GALATEA & WAI

Mathematics Meets Data Science Workshop, Sept,10th 2021

START

A collaboration between Geometers and Computer Scientist
GALATEA- Algebraic, Linear and Differential Geometry and WAI - Virtual Worlds, Visualization and AI

Carlos D'Andrea

Joan Carles Naranjo

Anna Puig

Maria Salamó

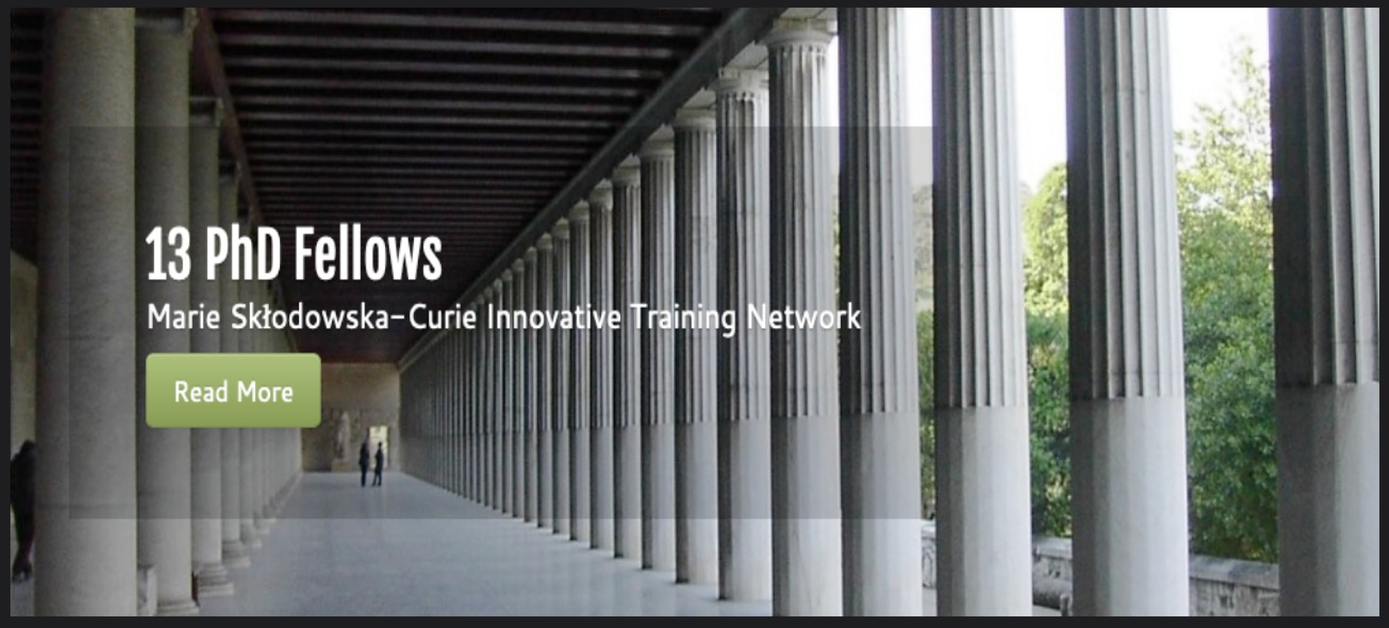
01

THE BEGINNINGS

The prelude....

THE PREQUEL (2015-2019)

