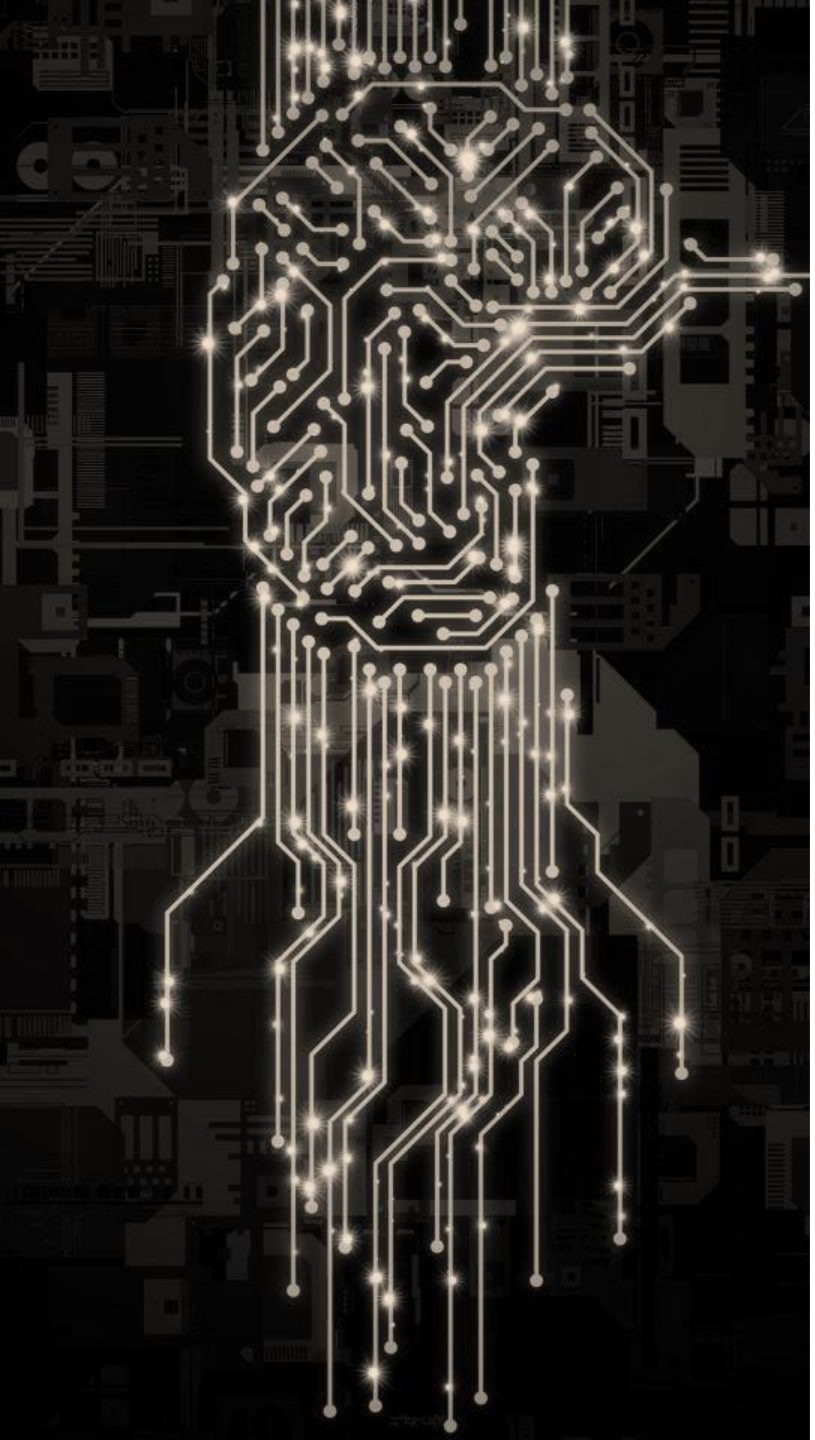


ADDOPTML
Optimized 3D printed structures

ADDOPTML Midterm Meeting - Welcome

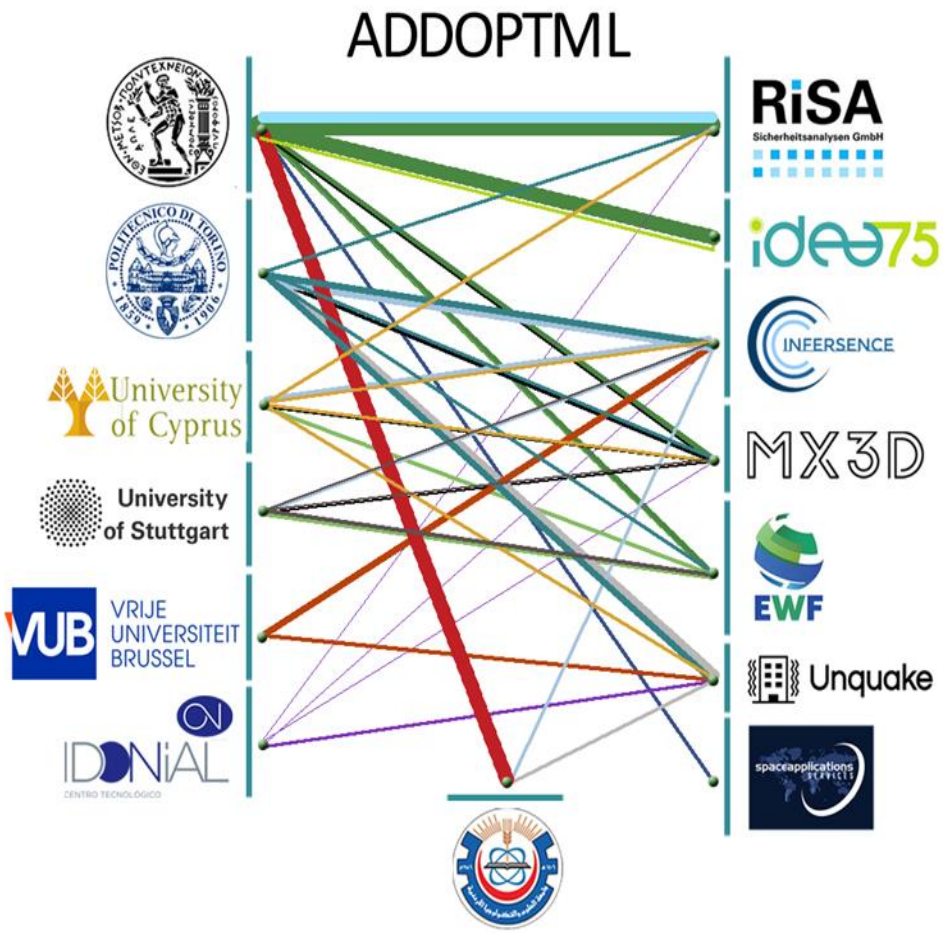
NIKOS D. LAGAROS

Agenda of the meeting

ADDOPTML
Optimized 3D printed structures

1. 10:00 to 10:45 Welcome
2. 10:45 to 11:45 General status of the project and the WP implementation
3. 12:15 to 13:15 Training, Transfer of Knowledge & Networking
4. 14:00 to 14:30 Management and Impact
5. 14:30 to 15:30 Meeting between seconded staff members and the REA Representative
6. 16:00 to 17:00 Open discussion & Questions

The Consortium
Round the table Introduction



Achievements so far

starting date : 01.05.2021
duration : 48 months

- ✓ 1 Kickoff meeting — done
- ✓ 6 Progress meetings — done
- ✓ 90+ months of secondments have been performed
- ✓ D9.1, Website, M2 — done
- ✓ D9.2, Data management plan, M6 — **submitted.**
- ✓ D9.3, Progress report, M13 — **submitted. Pending review.**
- ✓ D8.1 Publications to conferences, M17 — **to be submitted on M17 or M18.**
- ✓ D9.4, Mid-term meeting, M18 — *in progress* — ***M18: October 2022***

Problems observed

- Open discussion

General status of the project and the WP implementation

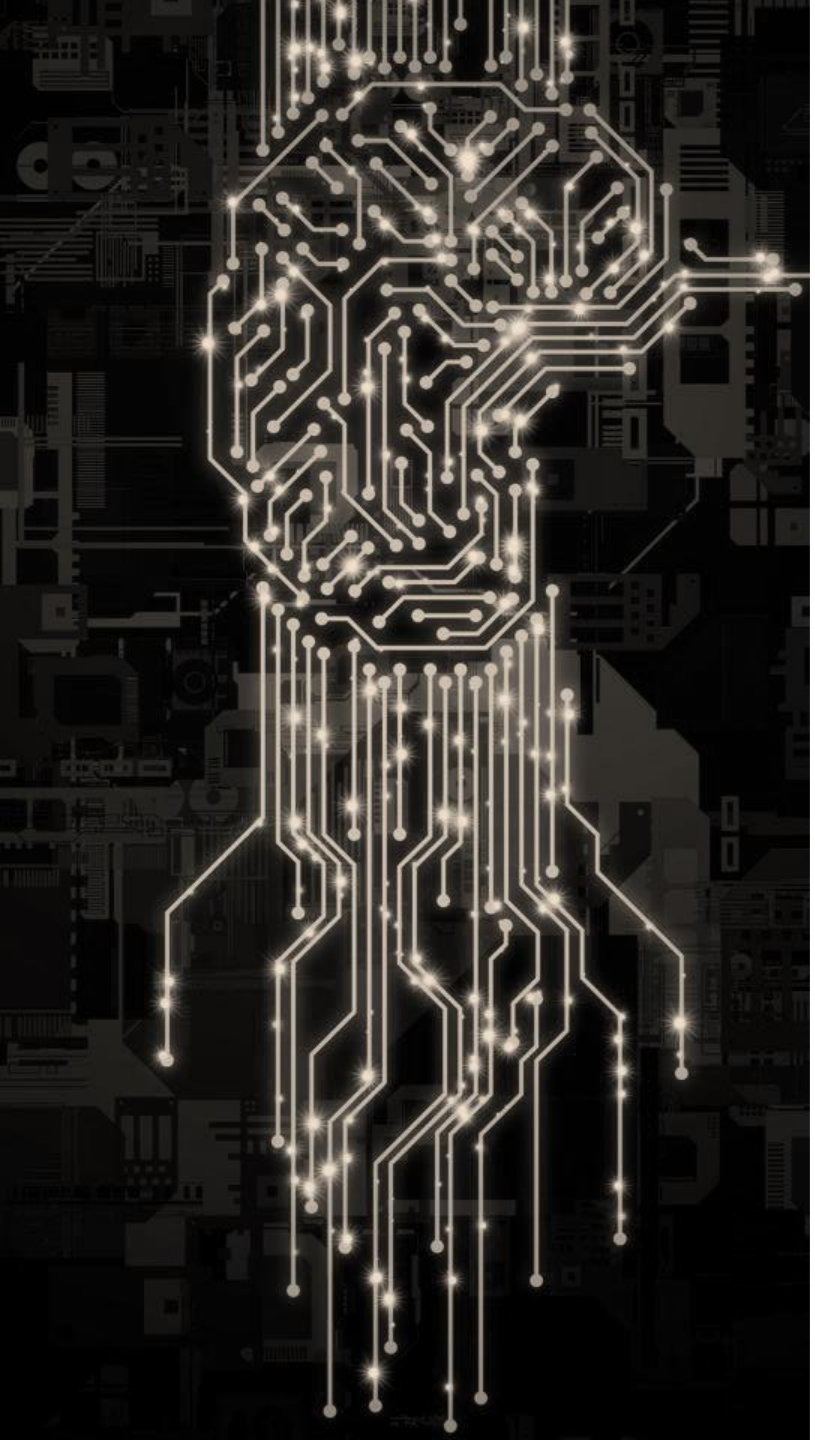
ADDOPTML
Optimized 3D printed structures

- WP1: Development of topology-sizing design optimization methodology incorporating nonlinear FEM analyses and machine learning (S. Triantafillou-NTUA)
- WP2: Determination of material constitutive relations for 3D printed metal and concrete specimens, using also recycled consumables, by means of tests and machine learning (N. Kallioras-INFERSENCE)
- WP3: Development of the ADDOPTML optimization and machine learning aided additive manufacturing framework, application to characteristic case studies and experimental verification (O. Kontovourkis-UCY)
- WP5: 3D printed optimized metal deployable structures to address humanitarian crisis (Ch. Gantes-NTUA)
- WP8: Diploma theses, seminars and an international conference on 3D printed optimized structures - Communication, dissemination and exploitation activities (E. Frangedaki-NTUA)

Social Media

Do not forget

- ADDOPTML Project H2020 MSCA-Rise 2020
- @addoptml
- ADDitively Manufactured OPTimized Structures by means of Machine Learning-ADDOPTML
- Web page: http://addoptml.ntua.gr
- Email: addoptml@mail.ntua.gr



ADDOPTML
Optimized 3D printed structures

Funded by the European Union

ADDOPTML Midterm Meeting - Welcome

NIKOS D. LAGAROS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101007595.

