

## A Combination of Artificial Intelligence with Genetic Algorithms on Static Time-Lapse Images Improves Consistency in Blastocyst Assessment, An Interpretable Tool to Automate Human Embryo Evaluation: A Retrospective Cohort Study

Marco Toschi, M.Sc.<sup>1</sup>, Lorena Bori, Ph.D.<sup>2</sup> , Jose Celso Rocha, Ph.D.<sup>3</sup>, Cristina Hickman, Ph.D.<sup>4</sup>, Marcelo Fábio Gouveia Nogueira, Ph.D.<sup>3</sup>, André Satoshi Ferreira, Ph.D.<sup>3</sup>, Murilo Costa Maffeis, Ph.D.<sup>3</sup>, Jonas Malmsten, Ph.D.<sup>5</sup>, Qiansheng Zhan, Ph.D.<sup>5</sup>, Nikica Zaninovic, Ph.D.<sup>5</sup>, Marcos Meseguer, Ph.D.<sup>6</sup>

- 1. IVIRMA Global Research Alliance, IVIRMA Roma, Italy
- 2. IVIRMA Global Research Alliance, IVI Foundation, Instituto de Investigación Sanitaria La Fe (IIS La Fe), Valencia, Spain
- 3. Universidade Estadual Paulista (Unesp), Faculdade de Ciências e Letras, Câmpus de Assis SP, Brazil
- 4. Aria Fertility, London, UK
- 5. Ronald O Perelman and Claudia Cohen Center for Reproductive Medicine, Weill Cornell Medicine, New York, NY, USA
- 6. IVIRMA Global Research Alliance, IVIRMA Valencia, Spain

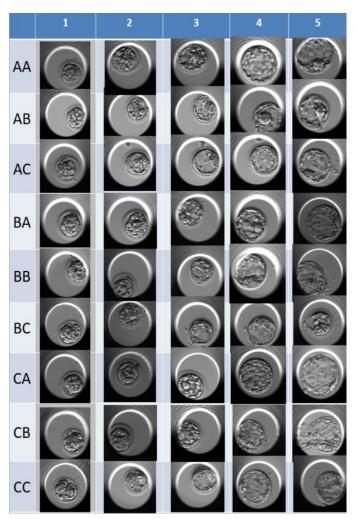
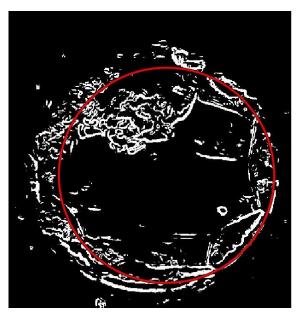
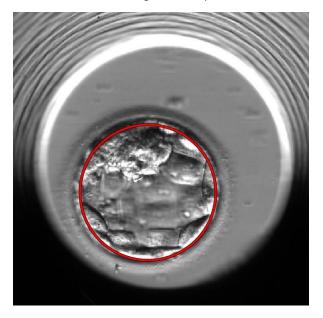


Fig.S1: Blastocyst time-lapse images representing the Gardner Grading System on day 5 of embryo development.

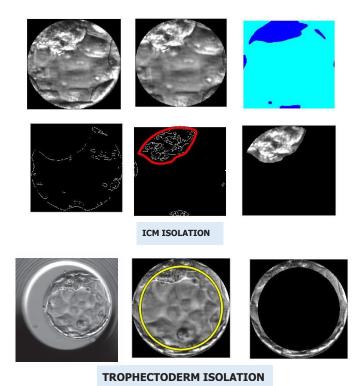




 $\label{Fig.S2:} \textbf{Blastocyst image showing the standardization of a human embryo image.} \ To ensure the contrast and consistency of the image, 1\% of all information is saturates between light and dark pixels.}$ 



 $\textbf{Fig.S3:} \ Isolated \ human \ blastocyst \ with \ Hough's \ function \ to \ determine \ the \ circumference \ that \ best \ characterizes \ the \ embryo.$ 



 $\label{eq:Fig.S4:} \textbf{Fig.S4:} \ \ \textbf{Sequence of steps required to segment a digital image from the human blastocyst.}$