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國立勤益科技大學講座推薦表

申請日期：112 年 3 月 24 日

推薦單位 (校長推薦由秘書室辦理)		推薦層級	■系(自薦) □院　　□校長
被推薦(自薦)人姓名	林正堅	教授證號	教字第014102號
專長領域	人工智慧 智慧製造 影像辨識	教授年資起算日	94 年 2 月 1 日
現職	講座教授		
推薦講座種類	■專任講座 □專職講座 □兼職講座 □榮譽講座	校長推薦時擬設置單位	

資格條件（本校講座設置辦法第3條第1項所列8款，請勾選其中之一）：

□一、諾貝爾獎得獎人。

獲獎年度：_______(西元)年，獲獎種類：□物理　□化學　□生理學或醫學　□文學　□和平　。

□二、中央研究院院士或國際知名之國家級院士。

名稱：________________，獲獎年度_________年(西元)　。

□三、曾獲總統科學獎或行政院傑出科技貢獻獎者。

獲獎年度：_________年(民國)。

□四、曾獲得教育部學術獎或國家講座者。

名稱：__________________，獲獎年度_________年(民國)　。

□五、曾獲國際著名大學之講座教授。

大學名稱：_____________，獲聘年度______(西元)。

□六、曾獲得國內外重要學術獎勵者。

獎勵名稱：________________，獲獎年度______年(西元)。

■七、重要國際學會會(院)士。

重要學會名稱：IET Fellow，獲聘年度 2016 (西元)。

■八、在學術上或專業領域上有傑出貢獻或聲望卓著者。

檢附資料：

一、符合上述資格條件一至三款其中之一者：

(一)學經歷(具5年以上合格教授證書)　(二)近5年著作目錄(自行表列)

(三)具體學術成就證明(獲獎證明文件)

二、<u>符合上述資格條件第四款至第八款其中之一者，除上述資料外，請依所推薦講座之種類，檢附下列資料，由推薦單位會辦研究發展處認定，其認定基準見附註。</u>

(一)■專任講座：下列各款擇一提列並勾選

1. ■前一年度以本校名義為第一作者或通訊作者發表 SCI 等級論文12篇以上(其中名列第1作者篇數應達6篇以上)。

2. □產學合作計畫、中央各部會計畫(含有行政管理費)、以本校名義進行之技術移轉金(技轉金績效不得重複認列)任計畫主持人之計畫金額採計，其前一年度計畫金額累計至少應達新台幣1 200萬元以上。

(二)□專職講座：下列各款擇一提列並勾選

1. □前一年度為第一作者或通訊作者發表或接受 SCI 等級論文12篇以上(其中名列第一作者篇數應達6篇以上)。

2. □產學合作計畫、中央各部會計畫(含有行政管理費)、技術移轉金(技轉金績效不得重複認列)任計畫主持人之計畫金額採計，其前一年度計畫金額累計至少應達新台幣1,200萬元以上。

(三)□兼任講座：

□首次推薦：前一年度為第一作者或通訊作者發表或接受 SCI 等級論文6篇以上(其中名列第一作者篇數應達4篇以上)。

□再次推薦：前一年度為第一作者或通訊作者發表或接受 SCI 等級論文6篇以上(其中名列第一作者篇數應達4篇以上且至少須有2篇以本校名義發表)。

履行義務具體說明

(依講座設置辦法第8條規定，續聘時填列，新推薦者免填)

一、聘任期間： 111 年 8 月 1 日至 112年 7 月 31 日，每學年至少一次校內演講，聘期內共辦理__1__次，辦理日期如下：

於112年4月8日完成校內演講，演講題目為「人工智慧於醫學輔助診斷之應用」

二、兼任講座授除上述演講外，並輔導本校特色發展專案計畫，名稱如下：

申請推薦人簽名：林正堅(※由推薦單位主動推薦者，免填)

推薦單位主管	研究發展處
經查被推薦人具講座設置辦法第3條所定積極資格且未具同條所定消極資格，被推薦案件審理期間如經檢舉查證有消極資格情事屬實願撤回推薦，絕無異議。 資訊工程系 主任 黃振坤 電資學院 院長 楊勝智 (由系所推薦時，仍請送所屬學院院長核章)	☑本案依講座設置辦法第3條之積極資格條件認定合符。 □本案認定不合符。原因：________ 校務基金運用 行政組員 范孟育 112. 3. 28 研究發展處 學術發展組長 陳凱榮 112. 3. 28 研究發展處 處長 葉彥良 3/28
人事室	校長核示

☐本案屬講座設置辦法第3條第1項第1款至第3款其中之一，奉核後聘任，並於校教評會列入工作報告備查。 ☑本案屬講座設置辦法第3條第1項第4款至第8款其中之一。 人事室 楊雅筑 0410 1535　人事室主任 鍾家政 0412/1607	☐屬講座設置辦法第3條第1項第1款至第3款其中之一，逕行聘任，並送校教評會備查。 ☑屬講座設置辦法第3條第1項第4款至第8款其中之一，提相關會議審議。 2023.04.14
系教評會 （院、校級推薦，免填）	112年4月18日 111 學年度 2 學期 5 次教評會審議通過(附會議紀錄)。 召集人核章：資訊工程系主任 欉振坤
學院教評會 （校級推薦，免填）	年 月 日 學年度 學期 次教評會審議通過(附會議紀錄)。 召集人核章：
校教評會	年 月 日 學年度 學期 次教評會審議通過(附會議紀錄)。 召集人核章：
校長核定聘任	

附註1. 依本校講座設置辦法第3條第4項、第5項規定如下：

第3條第4項：有關SCI論文與第一作者及通訊作者定義列述如下：

一、SCI等級論文：須發表論文於SSCI、SCI、SCIE、A&HCI收錄 期刊(不含收錄於前述資料庫之研討會論文，如Conference article、Proceedings、Book series、Lecture notes及Editorial Material等)，且以申請表所附資料庫ISI查詢網址中明列之發表日期(須有完整期數與頁碼)為判斷依據，須符合該論文收錄至Web of Science(或該期刊持續收錄至Web of Science)且該期刊可於JCR資料庫檢索。

二、講座教授本人須為論文之第一作者或通訊作者；第一作者，以獨立創作發表或共同合著發表時依論文排版之作者群排序名列最上方、最左方算起第一名認列之；通訊作者則應符合：(一)以名列作者群前三名為限；(二)通訊作者二名以上，應為自左方算起第一位始得認列之。同篇期刊論文僅能由一位教師提出申請，且每篇期刊論文限申請一次，如通訊作者標示不清，請提供接受函或與編輯者通信證明。

第3條第5項：產學合作計畫、中央各部會計畫(含有行政管理費)、以本校名義進行之技術移轉金(技轉金績效不得重複認列)任計畫主持人之計畫，其金額採計不含校補助款，並以結案日期為主(計畫展延期間不予採計)。

附註2. 依校教評會109年7月15日決議，專任講座之被推薦人於109年7月以前(1月1日至7月31日)產出之績效條件，仍按109年7月9日發布實施前之原設置辦法規定採計，109年8月以後之績效，則按現行已發布實施之新規定採計。

10908以後現行規定標準	10907以前採計標準(1090101-0731)