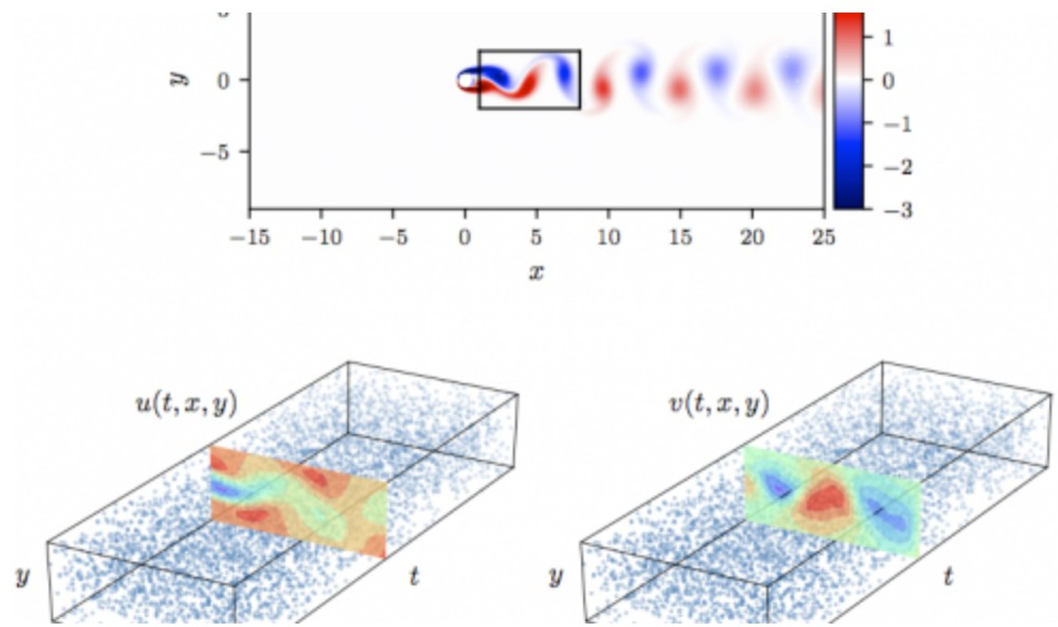
Algebraic Representations in Computer-Aided Design for complEx Shapes



- Node at the Department of Algebra and Geometry
- PI: Carlos D'Andrea
- PhD. Student: Yairon Cid Ruiz

NEXT EUROPEAN PROJECT PROPOSAL?

(ARCADES final meeting)



Mathematics & Machine Learning

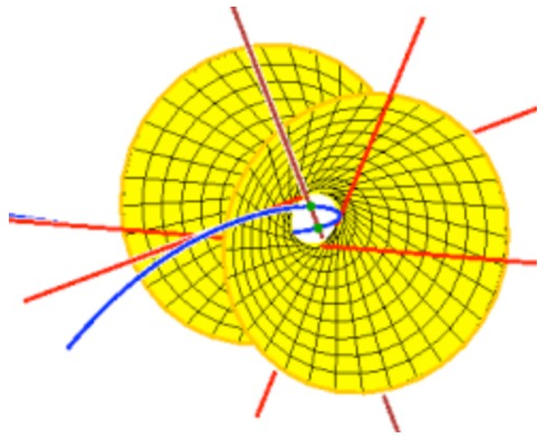
2 Phd's in Barcelona

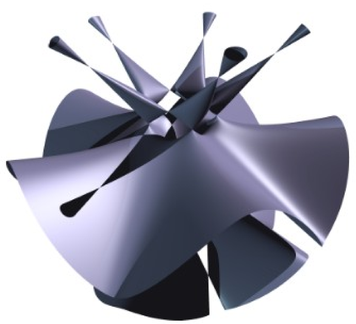
1 of them in (pure) Computer Science

GALATEA RESEARCH GROUP

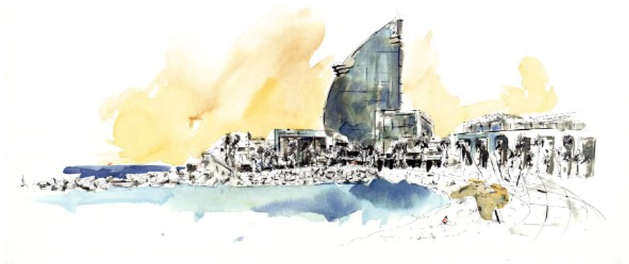
Carlos D'Andrea and Joan Carles Naranjo

Geometría Algebraica, Lineal y diferenciAl.
TEoría y Aplicaciones





Finite group actions in DG
Gauge theory
Abelian algebraic varieties
Irregular varieties
Arakelov Geometry
Singularities
Computations and Applications



