

UNRAVELING THE CYTOSKELETAL ARCHITECTURE OF CANCER CELLS: DEVELOPMENT OF A NOVEL COMPUTATIONAL APPROACH

Authors: Diogo Fróis Vieira¹, Maria Sofia Fernandes², Ana Margarida Moreira², Joana Figueiredo², Raquel Seruca², João Miguel Sanches¹

1, IST - University of Lisbon, Institute for Systems and Robotics

2, Institute of Pathology and Immunology of the University of Porto, Ipatimup; Instituto de Investigação e Inovação em Saúde, i3S

2023 USA-PT Leaders in Cancer Research | 20 July 2023

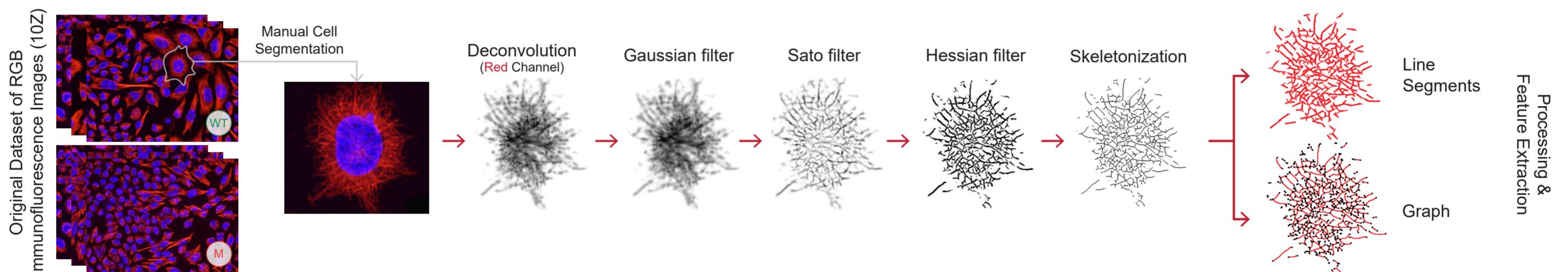


INTRODUCTION & OBJECTIVES

