AiVF (Project Code: ΕΚΠΑΡ01-0074556)

The Assisted Reproduction Unit (ARU) EUGONIA, internationally recognized for its scientific excellence, continues to expand the boundaries in the field of assisted reproduction. Guided by its longstanding commitment to research, EUGONIA constantly seeks innovative solutions to provide pioneering care to couples facing fertility issues and to advance and co-shape international scientific knowledge.

EUGONIA today continues to pioneer by utilizing artificial intelligence (AI) and deep learning (DL) for embryo assessment during the in vitro fertilization (IVF) process. The innovative research project titled "Advanced Image Processing and Artificial Intelligence Techniques for Embryo Assessment and IVF Outcome Prediction – AiVF" is being implemented by EUGONIA LTD in collaboration with Telematic Medical Applications (TMA), a software development and telemedicine solutions company.

The Project

AiVF is an innovative artificial intelligence system for the assessment of human embryos resulting from in vitro fertilization. The system will calculate the probability of achieving pregnancy depending on the number of embryos transferred (1 or 2), with the aim of selecting the optimal embryo(s) with the highest chances of achieving pregnancy. The project leverages experience from a previous research proposal that was awarded a Seal of Excellence in the H2020-SME Instrument Phase 1. The core innovation lies in the integration of not only embryological data, but also clinical (e.g., age), hormonal characteristics, and detailed gynecological history, combined with

advanced radiomic features from time-lapse video frames—data that existing systems do not possess.

Objectives

1. Improvement of prediction accuracy for successful embryo implantation in IVF.

2. Development and utilization of multiparametric embryological features (morphological, morphokinetic, and radiomic).

3. Application of machine learning and deep learning (DL) algorithms to support embryo selection.

4. Provision of personalized embryo transfer recommendations based on embryological and clinical data.

5. Enhancement of clinical decision-making in single or double embryo transfer.

6. Increase in pregnancy and implantation rates in IVF.

7. Development of a functional AI system for clinical and educational use by embryologists.

Outcomes

Upon completion of the AiVF project, the following outcomes are expected:

At the scientific level, advanced artificial intelligence predictive models will be developed and validated for predicting successful embryo implantation, based on a combination of morphological, morphokinetic, radiomic, and clinical data. Concurrently, new prognostic features will be identified through modern machine learning and deep learning (DL) techniques, contributing to the generation of new knowledge regarding embryonic development and the factors influencing successful IVF outcomes.

At the clinical level, improvement in implantation and pregnancy rates is expected, as well as substantial enhancement of clinical decision-making during embryo selection,

in both single and double embryo transfer cases. The system will function as a reliable advisory tool, particularly supporting embryologists and clinicians with limited experience, while simultaneously reducing the uncertainty associated with the embryo transfer process.

At the technological and commercial level, a comprehensive artificial intelligence platform (AiVF) will be developed, capable of providing personalized recommendations for embryo selection and continuously improving through feedback from real clinical data. The system will be implemented as a high-maturity functional prototype and will be integrated on a pilot basis into clinical practice, with the aim of commercial maturation and distribution to IVF clinics in Greece and the European Union.