



GIBIR

Research Group in Biomechanics and Rehabilitation Engineering

Professor: Juan Fernando Ramírez Patiño, PhD.

Sede Medellín



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DE COLOMBIA

Agenda

1

Introduction

2

Research Areas

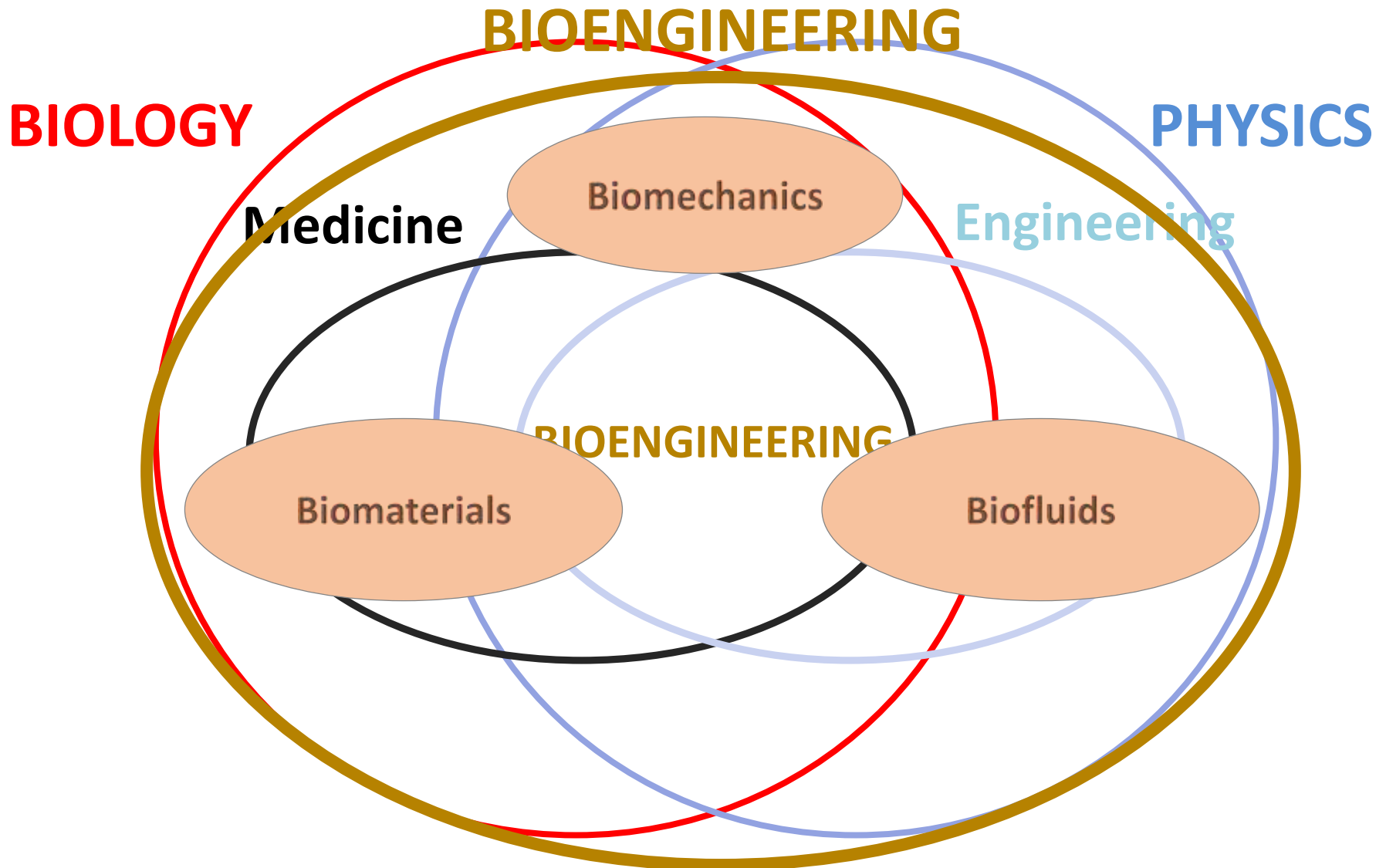
3

Our group



Introduction

1





Research Areas

2

Increase Quality of life
Our Challenge



Transfemoral Amputees

Since 2006!!