ADDOPTML Work Package 1

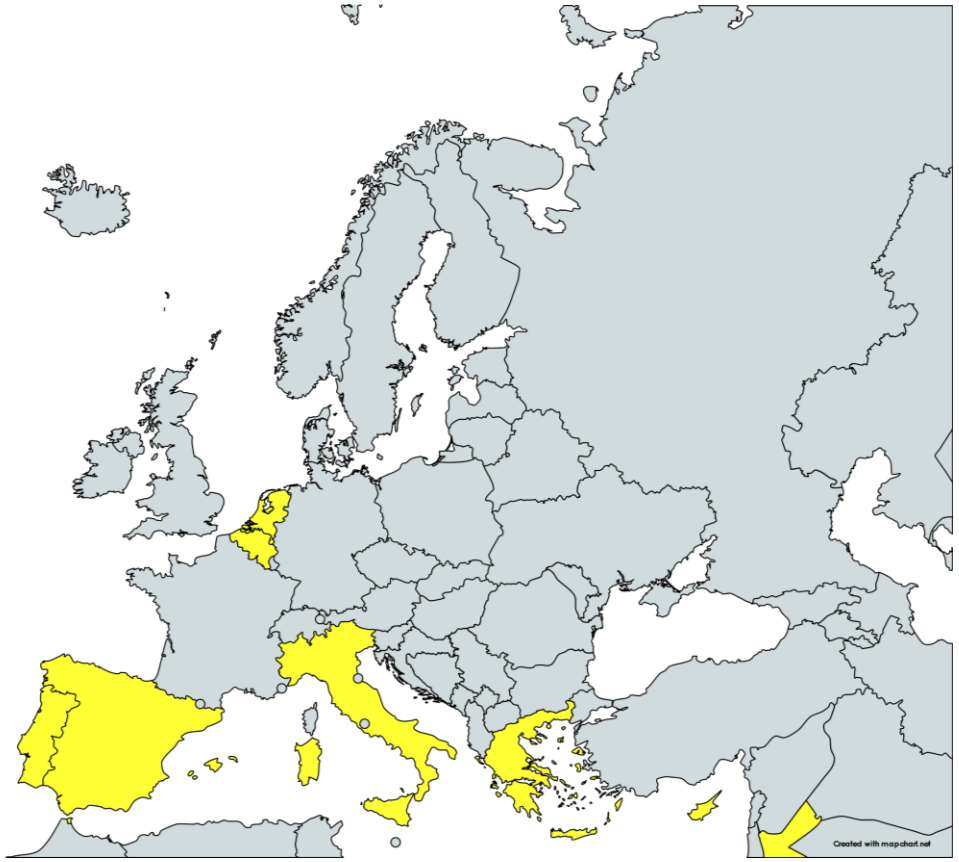
Development of a **topology-sizing** design optimization methodology incorporating **nonlinear FEM** analyses and **machine learning**

WP Leader
NTUA

Logistics and parties involved

Partner	Country	PMs
National Technical University of Athens	Greece	24
Politecnico di Torino	Italy	5
University of Cyprus	Cyprus	1
IDEA75	Italy	5
EWF	Portugal	2
IDONIAL	Spain	2
INFERSENSE	Greece	12
Jordan University of Technology	Jordan	12
Vrije University Brussels	Belgium	1
RISA	Germany	8
MX3D	The Netherlands	2
Structures & Sensors	Greece	6

Start Month: 1
End Month: 24



Logistics and parties involved

Partner	Country	PMs
National Technical University of Athens	**Greece**	**24**
Politecnico di Torino	**Italy**	**5**
University of Cyprus	**Cyprus**	**1**
IDEA75	Italy	5
EWF	Portugal	2
IDONIAL	Spain	2
INFERSENSE	Greece	12
Jordan University of Technology	**Jordan**	**12**
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RISA	Germany	8
MX3D	The Netherlands	2
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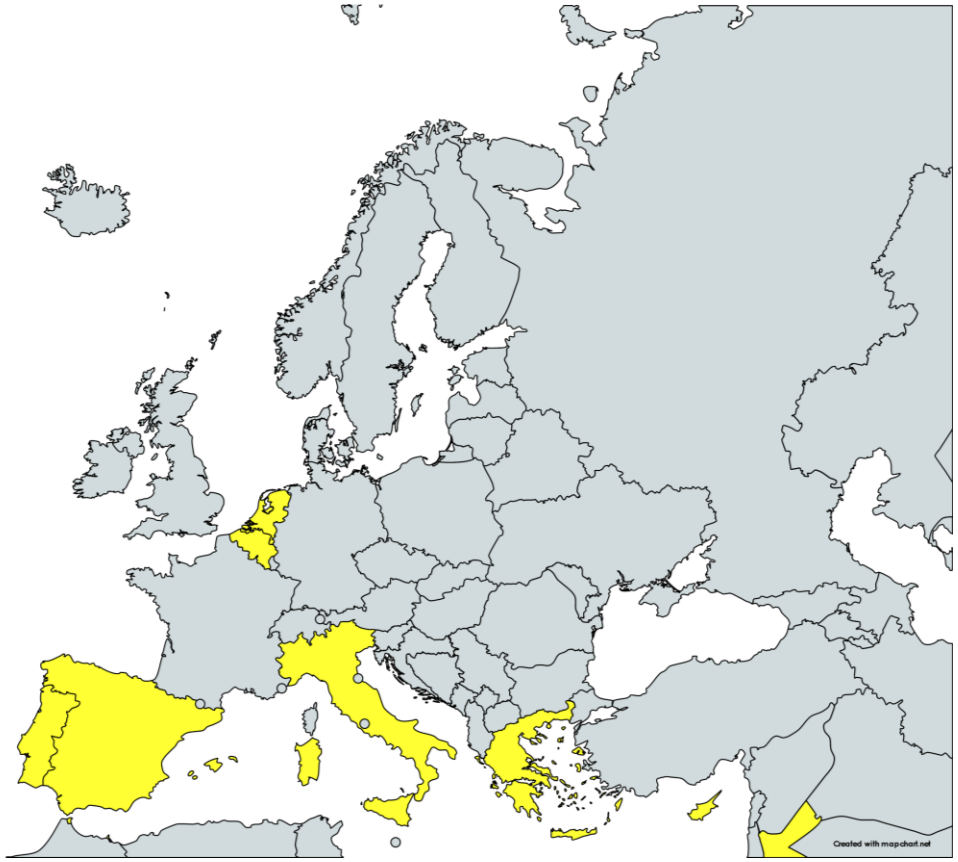
Start Month: 1
End Month: 24



Logistics and parties involved

Partner	Country	PMs
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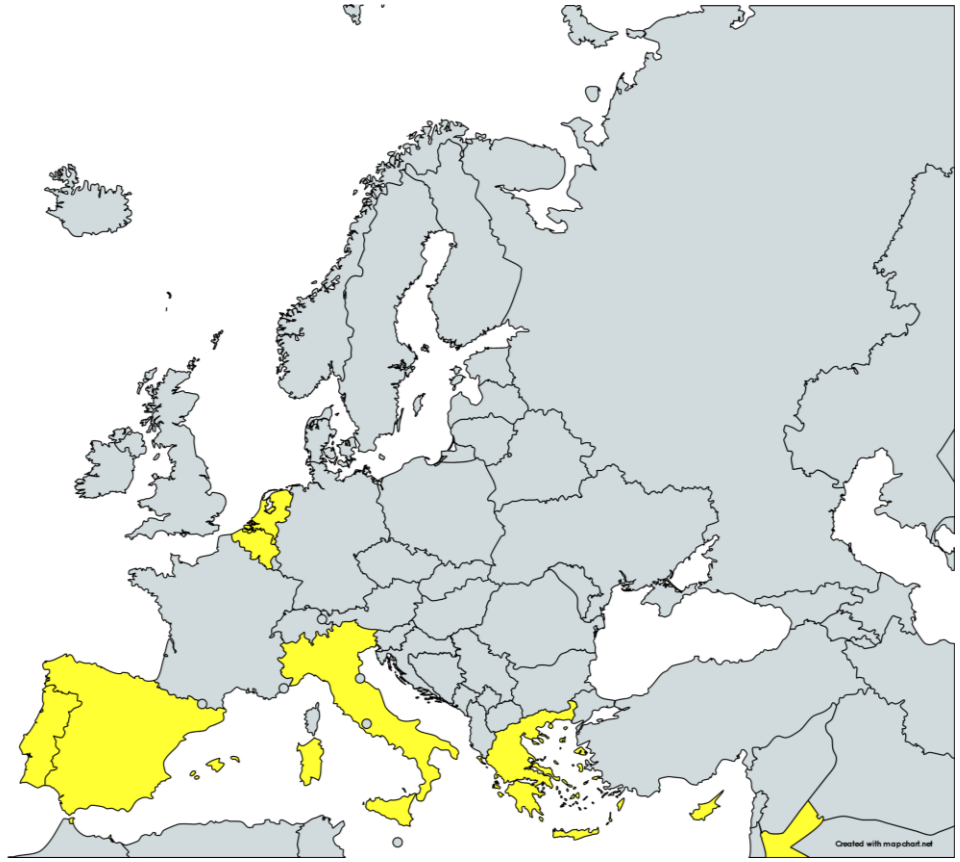
EWF	**Portugal**	**2**
IDONIAL	**Spain**	**2**
INFERSENSE	**Greece**	**12**
Jordan University of Technology	Jordan	12
Vrije University Brussels	Belgium	1
RISA	**Germany**	**8**
MX3D	**The Netherlands**	**2**
Structures & Sensors	**Greece**	**6**

Start Month: 1
End Month: 24

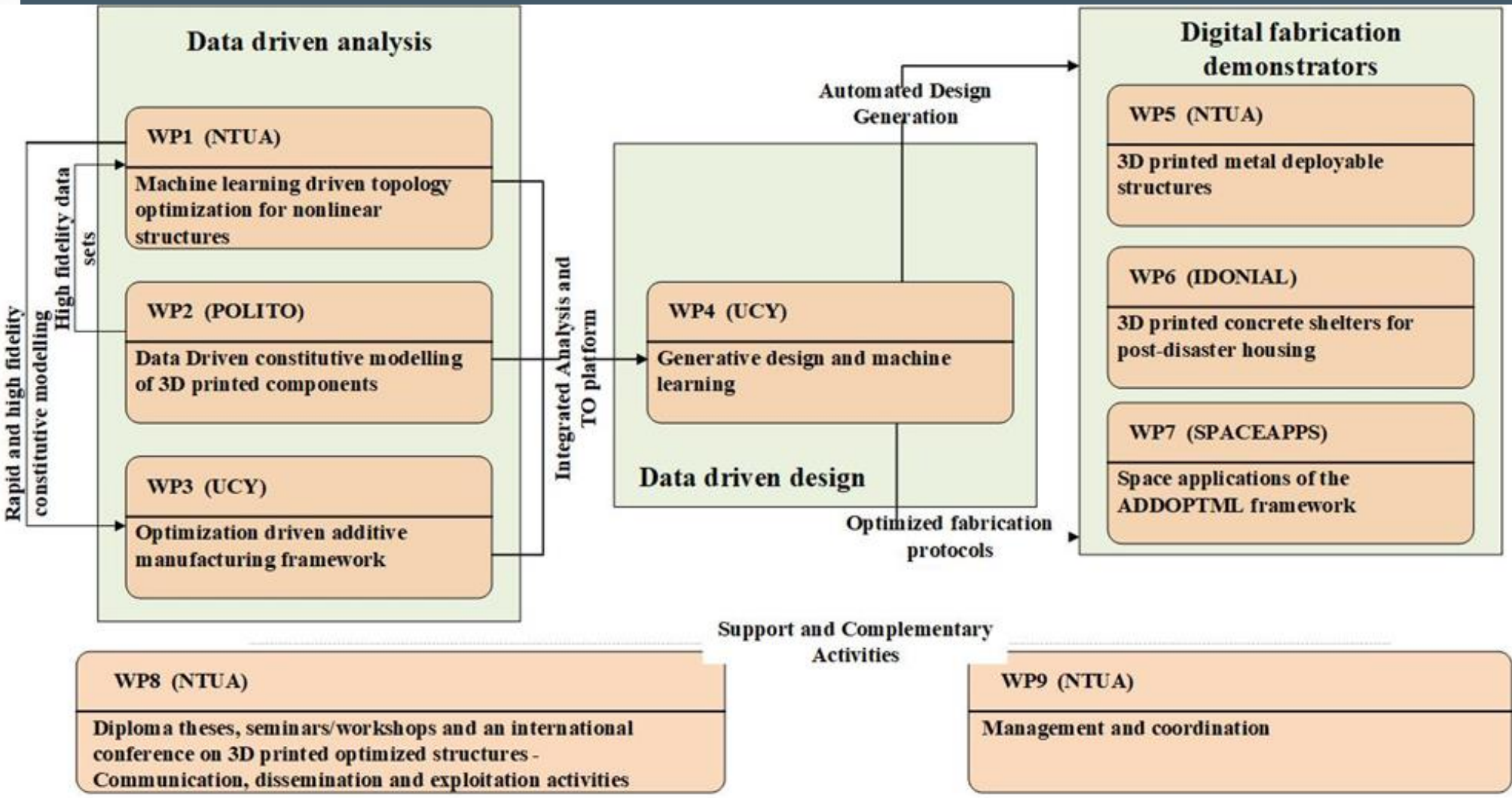


The objectives

To deliver a completely novel **three stage** topology-sizing design optimization methodology in which

- **Linear Buckling** and **Geometrical and Material Nonlinear Analyses** will be informing the optimization process
- **Considering:** Multiple loading cases in each search iteration.
- **Employing:** Machine Learning surrogates to accelerate the overall optimization process

Where do we fit?



