新加坡南洋理工大学

人工智能实验室科研论文项目
（线下）

哈尔滨工业大学（威海）

目录

人工智能实验室科研论文项目

(南洋理工大学科研结业证书、推荐信、等级评定报告、国际论文）

一、 项目概览

项目主题：	人工智能实验室科研论文项目
项目背景：	本科研项目主要面向对人工智能等领域感兴趣的学生，科研内容包括但不限于机器学习、深度学习、神经网络、图像处理及识别等人工智能领域前沿技术。依托新加坡南洋理工大学商业人工智能实验室（NTU Business AI Lab），学员将以小组形式，跟随实验室主任进行相关课题的科研，在导师的指导下，完成科研报告，并形成符合 IEEE 国际规范的科研论文。
项目历史：	本科研项目自启动以来，已成功举办 18 期，共 1000 余位优秀大学生参与并受益。往期学员来自武汉大学、北京邮电大学、重庆邮电大学等高校。往期学员的优秀科研论文、科研海报，多次成功发表在南洋理工大学官网、IEEE 等国际会议期刊。
南洋理工大学简介：	南洋理工大学（NTU），是新加坡的一所世界著名研究型大学。NTU 是环太平洋大学联盟、新工科教育国际联盟成员，全球高校人工智能学术联盟创始成员、AACSB 认证成员、国际事务专业学院协会（APSIA）成员，也是国际科技大学联盟的发起成员。作为新加坡的一所科研密集型大学，其在纳米材料、生物材料、功能性陶瓷和高分子材料等许多领域的研究享有世界

盛名，为工科和商科并重的综合性大学。

2023 QS 世界大学排名第 19 位。



二、 项目介绍

项目周期：	8天
课程时间	2023年暑假
科研实训模式：	线下实地科研实训（科研实训、机构参访、人文考察相结合）
科研项目工具：	Python 编程语言、Rstudio，Weka，Jupyter，Colab，Anaconda

项目收获：

完成科研项目的学员，将有以下可预期的收获：

1. 南洋理工大学主办部门商学院商业人工智能实验室官方颁发的**结业证书**
2. 南洋理工大学任课导师签发的**导师推荐信**
3. 南洋理工大学主办部门商学院商业人工智能实验室官方颁发的**等级评定报告（不含学分）**
4. 南洋理工大学主办部门商学院商业人工智能实验室官方颁发的**优秀学员证明信**
5. 一篇符合 IEEE 国际标准的科研论文

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | Business AI Lab

This is to certify that

BOWEN ZHU

has successfully completed the

Artificial Intelligence Internship Programme

from 23 January to 28 February 2021

Dr. Teoh Teik Toe

Associate Director, NTU Business AI Lab

Nanyang Technological University

结业证书（样本）

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Reg. No. 200604393R

23 March 2021,

COMMENDATION LETTER

To whom it may concern,

It is my great pleasure to confirm that CHAOHUA SHI has participated in the Artificial Intelligence Internship Programme in NTU Business AI Lab from 23 January to 28 February 2021.

During the programme, CHAOHUA SHI was a member of the team who won the final project presentation. The winning team succeeded in presenting creative and useful ideas and insights on the project and CHAOHUA SHI especially emerged as a contributing member of the winning team in the project competition which took place at the end of the programme.

We have previously worked with many international students from all over the world, and CHAOHUA SHI was amongst the top students within their group, with the potential of achieving great things as student or entrepreneur in the future.

We wish this student the best for the future.

Yours faithfully,

Prof. Teoh Teik Toe
+65 97905202
ttteoh@ntu.edu.sg
Associate Director, NTU Business AI Lab
Nanyang Technological University

推荐信（样本）

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Reg. No. 200604393R

Annex A

Programme Name: Artificial Intelligence Internship Programme

Programme Date: 23 January to 28 February 2021

Hosted Online by: Nanyang Technological University, Business AI Lab

BOWEN ZHU has successfully completed the Artificial Intelligence Internship Programme which comprised a series of discussions, assignments as well as a group project.

Overall Grade: Distinction

A fail *is given when the participant has not met the programme's objectives. The participant missed to attend all courses, to show enough effort and achievement in both academic course and assignments.*

A pass *is given when the participant has met the learning objectives and reached the expected outcomes. The participant has completed the whole programme, submitted assignments in due time.*

A merit *is awarded when the participant has fully participated in the programme, both in academic course and assignments. The participant has taken part in a team project and has contributed to the presentation of the project.*

A distinction *is awarded when a participant has taken a leading role in the course, has been interactive and has demonstrated a high capacity to understand and converse in English. This is a special award for outstanding performance and an encouragement to others.*

This programme was delivered in English online with 22 academic hours.

Nanyang Business School
50 Nanyang Avenue, Block S3, Singapore 639798, www.ntu.edu.sg

等级评定报告（样本）

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Reg. No. 200604393R

To whom it may concern,

I am writing this letter of recommendation for the quality of work displayed by BOWEN ZHU during his internship in NTU Business AI Lab. He has helped to develop some AI models based on a dataset given. In addition, he has also compared numerous models using WEKA. I am deeply impressed by his work attitude and quality.