WAI RESEARCH GROUP

Maria Salamó and Anna Puig

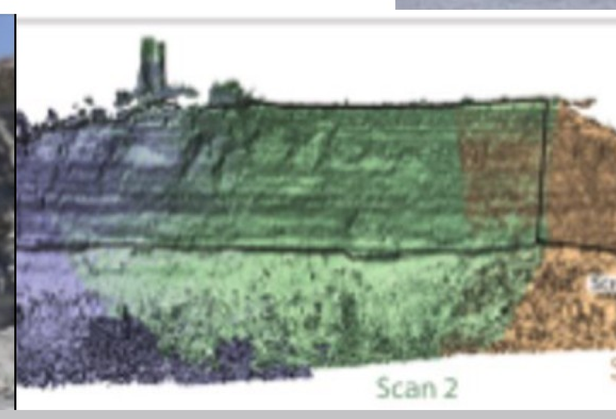
Machine Learning

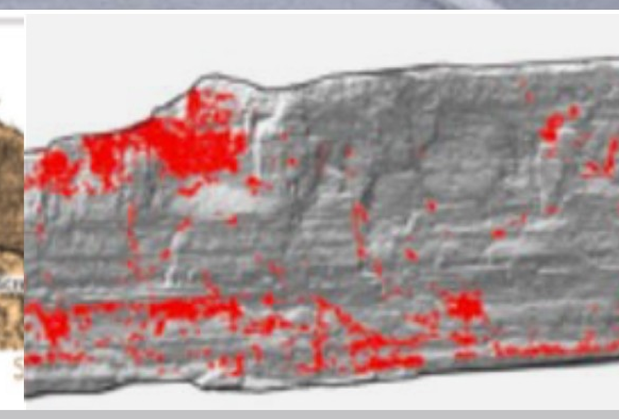
Scientific Visualization

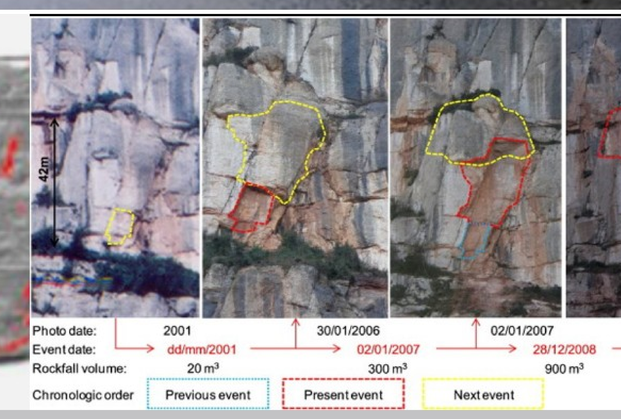
Case study:

Rockfall Identification and Detection utilizing ML and Deep Learning algorithms based on LIDAR

Collaboration with the Dpt. Earth and Ocean Dynamics, UB (Marta Ginau, David Garcia and Laura Blanco)







02

FIRST CONTACTS

The opportunity...