The Methodology

- **Task 1.1 Nonlinear three-stage topology-sizing design optimization methodology (Lead NTUA):**
- Objective: Through a three-iteration optimisation strategy, the roughly optimized shape of the first stage will be further optimized so that all verifications against all pertinent failure mechanisms will be included in the analysis.
  - **First Stage:** TO approaches to be improved in terms of computational efficiency (link to Task 1.2); multiple loading combinations (the design loading conditions). This will lead to roughly optimized shapes of the structural elements (members, nodes) or structures (**development by NTUA, POLITO and IDEA75**).
  - **Second Stage** (aka **the interpretation stage):** the optimized shapes resulted from the first stage will be interpreted into CAD designs (**development by NTUA, POLITO, IDEA75 and RISA**, interpretation guidelines will be written by **UCY**).
  - **Third Stage:** Fuse with Linear Buckling and Geometrical, Material Nonlinearities
- (development by **NTUA**, problem constraints regarding the structural part provided by **UCY, IDEA75, RISA** and **JUST**; constraints for the 3D printing part provided by **EWF, MX3D BV and IDONIAL**)

The Methodology

- **Task 1.2 Machine learning assisted TO (Lead NTUA):**
  - Objective : To accelerate the TO procedure employing ML machine learning driven surrogates.
  - To develop a methodology via combining a topology optimization approach (BESO, ESO, level set or SIMP) and a deep learning (DL) method (e.g. deep belief networks-DBN) – **development by NTUA INFERSENCE and STRUCTURES & SENSORS**)
- **Task 1.3 Design of members, connections and structures with non-linear FEM analyses (Lead NTUA):**
  - Objective: Design procedures for structures using nonlinear analysis
  - Metal members, connections and structures (development by **NTUA input by MX3D**)
  - Fibre reinforced concrete members (development by **NTUA, JUST and STRUCTURES & SENSORS and IDONIAL**).

Progress to date

Nonlinear Topology Optimisation

Extending TOCP capabilities to perform nonlinear topology optimisation

Interface with commercial solvers (Abaqus, Adina)

Interface with open-source solvers (FreeFEM)

Machine Learning Assisted Topology Optimisation

Deep belief surrogates for fast forward predictions

Training given experimental and artificial data-sets

Member and structural design

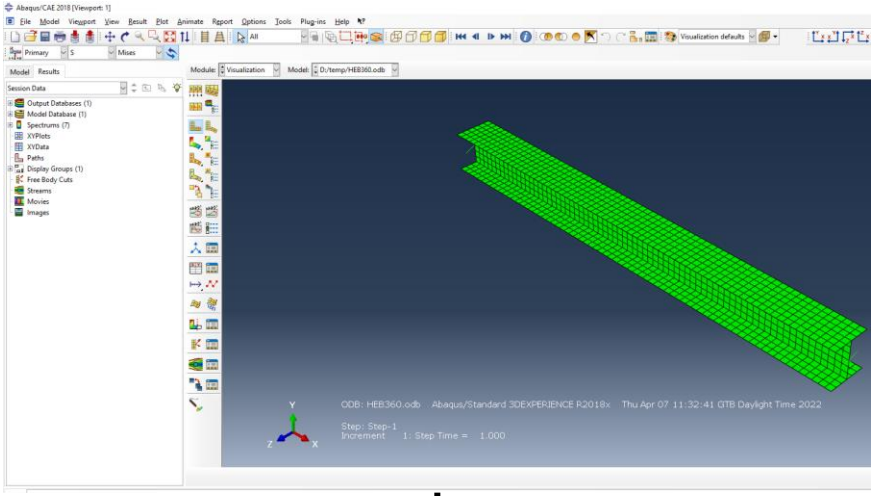
Additively manufactured concrete member damage modelling

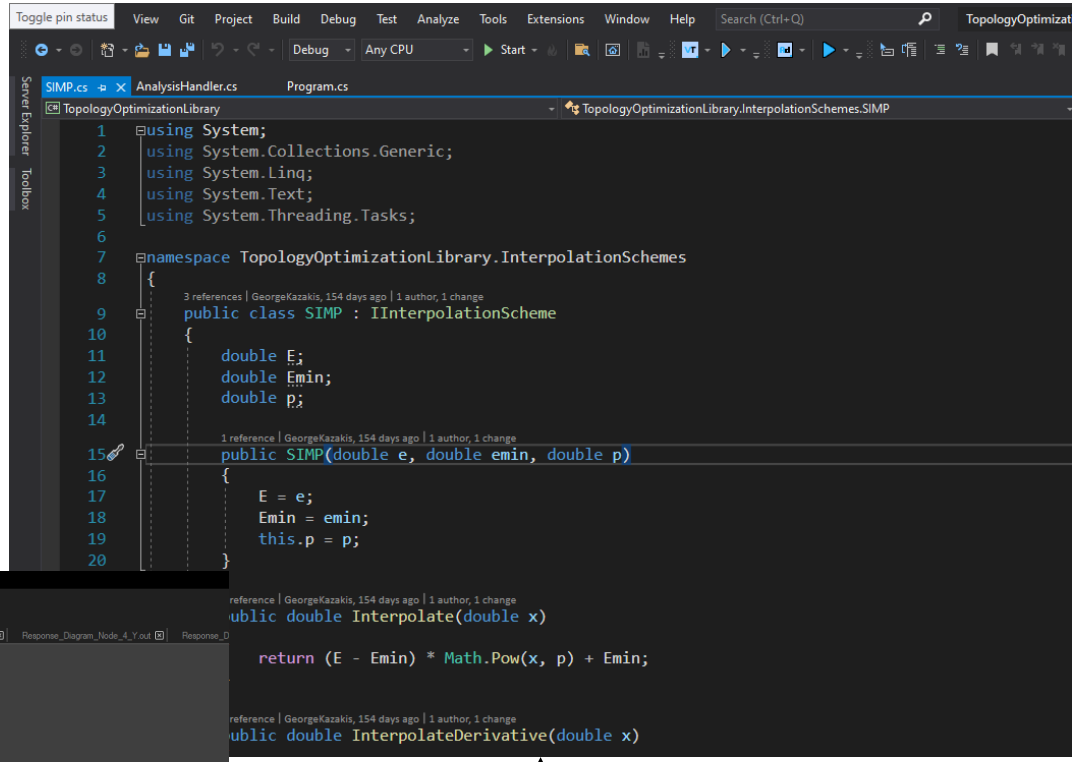
WAAM steel damage modelling

Process specifications for manufacturing constraints

Progress to date

Interfacing TOCP with Abaqus





```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

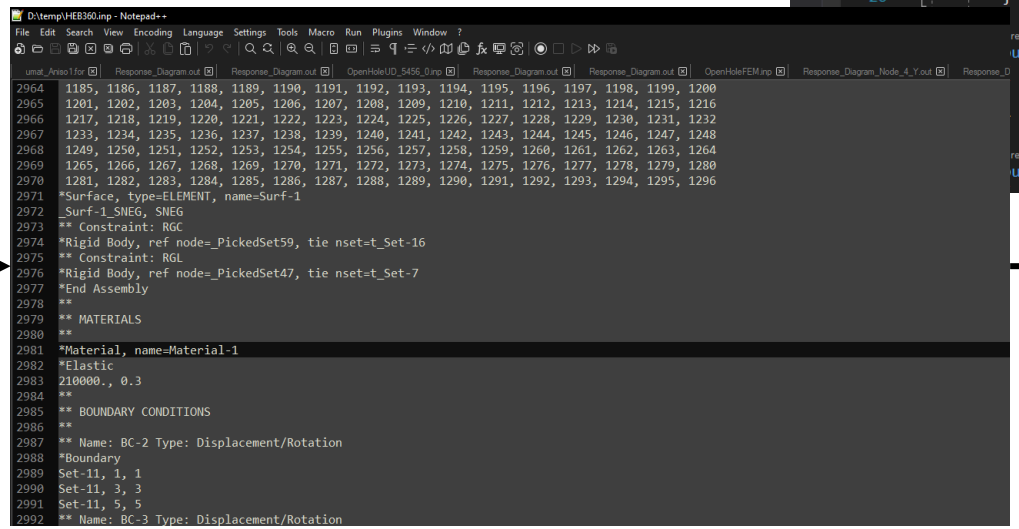
namespace TopologyOptimizationLibrary.InterpolationSchemes
{
    public class SIMP : IInterpolationScheme
    {
        double E;
        double Emin;
        double p;

        public SIMP(double e, double emin, double p)
        {
            E = e;
            Emin = emin;
            this.p = p;
        }

        public double Interpolate(double x)

            return (E - Emin) * Math.Pow(x, p) + Emin;

        public double InterpolateDerivative(double x)
```