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Transfemoral amputees

Violence

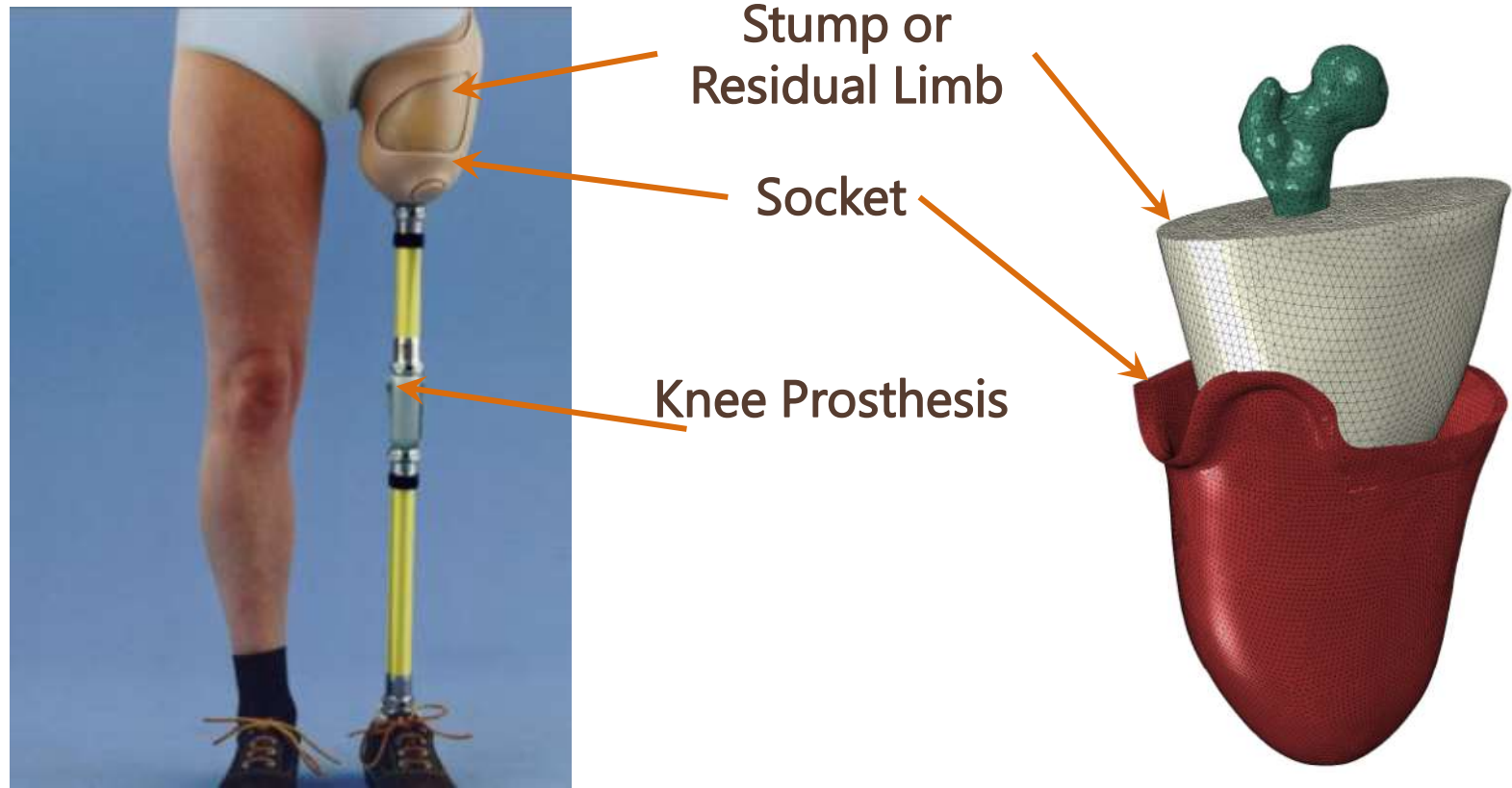
Traffic accident

Occupational Accident

