

Position Description

Group of research topics: Additive Manufacturing and AI

Position is funded by	<ul style="list-style-type: none"> - COFUND, Marie Skłodowska-Curie Actions (MSCA), Horizon 2020, European Union - Hamburg University of Technology (TUHH), Germany - RMIT University (RMIT), Australia
Research Host	Hamburg University of Technology (TUHH), Germany
PhD awarding institution/s:	Dual PhD awarded by TUHH and RMIT
Locations	<ul style="list-style-type: none"> - Primary: Hamburg, Germany - Secondary: Melbourne, Australia - Annual workshops in Barcelona, Spain
Contract	Full time, fixed term (24 months) and optional extension up to a maximum of 48 months
Gross annual salary	35.000 EUR
Preferred start date	01/09/2022
Deadline for applications	30/04/2022 (Reference: TUHH-DC1)

Your choice of research topics (only one of these projects will be funded):

Project 1: Federated Learning Framework for AM	Project 2: AM process simulation for AI training data	Project 3: Materials model for AM processes
<p>The aim of this project is to use AI methods to correlate input (machine data, materials, part geometries etc.) with output (mechanical properties, geometrical accuracy etc.) along the process chain of an AM process. Expert knowledge shall be integrated in a hybrid AI approach that combines multi-agent systems and federated learning to enable researchers from different institutions to train the AI. This position shall define specifically the framework for the federated learning approach.</p> <p><i>Further information may be obtained from the Supervisors.</i></p>	<p>Artificial intelligence is able to predict AM part performance from input parameters such as material and machine set-up, once sufficiently trained. However, AI relies on big data sets to produce valid results, which can often not be realised in experiments due to high costs and time efforts. The goal of this project is to set up simulation for selected AM process steps in order to simulate training data for the AI.</p> <p><i>Further information may be obtained from the Supervisors.</i></p>	<p>Metals undergo a complex process chain in Additive Manufacturing, involving phase changes as well as different temperature cycles in the solid state. This results in a complex process - microstructure - property relationship, that needs to be understood along the whole process chain. The goal of this project is to set up a material model for a selected metal alloy that covers all phases and conditions experienced along the process chain, and that can be used in subsequent simulations to predict part properties.</p> <p><i>Further information may be obtained from the Supervisors.</i></p>



Supervisors: Prof. Claus Emmelmann, Dr. Ing. Dirk Herzog (TUHH) **and** Dr. Andrey Molotnikov, Distinguished Prof. Milan Brandt (RMIT)

Research Fields: Advanced manufacturing and mechatronics, Artificial intelligence and Machine learning

REDI

The REDI (RMIT European Doctoral Innovators) program is a unique opportunity offering excellent PhD conditions including enviable international experience, top-class research discipline and transversal skills training as well as networking with academic and industry leaders across 60+ supporting partners and 11 countries.

As a REDI researcher you will be:

- enrolled by two entities, with the chance to be awarded dual doctorates and gain alumni status from multiple institutions, including the Marie Curie Alumni Association.
- seeing the world and spending a year at RMIT University in Melbourne, Australia (ranked in the top 20 of universities under 50 years old in the world).
- part of a rich multidisciplinary network of researchers and supervisors who come together in annual, week-long training events in Barcelona.
- working closely with industry and gaining experience with the 40+ leading companies supporting the program.
- earning a salary above national standards for doctoral positions with full social security benefits (with further support available for eligible researchers with additional needs).
- receiving support and guidance from two highest-calibre, experienced supervisors with high PhD completion rates.
- enhancing your career prospects through comprehensive technical and transversal skills training from leading institutions, intersectoral and international experience and mentoring.
- working on innovative and exciting projects of high commercial and societal value with up to four years to complete your research.

For more information visit: rediprogram.eu

Are you REDI? (Expected Profile)

Project 1

Your background and skills: You should have a Master's in Information Technology, Production Engineering, Materials Science or similar. Previous knowledge in Artificial Intelligence methods and tools is required. Experience in Additive Manufacturing is of benefit.

Your work experience: Professional experience is not required.

Your research experience: Research experience is not required.

Project 2

Your background and skills: You should have a Master's in Theoretical Mechanical Engineering, Materials Science or similar is required. Previous knowledge in modelling and simulation is expected. Knowledge about Additive Manufacturing is of benefit.

