LITERATURE SURVEY:

1. Trends in electronic health record system use among ofce-based physicians: United states, 20072012

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The National Ambulatory Medical Care Survey (NAMCS) is based on a national probability sample of nonfederal office-based physicians who see patients in an office setting. Prior to 2008, data on physician characteristics were collected through in-person interviews with physicians. To increase the sample for analyzing physician adoption of EHR systems, starting in 2008, NAMCS physician interview data were supplemented with data from an EHR mail survey. This report presents estimates from the 2007 in-person interviews, combined 2008-2010 data from both the in-person interviews and the EHR mail surveys, and 2011-2012 data from the EHR mail surveys. Sample data were weighted to produce national estimates of office-based physician characteristics and their practices.

1. Use of diagnostic imaging studies and associated radiation exposure for patients enrolled in large integrated health care systems

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Context: Use of diagnostic imaging has increased significantly within fee-for-service models of care. Little is known about patterns of imaging among members of integrated health care systems.

Objective: To estimate trends in imaging utilization and associated radiation exposure among members of integrated health care systems. Design, setting, and participants: Retrospective analysis of electronic records of members of 6 large integrated health systems from different regions of the United States. Review of medical records allowed direct estimation of radiation exposure from selected tests. Between 1 million and 2 million member-patients were included each year from 1996 to 2010. Main outcome measure: Advanced diagnostic imaging rates and cumulative annual radiation exposure from medical imaging. Results: During the 15-year study period, enrollees underwent a total of 30.9 million imaging examinations (25.8 million person-years), reflecting 1.18 tests (95% CI, 1.17-1.19) per person per year, of which 35% were for advanced diagnostic imaging (computed tomography [CT], magnetic resonance imaging [MRI], nuclear medicine, and ultrasound). Use of advanced diagnostic imaging increased from 1996 to 2010; CT examinations increased from 52 per 1000 enrollees in 1996 to 149 per 1000 in 2010, 7.8% annual increase (95% CI, 5.8%-9.8%); MRI use increased from 17 to 65 per 1000 enrollees, 10% annual growth (95% CI, 3.3%-16.5%); and ultrasound rates increased from 134 to 230 per 1000 enrollees, 3.9% annual growth (95% CI, 3.0%-4.9%). Although nuclear medicine use decreased from 32 to 21 per 1000 enrollees, 3% annual decline (95% CI, 7.7% decline to 1.3% increase), PET imaging rates increased after 2004 from 0.24 to 3.6 per 1000 enrollees, 57% annual growth. Although imaging use increased within all health systems, the adoption of different modalities for anatomic area assessment varied. Increased use of CT between 1996 and 2010 resulted in increased radiation exposure for enrollees, with a doubling in the mean per capita effective dose (1.2 mSv vs 2.3 mSv) and the proportion of enrollees who received high (>20-50 mSv) exposure (1.2% vs 2.5%) and very high (>50 mSv) annual radiation exposure (0.6% vs 1.4%). By 2010, 6.8% of enrollees who underwent imaging received high annual radiation exposure (>20-50 mSv) and 3.9% received very high annual exposure (>50 mSv).

1. A survey on deep learning in medical image analysis.

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Deep learning algorithms, in particular convolutional networks, have rapidly become a methodology of choice for analyzing medical images. This paper reviews the major deep learning concepts pertinent to medical image analysis and summarizes over 300 contributions to the field, most of which appeared in the last year. We survey the use of deep learning for image classification, object detection, segmentation, registration, and other tasks. Concise overviews are provided of studies per application area: neuro, retinal, pulmonary, digital pathology, breast, cardiac, abdominal, musculoskeletal. We end with a summary of the current state-of-the-art, a critical discussion of open challenges and directions for future research.

1. A logical calculus of the ideas immanent in nervous activity

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Because of the “all-or-none” character of nervous activity, neural events and the relations among them can be treated by means of propositional logic. It is found that the behavior of every net can be described in these terms, with the addition of more complicated logical means for nets containing circles; and that for any logical expression satisfying certain conditions, one can find a net behaving in the fashion it describes. It is shown that many particular choices among possible neurophysiological assumptions are equivalent, in the sense that for every net behaving under one assumption, there exists another net which behaves under the other and gives the same results, although perhaps not in the same time. Various applications of the calculus are discussed.

