Multimodal Learning for Embryo Viability Prediction in Clinical IVF

Supplementary Material

1   Dataset details

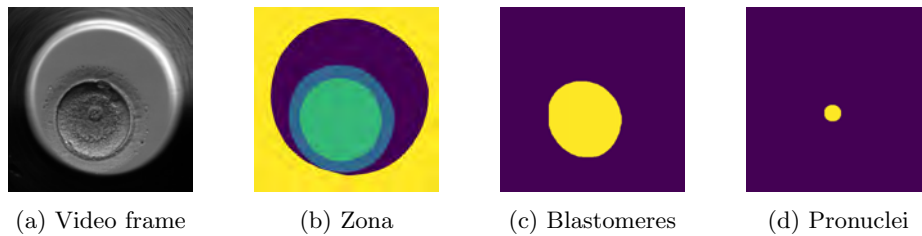(a) Video frame   (b) Zona   (c) Blastomeres   (d) Pronuclei

Fig. 1: Visualization of the Embryo-vision outputs for semantic segmentation (zona), and instance segmentation (blastomeres and pronuclei). Fragmentation prediction is a float value, and stage prediction is a 13-dimensional vector where each dimension represents the probability of each stage.

Table 1: EHR data columns. Columns marked as 'Index' are used to curate a dataset and splits. Columns marked as 'Input' are used as a multimodal model input. Columns marked as 'Output' are used to generate ground truth for training and evaluation.

Usage	Column name	Data type	Description
Index	PatientNumber	int	Unique patient ID
Index	TreatmentID	string	Index of a treatment
Index	WellID	int	Index of an embryo within a treatment cycle
Index	transferred	int	Whether an embryo is transferred or not
Input	Patient_age	float	Age of a patient
Input	Patient_BMI	float	BMI of a patient
Input	AgeOfFirstMenstrual	float	Age Of First Menstrual
Input	TotalRetrievedOocytes	int	Total number of oocytes retrieved for treatment
Input	FertilizationType	string	Type of the treatment. Converted to the class label.
Input	e2-1	int	E2 hormone level at day 1
Input	e2-2	int	E2 hormone level at day 2
Input	e2-3	int	E2 hormone level at day 3
Output	tot_number_embryos	int	Total number of embryos fertilized
Output	children_N	int	Number of children born

Table 2: BlastAssist columns. Columns marked as 'Index' are used to curate a dataset and splits. Columns marked as 'Input' are used as a multimodal model input. Columns marked as 'Output' are used to generate ground truth for training and evaluation.

Usage	Column name	Data type	Description
Index	PatientNumber	int	Unique patient ID
Index	TreatmentID	string	Index of a treatment
Index	WellID	int	Index of an embryo within a treatment cycle
Index	transferred	int	Whether an embryo is transferred or not
Input	zona_width_mean	float	Average zona well thickness
Input	zona_width_std	float	Standard deviation of zona well thickness
Input	zona_inner_diameter_max	float	Max diameter of an inner zona region
Input	zona_inner_diameter_min	float	Min diameter of an inner zona region
Input	zona_outer_diameter_max	float	Max diameter of an outer zona region
Input	zona_outer_diameter_min	float	Min diameter of an outer zona region
Input	frag_day2_median	float	Median fragmentation level on day 2
Input	frag_day3_median	float	Median fragmentation level on day 3
Input	2-cell_time	float	Transition time to 2-cell stage
Input	3-cell_time	float	Transition time to 3-cell stage
Input	4-cell_time	float	Transition time to 4-cell stage
Input	5-cell_time	float	Transition time to 5-cell stage
Input	6-cell_time	float	Transition time to 6-cell stage
Input	7-cell_time	float	Transition time to 7-cell stage
Input	8-cell_time	float	Transition time to 8-cell stage
Input	9+-cell_time	float	Transition time to 9+-cell stage
Input	morula_time	float	Transition time to morula stage
Input	blastocyst_time	float	Transition time to blastocyst stage
Input	zygote_area	float	size of zygote
Input	zygote_shape	float	Shape parameter of zygote
Input	2-cell_symmetry	float	cell symmetry index at 2-cell stage
Input	4-cell_symmetry	float	cell symmetry index at 4-cell stage
Input	pn_appear_time	float	Time when pronuclei appears
Input	pn_fade_time	float	Time when pronuclei disappears
Input	prob_0_pn	float	Probability of 0 pronucleus appeared
Input	prob_1_pn	float	Probability of 1 pronucleus appeared
Input	prob_2_pn	float	Probability of 2 pronuclei appeared
Input	prob_3+_pn	float	Probability of 3 or more pronuclei appeared
Output	tot_number_embryos	int	Total number of embryos fertilized
Output	children_N	int	Number of children born