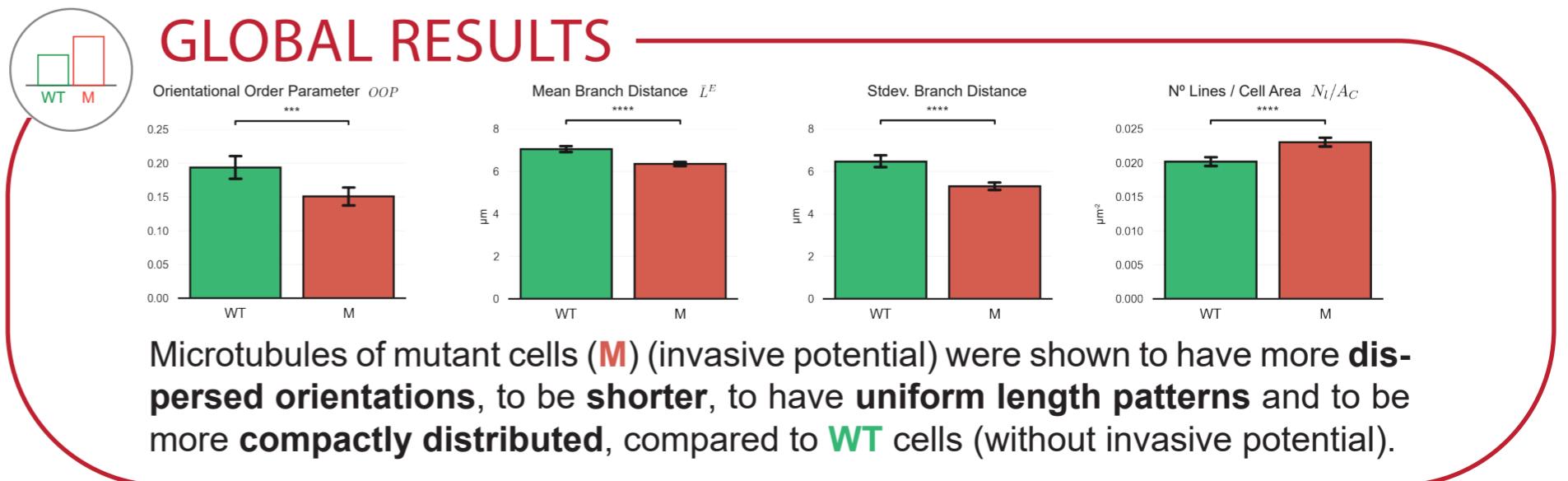
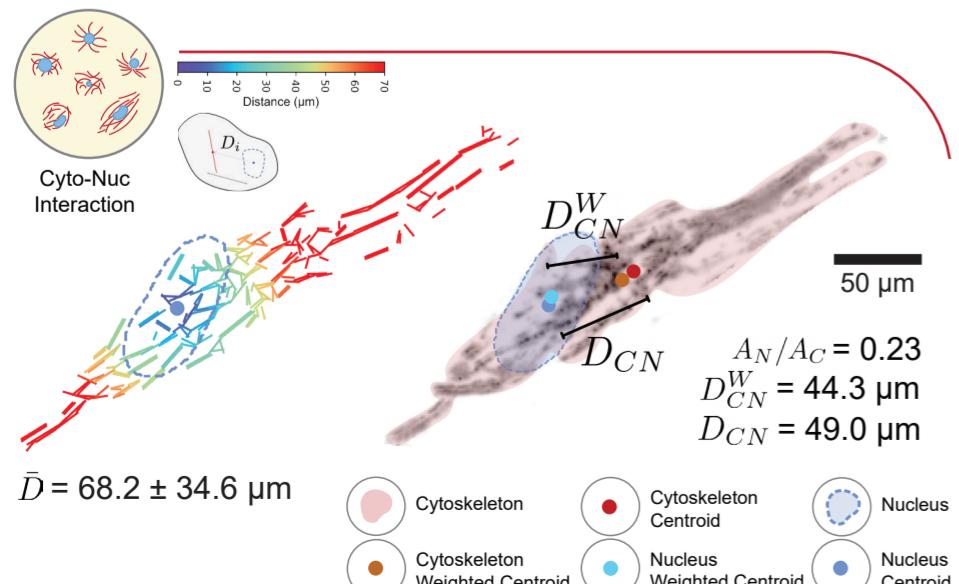
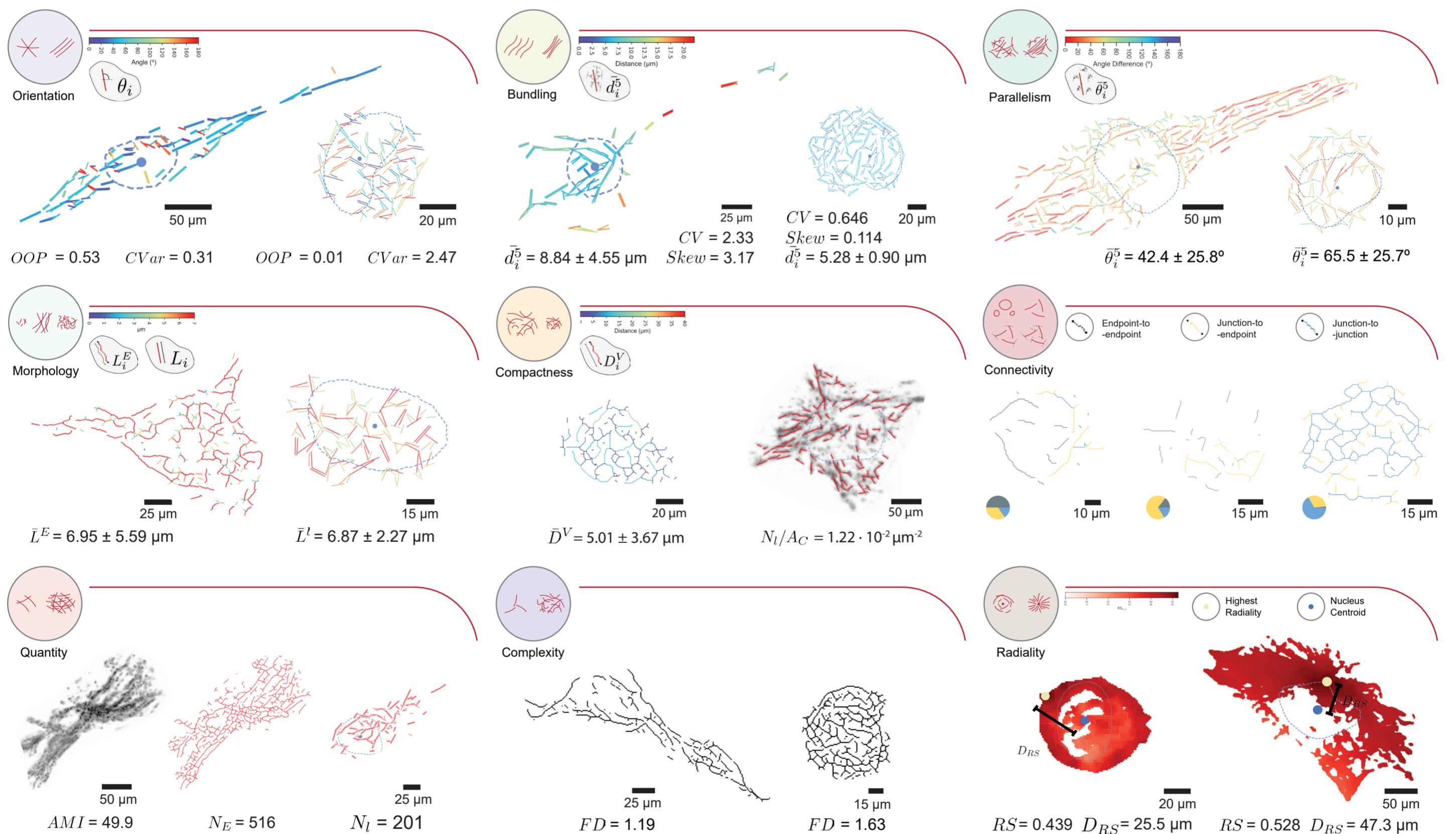
The **cytoskeleton** is a complex fibrous network spanning the whole cytoplasm [1, 2]. Composed of regulatory and structural proteins, it is pivotal in maintaining cellular architecture and in modulating various cellular processes such as migration and invasion [3, 4]. It is well established that during **cancer** progression, cells undergo cytoskeleton reorganization through the dynamic interplay of its components, including **microtubules** [5].

