
ITU

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)

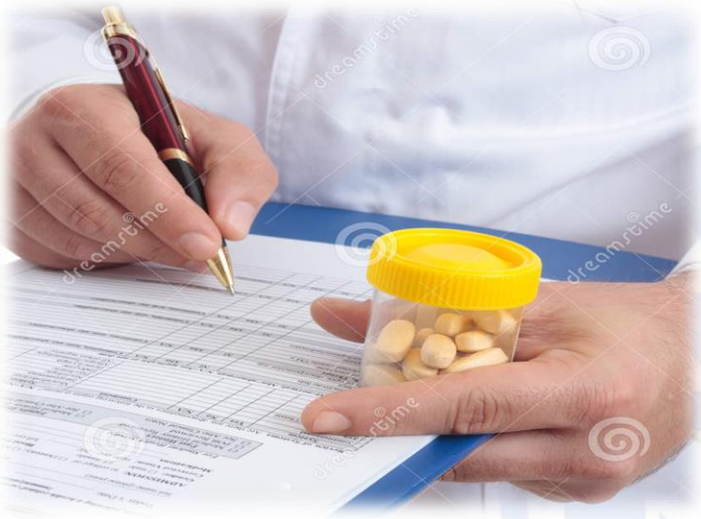
Defined by JMIR

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.

Seeing a doctor

Healthcare management

Medical record



Reading medical image

Development Path of eHealth

Main mode :

- Institutional Information ;
- Regional information ;

Main technique :

- Computer
- Broadband network
- Internet

1.0 Era : Medical Informatization

Main mode :

- Internet hospital
- mHealth

Main technique

- Wearable device
- 4G Network
- Cloud computing
- Big data

2.0 Era : Internet Healthcare

(Wireless)

Main mode :

- Assisted diagnosis
- Telemedicine

Main technique

- Medical robot
- VR/AR
- 5G Network
- **Artificial Intelligence**

3.0 Era : Smart Healthcare

（Intelligent）

AI processing workflow in eHealth Field

Processing

Perception
- Natural language processing
- Numerical processing
- Image Identification

Thinking
- Training
- Evaluation
- Clinical Testing

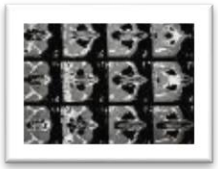
Acting
- Triage
- diagnosis
- Drug Development

Fundament

- data: **Big data**
- computing: **cloud**, **AI Chip**
- algorithm: **Deep learning**, **Brain-like intelligence**

Input

Images



Records

Health data

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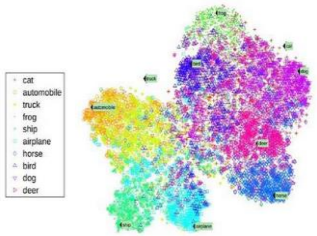
AI Platform

Output

Lesion Marking | Analysis Results |
Literature | Follow-up suggestion

- 80% of common disease analysis
- early screening of malignant tumors
- occupational disease examinations