Point clouds

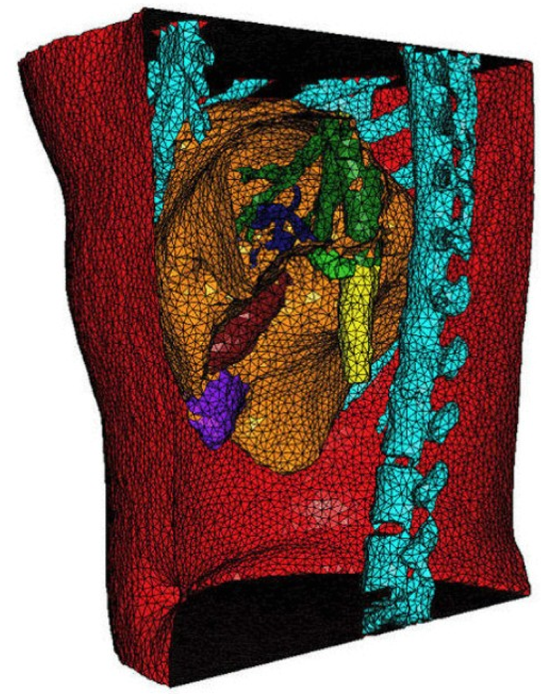
THE CHALLANGES

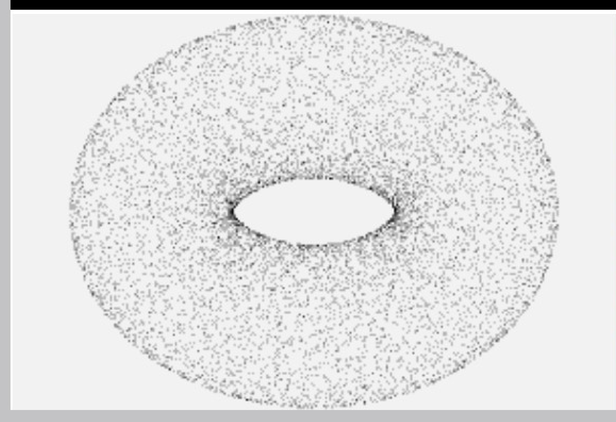
Implicit geometric structures

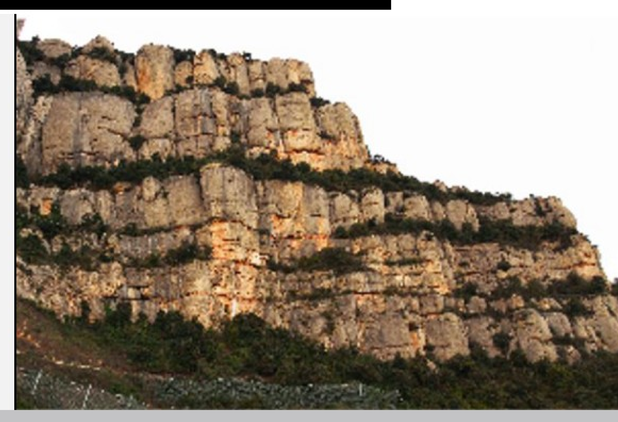
Huge amount of noisy data

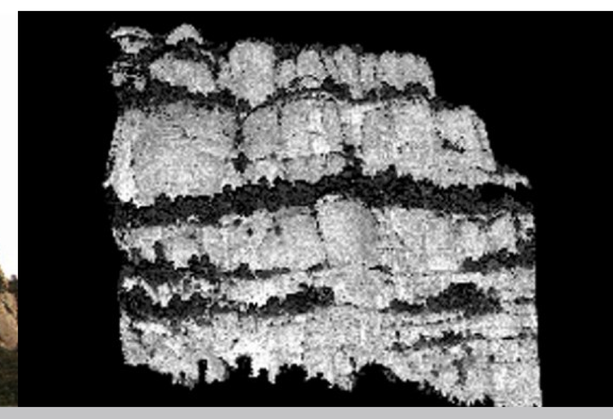
Difficult to classify and predict morphological changes

