garment production</i> Tatjana Spahiu, Erald Piperi, Andrea Ehrmann, Ermira Shehi &amp; Dudina Rama</p> <p><i>ARAMIS - Optical 3D Deformation Analysis</i> Dino Freitas &amp; Daniel Janeiro</p> <p><i>ATOS – Optical 3D Metrology In Industrial Quality Control</i> Dino Freitas &amp; Daniel Janeiro</p>
13:00 14:00	Cantine 3	<b>Lunch Break</b>
14:00 15:00	Main Auditorium	<p>Chair: Joel Vasco - Polytechnic of Leiria, Portugal</p> <p>Keynote: <b>“Digital Manufacturing is a reality with HP 3D Printing: Introducing the new HP 3D Jet Fusion 5200 Printing”</b> Jaume Homs - HP 3D Printing Iberia, Spain</p>
15:00 16:00		<p>Keynote: <b>“A systemic approach of the AM-based value chain - challenges and future trends”</b> Alain Bernard - École Centrale de Nantes, France</p>
16:00 16:15		<b>Coffee Break</b>

16:15 18:00	Room 1	<p><b>Materials 1</b> Chair: Milena Vieira - Polytechnic of Leiria, Portugal</p> <p><i>On the effect of deposition patterns on the residual stress, roughness and microstructure of AISI 316L samples produced by Directed Energy Deposition</i> Gabriele Piscopo, Alessandro Salmi, Eleonora Atzeni, Luca Iuliano, Mattia Busatto, Simona Tusacciu, Manuel Lai, Sara Biamino, Mostafa Toushekhah, Abdollah Saboori &amp; Paolo Fino</p> <p><i>Friction and wear study of laser metal deposition (LMD) components for automotive industry application</i> F. Q. Ramalho, M. L. Alves, Mário S. Correia, L.M. Vilhena &amp; A. Ramalho</p> <p><i>Fatigue life prediction in selective laser melted samples under variable amplitude loading via two constant-amplitude tests</i> L. Santos, R. Branco, J.D. Costa, C. Capela &amp; J.A. Martins Ferreira</p> <p><i>Efficient Tailoring of Geometrical Based Laser Parameters for Design-Elements on Universal SLM Machines</i> Julian Ferchow</p>
16:15 18:00	Room 2	<p><b>Green and Digital Manufacturing Environments and Simulation Systems 1</b> Chair: Helena Bártolo - Polytechnic of Leiria, Portugal</p> <p><i>Development of a supporting system of pass design in multi-pass welding based on GMAW weld pool simulation</i> Yosuke Ogino, Toshihiro Fujiwara, Satoru Asai, Kosuke Tamura &amp; Shin-Ichi Sakamoto</p> <p><i>Study on the On-line Support System for Welder</i> Satoru Asai, Yosuke Ogino, Kazufumi Nomura &amp; Kazunori Hattori</p> <p><i>Exploring the linkages between the Internet of Things and planning and control systems in industrial applications</i> Ricardo Soares, Alexandra Marques, Reinaldo Gomes, Luís Guardão, Elder Hernández &amp; Rui Rebelo</p> <p><i>Implementing RAMI4.0 in Production – a multi-case study</i> Elder Hernández, Pedro Senna, Daniela Silva, Rui Rebelo, Ana Barros &amp; César Toscano</p>
18:30		<p><b>Gala Reception - Campus Library José Saramago</b></p>



**Thursday – 3<sup>st</sup> October 2019**

9:15 10:00	Main Auditorium	Chair: Joel Vasco - Polytechnic of Leiria, Portugal Keynote: <b><i>“The digital twin of production, the ultimate tool to achieve first-time-right in metal additive manufacturing”</i></b> Omar Fergani - Siemens Digital Industries, Germany
10:00 10:45		Keynote: <b><i>“HP 3D Printing: Accuracy and Repeatability in Digital Manufacturing”</i></b> Bruno Romero Azorin - HP Inc.Barcelona, Spain
10:45 11:00		<b>Coffee Break</b>
11:00 13:00	Room 1	<b>Green and Digital Manufacturing Environments and Simulation Systems 2</b> Chair: Omar Fergani - Siemens Digital Industries, Germany <i>To simulate or not to simulate? Challenges in digitally prototyping HMI interactive technologies</i> Sevcan Yardim-Sener & Owain Pedgley <i>3DXPERT – A New Additive Manufacturing Experience</i> Dino Freitas <i>Assessing industry 4.0 readiness of Portuguese companies</i> Hélder Castro, Alexandre Carvalho, Fátima Leal & Helena Gouveia <i>Use of Photogrammetry Technique as Reverse Engineering Tool for Modelling in Additive Manufacturing-Case study</i> Pavan Kumar Gurralla & Arvind Jograna
11:00 13:00	Room 2	<b>Advanced Manufacturing Technologies 2</b> Chair: Paulo Bártolo - Manchester University, UK <i>AM was the answer, but what is the question?</i> Steinar Killi & William Kempton <i>Expectations of Additive Manufacturing for the Decade 2020-2030</i> Henrique Almeida & Joel Vasco <i>Impact of additive technologies in the health sector for 2030</i> Emanuel Serrano, Liliana Vitorino & Henrique <i>Strategies for Obtaining Porous Media Through the Process Planning in Material Extrusion Additive Manufacturing</i> Marcelo Okada Shigueoka, Elis Cassiana Nekonetchnei & Neri Volpato
11:15 13:00	Room 3	<b>Technical Session by HP 3D Printing</b> Bruno Romero Azorin - HP Inc.Barcelona, Spain
13:00 14:00	Cantine 3	<b>Lunch Break</b>