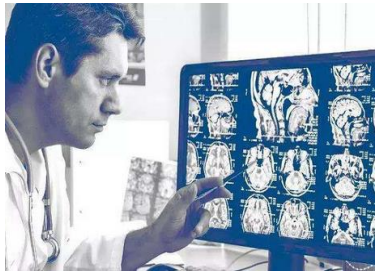
AI Applications in eHealth Field



Natural language processing

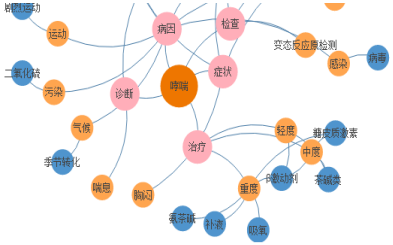
decision support system

Disease | Examination | Drug



Medical image recognition

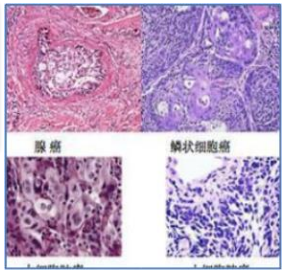
Intelligent triage



Medical knowledge atlas

Drug Development

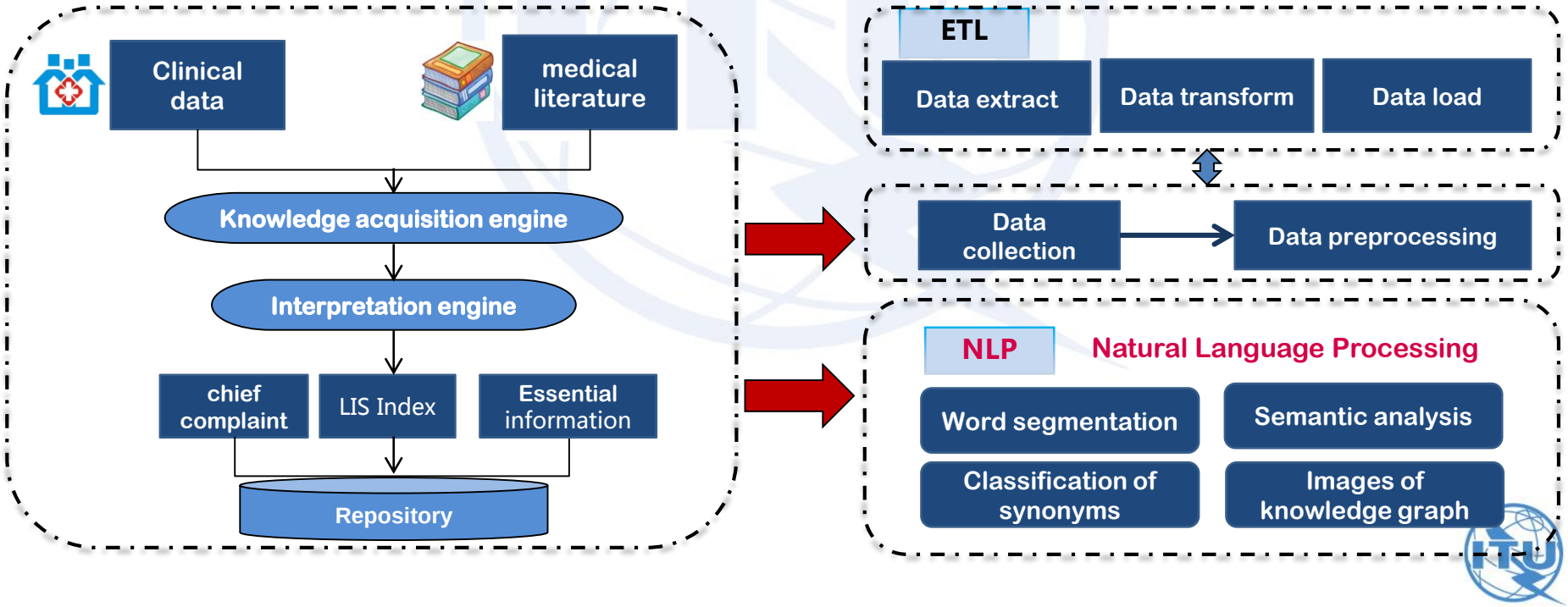
Pathological assistant diagnosis



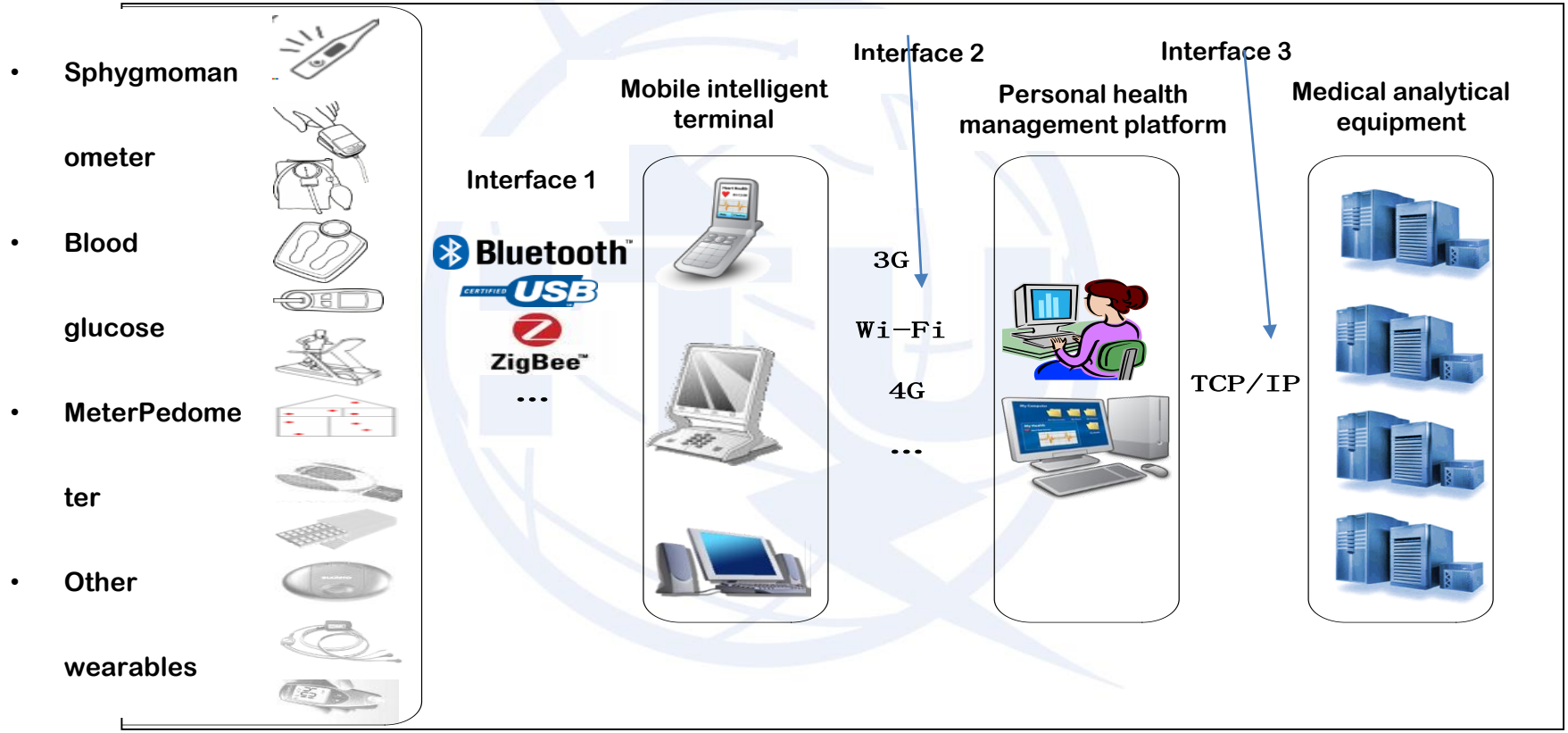
Application: AI-Intelligent triage

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.

Application: AI-Medical image recognition

AI-Medical image recognition: Computer vision & Deep learning

Technologies

Diagnosis effect

Multidimensional image fusion

Phase A

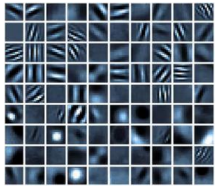


Image Recognition

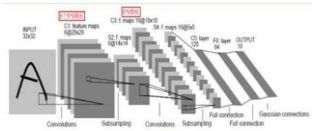
- Image preprocessing → Image separation