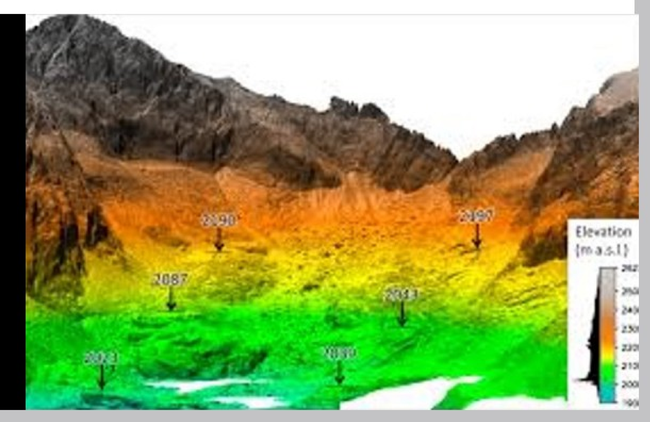
Low interactive visualizations

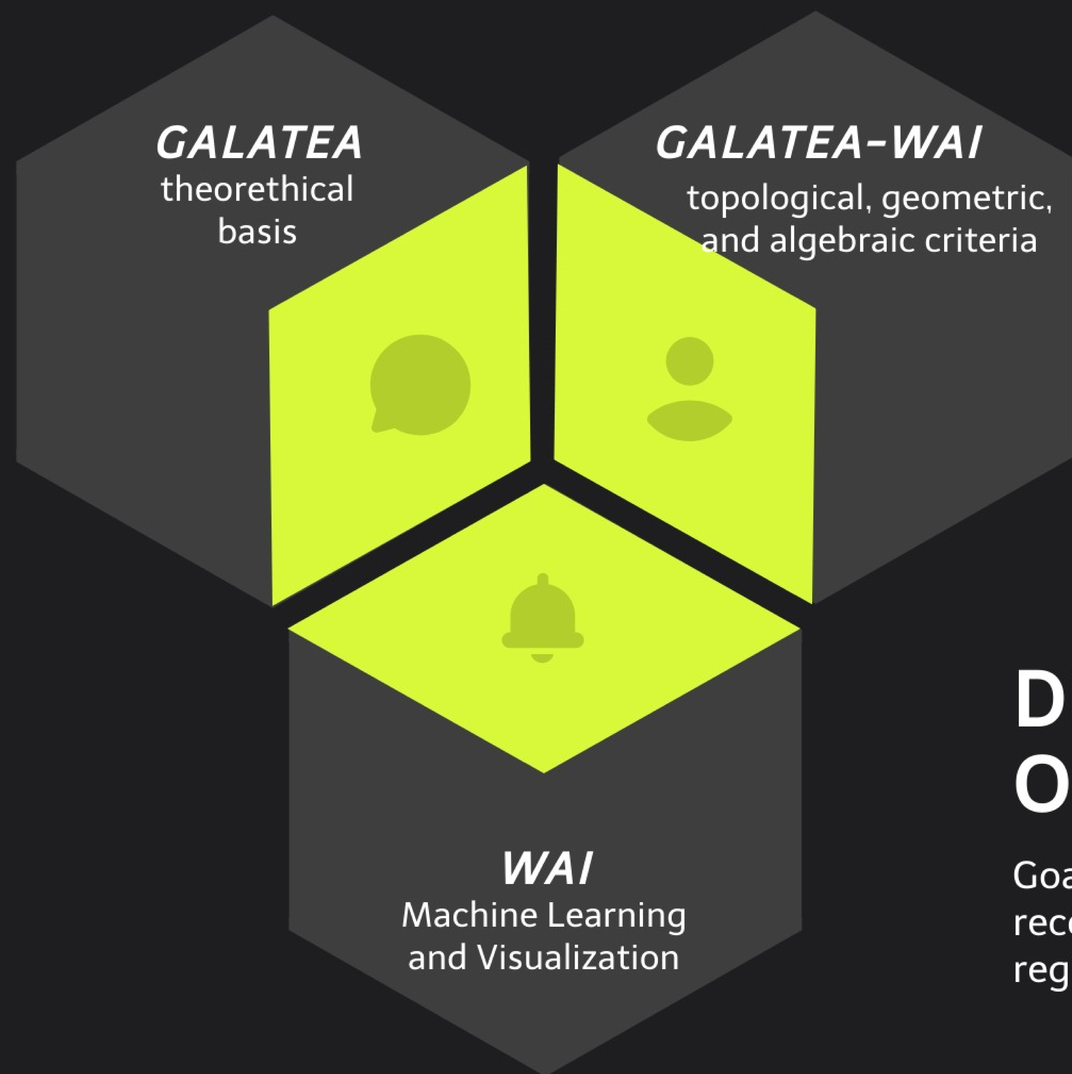












DIFFERENT PERSPECTIVES OF THE SAME PROBLEM

Goal: to give algorithmic solutions to reconstruct surfaces and to segment inner regions of point clouds.

