

Artificial Intelligence in *Cancer*

Artif Intell Cancer 2021 February 28; 2(1): 1-6





Artificial Intelligence in Cancer

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Bimonthly Volume 2 Number 1 February 28, 2021

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Bimonthly Volume 2 Number 1 February 28, 2021

ABOUT COVER

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AIMS AND SCOPE

The primary aim of *Artificial Intelligence in Cancer* (AIC, *Artif Intell Cancer*) is to provide scholars and readers from various fields of artificial intelligence in cancer with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

AIC mainly publishes articles reporting research results obtained in the field of artificial intelligence in cancer and covering a wide range of topics, including artificial intelligence in bone oncology, breast cancer, gastrointestinal cancer, genitourinary cancer, gynecological cancer, head and neck cancer, hematologic malignancy, lung cancer, lymphoma and myeloma, pediatric oncology, and urologic oncology.

INDEXING/ABSTRACTING

There is currently no indexing.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Yu-Jie Ma*, Production Department Director: *Xiang Li*, Editorial Office Director: *Jin-Lai Wang*.

NAME OF JOURNAL

Artificial Intelligence in Cancer

ISSN

ISSN 2644-3228 (online)

LAUNCH DATE

June 28, 2020

FREQUENCY

Bimonthly

EDITORS-IN-CHIEF

Massoud Mirshahi, Cedric Coulouarn, Mujib Ullah

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2644-3228/editorialboard.htm>

PUBLICATION DATE

February 28, 2021

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PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

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Cancer recognition of artificial intelligence

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Author contributions: Tanabe S contributed to the writing and editing of the manuscript.

Supported by Japan Agency for Medical Research and Development (AMED), No. JP20ak0101093.

Conflict-of-interest statement: The author has nothing to disclose.

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Manuscript source: Invited manuscript

Specialty type: Oncology

Country/Territory of origin: Japan

Peer-review report's scientific quality classification

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Abstract

The recognition mechanism of artificial intelligence (AI) is an interesting topic in understanding AI neural networks and their application in therapeutics. A number of multilayered neural networks can recognize cancer through deep learning. It would be interesting to think about whether human insights and AI attention are associated with each other or should be translated, which is one of the main points in this editorial. The automatic detection of cancer with computer-aided diagnosis is being applied in the clinic and should be improved with feature mapping in neural networks. The subtypes and stages of cancer, in terms of progression and metastasis, should be classified with AI for optimized therapeutics. The determination of training and test data during learning and selection of appropriate AI models will be essential for therapeutic applications.

Key Words: Artificial intelligence; Cancer; Network; Recognition; Therapeutic application

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Core Tip: Recently, rapidly growing advances in deep learning have enabled cancer recognition by artificial intelligence (AI). Differences between human insights and AI attention may exist, and the interpretation of the modeling would lead to the further progression of AI-oriented therapeutics. The massive ability of AI is useful for cancer recognition.

Citation: Tanabe S. Cancer recognition of artificial intelligence. *Artif Intell Cancer* 2021; 2(1): 1-6

URL: <https://www.wjgnet.com/2644-3228/full/v2/i1/1.htm>

DOI: <https://dx.doi.org/10.35713/aic.v2.i1.1>

Grade A (Excellent): 0
 Grade B (Very good): B
 Grade C (Good): 0
 Grade D (Fair): D
 Grade E (Poor): E

Received: February 12, 2021

Peer-review started: February 12, 2021

First decision: February 19, 2021

Revised: February 28, 2021

Accepted: February 28, 2021

Article in press: February 28, 2021

Published online: February 28, 2021

P-Reviewer: Eccher A, Sun DM

S-Editor: Wang JL

L-Editor: A

P-Editor: Ma YJ



INTRODUCTION

The automatic detection of cancer has already been in practice and will become generalized^[1]. Computer-aided diagnosis (CAD) is growing, and the detection and classification of cancer has been achieved in the identification of the subtypes of leukemia with dense convolutional neural networks and residual convolutional neural networks^[1]. A CAD system with a massive artificial neural network based on the soft tissue technique detected lung cancer in X-ray images^[2]. Infection of *Helicobacter pylori* was predicted with endoscopic images by artificial intelligence (AI)^[3]. A faster region-based convolutional neural network was applied to diagnose the T stage of gastric cancer in enhanced computed tomography (CT) images of gastric cancer^[4]. Digital images of pathological data in cancer have been utilized in cancer diagnosis^[5]. Digital pathology using whole-slide images may contribute into the "remote" assessment^[6]. Automated image analysis and AI applications are increasing in the field of thyroid pathology^[7]. Cancer recognition by AI has become more accurate and precise, accompanied by the progress of neural networks and calculation capacity^[8]. It is time to think of ways to manage teaching AI in cancer therapeutics^[9].