- Feature extraction → Matching & judging

CT film

According to lung nodules or lung cancer, the accuracy rate of AI is 50% higher.

Convolutional neural network

Phase B



Deep learning

Case Database + Other medical database → Judgement

X ray film

AI can detect a slight fracture of 0.01% of the entire X area.

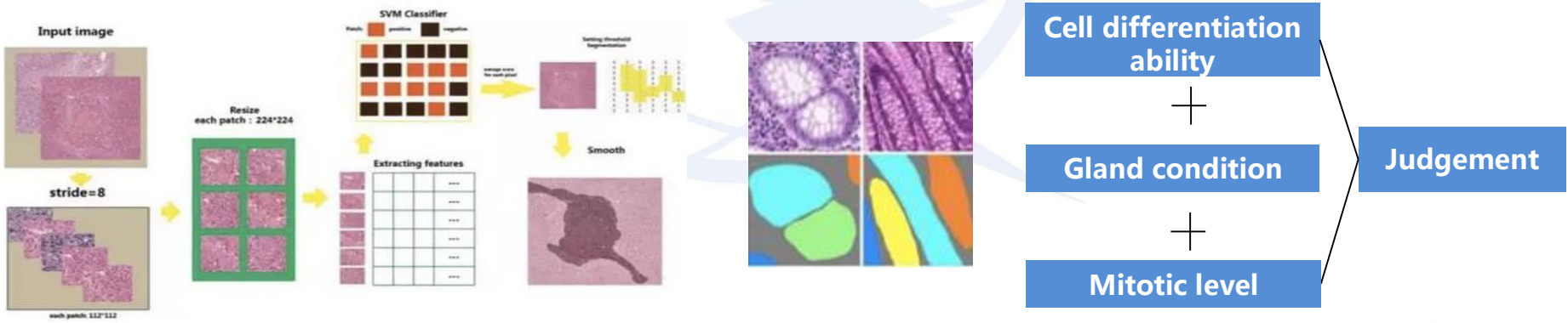
Application: AI-Pathological diagnosis

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



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**

AI

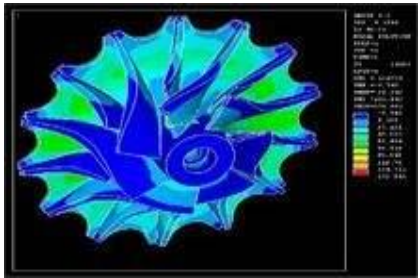
+

CTS

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.

Global medical AI enterprise map

Chinese medical AI enterprise map

Future prospects of medical AI

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

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

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 !