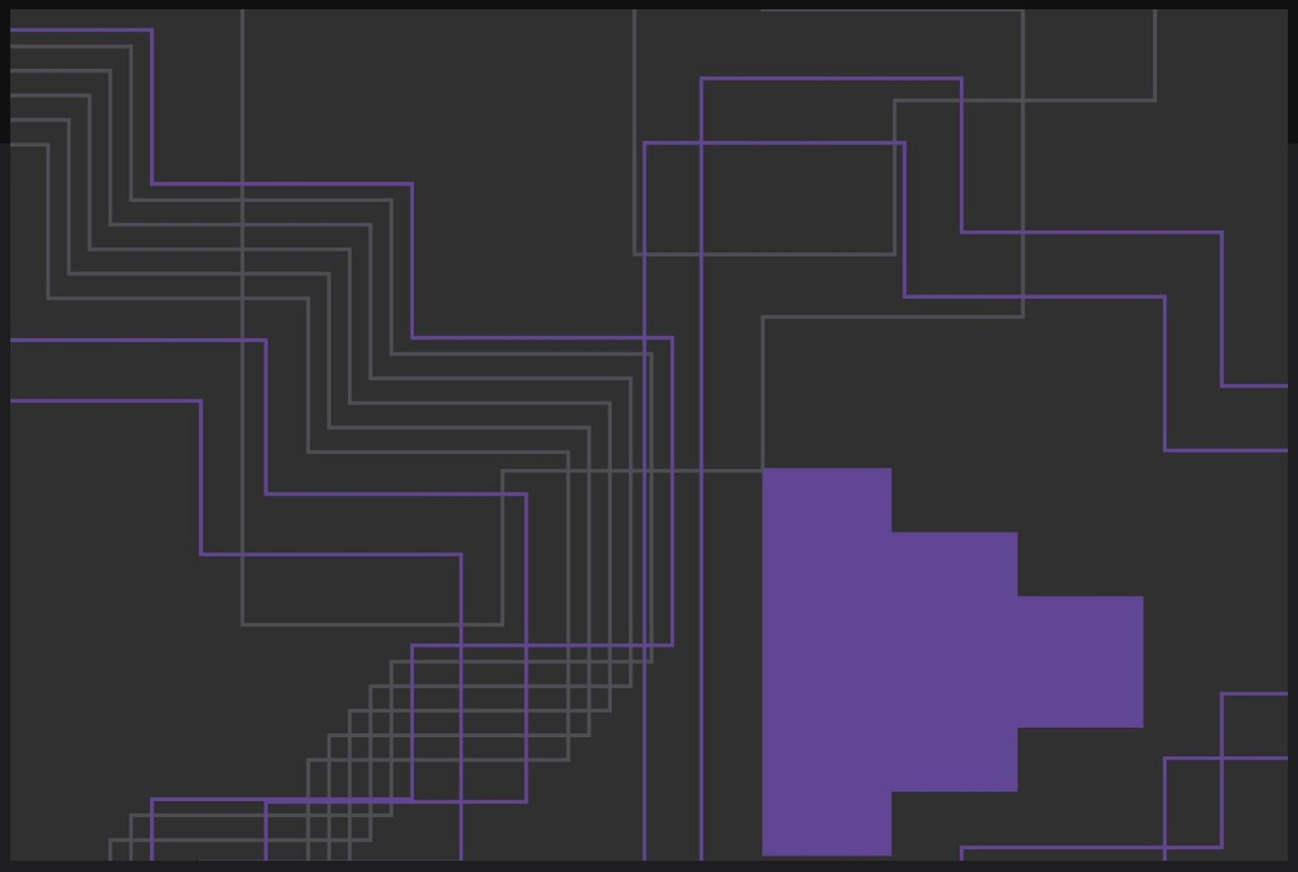
03

THE PROJECT

The deployment ...

GRAPES

learninG, pRocessing, And oPtimising shapES



2019-2024

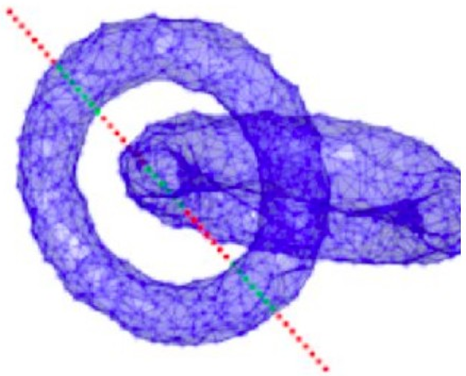
H2020-MSCA-ITN-2019 call and is part of the Marie Sklodowska-Curie Actions — Innovative Training Networks (ITN) funding scheme

MAP- GRAPES

15 Ph D - Students - 11 Reserarch centers - 5 Industrial partners

- Johannes Kepler Universitat Linz
- RWTH Aachen University
- Universitat de Barcelona
- ATHENA Reserach Center
- INRIA Sophia-Antipolis
- SINTEF Oslo
- University of Strathclyde
- USI Lugano
- Università di Roma “Tor Vergata”
- Vilnius University
- Imperial College of London
- University of Oslo