BOWEN ZHU has displayed excellent communication skills throughout my interactions with him. In addition, he is thoroughly organized, reliable and possess high domain knowledge in the field of Artificial Intelligence (AI). He is bright, hardworking and has a positive attitude that makes him a pleasure to work with.

BOWEN ZHU is able to complete the work assigned to him independently. He is also able to follow through the jobs assigned to him and complete them with high quality without any form of delay. He is highly flexible and is willing to work on any projects assigned to him.

BOWEN ZHU would be a tremendous asset for any organization or further study at higher degree and I highly recommend him. If you have any further questions, please do not hesitate to contact me.

Prof. Teoh Teik Toe
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Associate Director, NTU Business AI Lab
Nanyang Technological University

Nanyang Business School
50 Nanyang Avenue, Block S3, Singapore 639798, www.ntu.edu.sg

优秀学员证明（样本）

科研专业课及辅导课：	在专业课与辅导课上，导师会一边讲授专业知识，一边带领同学们进行实践操作，并且各位同学的成果也会及时和导师进行分享，在学习期间，导师带领同学们学习了人工智能领域的丰富知识，包括决策树、回归分析、神经网络、Power BI、Weka、长短期记忆、语音识别 、聊天机器人、语言处理、图像处理、区块链、强化学习等等。导师更是非常耐心地给予每位同学充分的指导，确保各位同学都能够掌握课堂学习内容，并进行实践操作。

除了每周的专业课程与辅导课程上的专业教学与指导，导师还安排了自己的助教，为有问题的同学进行课后的辅导。如果同学们在某个实践环节遇到问题，不能顺利进行操作，或者在结业任务准备中遇到任何困难，助教老师会针对每位同学们的情况，进行一对一的辅导，帮助每位同学解决自己在学习中遇到的问题。助教老师在学习环节中也给到了同学们非常大的帮助，通过这种形式，使得每位同学都能够在知识的海洋中尽情地研究学习，并在遇到问题时获得指导。

考核方式：	课程出勤　　个人　30% 小组作业　　小组　40% 最终作业　　个人　30% 合计　　100%
人均费用	**12000 元/人**（哈尔滨工业大学（威海）暑假特别定制团价格） **费用包含：** 大学课程费、 大学管理费、 企业参访费、 校园参访交流费、 住宿费、 境外集体活动大巴费、 保险费等。 **费用不含：** 签证费、 午晚餐费、 往返旅费、 其它个人消费
成班人数	**40 人**
授课语言	英语
后勤服务	项目将由丰富经验的领队全程陪同大家，对学生全方位的管理和陪伴。领队将确保团组的安全，并在日常学习和生活提供必要的指导和协助。同时，项目组在出发前将为每位学员购买境外险。并给予学员行前指导，确保充分了解交流期间的相关注意事项。

三、 导师背景

项目导师： Dr. Teoh Teik Toe

- 南洋理工大学商业人工智能实验室，执行主任
- 南洋理工大学商学院，商业分析硕士课程主任

学术背景：

背景概要：

- 南洋理工大学，商业人工智能实验室，执行主任
- 新加坡设计科技大学（SUTD）副主任、 SUTD Academy 院士
- 25 年研究与软件开发经验
- 13 年教学经验
- 论文发表：41 篇 (14 篇期刊论文、25 篇会议论文、2 篇专书论文)
- 谷歌学术 H 指数：4
- 新加坡设计科技大学创业公司（Luminaire、Luxury Mystery）联合创始人

教育背景：

- 南洋理工大学，计算机工程博士学位
- 新加坡技术设计大学，博士
- 南加州大学，计算机工程学硕士，电气工程（荣誉）学士

研究兴趣：

2016

- 人工智能：网络安全实验室深度学习
- 项目：通过 Weka、Matlab 和 Python 的机器学习/深度学习分析大据、高速网络安全
- 计算模式：Fuzzy、K-mean、PCA、MLP、Ngram、HMM、递归神经网络、LSTM、CNN

2006 - 2012

- 自闭症检测：使用包括自组织图在内的模糊神经网络开发一个计算模型，以使用 Weka、Visual Basic 和 Matlab 检测自闭症
- 人脸检测：用神经网络、多层感知器、决策树、朴素贝叶斯、SVM，Kmean 和 KNN 在 Weka、Visual Basic、Matlab、C ++和 C＃的计算机和手机中进行开发

- 人脸识别：用神经网络、多层感知器、朴素贝叶斯、Kmean、KNN 在 Weka、Visual Basic、Matlab、C ++和 C# 的计算机和手机中进行开发
- 情绪识别：使用模糊神经网络、遗传算法、Hindden Markov 来开发计算模型，以使用 Weka、Visual Basic、Matlab 识别人的情绪

