

THE EUROPEAN HIGH PERFORMANCE COMPUTING JOINT UNDERTAKING



AI Factories : Open for Business
**FaceGen: Leveraging GenAI techniques for
craniofacial reconstruction**



EuroHPC
Joint Undertaking

Webinar
20 May 2025

Panacea Cooperative Research

Who we are

We are the only **cooperative society** specialized in **Artificial Intelligence** worldwide.

We develop projects and products with **great social impact**, focusing on **forensic** applications.

Our team includes researchers with **more than 20 years of experience**.

Spin-off of the University of Granada: 5th place worldwide in Artificial Intelligence in the Times Higher Education (THE) ranking.



Panacea Cooperative Research

What we do



Diverse problems: image and video processing, process optimization, design, data mining and decision making, etc.

Experience in European and national calls for proposals

Research with own resources:

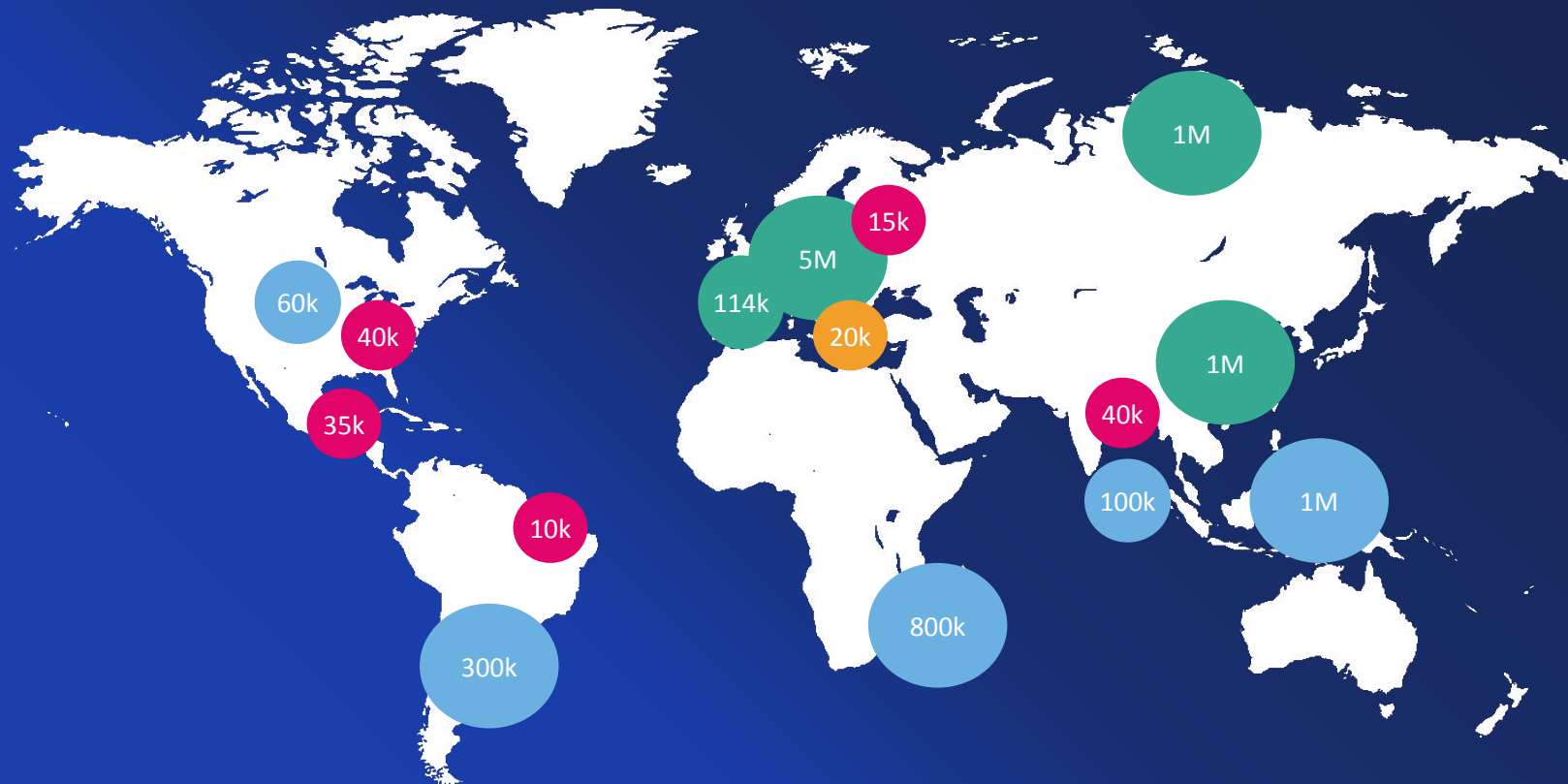
- Founded by 4 PhDs in AI
- 3 Professors as advisors

In collaboration with Universities and research centers: UGR, USC, UDC, UPV, ULE, URJC, INRIA, CNRS, etc.