一、專任講座教授：前一年度以本校名義為第一作者或通訊作者發表SCI等級論文十二篇以上(其中名列第一作者篇數應達六篇以上)；<u>或以產學合作計畫、中央各部會計畫(含有行政管理費)及以本校名義進行之技術移轉金(技轉金績效不得重複認列)</u>任計畫主持人<u>或共同主持人</u>之計畫金額採計，其前一年度計畫金額累計至少應達新台幣一千二百萬元以上。	一、專任講座教授：前一年度以本校名義為第一作者或通訊作者發表SCI等級論文十二篇以上(其中名列第一作者篇數應達六篇以上)；如以產學合作計畫(含有行政管理費之中央各部會計畫)任計畫主持人之計畫金額採計，其前一年度計畫金額累計至少應達新台幣一千二百萬元以上。
有關「績效獎勵金」之核算，依下列各款規定，其中SCI論文與第一作者及通訊作者定義，依第三條第四項規定；有關產學合作計畫、中央各部會計畫(含有行政管理費)、以本校名義進行之技術移轉金(技轉金績效不得重複認列)任計畫主持人<u>或共同主持人</u>之計畫之認定，依第三條第五項規定辦理。 一、專任講座教授：依第三條第三項第一款以本校名義所發表之SCI等級論文，列第一作者每篇須給績效獎勵金三萬元，列通訊作者(採計篇數不得超過第一作者篇數)每篇須給績效獎勵金二萬元；<u>若講座教授於論文中作者數超過五名以上或講座教授掛名單位超過三個以上，則該篇論文獎勵金不予採計</u>。如以產學合作計畫、中央各部會計畫(含有行政管理費)及以本校名義進行之技術移轉金(技轉金績效不得重複認列)任計畫主持人<u>或共同主持人</u>之計畫金額採計，其前一年度產學合作計畫累計金額達一千二百萬元者，須給績效獎勵金新台幣三十六萬元，嗣後累計每超過一百萬元增給績效獎勵金三萬元。	有關「績效獎勵金」之核算，依下列各款規定，其中SCI論文與第一作者及通訊作者定義，及有關產學合作計畫(含有行政管理費之中央各部會計畫)任計畫主持人之計畫之認定，依第三條<u>第三項、第四項</u>規定辦理。 一、專任講座教授：依第三條第二項第一款以本校名義所發表之SCI等級論文，列第一作者每篇須給績效獎勵金三萬元，列通訊作者(採計篇數不得超過第一作者篇數)每篇須給績效獎勵金二萬元。以產學合作計畫(含有行政管理費之中央各部會計畫)任主持人之計畫金額採計，其前一年度產學合作計畫累計金額達一千二百萬元者，須給績效獎勵金新台幣三十六萬元，嗣後累計每超過一百萬元增給績效獎勵金三萬元。

(一)學經歷(具5年以上合格教授證書)

教授證書

教字第〇一四一〇二號

姓名：林正堅

身分證字號：M120152220

出生年月日：伍拾貳年壹拾月壹拾壹日

年資起算：玖拾肆年貳月

送審學校：朝陽科技大學

經本部依專科以上學校教
師資格審定辦法審定合於
教授資格　此證

教育部部長 杜正勝

中華民國玖拾肆年柒月壹日

(二)近5年著作目錄(自行表列)

(Cheng-Jian Lin) (*表示通訊作者)

[1] **C.-J. Lin*** and J.-Y. Jhang (2022) "Intelligent Traffic-Monitoring System Based on YOLO and Convolutional Fuzzy Neural Networks" ***IEEE Access***, Vol. 10, Jan. 2022, pp. 14120 – 14133. DOI: 10.1109/ACCESS.2022.3147866. (SCI, IF: 3.476, Rank= 79/164 (COMPUTER SCIENCE, INFORMATION SYSTEMS))

[2] **C.-J. Lin***, X.-Y. Lin, and J.-Y. Jhang (2022) "Malware Classification Using a Taguchi-based Deep Learning Network," ***Sensors and Materials***, Vol. 34, No. 9, Sept. 2022, pp. 3569–3580. (SCI. IF: 0.879, Rank=317/345 (MATERIALS SCIENCE, MULTIDISCIPLINARY))

[3] D.-D. Yuan, M. Li, H.-Y. Li, **C.-J. Lin***, B.-X. Ji (2022) "Wind power prediction method: Support Vector Regression Optimized by Improved Jellyfish Search algorithm," ***Energies***, Sep. 2022, Vol. 15, No. 17, pp. 6404; https://doi.org/10.3390/en15176404. (SCI. IF: 3.252, Rank=80/119 (ENERGY & FUELS))

[4] **C.-J. Lin***, T.-C. Lin, and C.-W. Lin (2022) "Parameter Combination Optimization in Three-Dimensional Convolutional Neural Networks and Transfer Learning for Detecting Alzheimer's Disease from Magnetic Resonance Images" ***Sensors and Materials***, Vol. 34, No. 7(4), Jul. 2022, pp. 2837–2851. (SCI. IF: 0.879, Rank=317/345 (MATERIALS SCIENCE, MULTIDISCIPLINARY))

[5] **C.-J. Lin**, T.-S. Wei, P.-T. Liu, B.-H. Chen, C.-H. Shih* (2022) "Bed-exit Behavior Recognition for Real-time Images within Limited Range," ***Sensors***, Vol. 22, Issue 15, Jul. 2022, pp. 5495; https://doi.org/10.3390/s22155495. (SCI, IF=3.847, Rank= 95/276 (ENGINEERING, ELECTRICAL & ELECTRONIC))

[6] C.-H. Chen, S.-Y. Jeng, and **C.-J. Lin*** (2022) "Using Neural Networks for Tool Wear Prediction in CNC End Milling," ***Sensors and Materials***, Vol. 34, No. 2, Feb. 2022, pp. 803–817. (SCI. IF: 0.879, Rank=317/345 (MATERIALS SCIENCE, MULTIDISCIPLINARY))

[7] J.-Y. Jhang and **C.-J. Lin*** (2022) "Design of an Intelligent Grinding Parameter Selection Assistance System," ***Sensors and Materials***, Vol. 34, No. 2, Feb. 2022, pp. 819–833. (SCI. IF: 0.879, Rank=317/345 (MATERIALS SCIENCE, MULTIDISCIPLINARY))

[8] **C.-J. Lin***, J.-Y. Jhang, and S.-H. Chen (2022) "Tool Wear Prediction Using a Hybrid of Tool Chip Image and Evolutionary Fuzzy Neural Network," ***The International Journal of Advanced Manufacturing Technology***, Vol. 118, January 2022, pp. 921–936. https://doi.org/10.1007/s00170-021-07291-0. (SCI, IF: 3.563, Rank=28/65 (AUTOMATION & CONTROL SYSTEMS))

[9] **C.-J. Lin***, C.-C. Chuang, H.-Y. Lin (2022) "Edge-AI-Based Real-Time Automated License Plate Recognition System," ***Applied Sciences***, Vol. 12, Issue 3, Jan. 2022, pp. 1445; https://doi.org/10.3390/app12031445. (SCI, IF:2.217, Rank: 63/155 (Physics, Applied)).

[10] **C.-J. Lin***, S.-Y. Jeng, and H.-W. Lioa (2021) "A Real-time Vehicle Counting, Speed Estimation, and Classification System Based on Virtual Detection Zone and YOLO," ***Mathematical Problems in Engineering***, Vol. 2021, Nov. 2021, |Article ID 1577614: https://doi.org/10.1155/2021/1577614. (SCI, IF:1.305, Rank=67/91 (ENGINEERING, MULTIDISCIPLINARY))

[11] **C.-J. Lin*** and C.-H. Lin (2021) "Component Placement Process Optimization for Multi-head Surface Mounting Machine Using a Hybrid Algorithm," ***Sensors and Materials***, Vol. 33, No. 10(2), Oct. 2021, pp. 3529–3545. (SCI. IF: 0.879, Rank=317/345 (MATERIALS SCIENCE, MULTIDISCIPLINARY))

[12] **C.-J. Lin*** and C.-H. Lin (2021) "Using an Improved Differential Evolution for Scheduling Optimization of Dual-gantry Multi-head Surface Mount Placement Machine," ***Mathematics***, Vol. 9, Issue 16, August 2021, pp. 2016; https://doi.org/10.3390/math916201613. (SCI, IF:1.105, Rank=28/325 (MATHEMATICS, APPLIED))

[13] **C.-J. Lin***, J.-Y. Jhang, S.-Z. Huang, and M.-Y. Tsai (2021) "Surface Roughness Prediction and Parameter Selection for CNC Grinding Process," ***Sensors and Materials***, Vol. 33, No. 6, June 2021, pp. 1929-1944, https://doi.org/10.18494/SAM.2021.3269. (SCI. IF: 0.879, Rank=317/345 (MATERIALS SCIENCE, MULTIDISCIPLINARY))

[14] **C.-J. Lin***, C.-H. Lin, and S.-H. Wang (2021) "Using Fuzzy Control for Feed Rate Scheduling of Computer Numerical Control Machine Tools," ***Applied Sciences***, Vol. 11, Issue 10, May 2021, pp. 4701; https://doi.org/10.3390/app11104701. (SCI, IF:2.217, Rank: 63/155 Q2(Physics, Applied)).