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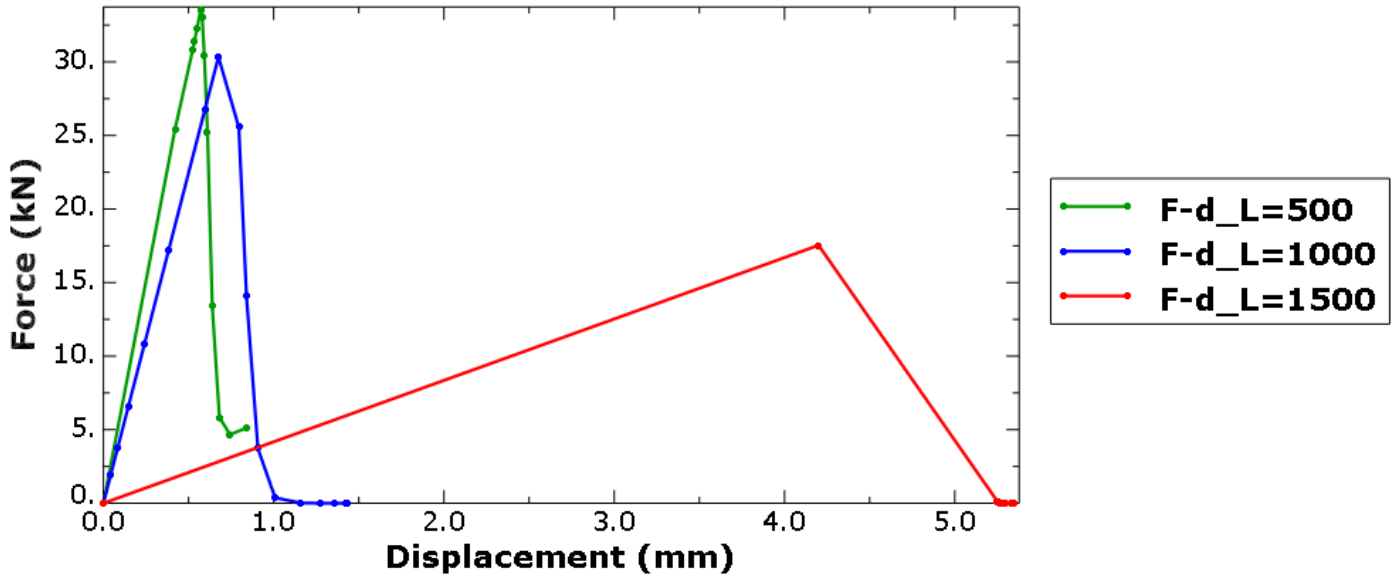
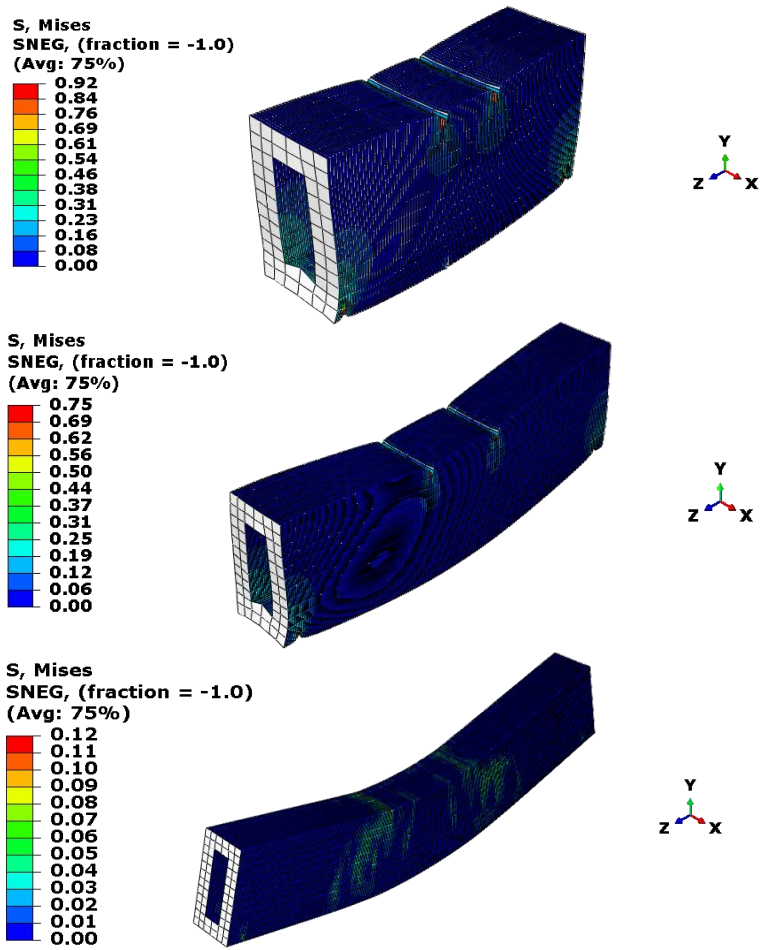
2970  1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296
2971 *Surface, type=ELEMENT, name=Surf-1
2972 _Surf-1_SNEG, SNEG
2973 ** Constraint: RGC
2974 *Rigid Body, ref node=_PickedSet59, tie nset=t_Set-16
2975 ** Constraint: RGL
2976 *Rigid Body, ref node=_PickedSet47, tie nset=t_Set-7
2977 *End Assembly
2978 **
2979 ** MATERIALS
2980 **
2981 *Material, name=Material-1
2982 *Elastic
2983 210000., 0.3
2984 **
2985 ** BOUNDARY CONDITIONS
2986 **
2987 ** Name: BC-2 Type: Displacement/Rotation
2988 *Boundary
2989 Set-11, 1, 1
2990 Set-11, 3, 3
2991 Set-11, 5, 5
2992 ** Name: BC-3 Type: Displacement/Rotation
```

Progress to date

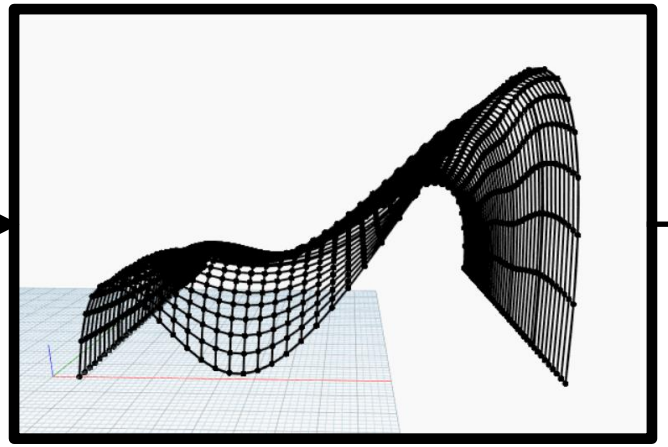
Damage modelling - experiments on concrete specimens by Wolfs et al., (2019)

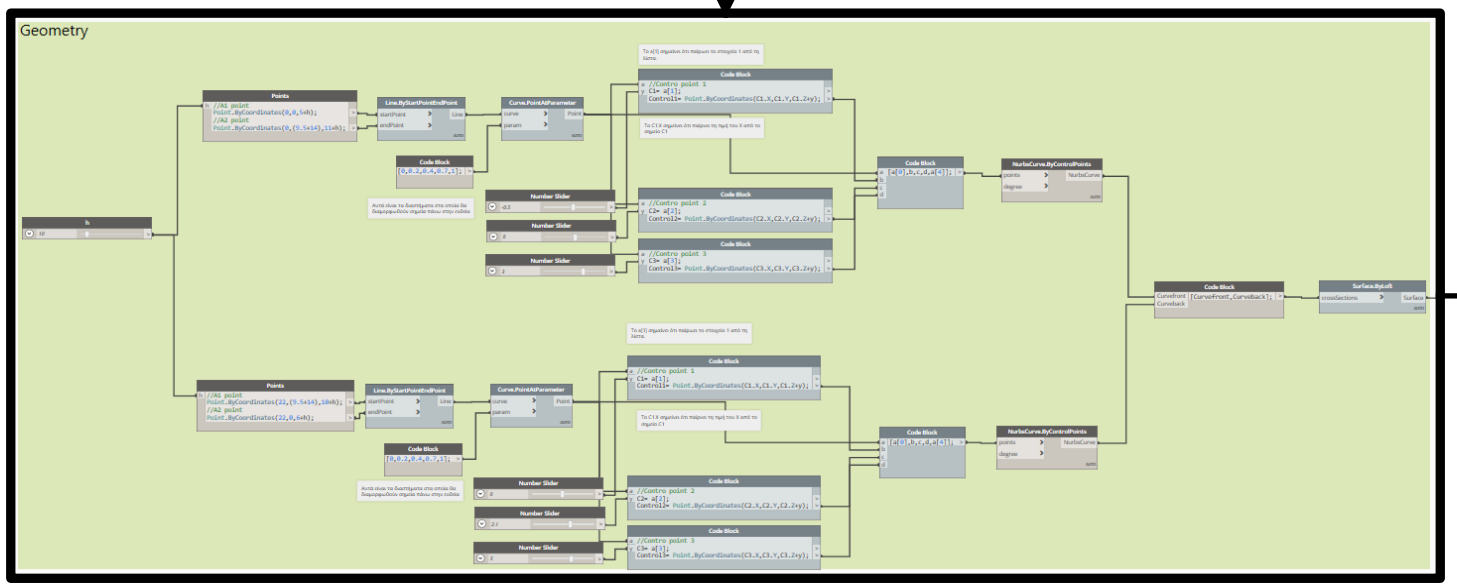


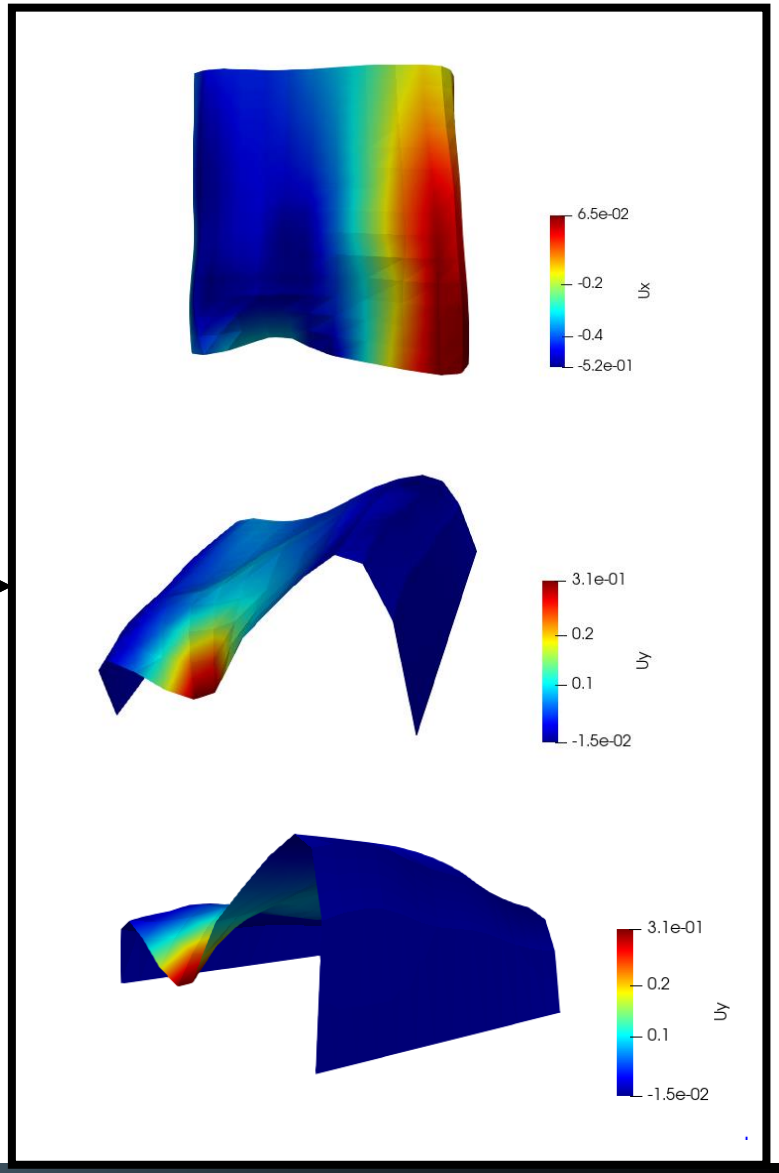


Progress to date

Parametric modelling of curved surfaces







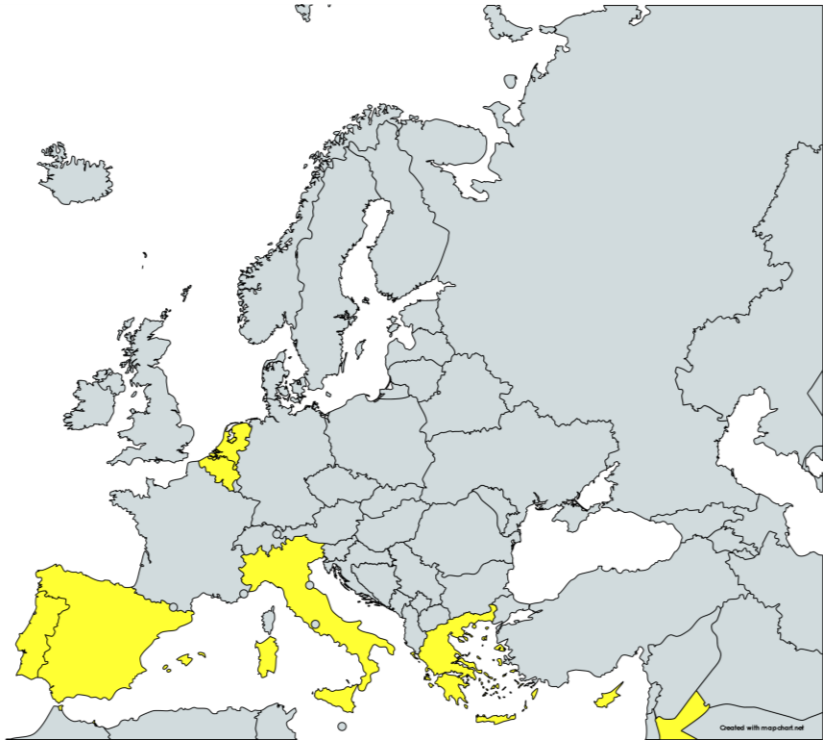
Deliverables

Deliverable D1.1 A software prototype to be released
Status: on schedule

Delivery date: M20

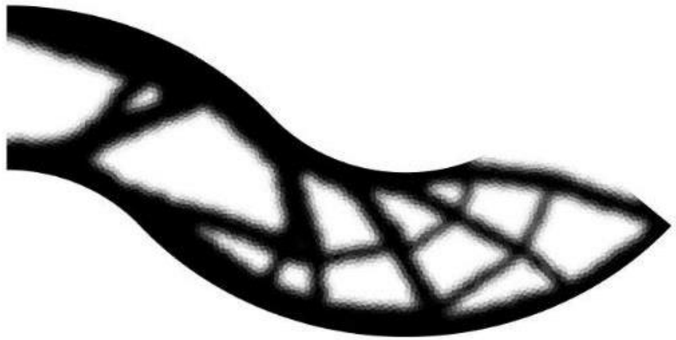
Deliverable D1.2 Journal publications (dissemination requirement: at least 1)
Status: 1 already published more are on the way

Delivery date: M24



Thanks for your attention

ADDitively Manufactured OPTimized Structures by means of Machine Learning

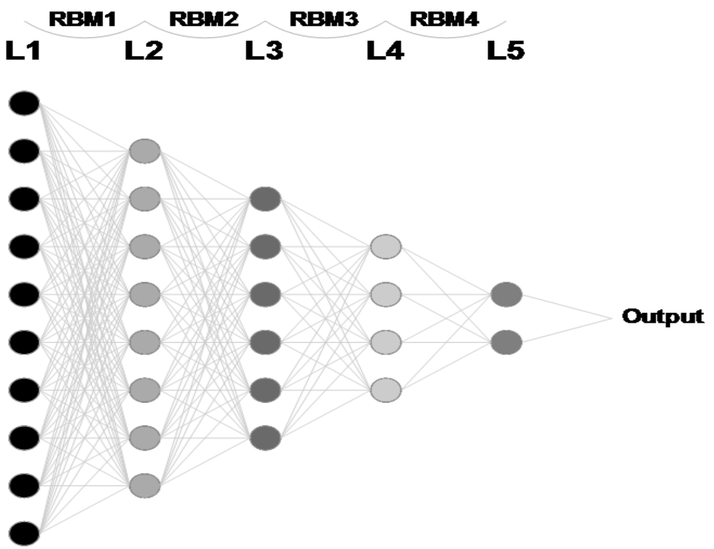


ADDOPTML

Midterm Meeting

WP2 Presentation

12/07/2022



WP2

Introduction

Goal – Participants – Person months

ADDOPTML
Optimized 3D printed structures

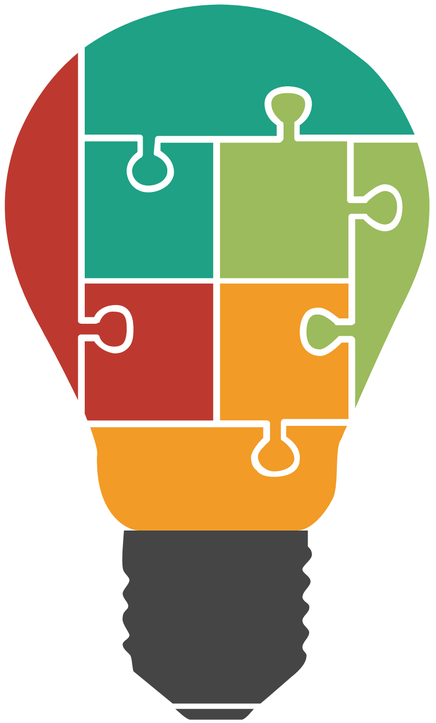
Horizon 2020

WP2 Presentation

Short Description of the WP

GOAL: Define material constitutive relations for both conventional and recycled consumables via AI

Duration: 36 months



Task 1.

Production, processing and classification of the recycled metal powder for Life Cycle Cost upgrading

Task 2.

3D printing of specific concrete and metal specimens

Task 3.

Experimental testing of concrete and metal specimens

Task 4.

Inverse analysis for identifying the constitutive laws for each material

Task 5.

Machine learning based metal and concrete constitutive laws

WP2
Partners and Secondments

11 Partners – 59 Person Months

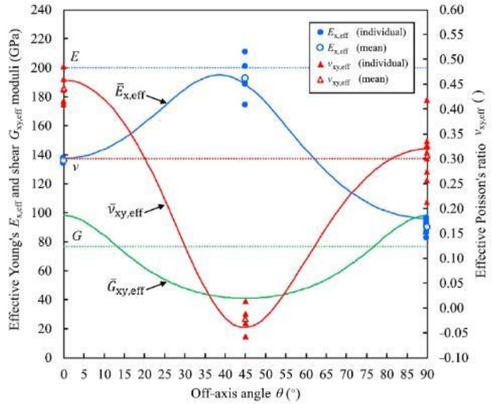
POLITO	NTUA	UCY	IDONIAL	EWF	MX3D	STRUCTURES & SENSORS	RISA	JUST	VUB	INFERSENCE
5	6	1	2	2	2	6	8	12	3	12

ADDOPTML
Optimized 3D printed structures

Horizon 2020

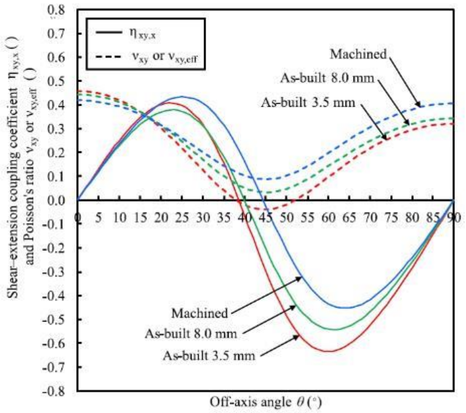
Problem Formulation

BASIC FEATURES



Determine Material Constitutive Relations

Ability to predict
Modulus of Elasticity, Yield strength, Ultimate strength, Ductility, etc.



- Material (Recycled or not)
- Production Method (WAAM, etc.)
- Construction/Load angle
- Etc.

Input Variables

A.I.
Algorithms/Scale

- Surrogate Models
- Expression Fitting
- Deep Learning

- Data volume
- Data Augmentation
- Single/Multiple Fidelity
- Bayes/Gauss methods

Output

Predicted Results

ADDOPTML
Optimized 3D printed structures

Nicolas Hadjipantelis, Ben Weber, Craig Buchanan, Leroy Gardner, Description of anisotropic material response of wire and arc additively manufactured thin-walled stainless steel elements, Thin-Walled Structures, Volume 171, 2022

Horizon 2020

Current Progress Status

BASIC FEATURES

Task 1. Production, processing and classification of the recycled metal powder

Undergoing examination of possible differences between recycled/non-recycled metal powder.

Up to now, no significant differences have been identified.

Task 2. 3D printing of specific concrete and metal specimens

Organized printing of metal specimens in UCY

Task 3. Experimental testing of concrete and metal specimens

Database creation from Bibliography research – Implementation of testing not started yet

Task 4. Inverse analysis for identifying the constitutive laws for each material

Bibliography research – Implementation not started yet

Task 5. Deep learning based metal and concrete constitutive laws