However, little is known on how cytoskeletal proteins are remodeled and how these modifications cooperate to mediate cell invasion. Thus, in this work, we have developed a novel computational approach, based on **image processing** and **feature extraction**, to assess and quantify **cytoskeleton organization**. Specifically, we have investigated immunofluorescence images of cells labelled for α -tubulin and expressing wild-type (**WT**) or mutant (**M**) forms of E-cadherin, as a model of **non-invasive** and **invasive** phenotypes, respectively [6].

METHODS



CYTOSKELETON ORGANIZATION



REFERENCES

- [1] H. Lodish, et al., Molecular Cell Biology, 8th ed. W. H. Freeman, 2016.
- [2] C. Ruggiero and E. Lalli, "Targeting the cytoskeleton against metastatic dissemination," *Cancer and Metastasis Reviews*, vol. 40, no. 1, p. 89–140, 2021.
- [3] T. Hohmann and F. Dehghani, "The cytoskeleton—a complex interacting meshwork," *Cells*, vol. 8, no. 4, 2019.
- [4] D. A. Fletcher and R. D. Mullins, "Cell mechanics and the cytoskeleton," *Nature*, vol. 463(7280), pp. 485–492, 2010.
- [5] C. M. Fife, et al., "Movers and shakers: cell cytoskeleton in cancer metastasis," *British Journal of Pharmacology*, vol. 171, no. 24, pp. 5507–5523, 2014.
- [6] J. Figueiredo, et al., "E-cadherin signal sequence disruption: a novel mechanism underlying hereditary cancer," *Molecular Cancer*, vol. 17, no. 112, 2018.

ACKNOWLEDGEMENTS

Porto Comprehensive Cancer Center Raquel Seruca. Portuguese Foundation for Science and Technology (FCT), under the projects 2022.02665.PTDC, EXPL/MED-ONC/0386/2021, LARsys-UIDB/EEA/50009/2020, NORTE-01-0145-FEDER-000029. The authors acknowledge "No Stomach for Cancer" for funding Seruca's research.