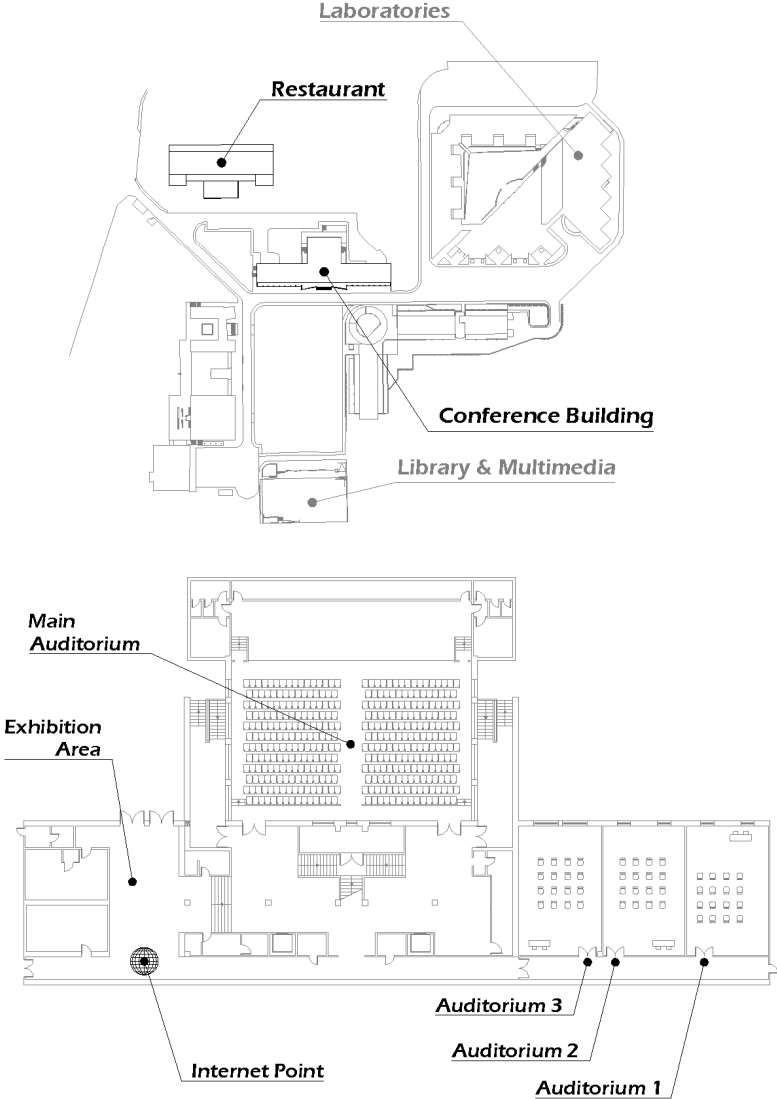
14:00 15:00	Main Auditorium	Chair: Henrique Almeida - Polytechnic of Leiria, Portugal Keynote: <b><i>“Shaping the future through additive manufacturing and advanced materials”</i></b> Paulo Bártolo - Manchester University, UK
15:00 16:00		Keynote: <b><i>“How Stratasys sees the future of additive manufacturing”</i></b> Inma Vazquez - Stratasys
16:00 16:15		<b>Coffee Break</b>
16:15 18:00	Room 1	<b>Materials 2</b> Chair: Inma Vazquez - Stratasys <i>Polymer matrix nanocomposites for 3D printing</i> Mylene Cadete, Tiago Gomes, Alfredo Costa, Maria Fonseca, João Dias-de-Oliveira & Victor Neto <i>A novel specimen geometry for fatigue crack growth in vacuum</i> L.M.S. Santos, Carlos Capela, F.V. Antunes, J.A.M. Ferreira & J.D. Costa <i>Morphology and thermal behaviour of new mycelium-based composites with different types of substrates</i> Rafael M.E. Alves, M.L. Alves & Maria J. Campos <i>Developing sustainable materials for marine environments: algae as natural fibers on polymer composites</i> Gleiciane dos Santos Silva, Carlos Capela & Marcelo Gaspar
16:15 18:00	Room 2	<b>Applications</b> Chair: Rui Ruben - Polytechnic of Leiria, Portugal <i>Photocurable alginate bionink development for 3D bioprinting</i> Hussein Mishbak, Enes Aslan, Glen Cooper & Paulo Bartolo <i>Fabrication of cellulose hydrogel objects through 3DPrinted sacrificial molds</i> Hossein Najaf Zadeh, Tim Huber, Freya Dixon, Conan Fee & Don Clucas <i>Bi-material electrospun meshes for wound healing applications</i> Enes Aslan & Paulo Bartolo <i>Room Temperature Extrusion 3D Printing of Polyether Ether Ketone Using a Stimuli-Responsive Binder</i> Chang-Uk Lee, Johanna Vandenbrande, Adam Goetz, Mark Ganter, Duane Storti & Andrew Boydston
20:00		<b>Gala Dinner - Quinta das Silveiras</b>

