AI Application and Development in eHealth Field

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What’s e-Health?

Defined by WHO

eHealth is the cost-effective and secure use of information and communications technologies (ICTs) in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research. (Resolution 58/28 of the World Health Assembly, Geneva, 2005)

Defined by JMIR

E-Health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies.
Development Path of eHealth

1.0 Era: Medical Informatization
- Main mode:
  - Institutional Information;
  - Regional Information;
- Main techniques:
  - Computer
  - Broadband network
  - Internet

2.0 Era: Internet Healthcare (Wireless)
- Main mode:
  - Internet hospital
  - mHealth
- Main techniques:
  - Wearable device
  - 4G Network
  - Cloud computing
  - Big data

3.0 Era: Smart Healthcare (Intelligent)
- Main mode:
  - Assisted diagnosis
  - Telemedicine
- Main techniques:
  - Medical robot
  - VR/AR
  - 5G Network
  - Artificial Intelligence
AI processing workflow in eHealth Field

**Processing**

- **Perception**
  - Natural language processing
  - Numerical processing
  - Image Identification

- **Thinking**
  - Training
  - Evaluation
  - Clinical Testing

- **Acting**
  - Triage
  - Diagnosis
  - Drug Development

**Fundament**

- **Input**
  - Images
  - Records
  - Health data

- **Output**
  - Lesion Marking | Analysis Results | Literature | Follow-up suggestion
  - 80% of common disease analysis
  - early screening of malignant tumors
  - occupational disease examinations

**Algorithm**

- **Deep learning**
  - Brain-like intelligence

**Computing**

- **Big data**
  - cloud
  - AI Chip

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AI Applications in eHealth Field

Natural language processing

Intelligent triage

Medical knowledge atlas

decision support system

Disease
Examination
Drug

Medical image recognition

Pathological assistant diagnosis

Drug Development
Application: AI-Intelligent triage

AI-Intelligent triage system

Based on various multimedia tools, the intelligent triage system established a “symptom-disease” model by analyzing and mining massive outpatient data, which can accurately diagnose the patient's initial symptoms and discriminating the subject.
Application: AI-decision support system

Through various multimedia means, AI can promote a decision support system for chronic disease management, providing advice for doctors and guiding patients to a healthy life.
According to lung nodules or lung cancer, the accuracy rate of AI is 50% higher.

AI can detect a slight fracture of 0.01% of the entire X area.
Application: AI-Pathological diagnosis

Pathological diagnosis for cancer

- Demand: Cancer has a certain rate of misdiagnosis;
- Computer Vision: Discovering the details of the human eye that are difficult to detect, and personalize the diagnosis and treatment

Phase A: Processing of large size pathological slices on cell surface

Phase B: Pathological changes recognition

- Cell differentiation ability
- Gland condition
- Mitotic level

Judgement

AI-Pathological diagnosis
Application: AI-Drug Development

Traditional pharmaceutical

- Development cycle: very long, with an average of 10 years
- Development cost: Expensive, average $1.5 billion
- Success rate: low, only one enters clinical phase II of 5000 carbon-containing compounds

Emerging pharmaceutical

- Screen out safer compounds
- Screening for drugs with lower side effects into animal and human trials
- Simulate the absorption, distribution, metabolism, and excretion of drugs
- Examine the relationship between dose-concentration-effects

Computer simulation of drug clinical research
Industrialization of medical AI

**Challenges**

**Data sharing problem:** Standardization of compatibility and interoperability of medical information systems needs to be done.

**Product and service quality:** There is no uniform standard in the quality of smart medical equipment products and health management services.

**Information security and privacy:** It is difficult for user data to obtain effective security protection because of the lacks of unified standards in current industry.
Future prospects of medical AI

**Technology**

With the innovation of deep learning algorithms, open benchmarks and assessment framework for evaluation and validation is necessary for technology development.

**Standard**

Architecture, interfaces, use cases, protocols, algorithms, data formats, interoperability, performance, application, security and protection of personal information, etc.

**Industry**

Promote cross-domain communication of all aspects in the industry to enable top-tier medical research based on big data and AI solutions, promote this new application mode in large scale.

Global platform: facilitate dialogue for all aspects in the industry (AI4H Focus Group in ITU SG 16)
Thank you !