RECOGNITION AND AI APPLICATION

It may be possible that deep learning approaches such as a pretrained biomedical text mining model in natural language corpora apply to the recognition of cancer by AI^[10]. The concept of the adversarial nets framework has advanced the field of recognition^[11]. The recognition mechanism of AI application can be translated to human language *via* the indication of attention^[12]. Future perspectives on cancer recognition in AI may need to focus on the translation of AI and human languages. Liver cancer survival can be predicted with deep learning-based multiomics integration^[13]. Autoencoder architecture was used to integrate RNA sequencing (RNA-Seq) data, DNA methylation data and microRNA sequencing (miRNA-Seq) data of hepatocellular carcinoma in the cancer genome atlas (TCGA) database^[13,14]. Data coordination with TCGA-Assembler was the first step to provide proper data for AI^[14]. A similarity network fusion approach predicted cancer subtypes and survival^[15]. A gene signature for the metastasis-related recurrence of hepatocellular carcinoma was identified with a classifier model consisting of class prediction algorithms, support vector machine (SVM), nearest centroid, 3-nearest neighbor, 1-nearest neighbor, linear discriminant analysis, and compound covariate prediction, to assess the risk of cancer recurrence in the early stage^[16]. Gene mutation sets were identified in liver cancers, including hepatitis-positive samples^[17]. SVM learning is useful for classifying and subtyping cancer^[18]. Tumor pathology, such as subtyping, grading and staging, can be predicted by deep learning-based AI^[19]. Clustering and machine learning methods have been used to classify immunotherapy-responsive triple-negative breast cancer patients^[20]. Progressive non-muscle-invasive bladder cancer and muscle-invasive bladder cancer were classified based on the molecular subtype of immunotherapy responsiveness^[21]. An interesting classifier model called cancer of unknown primary-AI-Dx predicted the tumor primary site and molecular subtype in RNA profiling^[22].

APPLICATION OF AI TECHNOLOGY IN CANCER TREATMENT

Enhanced clinical workflow with AI interventions has been suggested in cancer treatment, which includes AI-guided detection and characterization, AI-guided treatment planning and monitoring, and AI-oriented optimization of the outcome^[23]. AI tools can be used in detection of abnormalities, characterization of suspected lesion, and determination of prognosis or response to the treatment^[23]. AI technology provides robust tumor descriptors in segmentation, diagnosis, staging and imaging genomics^[23]. Radiomic feature extraction from CT images of lung cancer patients was successful to show association with gene expression and prognostic performance^[24]. CT-based radiomic features may predict distant metastasis for lung adenocarcinoma patients^[25]. The approach in evaluation and validation of novel biomarkers incorporates modified criteria in image data into Response Evaluation Criteria in Solid Tumours in cancer therapy^[26]. The results of clinical study in metastatic non-small-cell lung cancer demonstrated that the treatment of pembrolizumab in combination with chemotherapy showed longer overall survival and progression-free survival than chemotherapy alone in the patients without epidermal growth factor receptor or

anaplastic lymphoma kinase mutations^[27]. The AI application in medical fields such as early detection, diagnosis, and treatment of diseases is expanding^[28]. Clinical data is processed with natural language processing and machine learning of AI, which would be important components in clinical decision making on treatment strategy^[28,29] (Figure 1, Table 1).

CONCLUSION

The utilization of AI for cancer recognition is rapidly increasing. The traditional approach may evolve with AI neural networks to create a future field for the planet. The recognition of image data, as well as translated and untranslated transcripts of genes in cancer, will deepen the AI universe.

Table 1 Artificial intelligence application in cancer recognition and treatment

Step	AI application	Recognition/treatment
Early	Natural language processing	Clinical data in human language are translated into AI language to allow AI to recognize cancer
Middle	Machine learning	AI learns the feature of the data to generate the recognition model
Late	Deep learning	AI modeling is further evaluated and modified. Human interprets the results of the AI modeling prediction and decides the clinical treatment strategy

AI: Artificial intelligence.

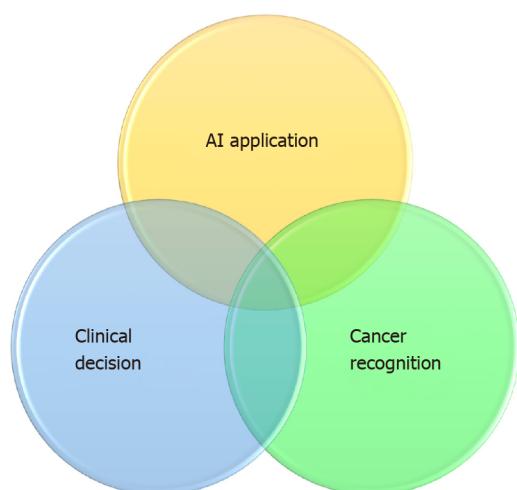


Figure 1 Artificial intelligence application and cancer recognition in clinic. Artificial intelligence is utilized for cancer recognition, which contributes in clinical decision such as the treatment strategy. AI: Artificial intelligence.

ACKNOWLEDGEMENTS

The author would like to acknowledge the colleagues for their support.

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