[15] **C.-J. Lin***, C.-H. Lin, and S.-H. Wang (2021) "Integrated Image Sensor and Light Convolutional Neural Network for Image Classification", ***Mathematical Problems in Engineering***, Vol. 2021, March 2021, Article ID 5573031, https://doi.org/10.1155/2021/5573031. (SCI, IF:1.305, Rank=67/91 (ENGINEERING, MULTIDISCIPLINARY))

[16] C.-H. Chen, **C.-J. Lin***, S.-Y. Jeng, H.-Y. Lin and C.-Y. Yu (2021) "Using Ultrasonic Sensors and a Knowledge-Based Neural Fuzzy Controller for Mobile Robot Navigation Control," ***Electronics***, Vol. 10, Issue 4, Feb. 2021, pp. 466; https://doi.org/10.3390/electronics10040466. (SCI, IF=1.764, Rank=125/266 (ENGINEERING, ELECTRICAL & ELECTRONIC))

[17] B. Zhang, R. Tan, and **C.-J. Lin*** (2021) "Forecasting of E-commerce Transaction

Volume using a Hybrid of Extreme Learning Machine and Improved Moth-flame Optimization Algorithm," ***Applied Intelligence***, Vol. 51, Jan. 2021, pp. 952–965, DOI 10.1007/s10489-020-01840-y. (SCI, IF:5.086, Rank=43/137(COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE))

[18] J.-Y. Jhang, C.-L. Lee, **C.-J. Lin*,** and K.-Y. Young (2020) "Using Self-Clustering Algorithm and Type-2 Fuzzy Controller for Multi-robot Deployment and Navigation in Dynamic Environments," ***Asian Journal of Control***, (First published: 13 January 2020), Vol. 22, Issue 6, Dec. 2020, pp. 2143-2155. (SCI. IF: 2.779, Rank=29/63 (AUTOMATION & CONTROL SYSTEM))

[19] **C.-J. Lin***, J.-Y. Jhang, and K.-Y. Young (2020) "Parameter Selection and Optimization of an Intelligent Ultrasonic-Assisted Grinding System for SiC Ceramics," ***IEEE Access***, Vol. 8, Oct. 2020, pp. 195721-195732, DOI: 10.1109/ACCESS.2020.3033884. (SCI, IF: 3.476, Rank= 79/164 (COMPUTER SCIENCE, INFORMATION SYSTEMS))

[20] **C.-J. Lin***, C.-H. Wu, C.-C. Sun, and C.-H. Lin (2020) "Using Uniform Experimental Design for Optimizing Parameters of Multi-input Convolutional Neural Networks," ***Sensors and Material***s, Vol. 32, No. 10, Oct. 2020 3137–3155. (SCI. IF: 0.879, Rank=317/345 (MATERIALS SCIENCE, MULTIDISCIPLINARY))

[21] **C.-J. Lin*** and S.-Y. Jeng (2020) "Optimization of Deep Learning Network Parameters Using Uniform Experimental Design for Breast Cancer Histopathological Image Classification," ***Diagnostics***, Vol. 10, Issue 9, September 2020, pp. 662; https://doi.org/10.3390/diagnostics10090662. (SCI, IF:3.11, Rank: 39/165(Medicine))

[22] C.-H. Chen, S.-Y. Jeng, and **C.-J. Lin*** (2020) "Mobile Robot Wall-Following Control Using Fuzzy Logic Controller with Improved Differential Search and Reinforcement Learning," ***Mathematics***, Vol. 8, Issue 8, July 2020, pp. 1254; https://doi.org/10.3390/math8081254. (SCI, IF:1.105, Rank=28/325(MATHEMATICS, APPLIED))

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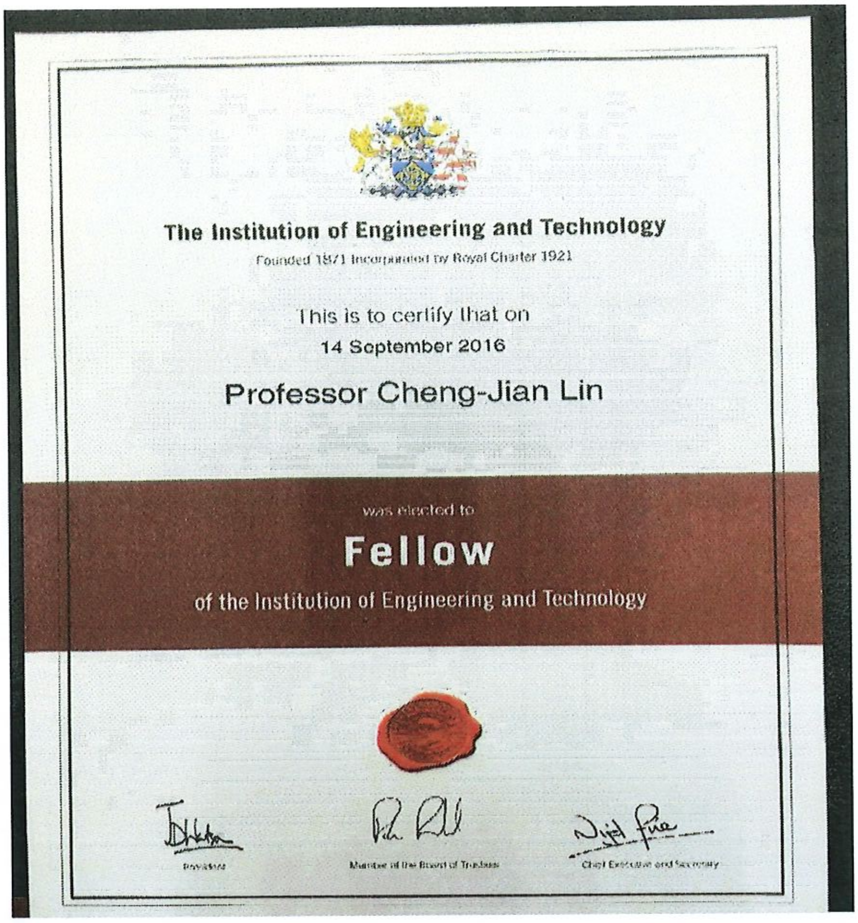

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編號	作者屬性	合著者依序詳列所有作者(通訊請以*1、*2加註)	發表年/月	論文名稱	期刊名稱	卷數 vol	期數 no	頁碼	論文屬性	研發處核符註記	備註
1	■第一作者 ■通訊作者	**C.-J. Lin***, J.-Y. Jhang, and S.-H. Chen	111年 1月	Tool Wear Prediction Using a Hybrid of Tool Chip Image and Evolutionary Fuzzy Neural Network	International Journal of Advanced Manufacturing Technology,	118		921–936	□SSCI □SCI ■SCIE □A&HCI	核符	
2	□第一作者 ■通訊作者	C.-H. Chen, S.-Y. Jeng, and **C.-J. Lin***	111年 1月	Prediction and Analysis of the Surface Roughness in CNC End Milling Using Neural Networks	Applied Sciences	12	1	393; https://doi.org/10.3390/app12010393.	□SSCI □SCI ■SCIE □A&HCI	核符	
3	□第一作者 ■通訊作者	C.-H. Chen, S.-Y. Jeng, and **C.-J. Lin***	111年 1月	Fuzzy Logic Controller for Automating Electrical Conductivity and pH in Hydroponic Cultivation	Applied Sciences	12	1	405; https://doi.org/10.3390/app12010405.	□SSCI □SCI ■SCIE □A&HCI	核符	
4	■第一作者 ■通訊作者	**C.-J. Lin***, Y.-C. Liu, and C.-L. Lee	111年 1月	Automatic Receipt Recognition System Based on Artificial Intelligence	Applied Sciences	12	2	853; https://doi.org/10.3	□SSCI □SCI ■SCIE □A&HCI	核符	

				Technology				390/ app1 2020 853.			
5	□第一作者 ■通訊作者	H.-Y. Lin and **C.-J. Lin***	111 年 1 月	Neural Fuzzy Inference Network Based on Differential Evolution for Nonlinear System Control	Sensors and Materials	34	1	105–120	□SSCI □SCI ■SCIE □A&HCI	核符	
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7	■第一作者 ■通訊作者	**C.-J. Lin***, C.-C. Chuang, H.-Y. Lin	111 年 2 月	Edge-AI-Based Real-Time Automated License Plate Recognition System	Applied Sciences	12	3	1445; https://doi.org/10.3390/app12031445	□SSCI □SCI ■SCIE □A&HCI	核符	
8	■第一作者 ■通訊作者	**C.-J. Lin*** and J.-Y. Jhang	111 年 1 月	Intelligent Traffic-Monitoring System Based on YOLO and Convolutional Fuzzy Neural Networks	IEEE Access	10		14120 – 14133	□SSCI □SCI ■SCIE □A&HCI	核符	