Bibliography research – Implementation not started yet

Two progress meetings so far (16/03/2022 and 01/07/2020) while a third one will be programmed for September.

One publication in journal: Al-Rousan, R., Nusier, O., Abdalla, K., Alhassan, M., & Lagaros, N. D. (2022). NLFEA of Sulfate-Damaged Circular CFT Steel Columns Confined with CFRP Composites and Subjected to Axial and Cyclic Lateral Loads. *Buildings*, *12*(3), 296. (3D Scanning/Printing: A Technological Stride in Sculpture))

WP2

Secondments so far:

- *Dr. Rajai Al Rousan*, *from* Jordan University of Science and Technology -JUST, to National Technical University Of Athens - NTUA, *01/09/2021 to 31/12/2021*, *and 15/02/2022 until mid of July in WP2*
- *Dr. Osama Nusier*, *from* Jordan University of Science and Technology -JUST, to National Technical University Of Athens – NTUA, *01/09/2021 to 31/01/2022*, *in WP2 15/02/2022 to 14/06/2022 in WP2*.
- *Dr. Ahmad Alawneh*, Jordan University of Science and Technology -JUST, to National Technical University Of Athens – NTUA, *15/02/2022 to 14/05/2022 in WP2*
- *Dr. Stavros Chatzieleftheriou*, from S&S to UCY, *13/12/2021 to 12/12/2022*, WP 1, 2, 3
- *Konstantinos Trikardos*, from S&S to UCY, *13/12/2021 to 12/06/2022 WP 1, 2, 3*
- Pantelis Tsakalis, from *Infersence to UCY*, 21/03/2022 to 20/09/2022 WP 2, 4
- *Ilias Chamatidis* from Infersence to UCY, *21/03/2022 to 20/09/2022 WP 2, 4*
- *Spyros Damikoukas* from NTUA to RISA, *17/02/2022 to 31/07/2022 WP 2, 3*
- *Paraskevi Mode* from NTUA to RISA, *10/05/2022 to 24/10/2022 WP 2, 3*

Future Steps

BASIC FEATURES

Task 1. Production, processing and classification of the recycled metal powder

- Classification of produced metal powder

Task 2. 3D printing of specific concrete and metal specimens

- Complete printing of metal specimens in UCY
- Organize and print other metal specimens
- Organize and print concrete specimens

Task 3. Experimental testing of concrete and metal specimens

- Perform tests once specimens are ready
- Combine results with database from bibliography

Task 4. Inverse analysis for identifying the constitutive laws for each material

- Implement inverse analysis

Task 5. Deep learning based metal and concrete constitutive laws

- Strict problem definition – Formulate AI pipeline– Run AI algorithms

Deliverables:

1. Conference presentation in 24th month
2. Article in 36th month

Future Steps

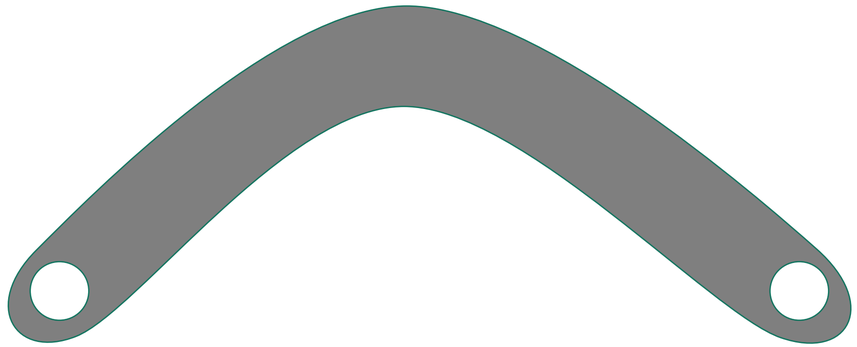
3D Printing and Evaluation of Seismic Isolation Parts

3D Printed Seismic Isolation Members Specimens

Performance Evaluation through Testing.

Optimize Topology and License Testing

Patentable Production



Deliverables:

1. Conference presentation in 24th month
2. Article in 36th month

Thank You

EUROPEAN RESEARCH EXECUTIVE AGENCY (REA)

REA.A - Marie Skłodowska-Curie Actions & Support to Experts
A.3 - MSCA Staff Exchanges

ADDOPTML

Optimized 3D printed structures

WP3

Development of the ADDOPTML Optimization and Machine Learning Aided Additive Manufacturing Framework

Application to characteristic Case Studies and Experimental Verification

Midterm meeting

101007595- ADDOPTML

Athens, 12 July 2022

Start / End Month: 13 (01.05.2022) – 48 (30.04.2025)

Lead Beneficiary: UCY

Participating organisation Short Name	NTUA	POLITO	UCY	USTUTT	EWF	MX3D BV	STRUCTURES & SENSORS
	IDONIAL	IDEA75	VUB	INFERSENCE	JUST		
Total Person Months per Participating organisation:	30	6	3	1	2	2	14
	2	5	2	6	17		

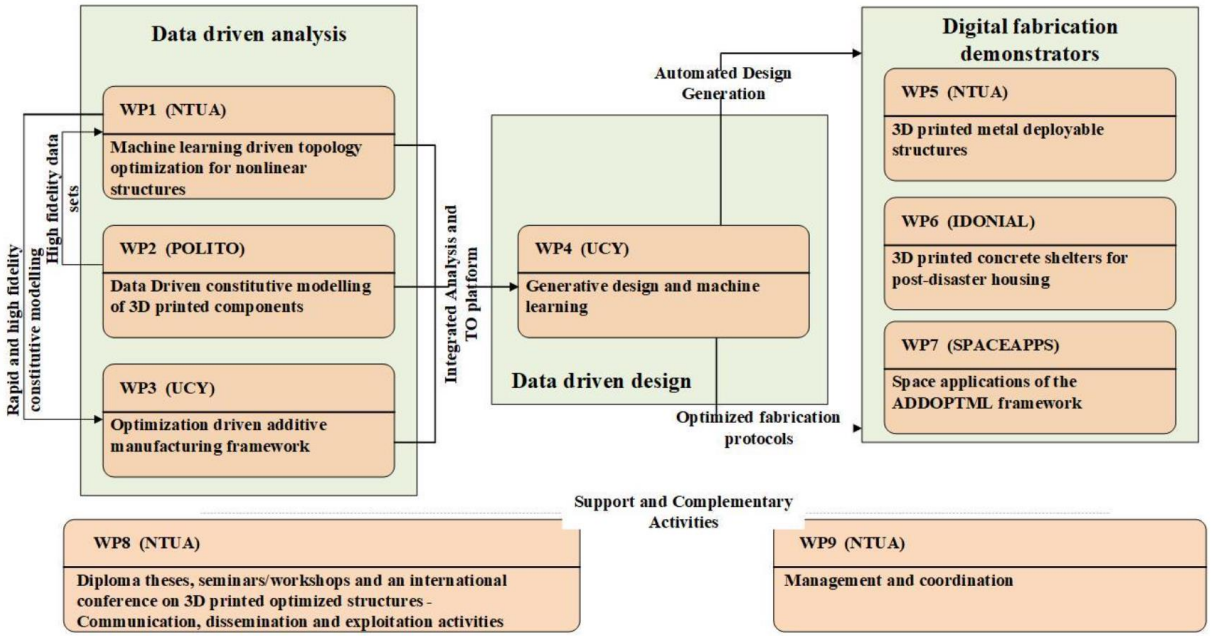


Fig. Global view of ADDOPTML WPs

OBJECTIVES

- The ADDOPTML optimization and machine learning aided additive manufacturing framework will be developed, aiming to work as a prototype generator.
- This framework aims to function as a combination of guided but intuitive at the same time prototyping applications from the starting point of drafting a design to the final part of 3D printing construction.
- This framework requires the collaboration of architects, structural engineers, 3D printing and optimization specialists in a knowledge transfer manner.

DEVELOPMENT

