PhD Open Days

A COMPUTATIONAL APPROACH FOR CYTOSKELETAL ORGANIZATION CHARACTERIZATION

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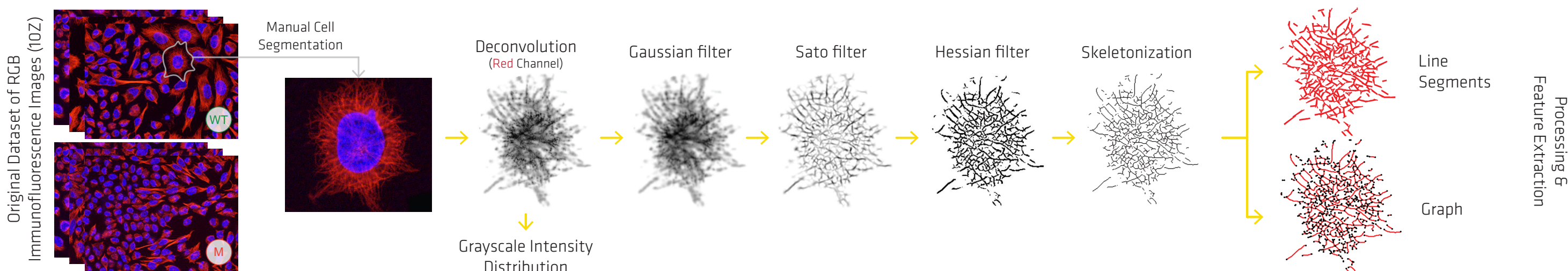1, IST - University of Lisbon, Institute for Systems and Robotics
2, Institute of Pathology and Immunology of the University of Porto, Ipatimup; Instituto de Investigação e Inovação em Saúde, i3S
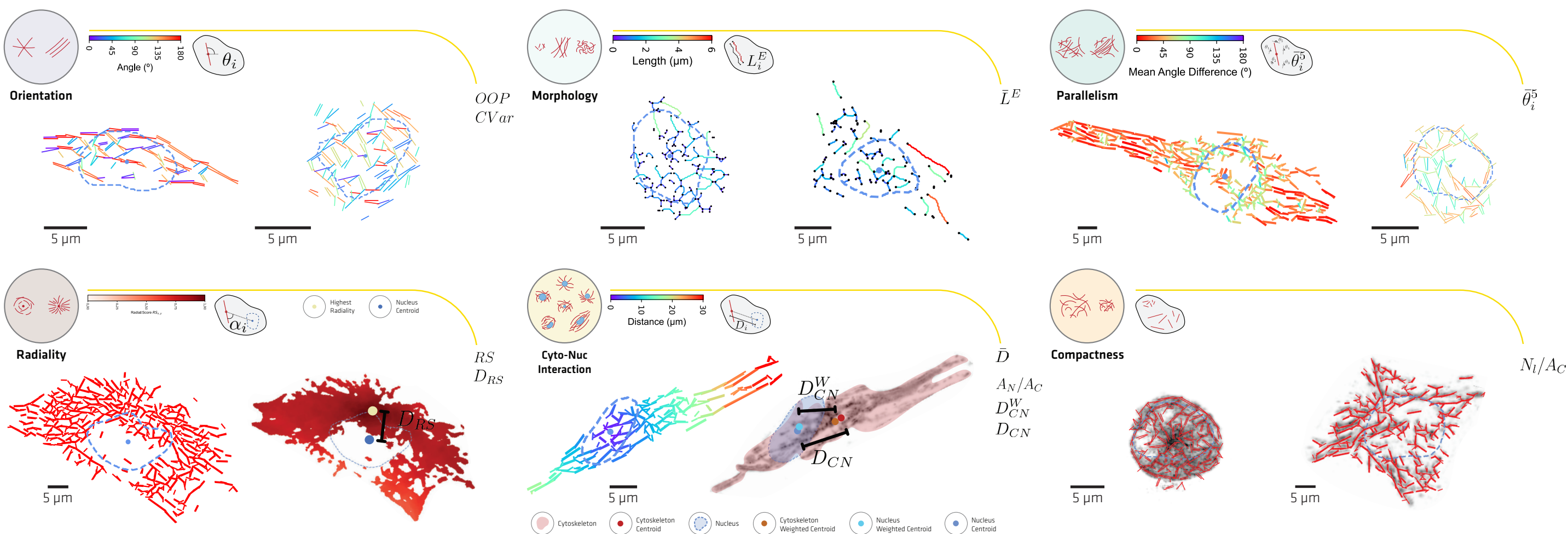
INTRODUCTION & OBJECTIVES

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 asses 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].
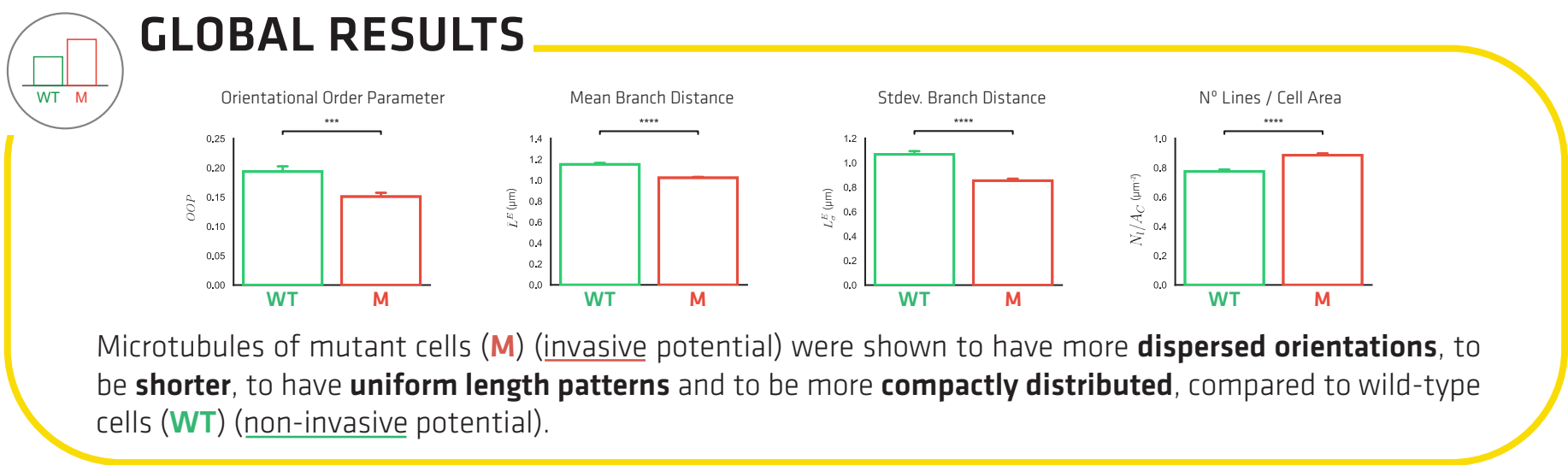
METHODS

CYTOSKELETON ORGANIZATION

GLOBAL RESULTS

Microtubules of mutant cells (**M**) (__invasive__ potential) were shown to have more **dispersed orientations**, to be **shorter**, to have **uniform length patterns** and to be more **compactly distributed**, compared to wild-type cells (**WT**) (__non-invasive__ potential).

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

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