9	□第一作者 ■通訊作者	J.-Y. Jhang and **C.-J. Lin***	111 年 2 月	Design of an Intelligent Grinding Parameter Selection Assistance System,	Sensors and Materials	34	2	819–833.	□SSCI □SCI ■SCIE □A&HCI	核符	
10	□第一作者 ■通訊作者	C.-H. Chen, S.-Y. Jeng, and **C.-J. Lin***	111 年 2 月	Using Neural Networks for Tool Wear Prediction in CNC End Milling	Sensors and Materials	34	2	803–817	□SSCI □SCI ■SCIE □A&HCI	核符	
11	■第一作者 □通訊作者	**C.-J. Lin**, T.-S. Wei, P.-T. Liu, B.-H. Chen, C.-H. Shih*	111 年 8 月	Bed-exit Behavior Recognition for Real-time Images within Limited Range	Sensors	22	15	5495; https://doi.org/10.3390/s22155495	□SSCI □SCI ■SCIE □A&HCI	核符	
12	□第一作者 ■通訊作者	J. Li, J.-Y. Jhang, **C.-J. Lin***, and X.-Q. Lin	111 年 7 月	Arrhythmia Detection Using a Taguchi-based Convolutional Neuro-fuzzy Network	Sensors and Materials	34	7	2853–2867	□SSCI □SCI ■SCIE □A&HCI	核符	
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				Alzheimer's Disease from Magnetic Resonance Images							
14	□第一作者 ■通訊作者	D.-D. Yuan, M. Li, H.-Y. Li, **C.-J. Lin***, B.-X. Ji	111 年 9 月	Wind power prediction method: Support Vector Regression Optimized by Improved Jellyfish Search algorithm	Energies	15	17	6404; https://doi.org/10.3390/en15176404	□SSCI □SCI ■SCIE □A&HCI	核符	
15	□第一作者 ■通訊作者	C.-H. Shih, **C.-J. Lin***, and J.-Y. Jhang	111 年 9 月	Floor Area Detection Using Multiple-Classifier Method Based on Improved Fuzzy Integral,	Sensors and Materials	34	9	3543 – 3560	□SSCI □SCI ■SCIE □A&HCI	核符	
16	■第一作者 ■通訊作者	**C.-J. Lin***, X.-Y. Lin, and J.-Y. Jhang	111 年 9 月	Malware Classification Using a Taguchi-based Deep Learning Network,"	Sensors and Materials	34	9	3569 – 3580	□SSCI □SCI ■SCIE □A&HCI	核符	
17	□第一作者 ■通訊作者	J. Li, **C.-J. Lin***, H. Wang, and J. Kan	111 年 9 月	Equivalent Circuit Modeling and Parameter Identification for Lithium-ion Batteries Based on Improved Barnacle Mating Optimizer,"	Sensors and Materials	34	9	3649 – 3670	□SSCI □SCI ■SCIE □A&HCI	核符	

18	■第一作者 ■通訊作者	**<u>C.-J. Lin*</u>**, M.-S. Huang, and C.-L. Lee	<u>111</u>年 <u>12</u>月	Malware Classification Using Convolutional Fuzzy Neural Networks Based on Feature Fusion and the Taguchi Method	Applied Sciences	12	24	12937; https://doi.org/10.3390/app122412937	□SSCI □SCI ■SCIE □A&HCI	核符	

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Tool Wear Prediction Using a Hybrid of Tool Chip Image and Evolutionary Fuzzy Neural Network

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Abstract

This paper proposed an evolutionary fuzzy neural network (EFNN) for tool wear prediction. The material chip is affected by cutting conditions during the cutting process. The different tool wear status causes different chip color which means the color of material chip can be an important factor for tool wear prediction. In this study, an industrial camera is used to capture chip image and convert it into CIE xy chromaticity features through a color conversion model. In addition, to improve the prediction accuracy, a dynamic group cooperative particle swarm optimization (DGCPSO) is proposed to optimize the EFNN parameters. The cutting time and CIE *xy* value are used as the input of the EFNN, and the output is predicted tool wear value. The experimental results show that the mean absolute percentage error (MAPE) of the proposed EFNN is 2.83% better than other methods.

Keywords: tool wear, chip surface, color calibration, evolutionary fuzzy neural network, particle swarm optimization

I. Introduction

Tool life prediction is one of the most important technologies in the machinery industry. When tool wear occurs, it affects the accuracy of the product, resulting in an increase defect rate of the product and cost. Many researchers have studied the field of tool wear prediction in order to improve the accuracy of prediction [1-2]. The researches on tool wear are extensive such as process parameters, down milling, up milling, cutting force measurement, and sensor signals from machine [3-4]. The approach using signals acquired by sensors is an indirect way that is difficult to reflect the actual cutting situation [5-6]. On the other hand, the measurement of the sensor needs to pass the force flow line. Using the sensor to measure tools of different materials will obtain different signal values. In this way, the established tool wear prediction model is only for one type of tool. Instead of using sensor signals, the chip is directly affected by the cutting force, shape of tool and the heat during the cutting process [7-8]. During the cutting process, the chip tool will directly contact the tool that is more reflective of the current situation of cutting than the method of measuring signals by sensors. Thus, this paper adopts the chip surface color as feature value which is able to correspond to the temperature of cutting procedure as well as reflect the current cutting status to further enhance the

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Article

Prediction and Analysis of the Surface Roughness in CNC End Milling Using Neural Networks

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Abstract: In the metal cutting process of machine tools, the quality of the surface roughness of the product is very important to improve the friction performance, corrosion resistance, and aesthetics of the product. Therefore, low surface roughness is ideal for mechanical cutting. If the surface roughness of the product can be predicted, not only the quality of the product can be improved but also the processing cost can be reduced. In this study a back propagation neural network (BPNN) was proposed to predict the surface roughness of the processed workpiece. ANOVA was used to analyze the influence of milling parameters, such as spindle speed, feed rate, cutting depth, and milling distance. The experimental results show that the root mean square error (RMSE) obtained by using the back propagation neural network is 0.008, which is much smaller than the 0.012 obtained by the traditional linear regression method.

Keywords: surface roughness prediction; back propagation neural network; machine tool; milling; linear regression; ANOVA

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1. Introduction

In metal cutting, the workpiece quality obtained by different machining parameters is also different. In the processing of the spindle, speed is fast and slow, the feed is high and low; in the processing of the chip, there are many factors affecting the final quality of the workpiece [1–4]. The back propagation neural network is used to detect the surface roughness [5]. Bit diameter, cutting speed, feed and processing time are used as inputs to the neural network structure, and the surface roughness is estimated. Design of Experiment (DOE) is a method to arrange the contents of the experiment and analyze the experimental data by using optimal words. This method has a wide range of applications, including production process and equipment parameters, process methods, raw materials, or formula selection, to improve product quality or output [6,7].

There are many ways to predict surface roughness and analyze each machining parameter. At present, the common prediction method is to establish the prediction model by using the method of neural network [8–11]. Zain et al. [12] present the Artificial Neural Network (ANN) model for predicting the surface roughness performance measure in the machining process by considering the ANN as the essential technique for measuring surface roughness. In the prediction of surface roughness, different processing parameters can be used as input to neural networks [13–20]. Zerti et al. [21] used the response surface methodology and the artificial neural networks approach for output modeling. The method of parametric analysis is also useful to analyze by many statistical methods. Surface roughness is not only an output but also an input to predict other processing parameters in

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Prediction and Analysis of the Surface Roughness in CNC End Milling Using Neural Networks

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Abstract: In the metal cutting process of machine tools, the quality of the surface roughness of the product is very important to improve the friction performance, corrosion resistance, and aesthetics of the product. Therefore, low surface roughness is ideal for mechanical cutting. If the surface roughness of the product can be predicted, not only the quality of the product can be improved but also the processing cost can be reduced. In this study a back propagation neural network (BPNN) was proposed to predict the surface roughness of the processed workpiece. ANOVA was used to analyze the influence of milling parameters, such as spindle speed, feed rate, cutting depth, and milling distance. The experimental results show that the root mean square error (RMSE) obtained by using the back propagation neural network is 0.008, which is much smaller than the 0.012 obtained by the traditional linear regression method.

Keywords: surface roughness prediction; back propagation neural network; machine tool; milling; linear regression; ANOVA

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1. Introduction

In metal cutting, the workpiece quality obtained by different machining parameters is also different. In the processing of the spindle, speed is fast and slow, the feed is high and low; in the processing of the chip, there are many factors affecting the final quality of the workpiece [1–4]. The back propagation neural network is used to detect the surface roughness [5]. Bit diameter, cutting speed, feed and processing time are used as inputs to the neural network structure, and the surface roughness is estimated. Design of Experiment (DOE) is a method to arrange the contents of the experiment and analyze the experimental data by using optimal words. This method has a wide range of applications, including production process and equipment parameters, process methods, raw materials, or formula selection, to improve product quality or output [6,7].

