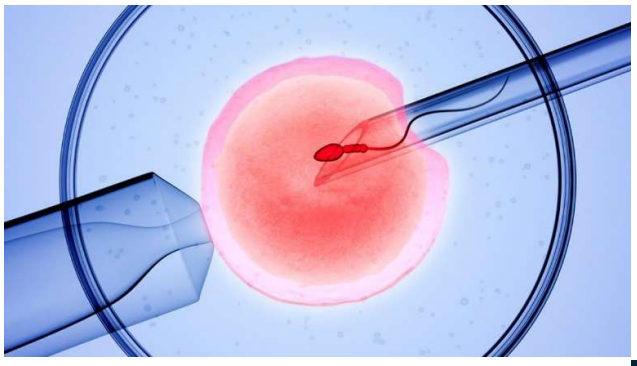
PRD:
IVF Prediction System



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Problem Alignment

The Problem

> As humans grew in population, it is crucial for parents to have a clear view on the both father's and mother's condition to be able to have a pregnancy. If the cell from both parents is not strong enough to conceive naturally, one of the things that parents could do is by IVF or what we called In Vitro Fertilization. This is by combining the sperm and egg cells that would be taken from both parents in a laboratory, which then be planted again in the mother's womb. Even then, there are many factors that would influence and lead to the successfulness of the IVF process. As such, we aim to make a prediction system using previous result of IVF on other patients based on their profile and their history, while also includes the condition of IVF process, including the storage process, time reserves, etc. This prediction system would conclude the successfulness from doing the IVF until birth. But this does not include the patient lifestyle during the pregnancy. From this prediction result, we would inform the patients of the outcome, whether it would be successful or not. Based on this information, the patients will now not blindly try the program without any prior knowledge and they would consider if they would risk the IVF process even if the program is expensive.

High-Level Approach

> We are going to create the prediction system using machine learning algorithm that use data from previous patients, including their condition and the successfulness of the program. The prediction system will input the current patient's profile and condition of the process. The output would result in whether the parents would have a successful birth or not.

Goals & Success

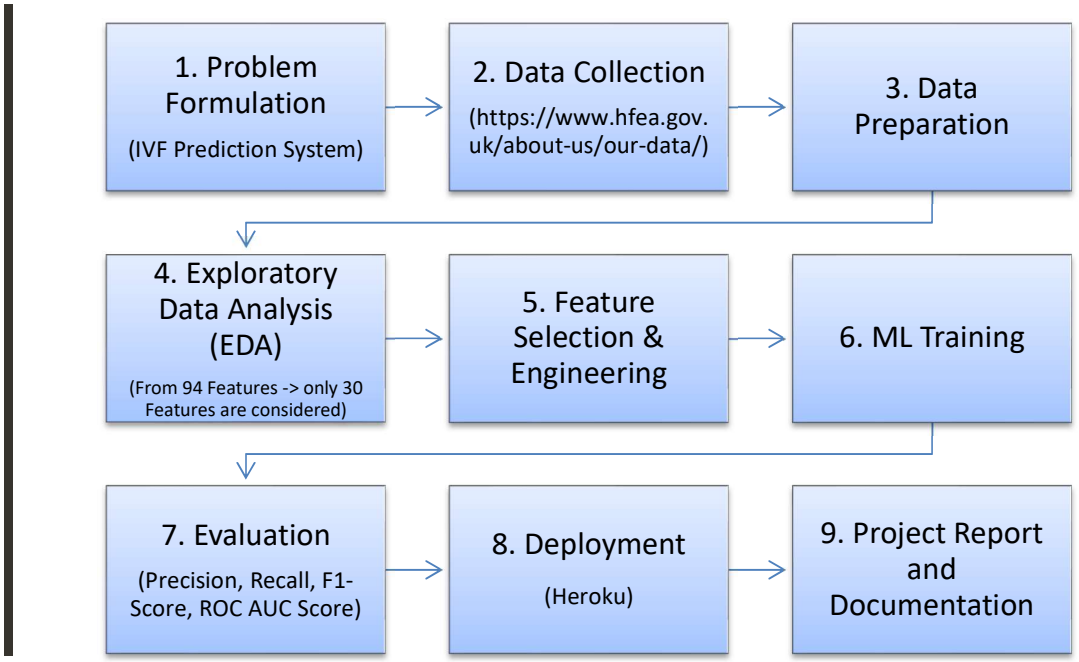
> The success would be if the prediction reaches an ROC-AUC score of 75%. It would take the patients profile and condition of the process to ML metrics. The only metrics that we could control would be the condition of taking and storing both of parent's cell in a lab, before it would be taken into the womb. Based on the metrics/features that can be controlled, hospital or laboratory which would carry out this program, could understand and maximize the facility or treatment that would heavily impact the successfulness of this program. As such, it would be beneficial for both the parents financial and the hospital/lab credibility.