Your work experience: Professional experience is not required.

Your research experience: Research experience is not required.



Project 3

Your background and skills: You should have a Master's in Materials Science of similar is required. Previous knowledge in modelling and simulation is expected. Knowledge about Additive Manufacturing is of benefit.

Your work experience: Professional experience is not required.

Your research experience: Research experience is not required.

Employment Benefits and Conditions

TUHH offers a 24-months full-time work contract (extendable up to 48 months as required), indicatively starting on 01/09/2022. The position will be based in Hamburg (Germany). International travel is foreseen, including to Australia (up to 12 months) and Spain (one week per year). At TUHH, there is a probation period of six (6) months and there are 39 working hours per week.

The remuneration, in line with the European Commission rules for Marie Skłodowska-Curie grant holders, will consist of a gross annual salary of around 35.000 EUR gross per year. Of this amount, it is very hard to give the exact net salary to be perceived by the Researcher as it is subject to national tax legislation and will depend on the personal situation and choices of the candidate, but it would be approximately EUR 1,950.

Benefits include:

- 30 working days off per year.
- Paid sick days up to 6 weeks per year.
- Citizens of foreign countries who live and work in Germany and have a settlement permit or a residence permit can apply for parental benefit (Elterngeld) after the birth of their child.
- 1,000€ yearly travel allowance to cover flights and accommodation to participate in the annual workshop at RMIT Europe in Barcelona (Spain).
- 10,000€ allowance to cover flights and living expenses for up to 12 months in Australia.

For more details, please see:

<https://www.tuhh.de/alt/tuhh/education/degree-courses/doctoral-degrees/doctoral-degree-regulations.html>

REDI to apply? First a little more about us...

TUHH

TUHH is a compact technical university with a clear profile in research and innovative learning methods where theory and practice meet. From the beginning of its existence, TUHH has had the ambition to be one of the most internationally connected universities in Germany. Our research excellence is the crux of our international outreach program. The TUHH has direct and indirect ongoing international research collaborations with partners in more than 50 countries. One of the TUHH's core strategic development goals is to intensify and extend the relationships between it and other leading centres of excellence in research and teaching, as well as student and staff exchanges.

TUHH university offers to its Doctoral Students a wide range of benefits, including:

- **Mentoring program:** TUHH is one of nine member universities of Hamburg Research Academy (HRA). The HRA offers individual advising sessions with a focus on specific career stages and topics, such as: Doctorate and beyond; Postdocs and Junior Professors; Good Scientific Practice and Career Coaching.
- **Courses and training opportunities:** The Graduate Academy for Technology and Innovation at TUHH offers training that helps Early-Stage Researchers to develop and expand your generic competences or so-called transferable skills and to plan the next steps in their careers.
- **Language courses:** TUHH offers in cooperation with the Volkshochschule Hamburg to all TUHH-members semester-time language courses: English, Chinese, French, Japanese, Italian, Spanish, Arabic and German.



- **Relocation support:** The Accommodation Office from TUHH helps international exchange students and degree students in hunting for accommodation in Hamburg.
- **Cultural and social activities:** The international office of the TUHH promotes an intercultural program called “Welcome@TUHH” <https://www.tuhh.de/welcome/home.html>
- **Engagement with industry:** The Doctoral Student will closely work with relevant industry partners and benefit from specific training and mentoring opportunities (i.e. secondments, site visits, access to facilities and data, etc.)

For more information, visit: <https://www.tuhh.de/alt/tuhh/startpage.html>

RMIT

RMIT is a global university of technology, design and enterprise, ranked in the top 20 of universities under 50 years old in the world. World-class people, leading edge resources, collaboration with industry partners and multi-disciplinary approaches are just a few of the trademarks of research at RMIT, which boasts almost 90,000 students and campuses in Australia, Vietnam, a centre in Barcelona, Spain and research and industry partners on every continent.