Skeleton-ID is the only software on the market to provide comprehensive support for **forensic identification using physical anthropology techniques**

Others: ImageLab, Age Estimation, Facial Comparison, etc.

Forensic Human Identification Relevance



Historical memory
+7.000.000 (1936-1975)

World War II left millions of unidentified corpses, mainly in the EU and Russia. Multiple US and Chinese wars. **114.000** are in mass graves in Spain (civil war).

Everyday police work
+100.000 annually

Migration +60.000 (2014-2024)

More than **30,000** migrants have died trying to reach Europe in the last 10 years; more than **60,000** if other migratory routes are also taken into account. In Europe, more than **20,000** could not be identified.

Recent conflicts +3.000.000 (1976-21)

In LATAM, **dictatorships and organized crime** are responsible for the loss of **300.000 people**. Millions if you consider the armed conflicts in Vietnam, Rwanda, Cambodia, Iraq or the recent war in Ukraine.

In the EU over 15.000 cadavers are being identified using scientific methods **every year**. Over 1000 remain unidentified. The US alone have a backlog of over **60.000** unidentified cadavers



Forensic Human Identification

Craniofacial Identification Techniques



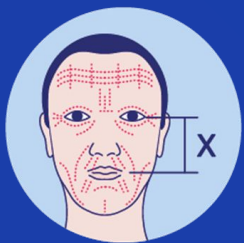
Craniofacial Superimposition: compares **one or more photos** of a missing person with a candidate skull. By overlaying both images, the expert tries to determine whether or not they are the same person by analyzing morphological correspondences.

Comparative



Craniofacial Reconstruction or **Facial Approximation** is the process of recreating the face of an unidentified subject from the skull through a combination of art, forensic science, anthropology, osteology and anatomy.

Reconstructive



Forensic Facial Comparison: involves the manual examination of the similarities and differences between two facial images, in order to determine if it is the same person appearing in both.

Comparative



Craniofacial reconstruction

useful when no ante-mortem data is available

SCIENCE



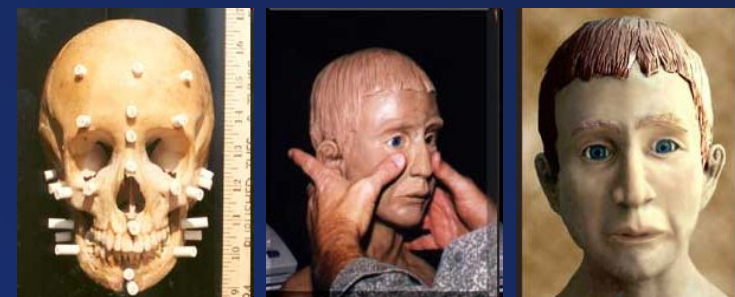
- Facial soft tissue depth studies (population means) and regression formulas for the estimation of facial features
- Use of templates to predict facial morphology (population means)