**Friday – 4<sup>th</sup> October 2019**

9:15 10:00	Main Auditorium	Chair: Henrique Almeida - Polytechnic of Leiria, Portugal
		Keynote: <b>“Additive Manufacturing State of the Industry”</b> Terry Wohlers - Wohlers Associates, USA
10:00 10:45		Keynote: <b>“Voice of our customers Stratasys helping industries for more than 30 years, Shared experience with Portuguese manufacturer”</b> Joana de Medina - Stratasys, France
10:45 11:00		<b>Coffee Break</b>
11:00 13:00	Room 1	<b>Biomanufacturing</b> Chair: Igor Drstvensek - Maribor University, Slovenia
		<i>Modelling and Simulation of a Novel Functional Brace for Large Bone Defects</i> Mohammed Alqahtani & Paulo Bartolo
		<i>Study of Geometry and Fused Filament Fabrication Parameters in PLA Scaffolds for Bone Tissue Replacement</i> Ricardo Baptista & Mafalda Guedes
		<i>Composite scaffolds for large bone defects</i> Evangelos Daskalakis & Paulo Bartolo
		<i>Optimization Techniques for Automatic Reconstruction of Dental Computed Tomography Images</i> Rui Ruben, Paulo Amorim, Thiago Moraes, Jorge Silva & Helio Pedrini
11:00 13:00	Room 2	<b>Construction</b> Chair: Terry Wohlers - Wohlers Associates, USA
		<i>Novel robot based 3D-printing technology for the production of large parts</i> Uwe Klaeger & Andriy Telesh
		<i>Moving forward to 3D/4D printed building facades</i> Flávio Craveiro, José P. Duarte, Helena Bártolo & Paulo Bártolo
		<i>Integration of BIM and generative design for earthbag projects</i> Deborah Santos & José Beirão
		<i>Potential of Natural Ventilation and Vegetation for achieving low-energy tall buildings in tropical climate: An overview</i> Humera Mughal & Jose Nuno Beirão
11:00 13:00	Room 3	<b>Technical Session by Trumpf</b> Carlos Mougueira - Trumpf, Germany

13:00 14:00	Cantine 3	<b>Lunch Break</b>
14:00	Main Auditorium	Chair: Joel Vasco - Polytechnic of Leiria, Portugal
15:45		Keynote: <b><i>"Metal 3D Printing is a Materials Game"</i></b> Ulric Ljungblad - Freemelt AB, Sweden
15:45 16:30		Keynote: <b><i>"Laser Metal Deposition &amp; Laser Metal Fusion"</i></b> Carlos Mougueira - Trumpf, Germany
16:30 17:15		Keynote: <b><i>"Bespoke Medical Devices; Exceptional innovation or universal solution?"</i></b> Igor Drstvensek - Maribor University, Slovenia
17:15 17:30	Main Auditorium	Awards: Best Paper, Best Young Researcher, Best Industrial
17:30 17:45		<b>Closing Ceremony</b>
18:00		<b>BBQ - Cantine 3</b>

# Additional Information



## Bus Schedules

Morning Pick Up Times:

Location	2 <sup>nd</sup> Oct.	3 <sup>rd</sup> Oct.	4 <sup>th</sup> Oct.
Hotel Ibis Leiria Fátima	7:10	7:30	7:30
Hotel D. Dinis	7:20	7:40	7:40
Hotel São Luis	7:35	7:55	7:55
Hotel Eurosol Leiria & Jardim	7:45	8:05	8:05
Pousadinha José Saramago	7:50	8:10	8:10
Tryp Leiria Hotel	8:00	8:20	8:20

At the end of the day, the bus will take you back to the hotels.

## General Information

### Taxis:

**Cooperativa Rádio Táxis Ideal de Leiria:**  
+351 244 815 900 or  
+351 244 815 902  
**Raditáxi-Táxis CB de Leiria Lda:**  
+351 244 801 860  
**Táxis Luz do Dia Lda:**  
+351 244 856 569  
**José Ferreira & Filho Lda:**  
+351 244 881 147  
**Táxis Antral de Leiria:**  
+351 244 831 925

### Health Services:

**Hospital São Francisco:**  
+351 244 819 300  
**Hospital of Sto André:**  
+351 244 817 000  
**Permanente Medical Assistance SAP:**  
+351 244 831 692

### Emergencies

**SOS – Emergencies:**  
112  
**Leiria Fire Brigade:**  
+351 244 813 033  
**Local Police:**  
+351 244 859 859  
**Intoxications:**  
+351 808 250 143

Conference Notes

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## **Progress in Digital and Physical Manufacturing**

ProDPM'19 – International Conference on Progress in Digital and  
Physical Manufacturing

2-4, October, 2019

Leiria, Portugal