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Fuzzy Logic Controller for Automating Electrical Conductivity and pH in Hydroponic Cultivation

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Abstract: This study proposes a fuzzy logic controller for adjusting the electrical conductivity (EC) and pH of the nutrient solution in a hydroponic system. The proposed control system detects the EC and pH of the solution through sensors and adjusts the working time of the solution pump through the fuzzy controller. Specifically, the EC and pH of the nutrient solution are maintained at specific values. A Raspberry Pi3 development board is used in the proposed control system to realize and solve the problem of adjusting the EC and pH of the solution. In the fuzzy controller, the inputs are EC and pH sensors, and the output is the operating time of the pump. Experimental results indicate that the proposed control system can effectively reduce the measurement burden and complex calculations of producers by adjusting nutrient solutions.

Keywords: hydroponics; nutrient solution; fuzzy controller; electrical conductivity; pH

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1. Introduction

Hydroponics technology is used throughout the world. Numerous methods and techniques have been developed. However, most hydroponic nutrient solutions are prepared in a traditional manner, with their electrical conductivity (EC) and pH manually measured by producers, often daily. Adjustments are calculated to meet the needs of the plants. This is a time-consuming and labor-intensive task, and a computational error can result in plant death.

The conditions to be controlled to promote plant growth include ambient temperature, light, water temperature, water oxygen concentration, humidity, water level, EC, pH, and nitrate level [illegible]. These conditions have been closely studied, and manufacturers exhibit equipment designed to address them at international exhibitions. However, the key to stable hydroponic growth remains the balance of the nutrient solution. The solution is formulated with the fertilizer required by the crop for optimal growth until harvest [illegible]. Nutrients must be controlled correctly and effectively.

The composition of the nutrient solution is responsible for half of the success of the solution. Crucial to the suitability of a nutrient solution are its pH and EC [illegible]. Adjustments to pH levels are frequently required, because pH affects photosynthesis. CO2 is readily dissolved in water, and this lowers its pH [illegible]. The pH of a nutrient solution affects plant growth, health, and yield [illegible]. EC is an indicator of the concentration of a nutrient solution (and can also be said to be an indicator of the salt concentration of a solution). The EC value represents the conductivity of ions per volume of solution. Ions can carry positive or negative charges; as EC increases, resistance decreases. Therefore, a higher EC indicates a higher ion concentration in the solution. High EC cases can result in plant death. The pH and EC of a nutrient solution may be reduced due to environmental factors such as high

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Automatic Receipt Recognition System Based on Artificial Intelligence Technology

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Abstract: In this study, an automatic receipt recognition system (ARRS) is developed. First, a receipt is scanned for conversion into a high-resolution image. Receipt characters are automatically placed into two categories according to the receipt characteristics: printed and handwritten characters. Images of receipts with these characters are preprocessed separately. For handwritten characters, template matching and the fixed features of the receipts are used for text positioning, and projection is applied for character segmentation. Finally, a convolutional neural network is used for character recognition. For printed characters, a modified You Only Look Once (version 4) model (YOLOv4-s) executes precise text positioning and character recognition. The proposed YOLOv4-s model reduces downsampling, thereby enhancing small-object recognition. Finally, the system produces recognition results in a tax declaration format, which can upload to a tax declaration system. Experimental results revealed that the recognition accuracy of the proposed system was 80.93% for handwritten characters. Moreover, the YOLOv4-s model had a 99.39% accuracy rate for printed characters; only 33 characters were misjudged. The recognition accuracy of the YOLOv4-s model was higher than that of the traditional YOLOv4 model by 20.57%. Therefore, the proposed ARRS can considerably improve the efficiency of tax declaration, reduce labor costs, and simplify operating procedures.

Keywords: receipt recognition; deep learning; YOLO; handwritten receipt; printed receipt; human machine interface

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1. Introduction

Receipts are vouchers that people obtain through exchanges in daily life. They are also used as the basis for taxation. As the number of transaction receipts between enterprises and individuals increases, the management of receipts becomes more cumbersome. Paper receipts are easily damaged by external environmental impacts, thus rendering their conservation a difficult task. Therefore, the information on a receipt must be manually entered into a computer promptly. For example, for tax declaration, the word track, uniform number, date, and consumption amount on each receipt must be recorded in sequence. Each of such receipts contains a large quantity of data for recording, and the various types of receipts are complex; consequently, they are usually processed manually. Processing personnel classify the receipts and compare the information on each receipt. After checking the information, they record it in the system; this is a time-consuming and labor-intensive task. For tax filing, accounting firms must process tens of thousands of receipts. To save human resources, improve work efficiency, and reduce human errors in tax-filing processes, an automatic system for recognizing receipt information must be developed.

Because manually transferring the receipt information to a computer is a labor-intensive, time-consuming, less efficient, and error-prone process, automatic information recognition systems have been developed to address these limitations. For example, optical

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Neural Fuzzy Inference Network Based on Differential Evolution for Nonlinear System Control

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(Received April 28, 2021; accepted November 12, 2021)

Keywords: temperature-sensing control, differential evolution, symbiotic evolution, neural fuzzy networks, Taguchi method

We propose a neural fuzzy inference network (NFIN) based on a symbiotic Taguchi-based modified differential evolution (STMDE) algorithm for solving nonlinear control problems. The proposed STMDE algorithm not only uses the Taguchi method in its search for the best individual but also employs adjustable parameter control to tune the scaling factor, which can prevent a solution from being trapped at local optima and reinforce the search ability. Moreover, symbiotic evolution (SE) is applied to improve the structure of individual compositions. Unlike the traditional differential evolution (DE) algorithm, SE regards each individual in a population as being the partial solution to a problem instead of the full solution. Compared with traditional DE, the proposed STMDE algorithm reduces the error by 7.95, 4.51, 5.22, and 51.34% in terms of regulation performance, noise rejection ability, robustness to parameter variation of the controlled system, and controller tracking capability, respectively. In addition, our experimental results also indicate that the proposed STMDE algorithm exhibits superior performance to other algorithms used for solving nonlinear temperature-sensing control problems.

1. Introduction

Recently, neural fuzzy inference networks (NFINs) have been commonly used in different fields, such as mobile robotic control,[1] image processing,[2] and fabric pilling classification.[3] The advantage of an NFIN is that it incorporates the reasoning characteristic of a fuzzy inference system with learning ability. NFINs can be divided into two types: Mamdani-type NFINs (M-NFINs)[4,5] and Takagi–Sugeno–Kang (TSK)-type NFINs (T-NFINs).[6–[illegible]] The fuzzy reasoning in an M-NFIN involves the minimum fuzzy implication rule. However, in a T-NFIN, the consequence of each fuzzy rule is a linear function including a combination of input variables. Many studies[7,8] have shown that a T-NFIN achieves superior performance to an M-NFIN in terms of accuracy and network size. In general, the function involving a combination of input variables in a T-NFIN is linear. The traditional T-NFIN does not fully capitalize on the

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Integrated Image Sensor and Deep Learning Network for Fabric Pilling Classification

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Keywords: deep learning network, fabric image, pilling level classification, image sensor

Manufacturers' fabrics are tested for abrasion resistance before leaving the factory, and the fabrics are manually visually graded to ensure that there are no defects. However, manual visual classification consumes a lot of human resources. In addition, long-term visual inspections using the eyes often result in occupational injuries. As a result, the overall efficiency is reduced. To overcome and avoid such situations, we devised an image preprocessing technology and deep learning network for classifying the pilling level of knitted fabrics. In the first step, fabric images are collected using an image optical sensor. The fast Fourier transform (FFT) and Gaussian filter are used for image preprocessing to strengthen the pilling characteristics in the fabric images. In the second step, the characteristics and classification of fabric pilling are automatically captured and identified using a deep learning network. The experimental results show that the average accuracy of the proposed method for pilling level classification is 100%. The proposed method has 0.3% and 2.7% higher average accuracy than deep-principal-component-analysis-based neural networks (DPCANN) and the type-2 fuzzy cerebellar model articulation controller (T2FCMAC), respectively, demonstrating the superiority of the proposed model.

