INSTITUTO CAJAL

SEMINARIO PRESENCIAL

Viernes, 3 de Marzo de 2023
12:30 h. Instituto Cajal (CSIC) Madrid

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CENTRO DE BIOLOGÍA MOLECULAR SEVERO OCHOA
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Quantifying the development of the zebrafish retina in four dimensions

Abstract

Analysis and quantification of biological images is often based on accurate automated cell segmentation. Unfortunately, imaging dense three-dimensional tissues result in reduced resolution, and most tools fail to accurately segment cells in these more challenging and realistic conditions. In this direction, we have developed an novel Object Segmentation, Counter and Analysis Resource (OSCAR) specifically designed to quantify three-dimensional images from densely packed biological samples with reduced signal-to-background ratio.Based on a combination of arithmetic, geometric and statistical algorithms, OSCAR is able to bypass segmentation errors and accurately quantify features of objects in the 3D space. When applied to the zebrafish developing retina, OSCAR is able to locate and identify the fate of each nuclei as a cycling progenitor or a terminally differentiated cell, and provide a quantitative characterization of the dynamics of the developing vertebrate retina in space and time with unprecedented accuracy.

Affiliation and short bio

David G. Míguez is an assistant professor at the Facultad de Ciencias at the Universidad Autónoma de Madrid. His lab is located at the Centro de Biologia Molecular Severo Ochoa, and currently focuses on how properties at the level of the system can regulate morphogenesis, with a quantitative and interdisciplinary perspective. The lab integrates techniques, concepts and tools from nonlinear dynamics, biophysics, computer vision, systems biology and developmental biology to study basic aspects of the biological regulation of developmental systems.

Related publications with the topic:

D. G. Míguez*, A. Lanini, D. Garcia-Morales & F. Casares*; The effects of Hh morphogen source movement on signaling dynamics, Development 147: dev.199842. (2022), (*shared corresponding authorship)

D. Pérez-Dones, M. Ledesma-Terrón and D. G. Míguez, Quantitative Approaches to Study Retinal Neurogenesis, Biomedicines 9, 1222 (2021).

D.G. Míguez, “A Branching Process to Characterize the Dynamics of Stem Cell Differentiation”, Scientific Reports, 5, 13265 (2015)

D.G. Míguez*, E. Gil-Guiñón, S. Pons and E. Martí, “Smad2 and Smad3 cooperate and antagonize simultaneously in vertebrate neurogenesis”, Journal Of Cell Science 126, 5335 (2013) (*First and corresponding author)

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