1. The perceptron: A probabilistic model for information storage and organization in the brain

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To answer the questions of how information about the physical world is sensed, in what form is information remembered, and how does information retained in memory influence recognition and behavior, a theory is developed for a hypothetical nervous system called a perceptron. The theory serves as a bridge between biophysics and psychology. It is possible to predict learning curves from neurological variables and vice versa. The quantitative statistical approach is fruitful in the understanding of the organization of cognitive systems. 18 references. (PsycINFO Database Record (c) 2016 APA, all rights reserved)

1. Receptive elds, binocular interaction and functional architecture in the cat's visual cortex

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What chiefly distinguishes cerebral cortex from other parts of the central nervous system is the great diversity of its cell types and inter-connexions. It would be astonishing if such a structure did not profoundly modify the response patterns of fibres coming into it. In the cat's visual cortex, the receptive field arrangements of single cells suggest that there is indeed a degree of complexity far exceeding anything yet seen at lower levels in the visual system. In a previous paper we described receptive fields of single cortical cells, observing responses to spots of light shone on one or both retinas (Hubel & Wiesel, 1959). In the present work this method is used to examine receptive fields of a more complex type (Part I) and to make additional observations on binocular interaction (Part II). This approach is necessary in order to understand the behaviour of individual cells, but it fails to deal with the problem of the relationship of one cell to its neighbours. In the past, the technique of recording evoked slow waves has been used with great success in studies of functional anatomy. It was employed by Talbot & Marshall (1941) and by Thompson, Woolsey & Talbot (1950) for mapping out the visual cortex in the rabbit, cat, and monkey. Daniel & Whitteiidge (1959) have recently extended this work in the primate. Most of our present knowledge of retinotopic projections, binocular overlap, and the second visual area is based on these investigations. Yet the method of evoked potentials is valuable mainly for detecting behaviour common to large populations of neighbouring cells; it cannot differentiate functionally between areas of cortex smaller than about 1 mm2. To overcome this difficulty a method has in recent years been developed for studying cells separately or in small groups during long micro-electrode penetrations through nervous tissue. Responses are correlated with cell location by reconstructing the electrode tracks from histological material. These techniques have been applied to CAT VISUAL CORTEX 107 the somatic sensory cortex of the cat and monkey in a remarkable series of studies by Mountcastle (1957) and Powell & Mountcastle (1959). Their results show that the approach is a powerful one, capable of revealing systems of organization not hinted at by the known morphology. In Part III of the present paper we use this method in studying the functional architecture of the visual cortex.

1. Neocognitron: A self-organizing neural network model for a mechanism of visual pattern recognition

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A neural network model for a mechanism of visual pattern recognition is proposed in this paper. The network is self-organized by “learning without a teacher”, and acquires an ability to recognize stimulus patterns based on the geometrical similarity (Gestalt) of their shapes without affected by their positions. This network is given a nickname “neocognitron”. After completion of self-organization, the network has a structure similar to the hierarchy model of the visual nervous system proposed by Hubel and Wiesel. The network consits of an input layer (photoreceptor array) followed by a cascade connection of a number of modular structures, each of which is composed of two layers of cells connected in a cascade. The first layer of each module consists of “S-cells”, which show characteristics similar to simple cells or lower order hypercomplex cells, and the second layer consists of “C-cells” similar to complex cells or higher order hypercomplex cells. The afferent synapses to each S-cell have plasticity and are modifiable. The network has an ability of unsupervised learning: We do not need any “teacher” during the process of self-organization, and it is only needed to present a set of stimulus patterns repeatedly to the input layer of the network. The network has been simulated on a digital computer. After repetitive presentation of a set of stimulus patterns, each stimulus pattern has become to elicit an output only from one of the C-cell of the last layer, and conversely, this C-cell has become selectively responsive only to that stimulus pattern. That is, none of the C-cells of the last layer responds to more than one stimulus pattern. The response of the C-cells of the last layer is not affected by the pattern's position at all. Neither is it affected by a small change in shape nor in size of the stimulus pattern.