1. Introduction

Modern people are very particular about the quality of fabrics; however, defects in a fabric, such as fabric pilling, may result in the fabric being returned, causing heavy losses to the producer. Among these defects, fabric pilling is a common phenomenon in many fabrics and clothes. It refers to the appearance of bundles or balls of tangled fibers suspended on the fabric surface. Fabric pilling affects not only the aesthetic quality of the fabric but also reduces its reliability and durability. To ensure the sufficient quality of fabrics, fabrics must pass the Société Générale de Surveillance SA (SGS) International Standard for an abrasion resistance test before shipment. The fabric level is judged by manual visual inspection, which may result in some

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Edge-AI-Based Real-Time Automated License Plate Recognition System

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Abstract: The rapid development of urban intelligence has turned intelligent transport system (ITS) development into a primary goal of traffic management. Automated license plate recognition (ALPR) for moving vehicles is a core aspect of ITS. Most ALPR systems send images back to a server for license plate recognition. To reduce delays and bandwidth use during image transmission, this study proposes an edge-AI-based real-time ALPR (ER-ALPR) system, in which an AGX XAVIER embedded system is embedded on the edge of a camera to achieve real-time image input to an AGX edge device and to enable real-time automatic license plate character recognition. To assess license plate characters and styles in a realistic setting, the proposed ER-ALPR system applies the following approaches: (1) image preprocessing; (2) You Only Look Once v4-Tiny (YOLOv4-Tiny) for license plate frame detection; (3) virtual judgment line for determining whether a license plate frame has passed; (4) the proposed modified YOLOv4 (M-YOLOv4) for license plate character recognition; and (5) a logic auxiliary judgment system for improving license plate recognition accuracy. We tested the proposed ER-ALPR system in selected real-life test environments in Taiwan. In experiments, the proposed ER-ALPR system achieved license plate character recognition rates of 97% and 95% in the day and at night, respectively. Through the AGX system, the proposed ER-ALPR system achieves a high recognition rate at a low computational cost.

Keywords: license plate recognition; deep learning; embedded system; You Only Look Once (YOLO)

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1. Introduction

Governments worldwide are rushing to integrate artificial intelligence (AI) technology into urban management. In particular, large cities have many cars on their roads, and vehicle management automated license plate recognition (ALPR) systems have been developed to manage this traffic. Many ALPR systems incorporate information technology in urban settings; these technologies include interval speed tracking [1,2], unmanned parking lot management [3], and roadside illegal traffic enforcement [4].

Existing ALPR systems can be divided into two main categories, namely multi- and single-stage methods. Most existing ALPR systems employ the multi-stage method, which is divided into three main stages as follows: (1) location of license plate, (2) character segmentation, and (3) identification of license plate characters [5]. Each step employs different image processing or machine learning methods. A single-stage method uses deep learning technology to locate and recognize a license plate. In a traditional ALPR system, the multi-stage method uses techniques such as binarization [6], edge detection, character detection, texture detection, color detection, template matching technology, and feature extraction [7]. However, the aforementioned techniques are easily affected by environmental factors such as license plate tilt, blurring, and lighting-related changes [8]. Compared with the multi-stage method, the single-stage method is less affected by the environment and provides better recognition accuracy.

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Intelligent Traffic-Monitoring System Based on YOLO and Convolutional Fuzzy Neural Networks

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[1][illegible]

[2][illegible]

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ABSTRACT With the rapid pace of urbanization, the number of vehicles traveling between cities has increased significantly. Consequently, many traffic-related problems have emerged, such as traffic jams and excessive numbers and types of vehicles. To solve traffic problems, road data collection is important. Therefore, in this paper, we develop an intelligent traffic-monitoring system based on you only look once (YOLO) and a convolutional fuzzy neural network (CFNN), which record traffic volume, and vehicle type information from the road. In this system, YOLO is first used to detect vehicles and is combined with a vehicle-counting method to calculate traffic flow. Then, two effective models (CFNN and Vector-CFNN) and a network mapping fusion method are proposed for vehicle classification. In our experiments, the proposed method achieved an accuracy of 90.45% on the Beijing Institute of Technology public dataset. On the GRAM-RTM data set, the mean average precision and F-measure (F1) of the proposed YOLO-CFNN and YOLO-VCFNN vehicle classification methods are 99%, superior to those of other methods. On actual roads in Taiwan, the proposed YOLO-CFNN and YOLO-VCFNN methods not only have a high F1 score for vehicle classification but also have outstanding accuracy in vehicle counting. In addition, the proposed system can maintain a detection speed of more than 30 frames per second in the AGX embedded platform. Therefore, the proposed intelligent traffic monitoring system is suitable for real-time vehicle classification and counting in the actual environment.

INDEX TERMS Traffic-monitoring system, fuzzy neural network, vehicle classification, feature fusion, deep learning.

I. INTRODUCTION

Road traffic monitoring is an important research topic. By analyzing the types of vehicles and traffic flow on the road, current traffic conditions can be understood, and actionable information can be provided to traffic management agencies. This information can help these agencies to make decisions that improve people's quality of life. For example, on holidays, information regarding the road traffic volume can be used to suggest alternate routes to drivers to divert traffic from congested areas. In addition, if large trucks often use a certain road, roadside warnings can be installed to alert drivers and reduce traffic accidents. Moreover, the type and color of a specific vehicle can be used to identify and track the vehicles of criminals. The abovementioned applications all rely on information collected by a road monitoring system for analysis. Therefore, to obtain information on passing vehicles, many researchers have used different methods to achieve vehicle detection and classification.

Traditional vehicle-detection methods are mainly divided into two types: (1) Static-based methods [1]–[7] that use sliding windows or shape feature comparison methods to generate vehicle prediction frames and verify them based on the information in the prediction frames and (2) methods that use the dynamic features of a moving object [8]–[12] to separate it from the image to obtain the contour of the object. Regarding static-based methods, Mohamed *et al.* [1] proposed a vehicle-detection system that uses Haar-like features to extract vehicle shape features and inputs the extracted features into an artificial neural network to realize vehicle classification. Wen *et al.* [2] also used Haar-like features to extract the edge and structural features of vehicles and input them

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Design of an Intelligent Grinding Parameter Selection Assistance System

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Keywords: grinding, convolutional neural network, surface roughness, Taguchi method, differential evolution

In this study, an intelligent grinding parameter selection assistance system (IGPSAS) that can be used by operators for grinding was designed. In the data collection stage, an ESG-1020 surface grinder and aluminum were used for grinding experiments. The proposed IGPSAS consists of two parts: a Taguchi-based convolutional neural network (TCNN) and a differential evolution algorithm. First, the proposed TCNN was used to establish a surface roughness prediction model. Then, the proposed differential evolution algorithm was used to determine the best processing parameters. To achieve better surface smoothness prediction capabilities in the CNN model, the Taguchi method was used to optimize the parameters of the network model architecture. The effect of each factor was analyzed, and a network with stable parameters was selected for machine processing. The performance of the proposed TCNN was verified experimentally. The mean average percentage error (MAPE) of the proposed TCNN's surface roughness prediction in the measurement of a NewView 8300 optical surface profile was 15.65%. In addition, the differential evolution algorithm was used to select the best processing parameters and perform actual processing. The MAPE of the surface roughness prediction of the proposed IGPSAS was experimentally determined to be 10.97%, demonstrating that the system effectively provides the user with the ability to operate the machine with the parameters set according to the desired processing quality.

1. Introduction

Driven by Industry 4.0, Internet of Things and artificial intelligence applications are being widely employed in industrial manufacturing, and intelligent processing has become vital.[1,2] Surface roughness, which can directly affect product life, is frequently used as a quality evaluation standard. Many scholars have conducted experiments on optimizing process parameters to improve surface roughness, and many manufacturers now provide a user-friendly

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Using Neural Networks for Tool Wear Prediction in Computer Numerical Control End Milling

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Keywords: backpropagation neural network, tool wear prediction, linear regression, machine tool, milling

The precision of the machining tool in computer numerical control (CNC) machining is affected by several factors. For example, cutting parameters considerably affect machining accuracy and tool wear. Tool wear results in the manufacture of substandard products. Therefore, predicting tool wear is crucial in CNC machining. In this study, we proposed a backpropagation neural network (BPNN) to predict tool wear. In machine learning, backpropagation is a widely used algorithm for training artificial neural networks. The proposed BPNN considered the variation of tool wear with different cutting parameters, such as the spindle speed, feed, cutting depth, and cutting time. The experimental results revealed that the root mean square error of the BPNN prediction model was less than that of the linear regression prediction model. Furthermore, the proposed model achieved a coefficient of determination (R^2) of 0.9964, which indicated that the BPNN model can accurately predict tool wear.

