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EDITORIAL

Editorial

John Darrell Van Horn[1]

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> "It's dangerous to make forecasts. Especially about the future."

– Versions of this quote have been attributed to an ancient Danish Proverb; Yogi Berra, famed catcher for the New York Yankees baseball team; Niels Bohr, Nobel Prize-winning physicist; Samuel Goldwyn, prominent Hollywood movie mogul; and Mark Twain, noted American humorist.

Since its first descriptions in the 1990's, neuroinformatics has been a subject covering a wide intellectual area, seeking to turn data from the brain into new understanding. But even from its earliest days, the field embraced novel mathematical concepts, emerging quantitative methods, and leveraged advances in computing power to wrangle[1], share[2], and make comprehensible[3] the vast quantities of multi-scale data being obtained concerning brain form, function, and connectivity, in health as well as in disease. During these earliest years, new quantitative approaches challenged us to explore beyond traditional analyses[4], even when the philosophy of open source software was still in its infancy[5], and promoting open forms of science[6] could be seen as threatening. Twenty years on, my how things have changed.

Yet, among the earliest publications listed by PubMed when searching for the term "neuroinformatics" is a study by Pfurtscheller et al.[7] that would, indeed, resonate with many today. Their study reports on the possibility of classifying sleep stages in infants using an artificial neural network. Twenty-two multivariate data time courses – including EEG, motion actigraph, respiration, EMG, and other signals concerning brain function—were recorded from 4 babies, aged 6 weeks, 6 months, and 1 year. Thirty-second subsets of these signals were used in training and parameters were measured to obtain data vectors representing the signals over those intervals. Two types of neural networks were employed to perform sleep stage classification—a Multilayer Perceptron and a "Learning Vector Quantizer". The training input for both network types was provided by a human expert. For six distinct classes of sleep in the 6-month-olds, a 65% to 80% rate of correct classification was obtained for the testing data not previously used in model training. While, certainly not the first application of artificial neural networks involving neurophysiological time courses, nor the first that we might recognize as resembling an application of an informatics-driven approach to understanding clinical phenotypes, it stands out as an interesting early attempt to make predictions using neural network methods. In due course, accompanied by emerging data-rich methods in medical imaging, electrophysiology, and genetics, articles began to appear noting that neuroinformatic methods would form an important organizing framework for the perceived onslaught of data where "technological advances, particularly in computer and

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✉ John Darrell Van Horn
jdv7g@virginia.edu

[1] Department of Psychology and School of Data Science, University of Virginia, Charlottesville, VA 22903, USA

information sciences, should allow this information 'explosion' to become more manageable"[8].

Those working in the field of neuroinformatics have long sought to provide a broad basis for the conversion of raw brain data into actionable knowledge[9] and for it to serve as a discipline which strategically combines shared data, quantitative analytics, and neuroscience[10]. In recent years, neuroinformatics has grown to embrace machine learning methods[11], classification strategies[12], neural networks[13], and artificial intelligence approaches[14] to extracting information from ever-rich neuroscience data across spatial and temporal scales. Current exploration of brain form, function, and connectivity, in health and in disease, now depends heavily upon such informatics-based approaches seeking to provide insight and understanding through mathematical and statistical description. As the brain sciences continue to pursue the collection of 'big data'[15], you can bet that neuroinformaticists will, undoubtedly, be needed in writing this next chapter, applying more and more clever quantitative techniques, to grow the *scientia corporis* about the brain.

Stepping into the twentieth year of *Neuroinformatics*—the journal—also begins a new era. With this newest volume, the journal sees a change in leadership, editorial board membership, and path forward. Rightly so, the journal and its editorial board expresses sincerest thanks to the original Editors-in-Chief for their passion, curation, cultivation, and stewardship over the past two decades. Drs. Ascoli, Kennedy, and De Schutter[16] are to be commended for their leadership and, heretofore, be recognized as the journal's founding editors *emeriti*. Their efforts have ensured that neuroinformatics—as a field—has enjoyed a strong voice, through thick and thin, and provided a platform to promote the development and use of data science approaches applied to data obtained from the brain.

We begin this new period for the journal with a *Neuroinformatics* Special Issue: "Building the NeuroCommons" with guest editors Maryann Martone, from the University of California, San Diego (UCSD) and Satrajit Ghosh, from the Massachusetts Institute of Technology (MIT). This themed issue is focused on the design and implementation of a communal framework for neuroscience data sharing, best-practices, data processing, and reproducibility. Articles seek to address what will it take for neuroscience to become a data-driven discipline based on pools of open research data, what are challenges and opportunities, where have there been successes, as well as areas for improvement. Special issues such as this permit a closer look at the types of activities which can strengthen the role of informatics and data science approaches in the neurosciences.

With this anniversary volume of *Neuroinformatics*, we celebrate the achievements of this vital periodical, and look forward to many new and exciting breakthroughs in the quantitative analysis of brain data, at various levels of spatial and temporal resolution, described in its pages. Though, as noted above, forecasting can be difficult – especially about what has yet to happen. One thing we can all be assured of, however, is that the neurosciences will continue to collect ever-larger datasets which will necessitate still newer thinking in neuroinformatics to store, process, model, interpret, characterize, explain, and share them. We welcome that future and predict great things.

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