ART

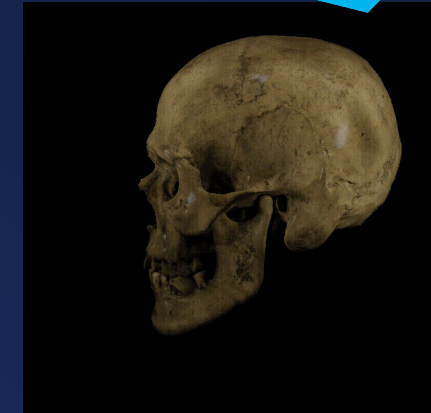
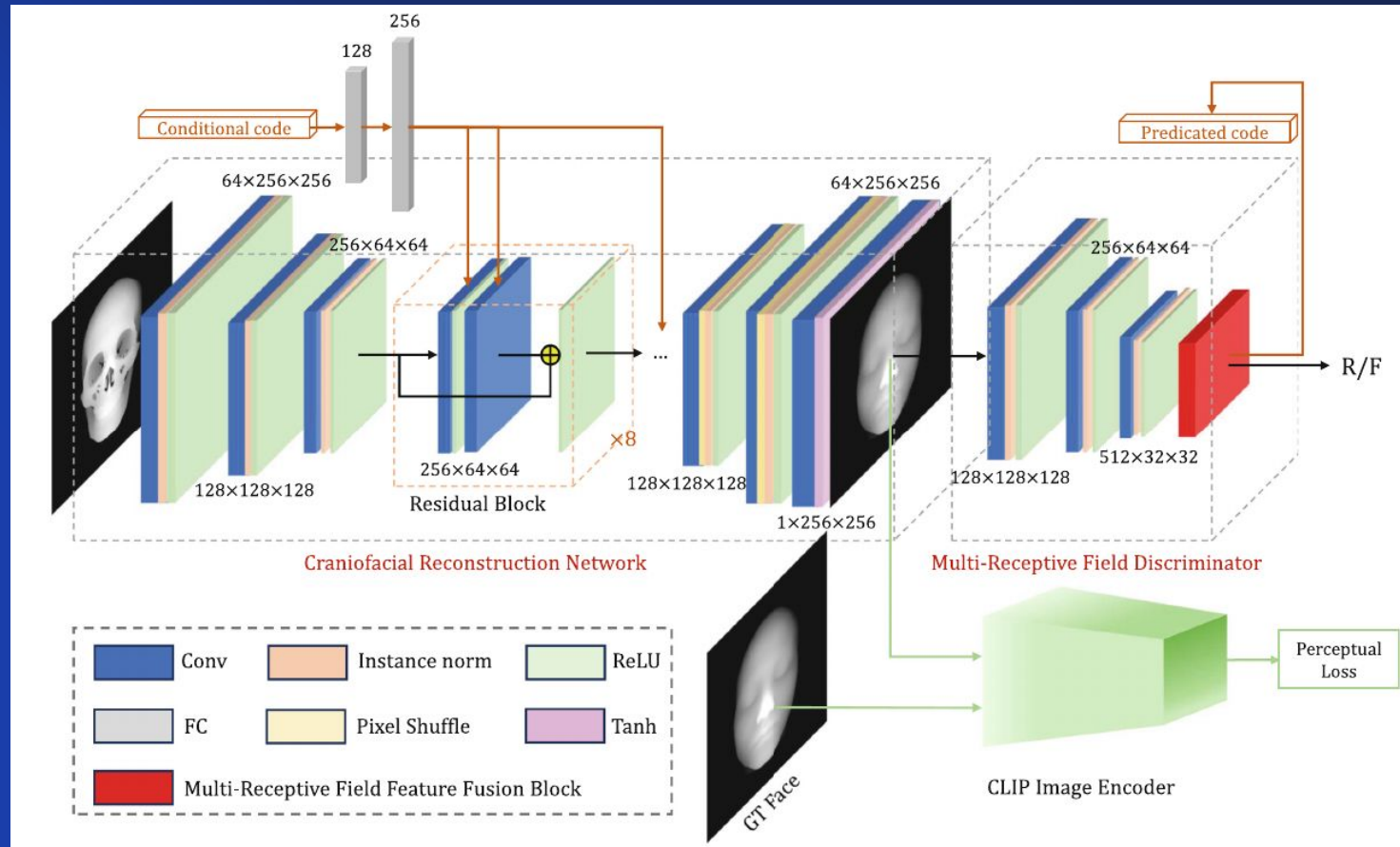


- **Subjectivity**, result influenced by skill
- No information on hair/eye/skin colour
- → DNA phenotyping