1. Introduction

Several measurement techniques have been used to indirectly predict tool wear.[1] For decades, piezoelectric sensors and dynamometers have been widely used to collect data and monitor cutting processes. Previous studies on output response methods have mainly employed dynamometers, accelerometers, acoustic emission, and current sensors. Currently, tool wear prediction is performed using regression analysis, neural networks (NNs), and other methods. Among these, NNs are being increasingly adopted in machine tool wear prediction. Advanced sensors, such as current sensors, dynamometers, infrared sensors, and ultrasonic sensors, can help monitor machine tool processing parameters such as feed rate, spindle speed, and cutting depth.[2–8]

Linear regression is a regression analysis technique that models the relationship between one or more independent and dependent variables by using the least squares function (also known as

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sensors

Article

Bed-Exit Behavior Recognition for Real-Time Images within Limited Range

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Abstract: In the context of behavior recognition, the emerging bed-exit monitoring system demands a rapid deployment in the ward to support mobility and personalization. Mobility means the system can be installed and removed as required without construction; personalization indicates human body tracking is limited to the bed region so that only the target is monitored. To satisfy the above-mentioned requirements, the behavior recognition system aims to: (1) operate in a small-size device, typically an embedded system; (2) process a series of images with narrow fields of view (NFV) to detect bed-related behaviors. In general, wide-range images are preferred to obtain a good recognition performance for diverse behaviors, while NFV images are used with abrupt activities and therefore fit single-purpose applications. This paper develops an NFV-based behavior recognition system with low complexity to realize a bed-exit monitoring application on embedded systems. To achieve effectiveness and low complexity, a queueing-based behavior classification is proposed to keep memories of object tracking information and a specific behavior can be identified from continuous object movement. The experimental results show that the developed system can recognize three bed behaviors, namely off bed, on bed and return, for NFV images with accuracy rates of 95~100%.

Keywords: behavior recognition; images; bed exit

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1. Introduction

Human behavior recognition is a process consisting of object detection and tracking and has become the core component of intelligent applications such as security surveillance, bed-exit monitoring, and fall detection [1]. According to the techniques used to identify the target object, object detection approaches can be divided into two categories: sensor and image. In sensor-based techniques, the object can be detected by means of either fixed or mobile modules. Fixed modules, such as infrared (IR) sensors [2,3], hybrid IR and pressure sensors [4], and radio frequency identification (RFID) [5,6], detect the object in a limited range. On the other hand, mobile modules based on accelerometers and gyroscopes can be integrated into wearables, which are attached to the detected objects [7,8]. Image-based techniques are typically combined with deep learning model to detect a target object after a data training process. The common source of images can be video sequences [9,10], IR thermal images [11], and integrated images from RGB and IR cameras [12,13]. Compared with sensor-based techniques, image-based techniques can better preserve the spatial information for object detection and have the potential to achieve multi-object detection.

Based on deep learning techniques, three main stages are included in an image-based behavior recognition process, namely object detection, object tracking, and behavior recognition. Three stages can be associated with their respective deep learning techniques. In the object detection stage, a convolution-based model is generally used to extract features of the target object from an image. Popular object detection models include You Only

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S & M 3010

Arrhythmia Detection Using a Taguchi-based Convolutional Neuro-fuzzy Network

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Keywords: arrhythmia detection, convolutional neural network, electrocardiography, neuro-fuzzy network, Taguchi method

With improvements in the quality of life, people have paid increased attention to their health. According to the American Heart Association, cardiovascular disease was one of the leading causes of death globally as of 2016. Medical experts estimate that the worldwide annual number of people dying from cardiovascular disease will reach 23.6 million by 2030. Detecting heart arrhythmias effectively and quickly is critical for preventing cardiovascular disease. In this paper, a one-dimensional Taguchi-based convolutional neuro-fuzzy network (1D-TCNFN) for detecting arrhythmia in electrocardiograms (ECGs) is proposed. The proposed 1D-TCNFN adopts neuro-fuzzy instead of conventionally connected layers to reduce the number of learned parameters in the network. Four feature fusion methods, namely, global average pooling, global max pooling, channel average pooling, and channel max pooling, are employed in the 1D-TCNFN. For an increased detection accuracy, the Taguchi method was used to optimize the network architecture of the proposed 1D-TCNFN. In the experiments, the open Massachusetts Institute of Technology–Beth Israel Hospital (MIT-BIH) Arrhythmia Database was adopted to verify the performance of the proposed method for detecting 17 different arrhythmia signals. The proposed 1D-TCNFN exhibited a detection accuracy of 93.95% for the MIT-BIH Arrhythmia Database.

1. Introduction

Arrhythmia is a common cardiovascular condition that is caused by abnormal electrical conduction in the heart. The most common clinical symptoms include palpitations, chest tightness, and chest pain.(1) According to the American Heart Association, as of 2016, cardiovascular disease caused 17.3 million deaths annually worldwide.(2) Electrocardiogram (ECG) analysis is typically used to determine the type of arrhythmia. Electrocardiogram signal measurement is a simple, fast, safe, and noninvasive procedure that can collect a large amount of

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Parameter Combination Optimization in Three-Dimensional Convolutional Neural Networks and Transfer Learning for Detecting Alzheimer's Disease from Magnetic Resonance Images

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Keywords: Alzheimer's disease, magnetic resonance imaging, three-dimensional convolutional neural networks, Taguchi experimental design, transfer learning

Alzheimer's disease (AD) destroys neurons in the brain, engendering brain atrophy and severely compromising brain function. Magnetic resonance imaging (MRI) is widely applied to analyze brain degeneration. AD is typically detected by examining specialist-selected features of two-dimensional images or region-of-interest features identified by trained classifiers. We developed a Taguchi-based three-dimensional convolutional neural network (T-3D-CNN) model for detecting AD in magnetic resonance images. CNN parameters are generally obtained through trial-and-error methods. To stabilize the CNN diagnostic accuracy, the Taguchi method was employed for parameter combination optimization. Obtaining patient data is difficult; thus, we performed transfer learning to verify the proposed T-3D-CNN model's effectiveness by using only a small quantity of patient data from various databases. The experimental results confirmed that the T-3D-CNN model detected AD from images in the Open Access Series of Imaging Studies (OASIS)-2 data set with an accuracy of 99.46%, which was 2.06 percentage points higher than that of the original 3D-CNN. After a complete investigation of the OASIS-2 data set, we selected 10, 30, 60, 80, and 100% of the data from the OASIS-1 data set to verify the T-3D-CNN and updated the original network weights through transfer learning; the average accuracies were 81.31, 92.88, 95.85, 100, and 100%, respectively.

1. Introduction

Alzheimer's disease (AD) is a major public health concern worldwide. This neurodegenerative condition destroys brain neurons and induces brain degeneration that causes dementia in adults aged over 65 years. Patients with AD experience emotional instability, loss of short-term memory, loss of speech, and loss of the ability to perform some activities of daily living. Approximately 44 million people worldwide have been tested for AD, and this number may increase to 131.5 million by 2050. According to the results of the epidemiological survey of

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Wind Power Prediction Method: Support Vector Regression Optimized by Improved Jellyfish Search Algorithm

Dong-Dong Yuan [1], Ming Li [2], Heng-Yi Li [2,3], Cheng-Jian Lin [4,*] and Bing-Xiang Ji [3,5]

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Abstract: To address the problems of grid connection and power dispatching caused by non-stationary wind power output, an improved Jellyfish Search algorithm optimization support vector regression (IJS-SVR) model was proposed in this study to achieve high-precision wind power prediction. The random selection of internal parameters of SVR model will affect its performance. In this study, the Jellyfish Search (JS) algorithm was selected and improved to propose an Improved Jellyfish Search (IJS) algorithm. Compared with the comparative algorithms, the optimized values of IJS algorithm are closer to 0. It exhibits good convergence ability, search stability, and optimization-seeking ability, as well as being more suitable for solving optimization problems. Therefore, IJS was used to optimize SVR, and the prediction model of IJS-SVR was established. Different weather and seasons affect wind power and model prediction accuracy. The wind power in spring and winter was selected for model prediction verification in this study. Compared with other methods, the IJS-SVR model proposed in this study could achieve better prediction results than other models in both seasons, and its prediction performance was better, which could improve the prediction accuracy of wind power. This study provides a more economical and effective method of wind power to solve its uncertainties and can be used as a reference for grid power generation planning and power system economic dispatch.

