Automatic Classification of Human Granulosa Cells in Assisted Reproductive Technology using vibrational spectroscopy imaging

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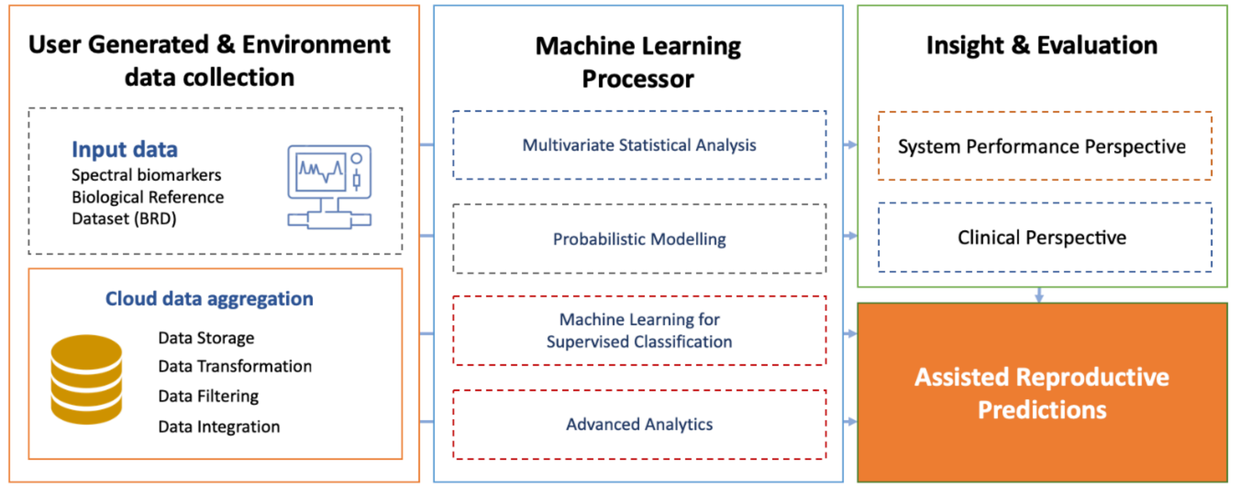
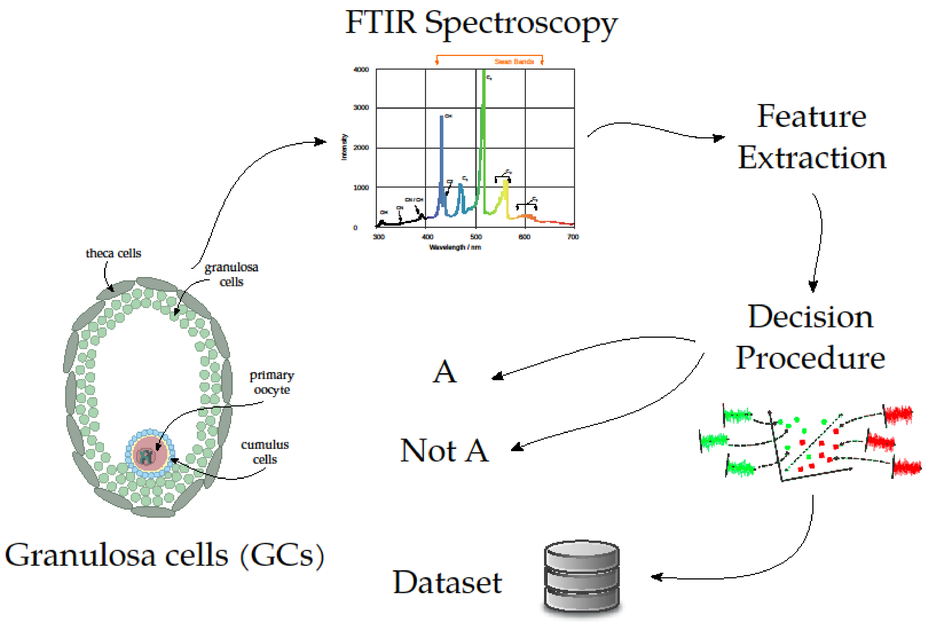
IDEA AND MOTIVATION

In the field of reproductive technology, the biochemical composition of female gametes has been successfully investigated with the use of vibrational spectroscopy. Currently, in **Assistive Reproductive Technology** (ART), there are no shared criteria for the choice of oocyte, and automatic classification methods for the best quality oocytes have not yet been applied. In this work, considering the lack of criteria in ART, we use **Machine Learning** (ML) techniques to predict oocyte quality for a successful pregnancy. To improve the chances of successful implantation and minimize any complications during the pregnancy, **Fourier Transform Infrared Microspectroscopy** (FTIRM) analysis has been applied on granulosa cells (GCs) collected along with the oocytes during oocyte aspiration, as it is routinely done in ART, and specific spectral biomarkers were selected by multivariate statistical analysis. A proprietary **Biological Reference Dataset** (BRD) was successfully collected to predict the best oocyte for a successful pregnancy.

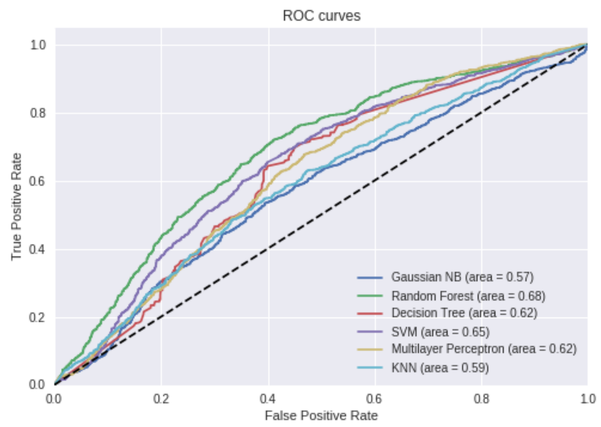
DSS FOR ASSISTED REPRODUCTIVE TECHNOLOGIES

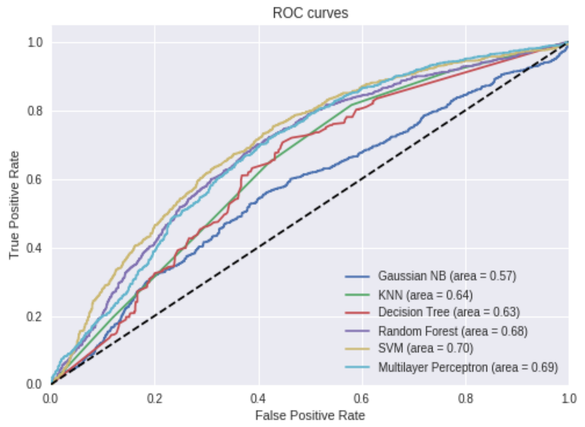


Biological Reference Dataset and Feature Set



RESULTS





Several ML methods were compared for oocyte classification based on vibrational spectroscopy imaging, such as SVM, kNN, DT, and RF. The results confirm the efficiency of the method with high values of precision, recall, and F-measure.

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