- **TASK 3.1:** ADDOPTML optimization and machine learning aided additive manufacturing framework (Lead by NTUA)

  (i) Problem formulation, (ii) Problem solving, (iii) 3D Printing of optimized forms

APPLICATION

- **TASK 3.2:** Case studies (Lead by UCY)
- **TASK 3.3:** Methodologies of interdisciplinary and parametric design (Formulation) (Lead by NTUA)
- **TASK 3.4:** Performance-based interdisciplinary and parametric design-based engineering optimization (Solution) (Lead by UCY)
- **TASK 3.5:** Additive manufacturing (3D printing) (Lead by MX3D BV)
- **TASK 3.6:** New 3D printing approaches (Lead by IDONIAL)

VERIFICATION

- **TASK 3.7:** Verification of numerically designed 3D-printed structural elements, connections and structures with experimental tests (Lead by NTUA)
- **TASK 3.8:** Vibration measurements and interpretation for experimental testing (Lead by STRUCTURES & SENSORS)

CONTRIBUTION

- The academic contributors will be involved in the design optimization problem formulation and application of the ADDOPTML framework.
- AM experts will be involved in the manufacturing process.
- STRUCTURES & SENSORS together with the academic contributors will contribute to the monitoring and verification process of specimens, all in line with research work plan.

DELIVERABLES

- **D3.1 Publications to conferences**: two presentations in international conference on interdisciplinary design methodologies (Delivery M36), one presentation on parametric design and one on the 3D printed specimens (Delivery M48)
- **D3.2 Publications to scientific journals**: one journal publication on the interdisciplinary design and parametric design optimization methodologies and one on additive manufacturing will be published (both providing open access) (Delivery M48)

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A.3 - MSCA Staff Exchanges

ADDOPTML
Optimized 3D printed structures

WP3 ACTIVITIES SO FAR

- **Kick-off Online Meeting,** December 14, 2021 03:00 PM (GMT+3), Nicosia
- **WP3 Online Presentation on AM,** January 18, 2022 04:00 PM (GMT+3), Nicosia

WP3 ONLINE PRESENTATION

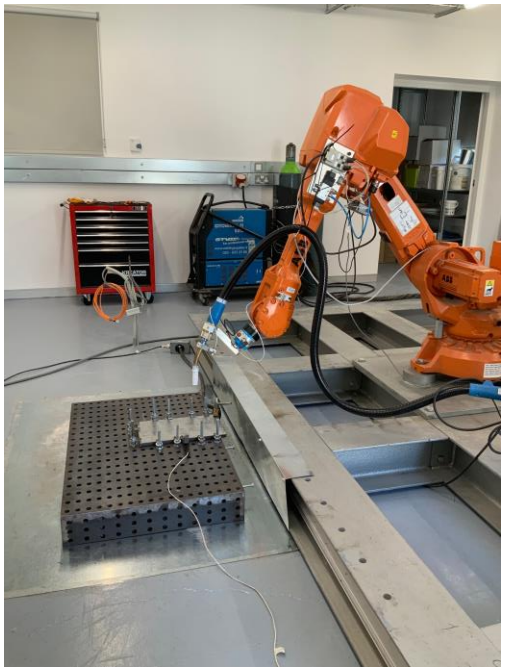
WAAM – Wire-Arc Additive Manufacturing - Thomas Van Glaabeke

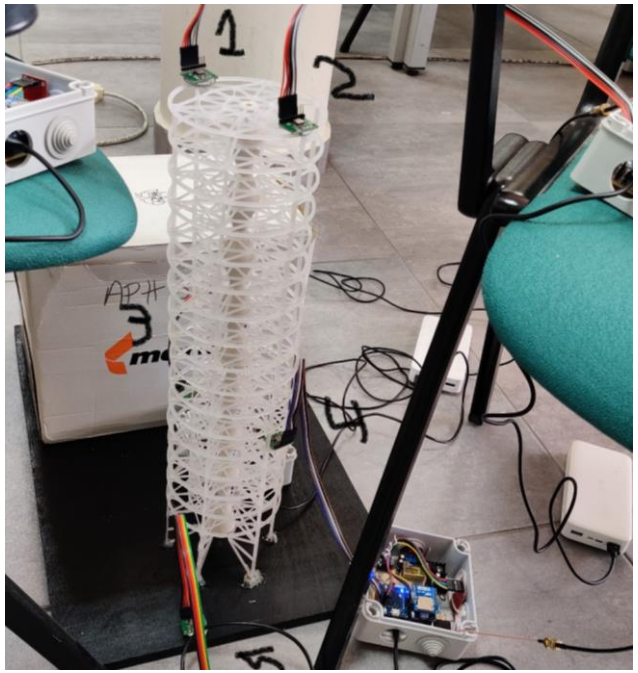
MX3D

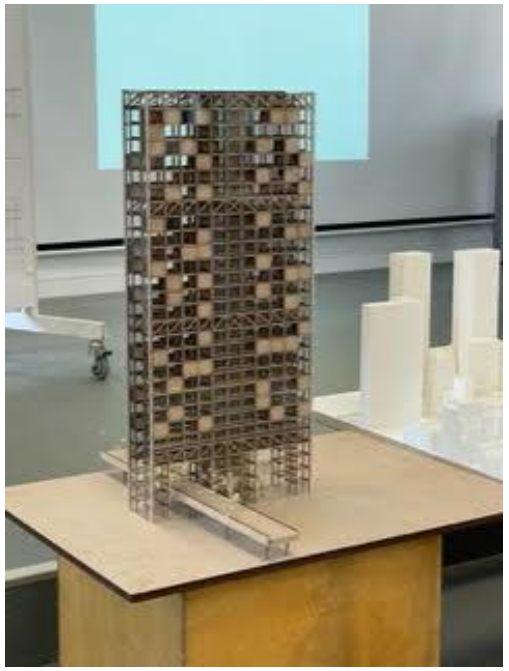
3D Concrete Printing - Pablo Cabal Pérez with David Santos

IDONIAL
CENTRO TECNOLÓGICO

WP3 CURRENT AND FUTURE COLABORATIONS







- Contribution of WAAM laboratory and collaboration with ADDOPTML partners for the 3D printing of steel specimens and experimental verification.
- Collaboration with ADDOPTML partners for the modal analysis tests of plastic and steel specimens.
- Collaboration with ADDOPTML partners for measuring dynamic characteristics of slender tall skyscrapers mock ups.

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WP3 PARTNERS

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WP5: 3D printed optimized metal deployable structures to address humanitarian crisis

Midterm meeting

12 July 2022

Start Month	13 (1/5/2022)
End month	48 (30/4/2025)

Lead Beneficiary: NTUA

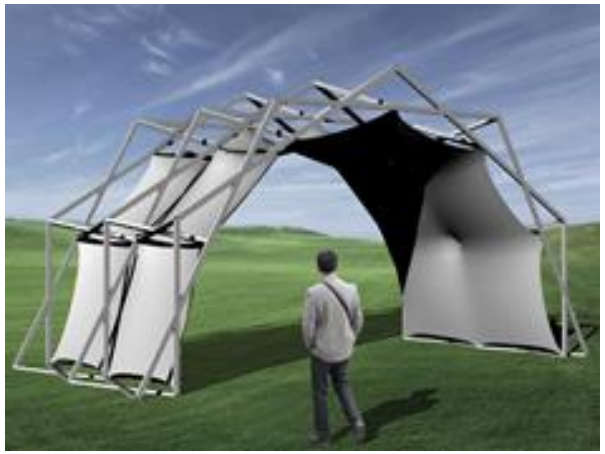
Person months per participating organization

NTUA	RISA	JUST	VUB	USTUTT	STRUCTURES & SENSORS	POLITO	INFERSENCE	MX3D BV	UCY	EWF
24	10	10	8	8	6	6	4	3	2	1

Objectives

- This WP aims to design deployable structures that will exploit AM techniques for the fabrication of their members and connections, thus achieving short fabrication times, to respond quickly to urgent sheltering needs in times of humanitarian crises, such as the current corona-virus pandemic.
- The design of the prototype shelter in this WP will follow the guidelines and specifications for shelter kits of the International Organization for Migration (IOM).
- Scissor-based as well as origami-inspired deployable structures will be explored.

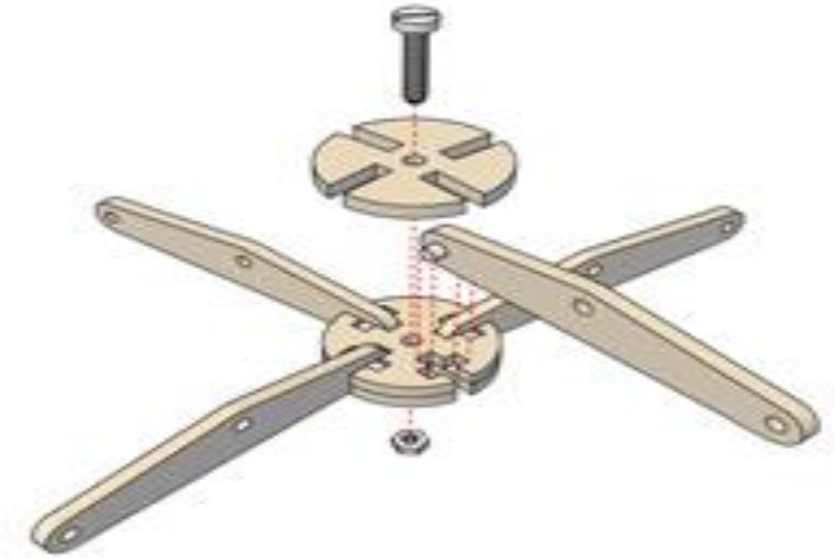
2010 Haiti earthquake



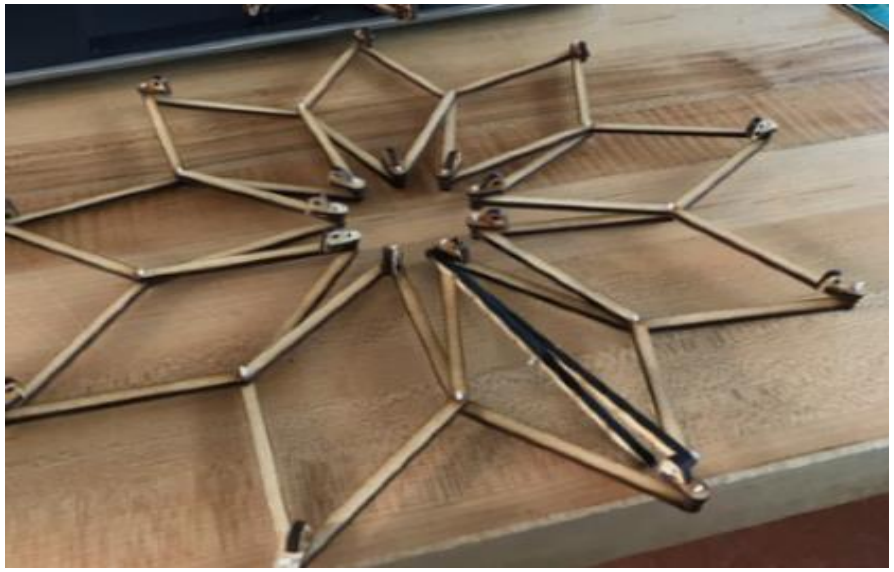
Koumar 2016 (VUB)

Why are deployable structures an interesting problem for additive manufacturing?