Keywords: wind power prediction; improved jellyfish search algorithm; support vector regression model

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1. Introduction

With the increase of global energy demand and the shortage of fossil energy supply, the greenhouse effect and environmental pollution problems caused by fossil energy have attracted much attention. Most countries pay more attention to developing renewable energy as an important part of national development [1]. Wind energy, as an important part of renewable energy, has attracted much attention because of its advantages of green environmental protection, low cost, and renewable energy [2,3]. However, wind power output is affected by discontinuous natural wind with stochastic non-smooth characteristics [4]. This feature leads to increase difficulty in grid integration and the power dispatch of wind power, which can bring challenges to the power system [5]. Accurately prediction of the power fluctuation to the next stage through wind power prediction technology is an economical and effective method to solve the uncertainties of wind power, which can provide important reference information for grid power generation planning as well as economic dispatch of the power system [6,7].

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S & M 3059

Floor Area Detection by Multiple-classifier Method Based on Improved Fuzzy Integral

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Keywords: image segmentation, fuzzy integral (FI), artificial bee colony (ABC), fully convolutional network (FCN), area contour detection (ACD).

The areas of application of mobile robots are becoming increasingly extensive. Most mobile robots use visual images to obtain information about the surrounding environment, including information about the floor area that can be traversed or obstacles to be avoided. In this study, we propose a multiple-classifier method based on an improved fuzzy integral (IFI) for floor area detection using charge-coupled device sensors. The multiple classifiers include deep learning networks (DLNs) and an area contour detection (ACD) algorithm. The IFI in the proposed method is different from the traditional fuzzy integral in that its fuzzy density value is optimized using the artificial bee colony algorithm. The proposed method takes the outputs of several classifiers and the ACD algorithm as the input. The IFI is used to evaluate each classifier to leverage its advantages for the proposed method. Finally, the classification results are calculated to achieve accurate floor area detection. To verify the performance of the proposed method, we used the public MIT scene dataset and images of various indoor environments as the study dataset, with 200, 45, and 48 images used as training data, verification data, and test data, respectively. The experimental results revealed that the DLN–ACD–IFI combination achieved an average floor area detection accuracy of 97.8%, thus improving the overall recognition rate.

1. Introduction

In recent years, mobile robots have been widely used in different fields. In some mobile robot applications, visual images from charge-coupled device (CCD) sensors have been used to obtain information about the surrounding environment, thus enabling the mobile robot to avoid obstacles and move autonomously. Accordingly, image segmentation is a key technology that enables a mobile robot system to automatically segment object areas from an image and identify objects.

Numerous traditional image-sensing-based segmentation techniques have been proposed. For example, Chun *et al.*[1] proposed a novel method for calculating depth information from a single

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Malware Classification Using a Taguchi-based Deep Learning Network

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Keywords: malware, convolutional neural network, Taguchi method, orthogonal table

Malware is designed to damage computer systems, and malicious targets have proliferated recently. This rising use of malware requires an efficient malware detection method. Because new malware is constantly being created and old malware is constantly updated, manually updating a signature database with newly generated malware samples is increasingly challenging. To reduce the cost of feature engineering and the requirement for domain expert knowledge, researchers have used image-sensing methods to solve the malware family classification problem. In this study, a Taguchi-based deep learning network (TDLN) with optimization of the parameter combination is proposed for malware family classification. A total of 36 experiments were conducted and nine influential factors with various levels were selected for determining the optimal parameters of the proposed TDLN. The experimental results indicate that the accuracy, precision, and recall of malware family classification when using the proposed TDLN are 98.71, 96.90, and 96.78%, respectively. Moreover, the accuracy, precision, and recall of the proposed TDLN are 2.03, 5.59, and 6.09% higher, respectively, than those of the original deep learning network for the Malimg data set.

1. Introduction

Malicious software is generally disseminated through networks and portable storage devices and causes confidential data leakage, system damage, data loss due to unexpected failures, and information security problems. Because of the rapid development of technology, the use of malware for illegal purposes has increased considerably. For example, the Kaspersky Lab detected 69277289 types of malware in 2016 (including scripts and executable files). McAfee Labs stated in a report that in the past 4 years, the number of malicious software attacks has increased by 22% and has reached 670 million. Despite the rapid increase in malicious software,

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Equivalent Circuit Modeling and Parameter Identification for Lithium-ion Batteries Based on Improved Barnacle Mating Optimizer

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Keywords: evolutionary computation, parameter identification, barnacle mating optimizer, lithium-ion battery, electric vehicles

To address the current problems of accuracy and reliability of the equivalent circuit models for lithium-ion batteries and sensors, in this study we propose an improved barnacle mating optimizer (IBMO) to accurately identify parameters. First, an improved second-order RC model (ISO RC) is derived by segmenting the battery hysteresis voltage and introducing it into the second-order RC model (SO RC model) as a controlled source, which better reflects the dynamic effects of the battery than the SO RC model. Second, the tent chaos mapping, cosine control factor, and Levy flight strategy are introduced to enhance the convergence performance of the IBMO. Its convergence performance is verified by comparison with other existing intelligent algorithms using five single-peak and four multipeak test functions. Finally, the IBMO-ISO RC model is established by using the IBMO as the identification strategy of the ISO RC model in the simulation of two real operating conditions of lithium-ion batteries. The root mean square error of the model under the two operating conditions is only 0.0431 and 0.0483, and the mean absolute percentage error is only 0.38 and 0.56%, outperforming other existing models. The IBMO proposed in this study enables higher model recognition accuracy, making it highly convenient for lithium-ion battery and sensor-related research.

1. Introduction

Behind the increasing application of lithium-ion batteries (LIBs) and sensors, the related technologies based on their application have also received increasing attention from many researchers.(1) Li *et al.*(2) argued that battery and sensor modeling technology can simulate static and dynamic behaviors and is a fundamental technology for conducting sensor- and LIB-related research. Zhuo *et al.*(3) claimed that accurate models can simulate the actual operating conditions

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Article

Malware Classification Using Convolutional Fuzzy Neural Networks Based on Feature Fusion and the Taguchi Method

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Abstract: The applications of computer networks are increasingly extensive, and networks can be remotely controlled and monitored. Cyber hackers can exploit vulnerabilities and steal crucial data or conduct remote surveillance through malicious programs. The frequency of malware attacks is increasing, and malicious programs are constantly being updated. Therefore, more effective malware detection techniques are being developed. In this paper, a convolutional fuzzy neural network (CFNN) based on feature fusion and the Taguchi method is proposed for malware image classification; this network is referred to as FT-CFNN. Four fusion methods are proposed for the FT-CFNN, namely global max pooling fusion, global average pooling fusion, channel global max pooling fusion, and channel global average pooling fusion. Data are fed into this network architecture and then passed through two convolutional layers and two max pooling layers. The feature fusion layer is used to reduce the feature size and integrate the network information. Finally, a fuzzy neural network is used for classification. In addition, the Taguchi method is used to determine optimal parameter combinations to improve classification accuracy. This study used the Malimg dataset to evaluate the accuracy of the proposed classification method. The accuracy values exhibited by the proposed FT-CFNN, proposed CFNN, and original LeNet model in malware family classification were 98.61%, 98.13%, and 96.68%, respectively.

Keywords: malware image classification; convolutional neural network; fuzzy theory; Taguchi method; feature fusion

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1. Introduction

With the rapid development of information technology, the progress of network technology has made our lives more convenient. However, malware can penetrate information technology devices through loopholes in program security, which can cause system damage, limited network bandwidth, and the theft of crucial files. The frequency of malware attacks has been increasing. For example, antivirus company Kaspersky Lab detected 69,277,289 unique malicious objects in 2016 [1]. McAfee Labs reported that 670 million malware samples were detected in 2017 [2]. According to Malwarebytes' annual malware report, more than 50 million cyber threats were detected separately in 2018 and 2019 [3,4]. The 2020 Trend Micro Cybersecurity Report stated that 119,000 cyberattacks occur every minute [5]. Because of the wide variety of malware and the increasing number of malware attacks, various malware classification methods have been proposed by researchers.

Malware analysis can be broadly categorized into static analysis and dynamic analysis. Static analysis involves parsing and extracting the features of malicious programs without executing code. Common static analysis is a signature-based method that involves searching a signature database for matching signatures to determine whether the program is malware. A local signature database is required to store signatures extracted from malware by experts. The signature database must be regularly manually updated to effectively

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