IS1-4 胸部疾患のコンピュータ支援CT画像診断システム
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CADe/CADx for Multi-disease Thoracic CT Images
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Computed tomography (CT) is one of the widely used imaging modalities to monitor the development and progression of cancers. The quantitative CT imaging for personalized cancer medicine become increasingly attractive field. The underlying hypothesis of this research area is that the advanced computational approaches discover imaging biomarkers associated with cancer probabilities, clinicopathological prognostic factors, and gene-expression levels from large amounts of image-based features. If this hypothesis is proven through external and independent validation cohorts of patients, we can noninvasively infer biological characteristics of diseases, possibly representing cancer probability and prognostic information, from the quantitative CT imaging. The purpose is to develop computer-aided detection/diagnosis (CADe/CADx) systems based on the multidisciplinary computational anatomy models which support clinicians to detect early-stage cancers and decide risk-adaptive treatments. These CADe/CADx systems may have a large impact as imaging is routinely used in clinical practice, in all stages of diagnoses and treatment, providing an unprecedented opportunity to improve medical decision-support.

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IS1-5 歯科パノラマX線像に現れる健康情報
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Hidden healthcare information in dental panoramic radiography
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Panoramic radiography is the most frequently used imaging examination in dental practice in Japan. The regions imaged include not only the teeth and jaws, but also the nasal and cervical regions. There were several signs of medical disease appears in panoramic radiograph. It has been proposed that the morphology of the mandibular cortical bone in the panoramic radiograph can be used to detect osteoporosis. Secondly in the panoramic radiographs of elderly patients, Calcified bodies are sometimes observed in the cervical soft tissues. Calcifications in the carotid arteries are one of the risk factors for arteriosclerosis. Radiopacities in the maxillary sinus are often seen in the panoramic radiographs. Maxillary sinusitis is a familiar health problem. Inflammation in the parasanal sinuses is often due to allergic rhinitis, upper respiratory tract infections, or dental infections. The development of computer-aided detection/diagnosis (CAD) systems for dental imaging is progressing. One expected use of CAD is to detect these radiological signs of medical disease in the panoramic screening radiograph.

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IS2-1 Brain Computer Interface (BCI) and Brain to Brain Couplings Using Multiway Component Analysis
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In this talk we will review several promising paradigms for Brain Computer Interface, (including P300/N170 ERPs, SSVEP, and motor imagery-MI paradigms) and multi-way (tensor) signal processing tools for EEG-BCI and analysis of brain to brain couplings/interactions (BBC/I). We will discuss how tensor (multiway arrays) factorizations/decompositions can be applied for classification and recognition of evoked and event related potentials (EP/ERP). We illustrate this by Multiway Canonical Correlation Analysis (MCCA) which is applied to improve recognition rate of the Steady State Visual Evoked Potentials (SSVEP). Furthermore, we will present affective brain-computer interfaces (aBCI) based on oddball paradigm using visual stimuli with emotional facial images and short video-clips. Our experiments confirmed that the face-sensitive event-related potential (ERP) components N170 and vertex positive potentials (VPP) have reflected early structural encoding of emotional faces and allows us to improve performance and reliability of BCI. The developed multiway (tensor) signal processing tools are promising not only for BCI but also for real time neurofeedback (NF) and EEG hyper-scanning to investigate human emotions, social interactions and brain to brain couplings/interactions. Dynamic tensor analysis allows us to discover meaningful hidden structures of complex brain data and to extract hidden components or features by capturing multi-linear and multi-aspect relationships. The challenge is how to analyze intractably large-scale brain data for such problems as dimensionality reduction, feature extraction, classification, clustering and anomaly detection.