As Doctoral Student at RMIT you will be able to benefit from a wide range of training and mentoring opportunities including:

- **The PhD Up** program offering a huge range of workshops, seminars and short courses to build research knowledge and skills, including research writing, publishing, research methods, ethics, project management and careers (see more at: <https://www.rmit.edu.au/students/student-essentials/information-for/research-candidates/enriching-your-candidature/phd-up-program>)
- **RMIT PhD Online Modules**, designed specifically for PhD students, including *Researching your literature review*, *Writing a research proposal*, *Choosing where to publish*, *Writing for Publication*, *Research Integrity*, etc.
- **RMIT Creds**, RMIT’s Digital Credentials Platform, which includes over 80 credentials covering a wide range of topics such as *Understanding Responsible Research and Innovation*, *Academic Integrity Awareness*, *Emotional Intelligence*, *Diversity Matters*, *Agile Ways of Working*, *Why Gender Matters*, *Cross Cultural Communications*, etc. (see more at: <https://www.rmit.edu.au/study-with-us/levels-of-study/short-courses>);
- **The e-Grad School**, the online learning modules of the Australian Technology Network (ATN) of Universities’ covering a multitude of transferrable skills such as *Critical and Creative Thinking*, *Leadership and Communication*, *Entrepreneurship*, *Research Commercialisation*, *Public Policy*, etc.
- **The RMIT Mentoring platform also** gives you access to mentoring from trained professionals and experts, including:
 - o *Career Mentoring* - career guidance from industry professionals from all disciplines and global locations.
 - o *Women@RMIT Mentoring* - career guidance from industry professionals who are committed to gender diversity and equality in the workplace (especially for female students in male dominated industries)
 - o *Pride Mentoring* - a chance for students who identify as LGBTIQ+ to receive professional and social guidance from industry professionals who also identify as LGBTIQ+ or are familiar with the additional challenges these groups face in the workforce.

Find out more: rmit.edu.au

A little more about you...

Eligibility

You need to fulfil criteria of the REDI program and both universities to be recruited.

To apply for REDI, you must comply with the MSCA-COFUND general eligibility criteria:

- Be in the **first four years** (Full-Time Equivalent (FTE) research experience) **of your research career** and not yet have been awarded a doctoral degree. FTE Research Experience is measured from the date when a researcher obtained the degree entitling him/her to embark on a doctorate, **AND**



- **Not have resided or carried out your main activity** (work, studies, etc.) in the country of your research host for more than 12 months in the 3 years immediately before this call's deadline. Time spent as part of a procedure for obtaining refugee status under the Geneva Convention (1951 Refugee Convention and 1967 Protocol), compulsory national service and/or short stays such as holidays is not taken into account.

AND the following criteria:

- **Hold a bachelor's degree requiring at least 4 years of full-time study** in a relevant discipline awarded with honours and including a research component; **OR**
- **Hold a master's degree that includes a research component** or a master's degree without a research component with at least a high distinction average; **OR**
- **Have evidence of appropriate academic qualifications and/or professional experience** demonstrating that the applicant has developed knowledge of the field of study or cognate field and the potential for research sufficient to undertake the chosen project.

AND

- Have **English level C1 language proficiency**.

In addition to the above, if your application is successful, you will be required to:

- Apply for a working visa in Germany (More information): <https://www.tuhh.de/alt/tuhh/international/incoming-international-students.html>
- Apply for a student visa in Australia (More information: <https://www.rmit.edu.au/study-with-us/international-students/apply-to-rmit-international-students/student-visas/apply-for-a-visa>)

In addition to meeting the eligibility criteria for the REDI Program, you will also need to meet the admission criteria of both institutions:

Admission at TUHH

You will be enrolled as Doctoral Student at TUHH for the entire duration of the assignment. At admission, you will need to supply:

- CV
- Cover Letter
- Work references / appraisals
- Degree certificate and transcript of records of a relevant Master's degree. Candidates who have successfully completed academic study at a foreign university can be admitted to doctoral studies if the completed studies are equivalent to a German degree. A Master's abroad should encompass regular study over a period of two years.
- Proof of C1 level of English according to the European Framework of Reference for Languages (CEFR)

More information: <https://www.tuhh.de/alt/tuhh/education/degree-courses/doctoral-degrees.html>

Admission at RMIT University

You will also be enrolled as Doctoral Student at RMIT for the entire duration of the assignment. At admission, you will need to supply:



- CV
- Complete transcripts for all academic qualifications
- Research proposal or statement of interest in an available research project
- Language certificates
- List of referees

More information: <https://www.rmit.edu.au/research/research-degrees/how-to-apply>

Apply now (<https://www.rediprogram.eu>)