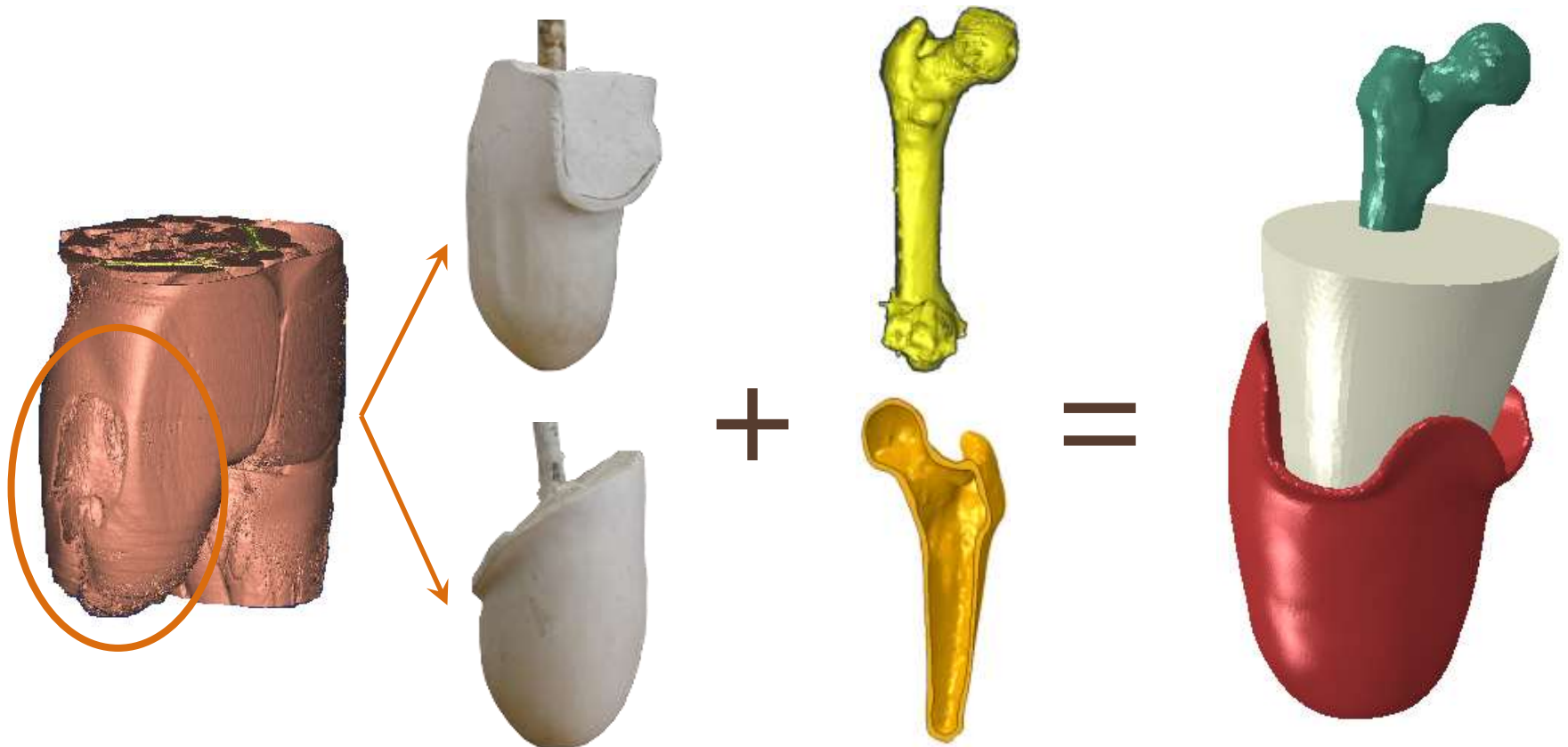
Vascular disease



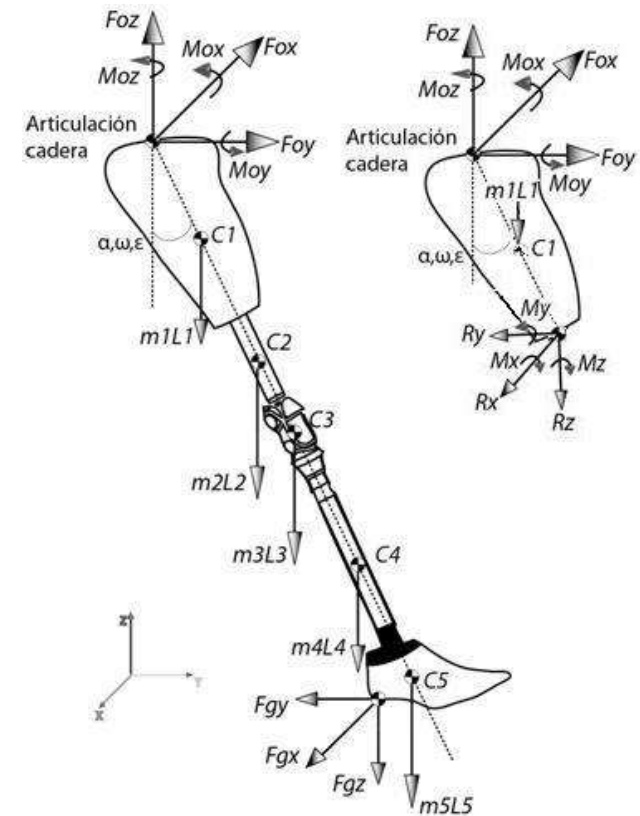
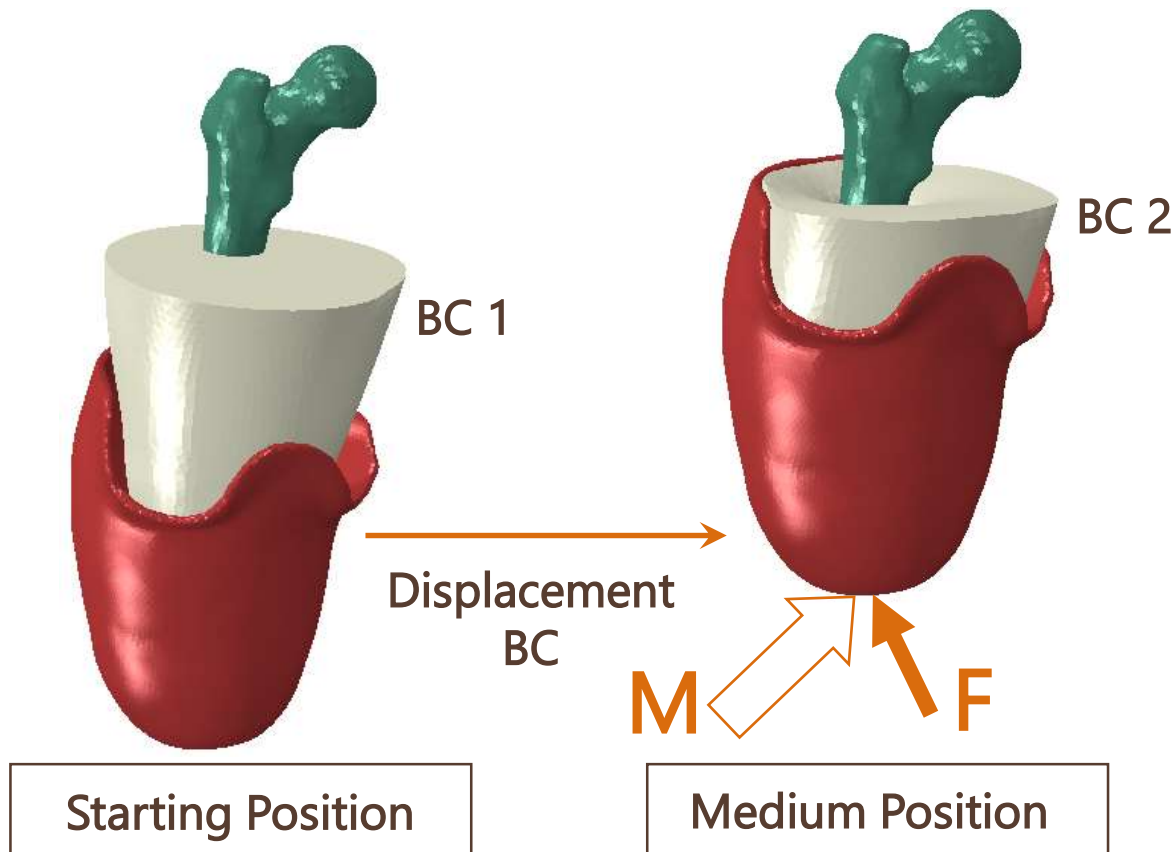
Terminology



