Executive summary

Name of the Project

Fai – AI's algorithm approach based on deep neural networks (DNNs) to select highest quality embryos using of human embryo time-lapse images.

Problems

Conventional embryo evaluation involves manual grading of human embryos at the blastocyst stage (embryo on day 5) based on morphological analysis by skilled embryologists. While this selection method is used universally in clinical practice, the evaluation of an embryo based on a static image represents a crude, subjective evaluation of embryo quality, which is incomplete as well as time-consuming. However, the assessment produces different results between embryologists and as a result, the success rate of IVF remains low. To overcome uncertainties in embryo quality, multiple embryos are often implanted resulting in undesired multiple pregnancies (twins or even triplets) and complications (low birth weight, premature delivery etc).

Benefit & Solutions

Improving the ability to select the single best embryo with the highest implantation potential would increase pregnancy rates as well as minimize the chance of multiple pregnancies due to the transfer of multiple embryos.

Target Market

More than 5 million children worldwide in 2015 were born with the help of IVF (Official statistics only)
Infertility remains an unremitting reproductive issue that affects about 186 million people worldwide.
In the United States, infertility affects ~8% of women of child-bearing age, in Russia ~10%, in Ukraine ~11%, in Europe ~9%. While IVF has helped millions give birth, the average success rate in the United States is ~45%, in Russia is ~43%, in Ukraine is ~46%, in Europe is ~44%.

Market analysis

Studies on human embryo evaluation are still very limited and mostly based on morphological features. They often involve low numbers of embryos from single centers, and they lack validations in independent cohorts. Furthermore, publications to date have relied on single static images. However, time-lapse images have the advantage of being consistent in terms of size, lighting, contrast, quality, and in terms of capturing the timing of embryo development, which is particularly important when quantifying blastocyst expansion. Currently, no robust and fully automatic method exists to analyze human embryo data by TLI.

Recently, there have been several studies utilizing classical machine learning approaches, such as support vector machine (SVM) and RF, and deep learning methods, and CNN-basic for outcome prediction or grade classification. To date, several AI methods have been used to assess blastocysts: Image segmentation and advanced image analysis techniques using neural

networks with textured descriptors, level set, phase congruency, and fitting of ellipse methods have been demonstrated in mouse, bovine, and human blastocysts.

Investment

The required investment is $1000000. (The implementation time from 1 to 3 years);

Stages of projects launching in countries

Deep learning approaches can provide accurate quality assessments in various clinical conditions. The Fai provides a method that can be easily implemented for a wide range of applications, including embryo grading. Our method yields a cutting-edge sensitivity when performing the challenging task of assessing embryo quality using multi-focal embryo images. Our Fai framework is fully automated and does not require any manual augmentations or preprocessing on the input images. In fact, it provides embryologists a straightforward platform to use without requiring sophisticated computational knowledge.

Exit strategy

By introducing new technology into the field of IVF we can automate and standardize a process that was very dependent on subjective human judgement. This pioneering work gives us a window into how this field might look in the future.

Deweloper & Owner

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Cofounders of FamilityTech Inc.

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