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SYSTEMS BIOLOGY & COMPUTATIONAL NEUROSCIENCE

SİSTEM BİYOLOJİSİ & HESAPLAMALI SİNİRBİLİM

Kaan Yılancıoğlu[1]

To the Editor;

Systems biology is an emerging branch of biological sciences aimed at describing interactions of complex biological mechanisms. Besides traditional scientific analysis methods, systems biology offers robust computer integrated, reliable data analysis approaches. Since, nervous system is fascinatingly complex and dynamic, classic data analysis techniques seem to be limited to fully understand the interactions and cross-talks among neuronal networks beneath cognitive and motor functioning mechanisms. Vast theoretical investigations resulted to better understanding of the neuronal circuits and their functions. Studies conducted on neural code generated quantitative measures of the processing made by initial sensory phases (Rieke et al.). Neural code comparisons with bounds adjusted by optimality principle helped finding underlying design criteria. Other computational studies conducted on structural and dynamic mechanisms carried out by specific local circuits, involving working memory, sensory processing, decision-making, neural learning, motor control and memory. Neuroscience strongly emphasize the use of computational modeling techniques to investigate the neural system and most importantly how the brain computes information using neural code and complex networks (Dayan & Abbott). Experimental, analytical and modeling studies mostly focus on understanding the brain architecture and function which are closely related to systems neuroscience subjecting computational approaches to investigate the features of nervous systems at different levels of detail (Van Hemmen & Callaway, Callaway). Studies in computational neuroscience imply simulation of numerical computational models besides analytical models and experimental verification models (De Schutter et al.). Systems biology could be similarly described in multiple ways including integrative computational and statistical approaches of the networks between various compounds of biological systems to understand how such interactions result to the function and systems behavior. Methodologies used by systems biology and computational neuroscience are highly similar and ideally, a strong interaction should be promoted between these fields. However, researchers working on system biology prejudicially find computational neuroscience as too specific field while computational neuroscientists are seem not to be interested in genes, molecular pathways and networks. There will be evidently increasing need of systems biology aspects among computational neuroscience community when modeling studies are more crossed over with subcellular and cellular level research. Currently, it is being more frequently noticed that the interest of computational neuroscience community on cellular modeling, neuronal networks and information coding is increased. As a result of this interest-shift, scientists working on traditional computational neuroscience will eventually concern more with neural code and cognitive processes and then bottom-up modelers become more interacted with systems biology field.

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[1] Uskudar University, Biomedical Equipment Technology Department, Mimar Sinan Mh. Selman-ı Pak Cd. PK:34664 Üsküdar / İstanbul / Türkiye, Phone: +90 216 400 22 22, Email: kaan.yilancioglu@uskudar.edu.tr