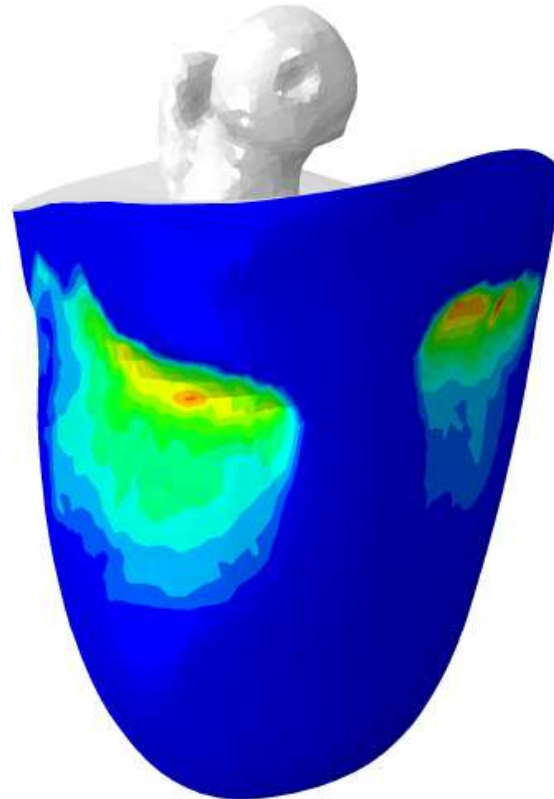
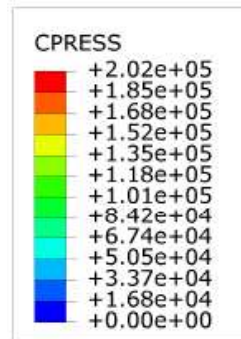
Geometry



