人工智能原理 Artificial Intelligence

- 教师介绍 Faculty

Hongguang LI（李宏光）

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Research Fields: Modeling, control and optimization for industrial systems ; Computer based intelligent control for industrial systems

Education

February, 2001---June, 2004:
East China University of Science and Technology
PhD in Control Science and Engineering

September, 1985---June, 1988:
East China University of Science and Technology
MS in Control Science and Engineering

September, 1980---June, 1984:
Hebei University of Science and Technology
BS in Control Science and Engineering

Work Experience

June, 2002--- present: Professor
College of Information Science and Technology, Beijing University of Chemical Technology

February, 2009 --- February, 2010: Visiting scholar
Department of Chemical Engineering, Carnegie Mellon University

October, 1996--- May, 2002: Associate professor
College of Information Science and Technology, Beijing University of Chemical Technology

July, 1987--- September, 1996: Lecturer
College of Information Science and Technology, Beijing University of Chemical Technology

Representative Publications

1. Bo Yang, Jun-jie Li, Chu Qi, **Hong-guang Li***, Ya-dong He. Novel Correlation Analysis of Alarms Based on Block Matching Similarities. *Industrial & Engineering Chemistry Research*, 58, 2019: 9465-9472
2. Yongjian Wang, Jingwen Huang, Chong Su, **Hongguang Li***. Furnace thermal efficiency modeling using an improved convolution neural network based on parameter-adaptive mnemonic enhancement optimization. *Applied Thermal Engineering*, 149, 2019: 332-343
3. Bo Yang, He Li, **Hongguang Li***. Multilayer Process Goose Queue (PGQ) Formation Adjustment Approaches based on Model-free Adaptive Control Strategies. *Transactions of the Institute of Measurement and Control*, 41(1), 2019: 45-54
4. Chong Su, Yue Gao, Bingxu Jiang, **Hongguang Li***. An Affective Cognition based Approach to Multi-attribute Group Decision Making. *Journal of intelligent & Fuzzy Systems*, 35(1), 2018: 11-33
5. Yongjian Wang, **Hongguang Li***. A novel intelligent modeling framework integrating convolutional neural network with an adaptive time-series window and its application to industrial process operational optimization. *Chemometrics and Intelligent Laboratory Systems*, 179, 2018: 64-72
6. Kashada Abubaker, **Li Hongguang***, Koshadah Osama. Analysis approach to identify factors influence digital learning technology adoption and utilization in developing countries. *International Journal of Emerging Technologies in Learning*, 13(2), 2018: 48-59
7. Bo Yang, **Hongguang Li***. A novel convolutional neural network based approach to predictions of process dynamic time delay sequences. *Chemometrics and Intelligent Laboratory Systems*, 174, 2018: 56-61
8. Bo Yang, **Hongguang Li***. A novel dynamic timed fuzzy Petri nets modeling method with applications to industrial processes. *Expert Systems with Applications*, 97, 2018: 276-289
9. Chong Su, Yue Gao, Yuxiao Xie, Yong Xue, Lijun Ge, **Hongguang Li***. A hybrid classifier based on nonlinear-PCA and deep belief networks with applications in dysphagia diagnosis. *Computer Assisted Surgery*, 22(s1), 2017: 135-147
10. Bo Yang, **Hongguang Li***. A similarity elastic window based approach to process dynamic time delay analysis, *Chemometrics and Intelligent Laboratory Systems*, 170, 2017: 13-24
11. Bo Yang, **Hongguang Li***. A dynamic time delay analysis approach for correlated process variables, *Chemical Engineering Research and Design*, 122, 2017:141-150
12. Jia Wang, **Hongguang Li***, Jingwen Huang, Chong Su. Association rules mining based analysis of consequential alarm sequences in chemical processes. *Journal of Loss Prevention in the Process Industries*, 41, 2016:178-185
13. Su Chong, **Li Hongguang***, Huang Jingwen, Bao Xianyu. Generating methods for group affective Preferences with Engineering Applications. *The Arabian Journal for Science and Engineering*, 40(6), 2015: 1539-1551
14. Jia Wang, **Hongguang Li***, Jinwen Huang, Chong Su. A data similarity based analysis to consequential alarms of industrial processes. *Journal of Loss Prevention in the Process Industries*, 35, 2015: 29-34
15. Chong Su, **Hongguang Li***. A novel interactive preferential evolutionary method for