- They require complex joints allowing large rotations that usually must be simplified due to fabrication difficulties, thus introducing eccentricities and leading to poor structural performance.
- In some deployable structure types members are unconventionally shaped, thus requiring specialized and expensive fabrication methods.



Roovers 2017 (VUB)



Krishnan 2018

Tasks

Task 5.1 Optimized design of deployable shelters for disaster relief

(i) Identification of suitable geometry and design criteria for deployable shelters for disaster relief

(ii) Structural design and member optimization.

(iii) Connection optimization.

(iv) Detailed design of prototype shelter.

Task 5.2 Case Study: 3D printing and testing of scaled prototype deployable shelter

(i) The prototype shelter designed in task 5.1 will be 3D printed in appropriate scale for demonstration as well as testing purposes.

(ii) The scaled model will be tested in the Laboratory of NTUA's Institute of Steel Structures.

(iii) The associated numerical model will be calibrated.

Tasks

Task 5.3 Typical designs of deployable shelters for disaster relief: A range of typical designs of deployable shelters for various applications related to disaster relief will be prepared

Task 5.4 Integration of working joints or movable features on PBF-LB (Powder Bed Fusion – Laser Beam) printed components: This task is based on the implementation of moving features within 3D printed components manufactured through PBF-LB technology

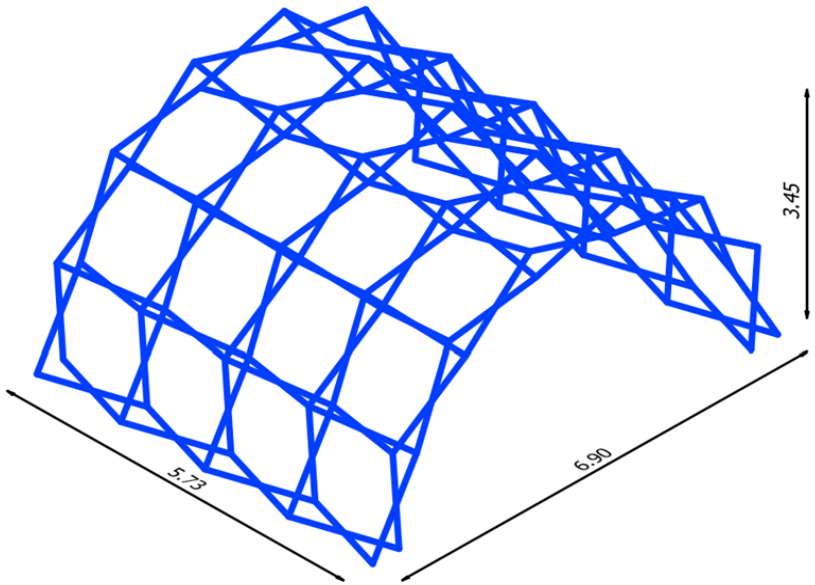
Task 5.5 Design and development of embedded sensors for safety assessment of deployable space scissor-based and origami structures

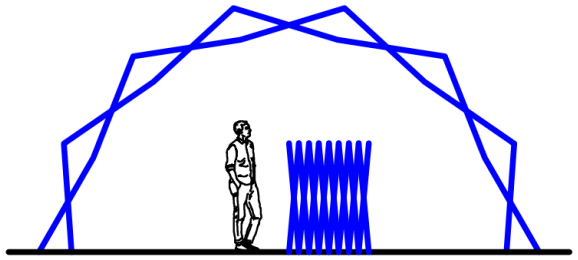
The contribution of beneficiaries and partners

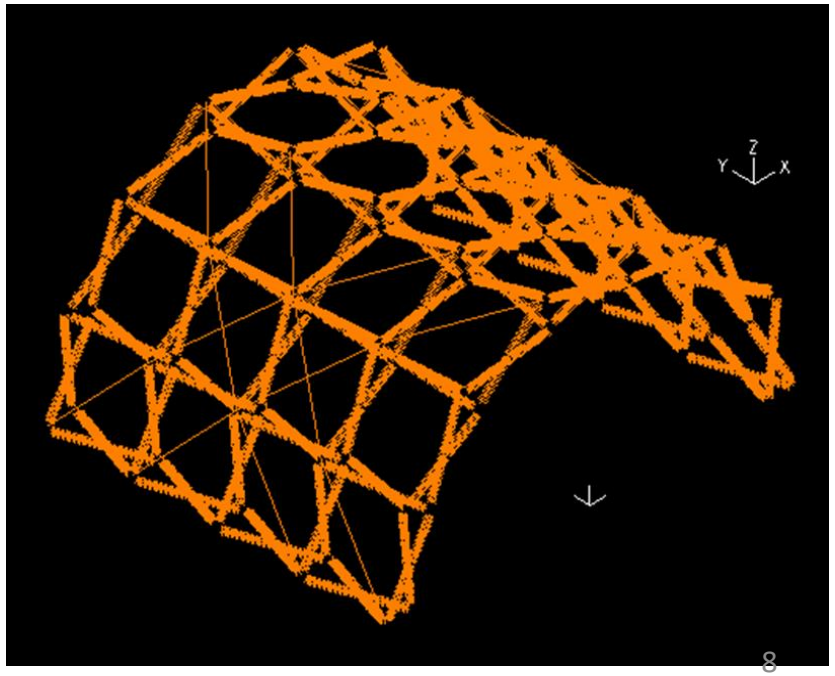
- Scissor-based deployable structures: NTUA – VUB
- Origami-based deployable structures: USTUTT – VUB
- Optimization: NTUA – POLITO – VUB – RISA
- Automation: UCY – USTUTT
- 3D printing (WAAM): MX3D – EWF – UCY
- 3D printing (PBF-LB): IDONIAL
- Structural steel design and testing: NTUA – JUST
- Structural health monitoring: STRUCTURES & SENSORS – INFERSENCE
- Material characterization: STRUCTURES & SENSORS – INFERSENCE

Progress achieved so far (Task 5.1)

- Numerical modeling, analysis and optimized design of the shelter proposed by Koumar

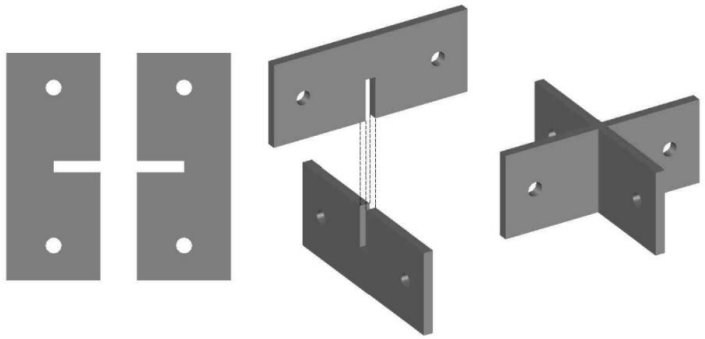


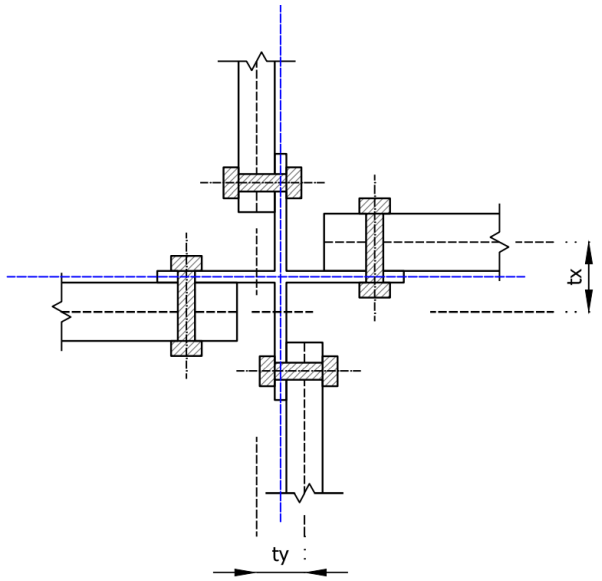


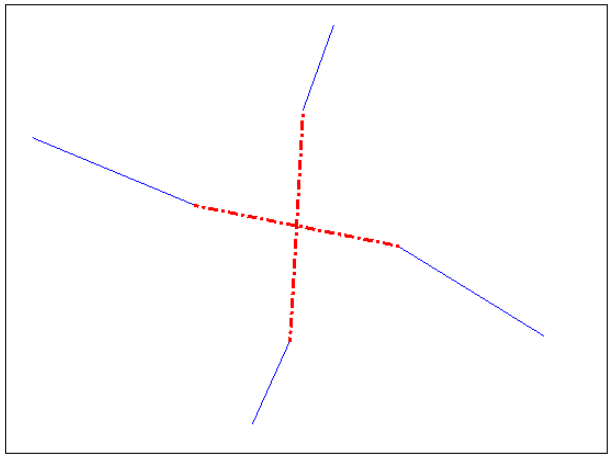


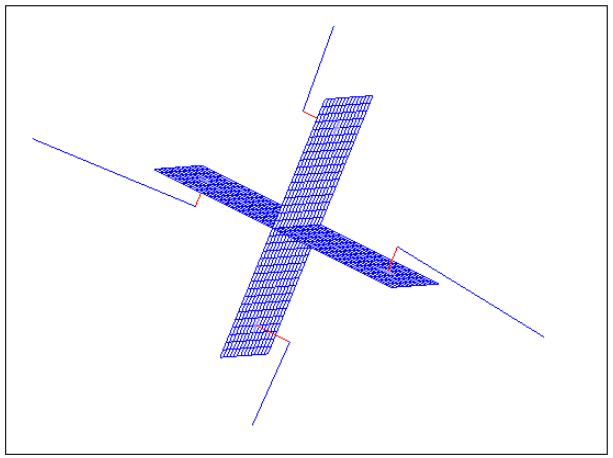
Progress achieved so far (Task 5.1)

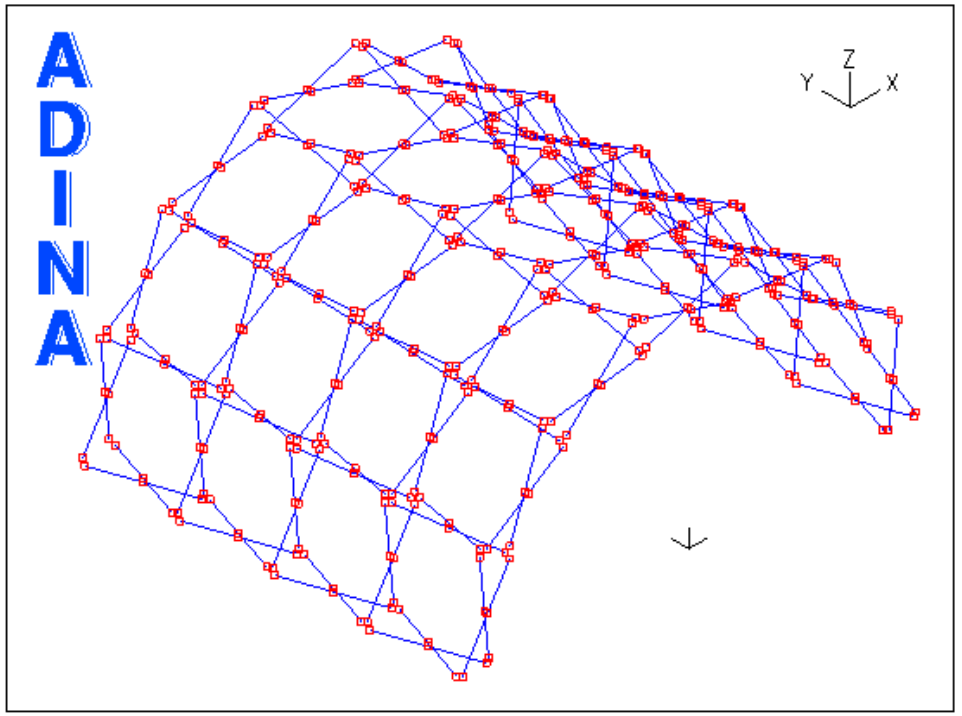
- Numerical modeling of joints





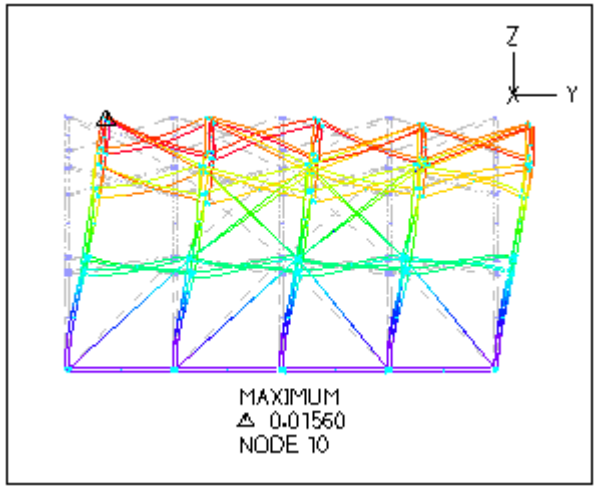


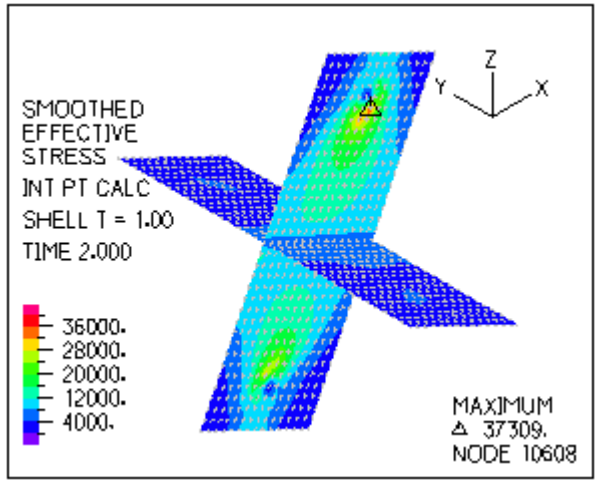


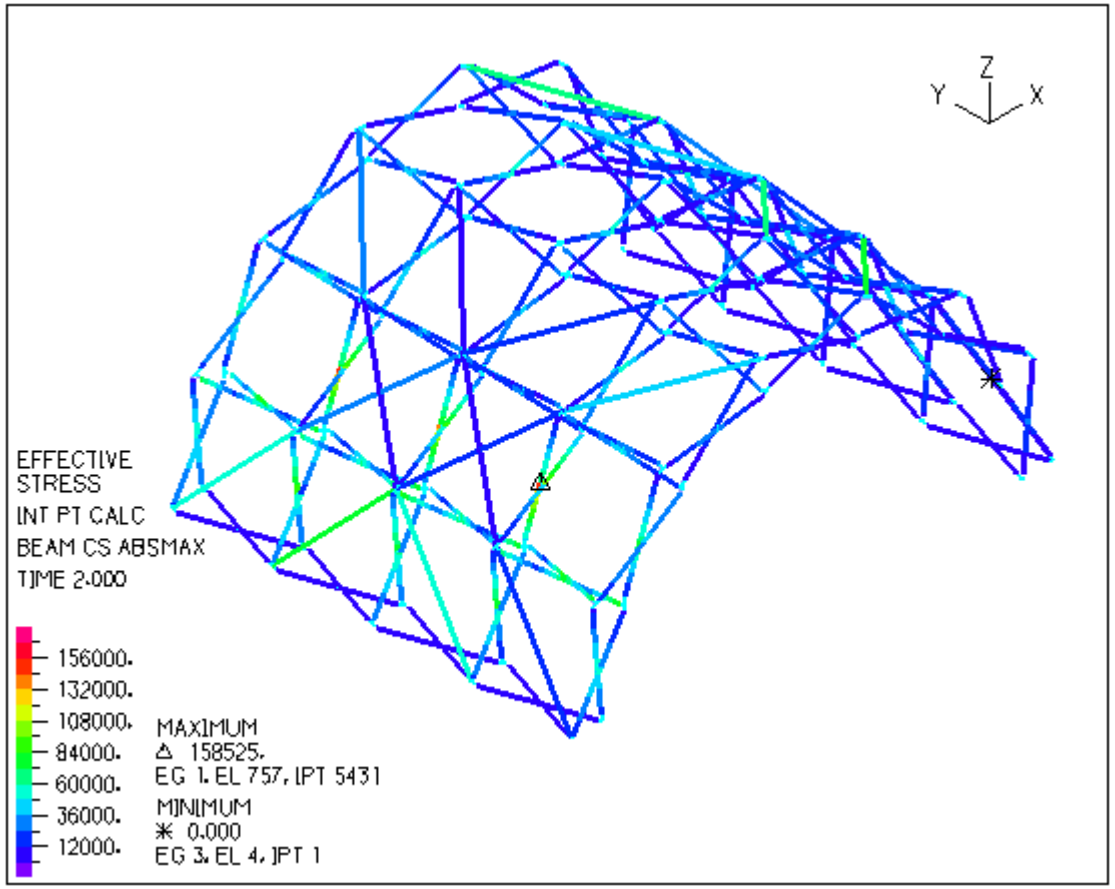


Progress achieved so far (Task 5.1)

- Analysis results of “manually” optimized structure







Next steps

- ❑ Mathematical optimization of member cross-sections
- ❑ Topology optimization of joints
- ❑ 3D printing of optimized joints
- ❑ Assembly of scaled model comprising 3D printed joints and conventional members
- ❑ Experimental testing
- ❑ Other typical designs
- ❑ Embedded sensors
- ❑ PBF-LB printed components
- ❑ Origami type deployable structures

Deliverables as described in the proposal

- D5.1 - Report:

  Methodology for optimized design of deployable shelters for disaster relief including 3D-printing-ready member and connection design

  Delivery M30

- D5.2 - Report, drawings and 3D printed prototypes

  Typical designs of deployable shelters for various applications related to disaster relief, fabrication and testing of prototype deployable shelter

  Delivery M48

Additional deliverables

- Scientific publications

Secondments

- In planning stage

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European Commission

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MIDTERM MEETING

ADDOPTML

Optimized 3D printed structures

Athens, 12th July 2022

National Technical University of Athens

School of Architecture

Evangelia I. Frangedaki

ADDitively Manufactured OPTimized Structures by means of Machine Learning