Solution Alignment

Key Solution

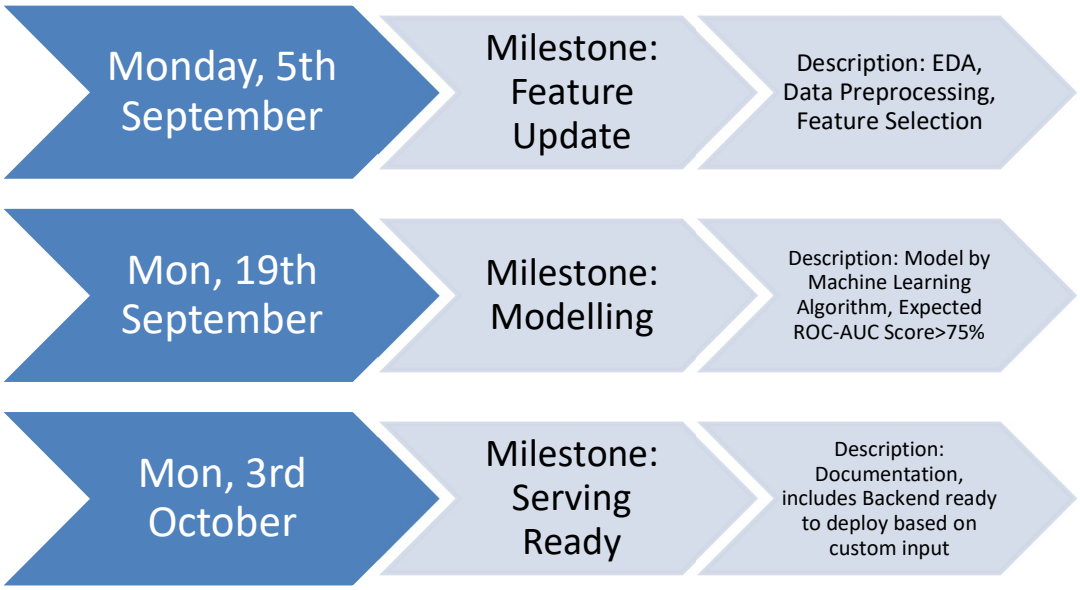
In this project we will use previous patients' dataset, obtained from Human Fertilization and Embryology Authority (HFEA) which is not confidential, and consist of 94 features, we will build the model (based on classification) using various Machine Learning algorithm such as Logistic Regression, K-nearest neighbors, random forest, decision tree, and support vector machine. We would compare those trained models and choose the best model with the best ROC-AUC Score.
The possibility of constraint is we lack a person of medical expertise that would explain which features must be inputted that would heavily impact the IVF program and the acceptance criteria of ROC-AUC Score to state if the model is acceptable for the upcoming patients. And for this we would still approach based on the highest possible of ROC-AUC Score as it still gives the glimpse of how the IVF program works best.

Key Flows



Launch Readiness

Key Milestones



Artifacts

Artifacts	Where to check?
Dataset Original	https://www.hfea.gov.uk/about-us/our-data/ There are 94 features in the dataset, but we only use 30 features.
Dataset Final	Dataset URL
Project Milestone	GitHub URL
App	App URL
Reference	1. Scientific Report: "Machine learning predicts live-birth occurrence before in-vitro fertilization treatment", "AshishGoyal, Maheshwar Kuchana & Kameswari Prasada RaoAyyagari", https://www.nature.com/scientificreports 2. "Multifactor Prediction of Embryo Transfer Outcomes Based on a Machine Learning Algorithm", "Ran Liu, Shun Bai, Xiaohua Jiang, Lihua Luo, Xianhong Tong, Shengxia Zheng, Ying Wang and Bo Xu". https://www.frontiersin.org/articles/745039