controller tuning in chemical processes. *Chinese Journal of Chemical Engineering*, 23(2), 2015: 398-411
16. Wen Bo, **Li Hongguang***. A PLMF-based decomposition-coordination algorithm for fuzzy linear programming in industrial applications. *The Arabian Journal for Science and Engineering*, 39(10), 2014: 7467-7474
17. Zang Hao, **Li Hongguang***. Optimization of process alarm thresholds: a multi-dimensional kernel density estimation approach. *Process Safety Progress*, 33(3), 2014: 292-298
18. Hao Zang, **Hongguang Li***, Huang Jingwen, Wang Jia. A composite model predictive control strategy for furnaces. *Chinese Journal of Chemical Engineering*, 22(7), 2014: 788-794
19. Bo Wen, **Hongguang Li***. An approach to formulation of FNLP with complex piecewise linear membership functions. *Chinese Journal of Chemical Engineering*, 22(4), 2014: 411-417

- **课程介绍 About Course**

This course will comprehensively introduce the theories and techniques of artificial intelligence. The course covers concepts of AI, problem-solving, logic and reasoning, fuzzy systems, artificial neural networks, rule-based expert systems, machine learning, evolutionary computations, respectively.

Outlines:

1. Introduction (4 hours)
2. Problem-solving (4 hours)
3. Logics with Programming (4 hours)
4. Fuzzy Systems (4 hours)
5. Artificial Neural Networks (4 hours)
6. Rule-based Expert Systems (4 hours)
7. Machine Learning (4 hours)
8. Evolutionary Computations (4 hours)

- **课程大纲 Syllabus**

Instructor: Li Hongguang

Hours: 32

Credits: 2.0

Prerequisites: Computer Technologies

Descriptions: This course will comprehensively introduce the theories and techniques of artificial intelligence. The course covers concepts of AI, problem-solving, logic and reasoning, fuzzy systems, artificial neural networks, rule-based expert systems, machine learning, evolutionary computations, respectively.

References:

[1] Stuart J. Russell, Artificial Intelligence: A modern Approach, Third Edition, 2017

[2] Michael Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, Second Edition, 2005

General Syllabus:

Chapter 1 Introduction (4 hours)

1. Course schedules
2. AI Concepts
3. The history of AI
4. AI Applications

Requirement: Knowing the research and application scope of artificial intelligence

Chapter 2 Problem-solving (4 hours)

1. Knowledge Basics
2. General Problem Solving
3. State-space Graphs & Searches
4. Problem Reductions
5. Intelligent Agents

Requirement: Knowing the fundamentals of problem-solving; mastering search methodologies and technologies

Homework: Exercise practice in searching approaches and knowledge representations

Chapter 3 Logics with Programming (4 hours)

1. Introduction
2. Propositional logic
3. Predicate logic
4. AI programming languages

Requirement: Mastering propositional logic and predicate logic; knowing AI programming languages

Homework: Exercise practice in logics and AI programming

Chapter 4 Fuzzy Systems (4 hours)

1. Introduction
2. Fuzzy sets
3. Fuzzy Relations
4. Fuzzy inference
5. Fuzzy Rule-bases

Requirement: Mastering the fuzzy sets along with the operations; mastering fuzzy rules and fuzzy inference

Homework: Exercise practice in fuzzy rules

Chapter 5 Artificial Neural Networks (4 hours)

1. Introduction
2. Feed-forward networks
3. Feed-back networks

Requirement: Mastering architectures, algorithms and applications of feed-forward and feed-back networks

Homework: Literature reports

Chapter 6 Rule-based Expert Systems (4 hours)

1. Introduction
2. ES architectures

3. Knowledge representations

4. Inference engines

Requirement: Mastering the architectures of expert systems, knowledge representations and reference methodologies

Homework: Literature reports

Chapter 7 Machine Learning (4 hours)

1. Introduction

2. Learning from examples

3. Data mining

Requirement: Knowing the fundamental technologies of machine learning

Homework: Literature reports

Chapter 8 Evolutionary Computations (4 hours)

1. Introduction

2. Genetic Algorithms

3. Detailed GAs

4. Realizations of GAs

5. Extensions of Simple GA

6. GA Application Areas

Requirement: Knowing genetic algorithms

Homework: Realizations of GA

Exams (2 hours)

Grade Points: Final exam 60%, Homework + Seminars 40%.

- 教案 **Teaching Plan**
- 视频 **Video**