GRAPES – UB NODE

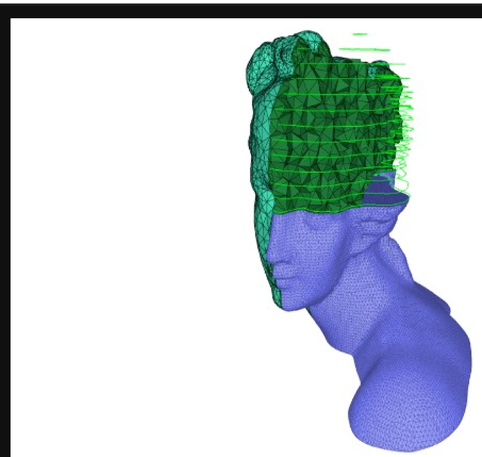


ESR3: Extraction of geometric primitives from 3D point clouds.

Carlos D'Andrea and Joan Carles Naranjo

ESR4: ML and interactive 3D visualisation of temporal point clouds for predicting morphological changes.

Maria Salamó and Anna Puig



Phd students

AMRUTHA BALACHANDRAN
ESR 3

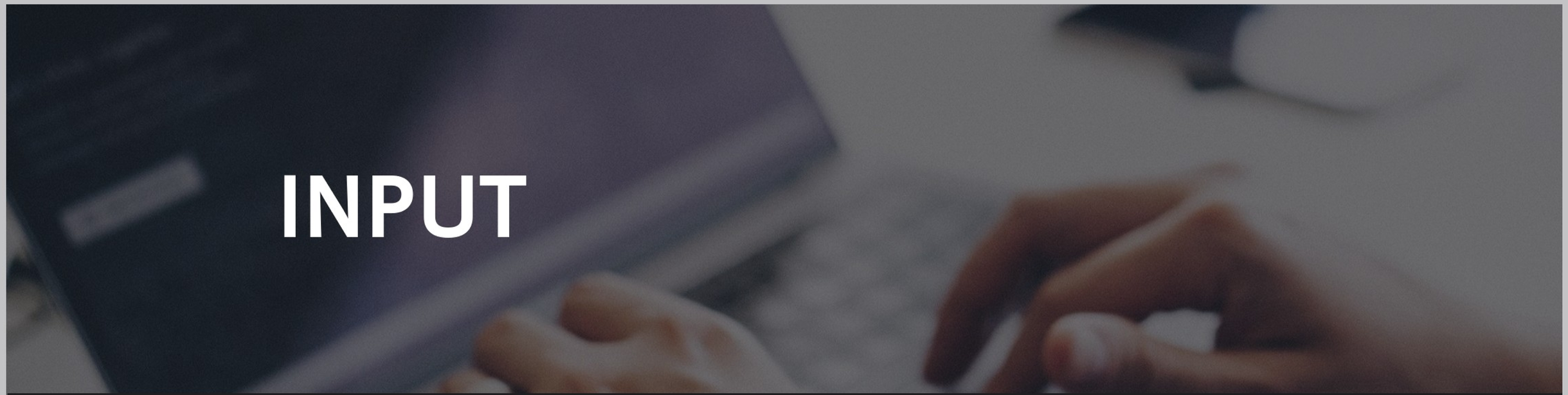
THANASIS ZOUMPEKAS
ESR 4

CARLES CHECA (ATHENS)

PABLO GONZALEZ MAZON (NICE)

04
ONGOING ACTIVITIES

First outcomes ...



INPUT

Doctoral Schools (first online)

Learning Weeks (in site)

Research Workshops (in site)

Research Seminars (in site)

PUBLICATIONS

AN INTELLIGENT FRAMEWORK FOR END-TO-END ROCKFALL DETECTION

International Journal of Intelligent Systems

ROCKFALL ACTIVITY IDENTIFICATION MEANS TERRESTRIAL LASER SCANNER AND MACHINE LEARNING. CASE STUDIES AT MONTSERRAT MASSIF AND CASTELLFOLLIT DE LA ROCA (CATALONIA, SPAIN)

VSG 2021

BENCHMARKING DEEP LEARNING MODELS ON POINT CLOUD SEGMENTATION

CCIA 2021

THAT'S ALL!