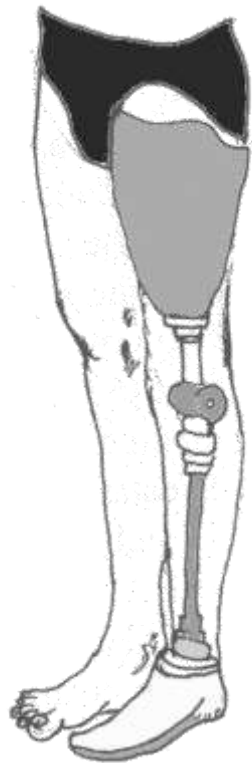
Forces



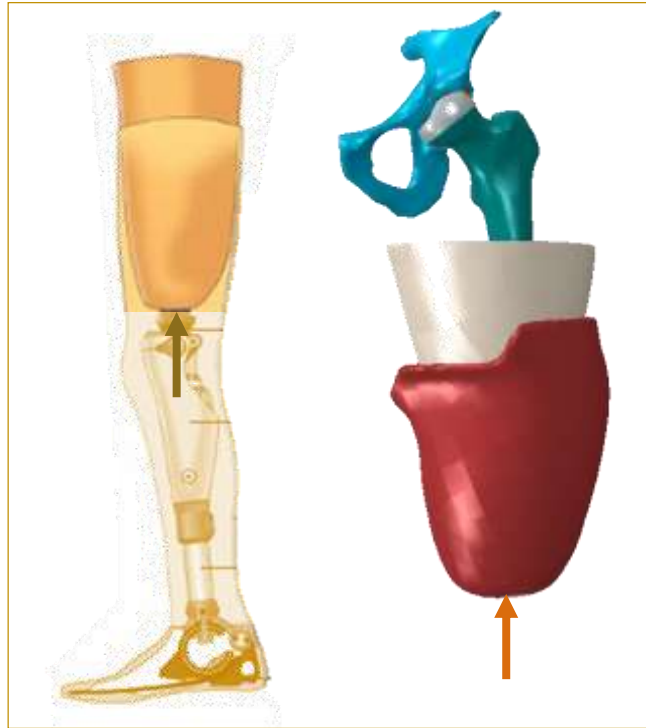
Results



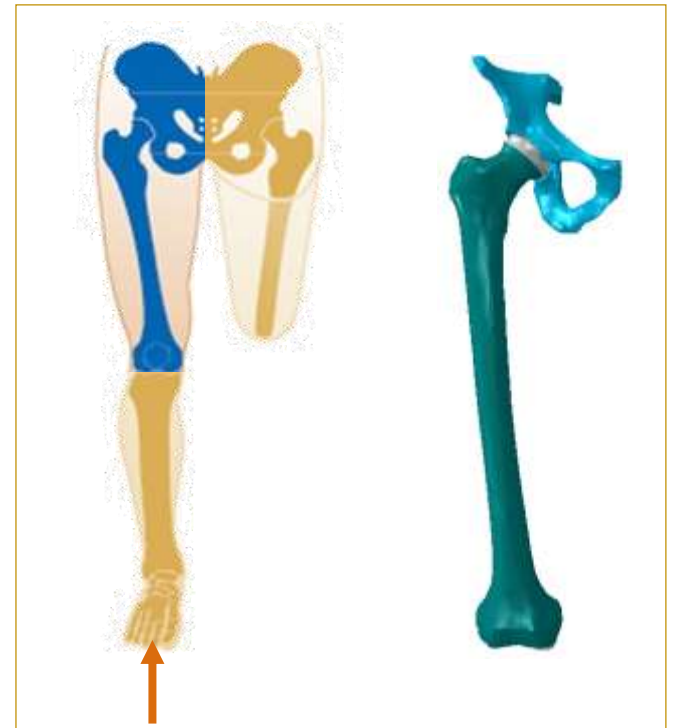
Cartilage Stress State



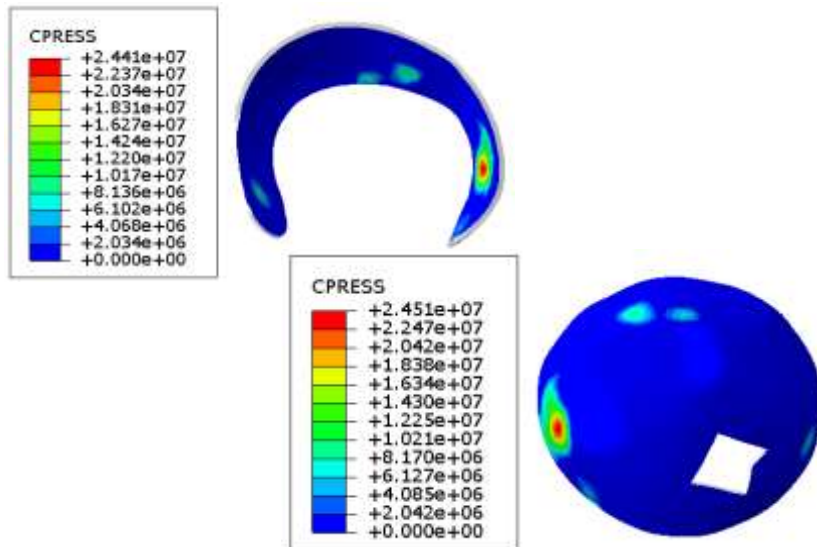
Amputated leg



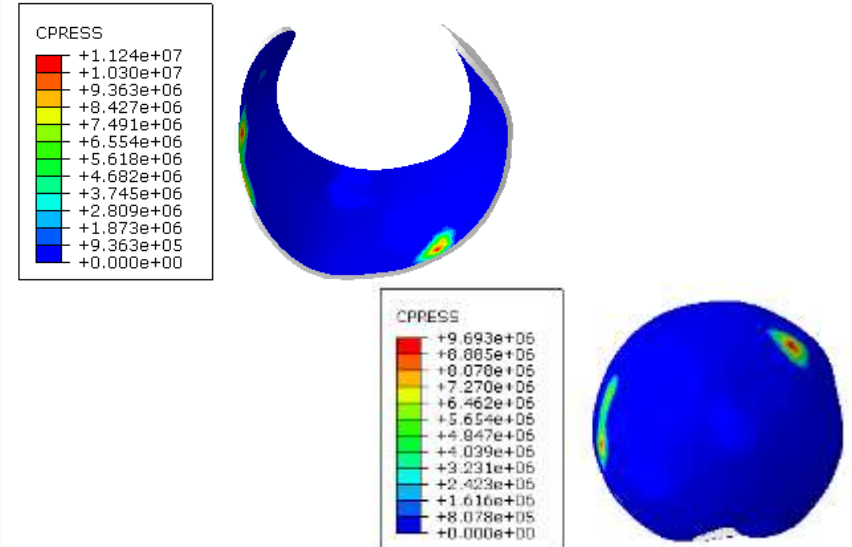
Healthy leg



Results

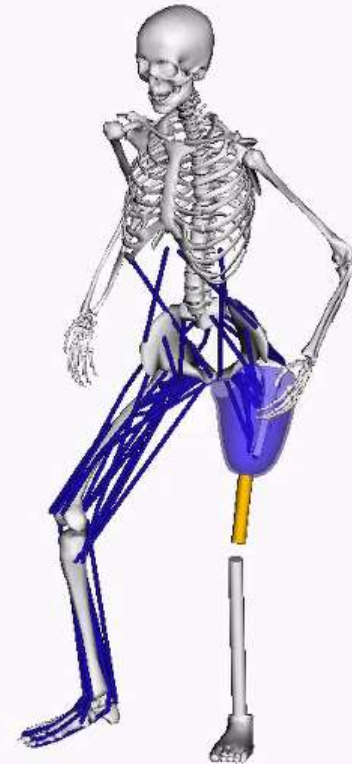
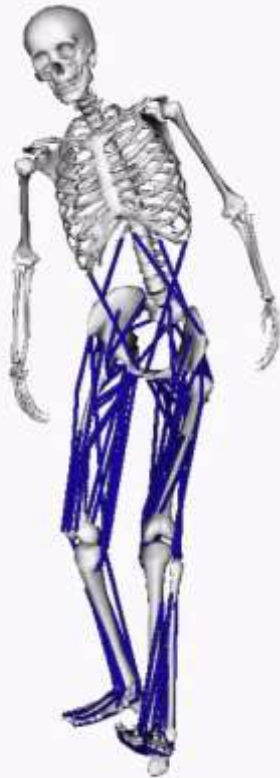