Work Package Number: 8

WP8

WORK PACKAGE TITLE:

DIPLOMA THESES,

SEMINARS/WORKSHOPS,

AN INTERNATIONAL CONFERENCE ON 3D PRINTED OPTIMIZED STRUCTURES

COMMUNICATION, DISSEMINATION AND EXPLOITATION ACTIVITIES

START/END MONTH: ***1/48***

D 8

DELIVERABLES:

D8.1 PUBLICATIONS TO CONFERENCES

D8.2 PUBLICATIONS TO SCIENTIFIC JOURNALS

D8.3 ADDOPT2024 CONFERENCE

D8.4 THESES

D8.5 ADDOPTML WORKSHOPS AND SEMINAR

D8.6 PUBLIC ANNOUNCEMENTS

Work Package Number: 8

Progress as depicted in deliverables

D8.2 PUBLICATIONS TO SCIENTIFIC JOURNALS

2 PUBLICATIONS OF A REVIEW JOURNAL PAPER

D8.4 THESES

3 MASTER DIPLOMA THESIS

2 FINALISED DOCTORAL THESIS

D8.5 ADDOPTML WORKSHOPS AND SEMINAR

WEBNINAR ON THE 27TH OF MAY 20221,

“3D PRINTING IN CONSTRUCTION, PAST, PRESENT, FUTURE”

D8.6 PUBLIC ANNOUNCEMENTS

- **The actions of the project are shared in social media as follows**

1. HTTPS://TWITTER.COM/ADDOPTML
2. HTTPS://WWW.FACEBOOK.COM/ADDOPTML/
3. HTTPS://WWW.RESEARCHGATE.NET/PROJECT/ADDITIVELY-MANUFACTURED-OPTIMIZED-STRUCTURES-BY-MEANS-OF-MACHINE-LEARNING-ADDOPTML

Work Package Number: 8

Progress

D8.2 PUBLICATIONS TO SCIENTIFIC JOURNALS

1. Sargentis, G.-F.; Frangedaki, E.; Chiotinis, M.; Koutsoyiannis, D.; Camarinopoulos, S.; Camarinopoulos, A.; Lagaros, N.D. 3D Scanning/Printing: A Technological Stride in Sculpture. Technologies 2022, 10, 9
2. Frangedaki, E., Sardone, L., & Lagaros, N. D. (2021). Design Optimization of Tree-Shaped Structural Systems and Sustainable Architecture Using Bamboo and Earthen Materials. *Journal of Architectural Engineering*, ASCE, *27*(4), 04021033.

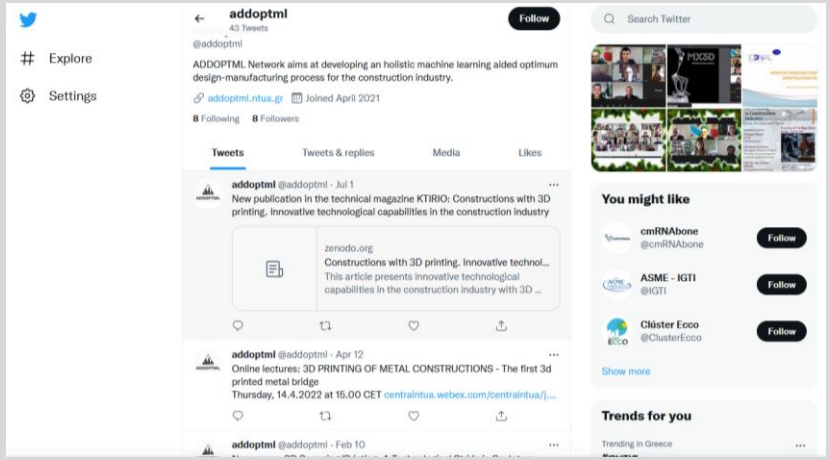
D8.4 THESES

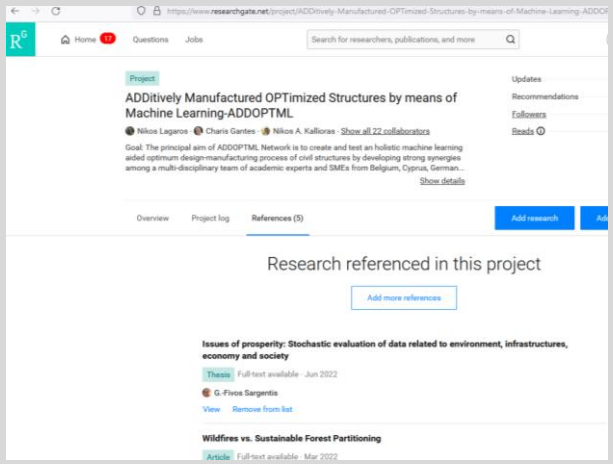
1. Tania Livanou: Automated analysis of parameterized surface carriers, November 2021,
2. Isidora Simatou: Non-linear analysis of three-dimensional concrete printed members, October 2021,
3. Sevastianos Liristis: Optimization of Vierendeel-Type Steel Structure by Means of Nonlinear Numerical Analyses, March 2022

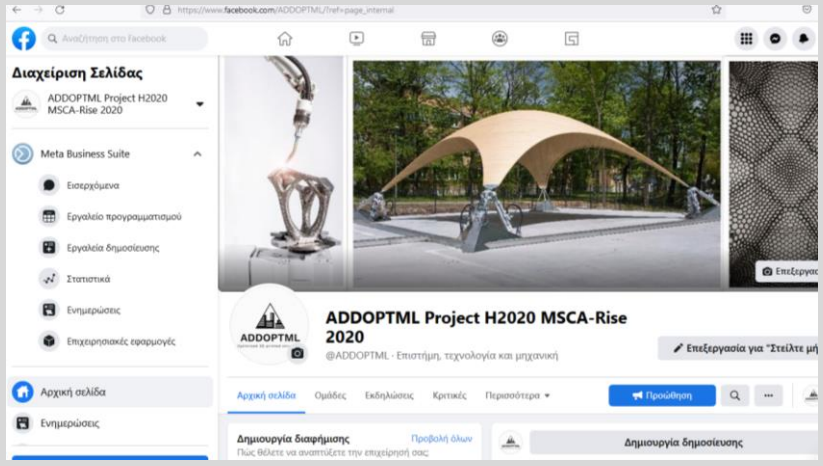
Work Package Number: 8

Progress

- TWITTER HTTPS://TWITTER.COM/ADDOPTML
- HTTPS://WWW.FACEBOOK.COM/ADDOPTML/
- HTTPS://WWW.RESEARCHGATE.NET/PROJECT/ADDITIVELY-MANUFACTURED-OPTIMIZED-STRUCTURES-BY-MEANS-OF-MACHINE-LEARNING-ADDOPTML





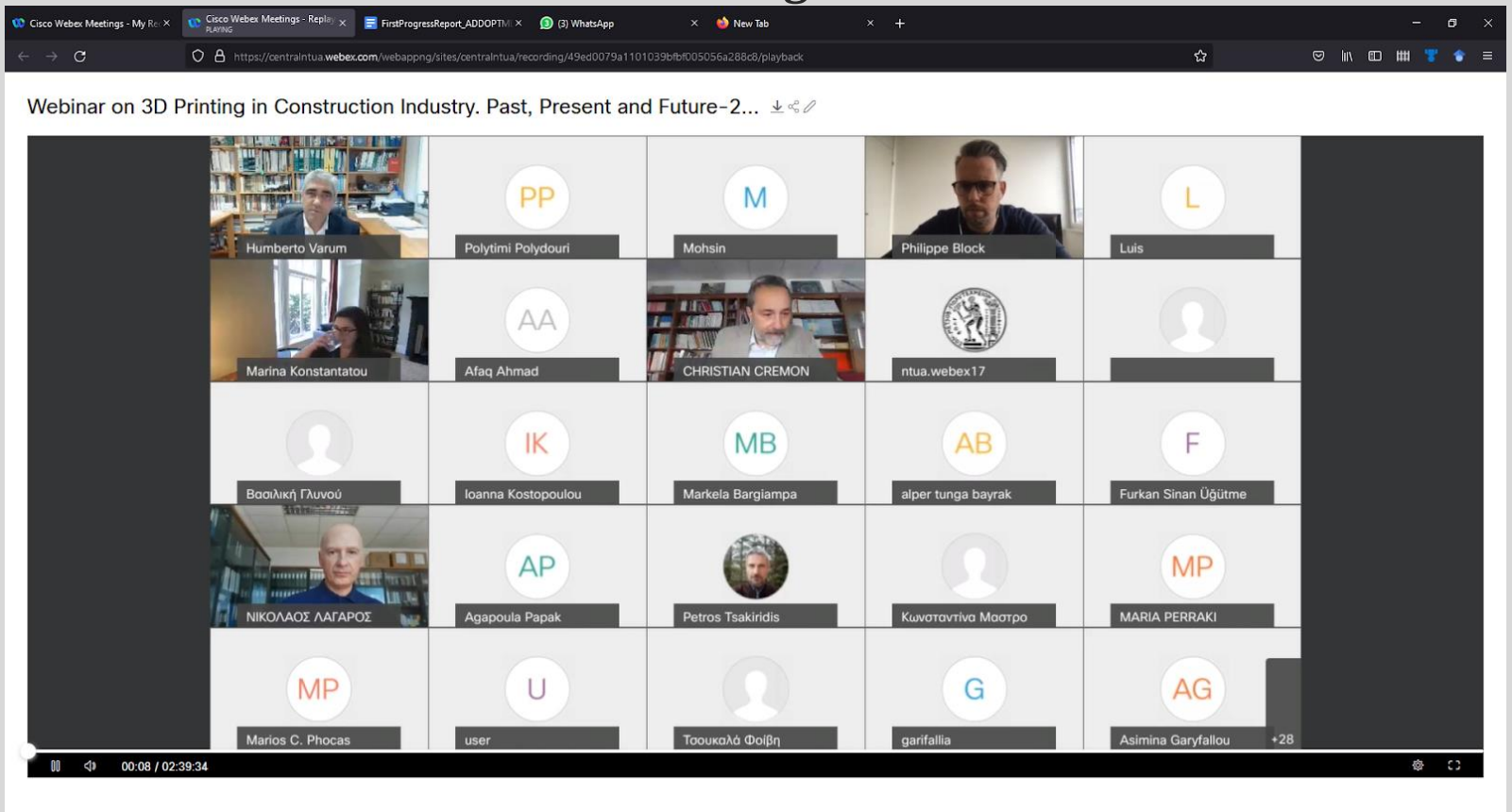


ADDOPTML
Optimized 3D printed structures

12th July 2022

ADDitively Manufactured OPTimized Structures by means of Machine Learning

Work Package Number: 8



An online meeting took place on 27th of May 20221

Work Package Number: 8

Link between secondments, tasks and deliverables

- **SECONDMENT FOR THE WP8**

The progress on WP8, has been performed in the framework of the following secondments:

- **secondment of Evangelia Frangedaki from National Technical University Of Athens - NTUA, at IDEA 75 (13/12/2021-1/8/2022).**
- **secondment of G.-Fivos Sargentis from National Technical University Of Athens - NTUA, at IDEA 75 (13/12/2021-1/8/2022).**

ADDitively Manufactured OPTimized Structures by means of Machine Learning

Work Package Number: 8

- **CONCLUSIONS**
- Implementation according to chart planning
- New knowledge through an multidisciplinary approach to additive manufacturing in the Webinar and collaboration in person.
- A professional knowledge base for all participants (researchers and employees from beneficiary members involved in this field).Presentations according to current theories and future possibilities for AM.
- knowledge sharing for Computational Mechanics and Additive Manufacturing through a essential collaboration between RISA, Idea75, Jordan University of Science & Technology and NTUA.
- Common research goals between secondees. Public presentation of research through published work and webinar.
-

Work Package Number: 8

Future implementation

FUTURE SECONDMENT FOR THE WP8

Organization for a seminar on ADDitively Manufactured OPTimized Structures

Organization for an International Conference on ADDitively Manufactured OPTimized Structures for 2024

Theses: One to two Diploma Theses are expected to be carried