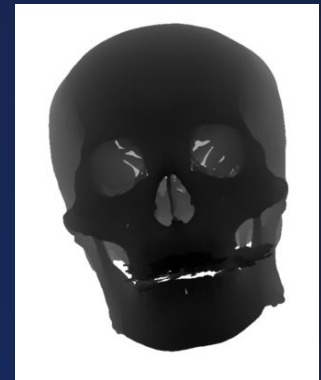


Craniofacial reconstruction

Using Artificial Intelligence: Project FACEGEN



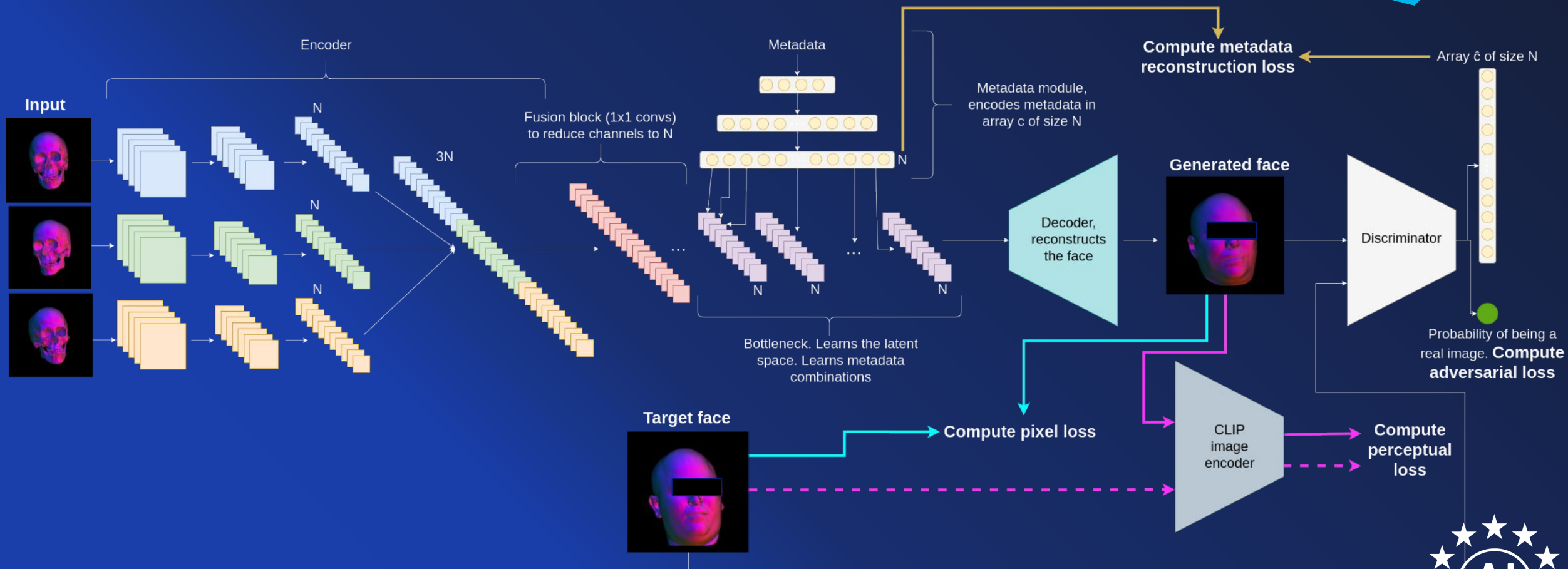
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Craniofacial reconstruction

Using Artificial Intelligence: Project FACEGEN



FFPlus Open Call: Innovation studies

HPC innovation for European Small-Medium Enterprises (SMEs)
funded by EuroHPC-JU: Generative AI using exa- or pre-exa-scale HPC
services

max 200K euro, 10 months project development

Several WPs with specific monitoring and support teams:

- WP1: Project Management
- WP2: Open Call Management
- WP3: Experiment and Innovation Studies Oversight
- WP4: Monitoring and supporting the HPC/HPDA/AI uptake
- WP5: Success stories, Dissemination to and Interaction with the HPC Ecosystem



High performance computing

A solution to our needs

For the funding application, we **theoretically computed** the time we would need to run our experiments, e.g., for the 3D case:

- Set a simple baseline: Analogous to Y.Pan et al., but for **3D matrices**.
- Resolution of 512x512x**102**: Almost **40 GB VRAM**.
- We proposed different WPs to tune the model:
 - 92 jobs.
 - 92.64 TeraFLOP for forward + backward pass (one time).
 - Considering dataset, epochs... 21.307.200.000 TeraFLOP.
- **4.33 years to run** if using the best GPU we could access at the time.

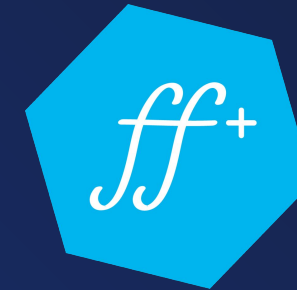


High performance computing

A solution to our needs

We first applied to the EuroHPC Benchmark Access Call to refine our computational requirements:

- Got access to **MareNostrum 5** in order to do this:
 - It has the **GPUs with the most VRAM** (64 GBs).
- Implementation of the proposed baseline model.
 - Had to use **PatchGAN** for the discriminator to **fit in VRAM**.
- Used 3 **synthetic** datasets, **representative** of the jobs we will run: same sizes.
- Almost **34 hours for the biggest jobs** we need to run.

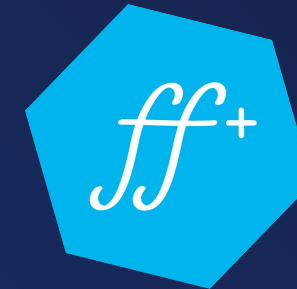
**EuroHPC**
Joint Undertaking**Barcelona
Supercomputing
Center***Centro Nacional de Supercomputación*

High performance computing

A solution to our needs

We then applied to the **AI and Data-Intensive Applications Access Call** to carry out the project work:

- Got renovated access to **MareNostrum 5** with **32,000 computer hours granted**.
 - ~ 500 hours so far
 - More than **2.000 jobs** to run within the project.
- FFPlus Access to the **Epicure support** team (technical and data protection)
- FFPlus Access to the **Business Development** support team

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THANK YOU

For more information, visit our website and social media channels:

- <https://panacea-coop.com/>
- <https://www.linkedin.com/company/panacea-coop/posts/?feedView=all>
- <https://www.youtube.com/@panacearesearch>