Amputated Side



Healthy Side

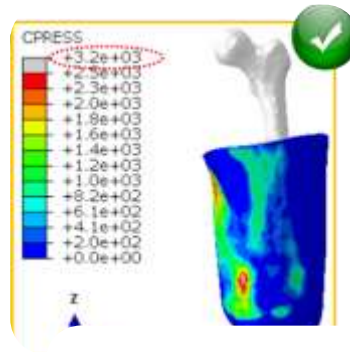
Kinematic Experimental data integration



Socket Design



Defining the
pain thresholds



Finding an
appropriate
stress
distribution



Designing a
new socket



Skin Tribology

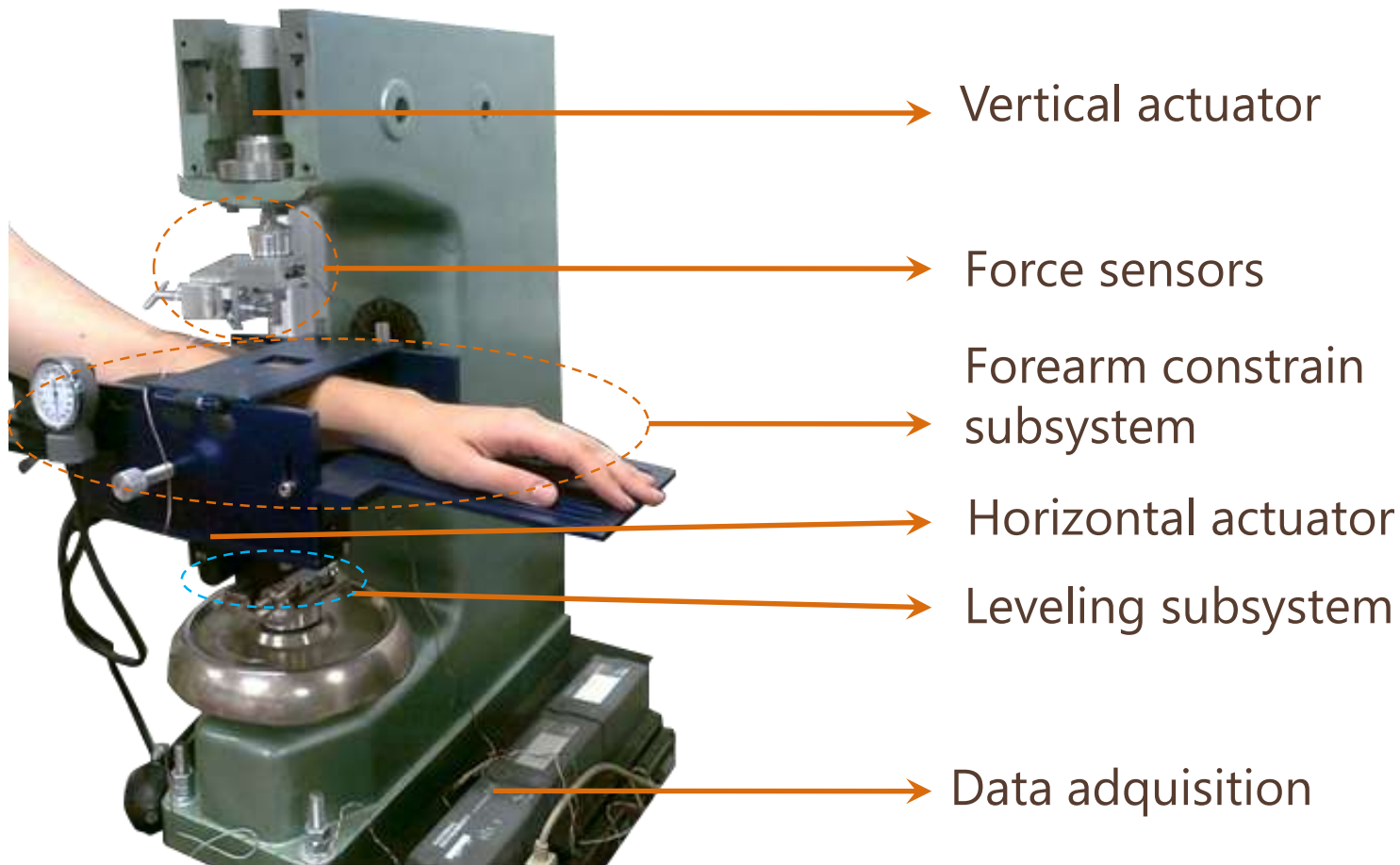
Since 2009

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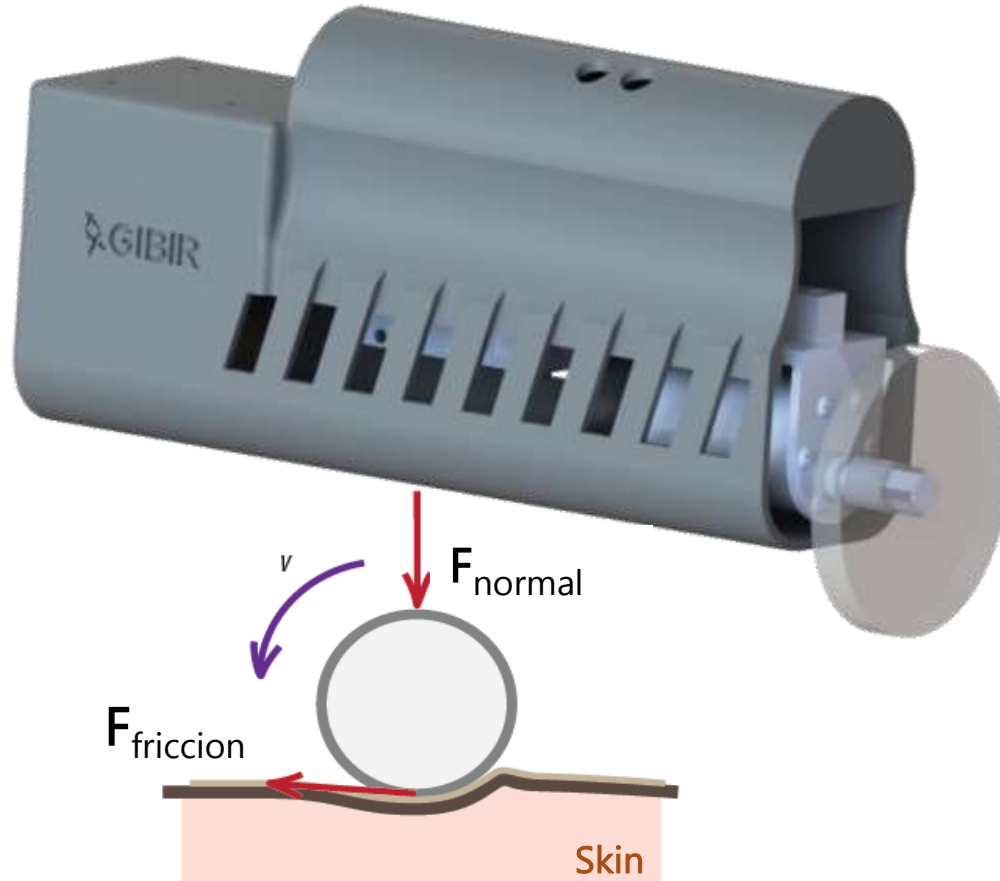


