Course Form for PKU Summer School International 2018

Course Title	Health Informatics: Big Data Approach
	健康信息学——大数据方法
Teacher	ZHANG Yanchun
First day of classes	July 14, 2018
Last day of classes	July 20, 2018
Course Credit	2 credits

Course Description

Objective：

Health informatics is a cross discipline combining current information technology with health sciences. Health informatics aims to improve the diagnosis of disease, achieve effective treatment of disease and predict disease through collecting, processing and managing health information.   How to use current computer science, database and information communication technology to improve disease diagnosis, and provide better support for clinical decision making has already become one of issues in current medical community. The purpose of the course is to enable students to be familiar with related topics of health informatics and master the current advanced technique in health informatics. The main content of this course includes health informatics, big medical data, big data analytical methods, Internet of things for healthcare, medical images processing and its application, sensing data streams mining, deep learning for healthcare applications and current research topics in health informatics. This course is appropriate for students and researchers in the computer science or medicine domains for helping them to understand related topics and apply big data approaches for analyzing big medical data.

Pre-requisites /Target audience

Data structures and Algorithms, Probability and Mathematical Statistics, Machine Learning / CS or medical students and researchers

Proceeding of the Course

None

Assignments (essay or other forms)

Exercises

Evaluation Details

Attendance(10%)
Question Answering(40%)
Special Report(50%)

Text Books
1. Siuly Siuly, Yan Li, Yanchun Zhang: **EEG Signal Analysis and Classification - Techniques and Applications. Health Information Science,** Springer 2016.

2. Xiao-Xia Yin, Sillas Hadjiloucas, Yanchun Zhang, **Pattern Classification of Medical Images: Computer Aided Diagnosis,** Springer; June 29, 2017.

Reading Materials
1. **Yanchun Zhang**, Guiqing Yao, Jing He, Lei Wang, Neil R. Smalheiser, Xiao-Xia Yin.Health Information Science.Springer 2014, ISBN 978-3-319-06268-6, 2014
2. Christopher Bishop. Pattern recogonition and Machine learning. Springer, 2007
3. Jiawei Han Mic, Micheline Kamber. Translated by Ming Fan, Xiaofeng Meng. Data Mining: Concepts and Techniques. China Machine Press, 2001.
4. Tom Wbite. Translated by Minqi Zhou. Hadoop Authoritative Guide. Tsinghua University Press, 2008.
5. Jimeng Sun, Chandan K. Reddy. Big Data Analytics for Healthcare. ACM SIGKDD international conference on Knowledge discovery and data mining, 2013
6. Karla Caballero Barajas, Ram Akella. Dynamically Modeling Patient's Health State from Electronic Medical Records: A Time Series Approach. ACM SIGKDD international conference on Knowledge discovery and data mining, 2015.
7. Guangyan Huang, Yanchun Zhang. Online mining abnormal period patterns from multiple medical sensor data streams.World Wide Web 17(4): 569-587 (2014)
8. Jian Ma. An Introduction to the Technology of the Internet of Things. China Machine Press, 2011
9. Robert Tibshirani, Trevor Hastie, Jerome Friedman. Elements of Statistical Learning. Electronic Industry Press, 2004.
10. Akgul, Ceyhun Burak, et al. Content-based image retrieval in radiology: current status and future directions. Journal of Digital Imaging 24.2 (2011): 208-222
11. Peter Schulam, Fredrick Wigley, Suchi Saria. Clustering Longitudinal Clinical Marker Trajectories from Electronic Health Data: Applications to Phenotyping and Endotype Discovery. Association for the Advancement of Artificial Intelligence, 2015
12. Xiang Wang, David Sontag, Fei Wang. Unsupervised Learning of Disease Progression Models. ACM SIGKDD international conference on Knowledge discovery and data mining,2014.

Academic Integrity (If necessary)

CLASS SCHEDULE
(Subject to adjustment)

Session 1：Health Informatics: Big Data Approach	Date: 14/07/2018

【**Description of the Session**】**(purpose, requirements, class and presentations scheduling, etc.)**

In this session, we mainly introduce the basic concepts of health informatics, big medical data, data collection, data processing and data management,

【**Questions**】

【**Readings, Websites or Video Clips**】

【**Assignments for this session (if any)**】

Session 2：Data Mining Methods and Applications	Date: 15/07/2018

【**Description of the Session**】**(purpose, requirements, class and presentations scheduling, etc.)**

In this session, we mainly introduce the basic concepts and methods in data mining, such as association rule mining, decision tree, Bayes and corresponding algorithms such as Apriori, ID3, SVM.

【**Questions**】

【**Readings, Websites or Video Clips**】

【**Assignments for this session (if any)**】

Session 3：Internet of thing for healthcare, sensing data streams mining and early-warning of medical monitoring	Date: 16/07/2018

【**Description of the Session**】**(purpose, requirements, class and presentations scheduling, etc.)**

In this session, we mainly introduce the basic concepts and application of the Internet of things for healthcare, mining sensor data streams and medical anomaly detection, early-warning and prediction.

【**Questions**】

【**Readings, Websites or Video Clips**】

【**Assignments for this session (if any)**】

Session 4： Internet of Things for Health Care: RFID Technology and its Application	Date: 17/07/2018

【**Description of the Session**】(**purpose, requirements, class and presentations scheduling, etc.**)

In this session, We mainly introduce the basic concepts of the Internet of Things, RFID （Radio Frequency Identification,）technology, uncertain data processing and applications of Internet of Things.

【**Questions**】

【**Readings, Websites or Video Clips**】

【**Assignments for this session (if any)**】

Session 5, Deep learning for healthcare applications， medical images processing	Date: 18/07/2018

【**Description of the Session**】(**purpose, requirements, class and presentations scheduling, etc.**)

In this session, we introduce the basic concepts, the existing models and applications of deep learning in healthcare and medical images processing and its applications.

【**Questions**】

【**Readings, Websites or Video Clips**】

【**Assignments for this session (if any)**】

Session 6： Current research topics in health informatics	Date: 19/07/2018

【**Description of the Session**】 (**purpose, requirements, class and presentations scheduling, etc.**)

In this session, we introduce current research hot research topics in health informatics.

【**Questions**】

【**Readings, Websites or Video Clips**】

【**Assignments for this session (if any)**】

Session 7： Project presentation	Date: 20/07/2018

【**Description of the Session**】 (**purpose, requirements, class and presentations scheduling, etc.**)

In this session, we introduce related projects and students also have opportunity to show presentation based on related topics.

【**Questions**】

【**Readings, Websites or Video Clips**】

【**Assignments for this session (if any)**】