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Coefficient of Friction



Portable skin tribometer





Soft Tissues

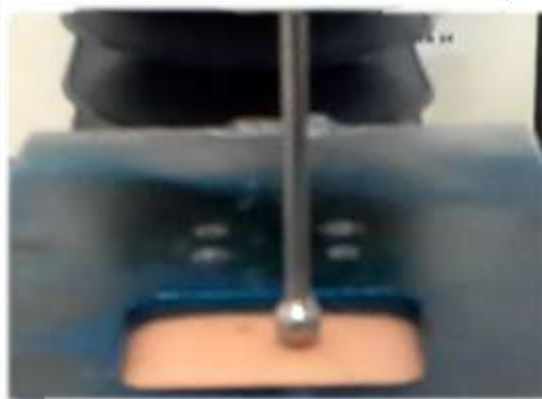
Since 2010

Sede Medellín

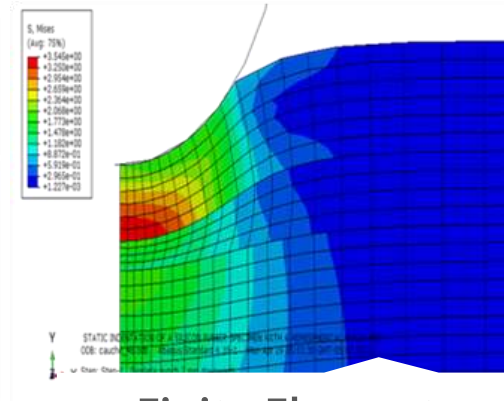


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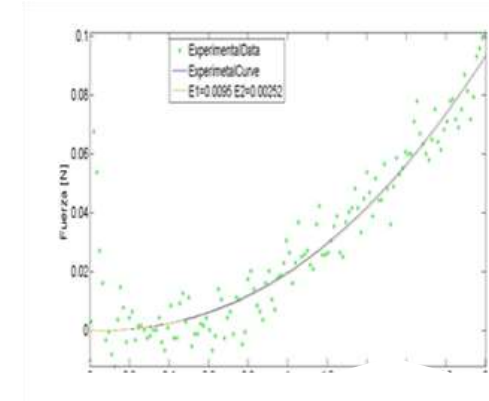
Inverse FEM



Indentation test



Finite Element Method



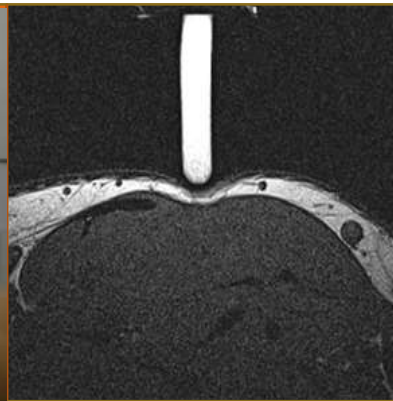
Inverse algorithm

Skin mechanical properties



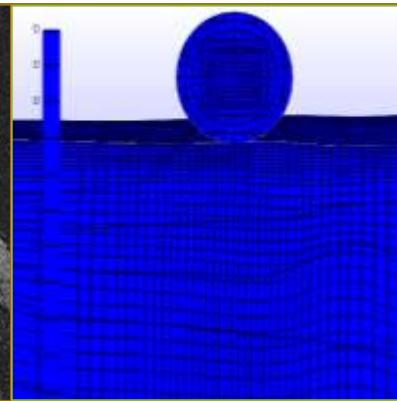
Experimental test

Indentation system



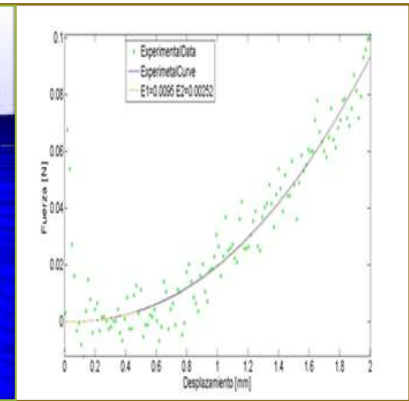
Measurement technique

Layers' geometry and thickness



Numerical model

Geometry and boundary conditions



Inverse algorithm

Standardization of the mechanical properties



Hard Tissues

Since 2012

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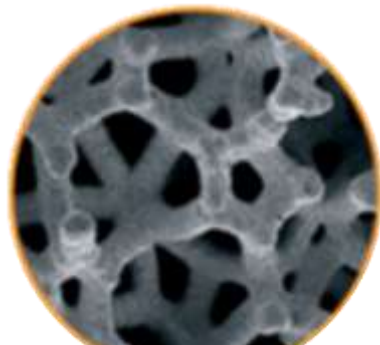


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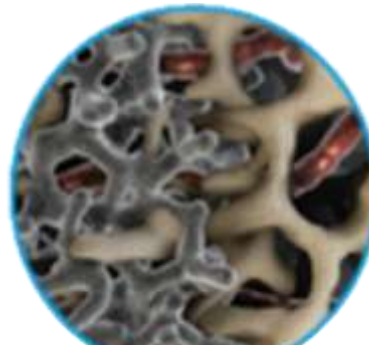
Mg Foams

Idea

Use biodegradable, structured and surface modified materials to manufacture implants, then they will disappear after fulfilling their function.



Trabecular
Material

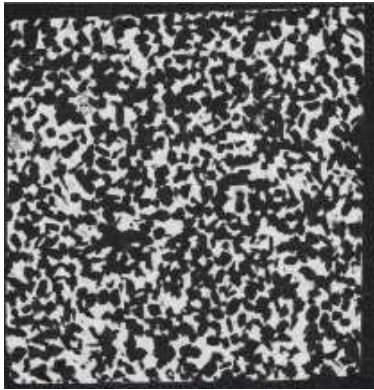


Incorporation

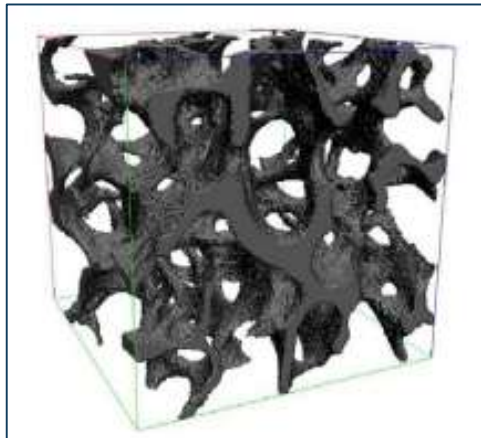


Trabecular
bone

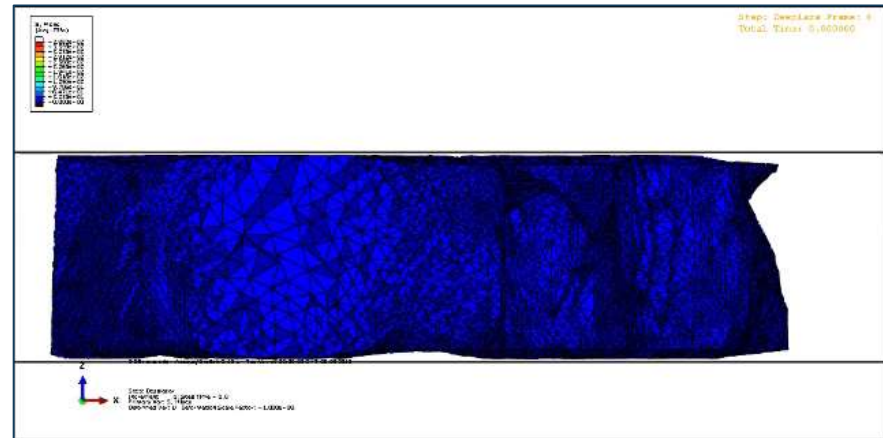
Foam mechanical properties



μCT Images



3D Reconstruction

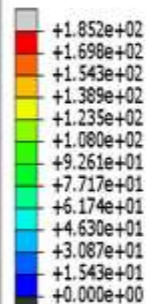


Compressive Load - FE Model

Mg Foams

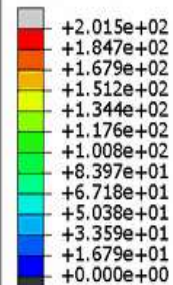


S, Mises
(Avg: 75%)

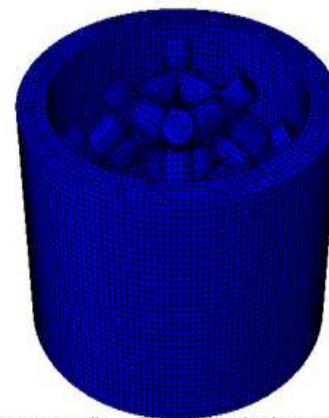


ODB: E1P1C_size01.odb Abaqus/Standard 3DEXPERIENCE R2018x Wed Mar 13 10:49:26
Step: desplazamiento
Increment 0: Step Time = 0.000
Primary Var: S, Mises

S, Mises
(Avg: 75%)



ODB: recubrimiento05mm.odb Abaqus/Standard 3DEXPERIENCE R2018x Thu Mar 21 15:00
Step: desplazamiento
Increment 0: Step Time = 0.000
Primary Var: S, Mises



Step: despla Frame: 0
Total Time: 1.000000

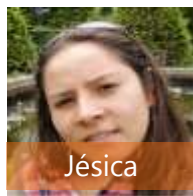


Our group

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Juan Fernando



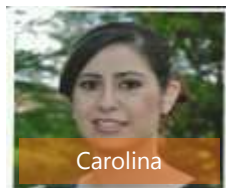
Jérica



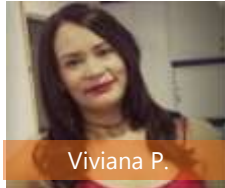
Viviana



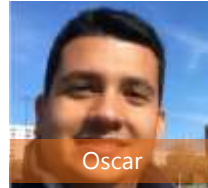
Sofía



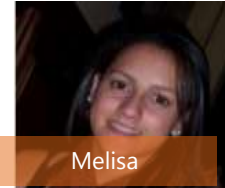
Carolina



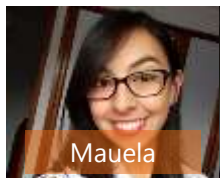
Viviana P.



Oscar



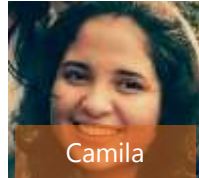
Melisa



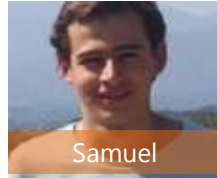
Mauela



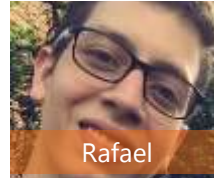
Simón



Camila



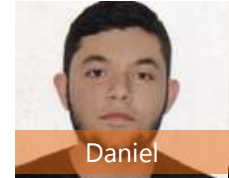
Samuel



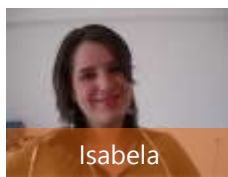
Rafael



Juan



Daniel



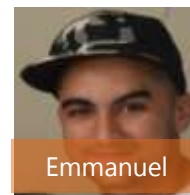
Isabela



Camilo



Jaime



Emmanuel



Our group



THANKS!

Questions?

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