2006 – 2012 新加坡科技局-开发游泳池淹没检测、图像压缩

新加坡教育部- 操作软件

电子商务、酒店软件、SMS 网关、学校财务系统、计算机跟踪监控系统、总体运行数据和报告软件、库存管理、客户关系管理、资产跟踪，考勤系统、访客跟进、销售代理管理

南洋理工大学讲授课题：

- AN6001 人工智能与大数据
- AN8002 人工智能与高级预测技术
- AN8008 深度学习与现代人工智能

四、 项目设置

以下日程基于往期课程，仅供参考。实际日程可能有调整，以最终课程安排为准。

日期	上午	下午
第 1 天	国内起飞，飞往新加坡	降落樟宜机场，接往酒店
第 2 天	南洋理工大学欢迎仪式 专业课程 **课题：深度学习与 Python 编程** **科研内容** • 什么是深度学习 • 面向对象编程及其优缺点 • Python Institute 的 PCAP 认证 • 数据结构（堆栈，数组，数据帧） **科研作业** • 通过 Python 进行对数据进行结构化	校园参访 **南洋理工大学参访与交流** • HIVE、ADM、李伟男图书馆等 • 学生代表分享 NTU 的学习生活

处理

第 3 天

专业课程

课题：基于计算机视觉技术的图像处理

科研内容

- 图像的直方图和均衡器分析
- 图像的色彩分析
- 图像的亮度分析
- 标准化以帮助图像分类
- 对图像进行变换：傅立叶变换

科研作业

- 使用计算机视觉对图像进行处理

机构参访

新加坡国会大厦

- 导览介绍国会大厦
- 参访国会大厦

第 4 天

专业课程

课题：深度学习的神经网络

科研内容

- 感知器概念：神经网络的基础
- 神经网络的激活函数 - 线性和非线性
- 分类与回归
- 虚拟变量与一种热编码
- Keras 深度学习库与 TensorFlow 机器学习资源库

科研作业

- 使用多层感知器 (MLP) 对数据进行分类和结构化处理

校园参访

新加坡国立大学参访与交流

- 校园游览、景点介绍
- 介绍新国大相关学习与生活情况
- 与学生代表问答环节

第 5 天

专业课程

课题：基于卷积神经网络 (CNN) 的图像识别

科研内容

专业课程

课题：人工智能论文写作

科研内容

- 摘要

	• 滤波器（Filter）与卷积核（Kernel），用途和应用 • 卷积神经网络的设计，Filter 的层数和数量，包括 MaxPool • AlexNet 和 ResNet 流行模型 • 平展卷积与多层感知器（MLP） **科研作业** • 使用卷积神经网络进行图像分类	• 文献评论（最少三篇） • 数据准备及实验设定 • 建议的模型 • 测试结果 • 对提交给 IEEE 的报告进行格式化 **科研作业** • 按照 IEEE 格式准备论文
第 6 天	结业比赛 • 分小组进行项目方案展示 结业仪式 • 为所有学员颁发结业证书 • 为优胜小组颁发推荐信	企业参访 **新加坡虎牌啤酒** • 企业生产参观 • 产品体体验
第 7 天	城市考察 建议：圣淘沙岛	
第 8 天	办理退房，接往樟宜机场	飞回国内

五、 项目成果

哈尔滨工业大学（威海）往期优秀学员科研论文成果范例：

优秀论文录用通知：

2023 8th IEEE International Conference on Intelligent Computing and Signal Processing (ICSP 2023)

04/21/2023 - 04/23/2023 Xi'an • China

Acceptance Letter

Dear Author(s):

Congratulations! Your manuscript has passed the peer review (the reviewers' comments are available in the attached file on AIS) and has been accepted by the 2023 8th IEEE International Conference on Intelligent Computing and Signal Processing (ICSP 2023). The conference will be held in Xi'an • China from 04/21/2023 - 04/23/2023. We are glad to invite you to attend the conference and make an oral report.

Manuscript No.: 216JMFQUVK

Author name(s): Menghan Zou, Mingze Ma, Anan Wang, Yujie Li, TeohTeikToe

Manuscript title: Brain tumor classification model of ResNet-50 network based on different data enhancement algorithms

Your manuscript, after presented in the oral report or poster in the conference, will be published on IEEE, after which it will be submitted for index in IEEE Xplore® digital library, EI Compendex, Scopus.

2023 8th IEEE International Conference on Intelligent Computing and Signal Processing (ICSP 2023)

ICSP Program Committee

04-24-2023

Notices:

1. Authors need to revise the manuscript as per the reviewers' comments before re-uploading the final version (in Word or PDF) to the AIS system.
2. Authors need to ensure that the submitted manuscript is an original paper with a similarity lower than 20%. Once the manuscript is submitted to AIS, the authors are not allowed to re-submit it to other journals for publication.
3. Authors need to confirm their attendance one week before the conference is held. If the authors are not able to be present on the conference after agreeing to attend the conference, the authors need to reach the conference secretary for re-arrangement.

Again, congratulations and we look forward to meeting you in Xi'an • China

优秀论文成果展示：

Brain tumor classification model of ResNet-50 network based on different data enhancement algorithms

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***Abstract*—The accuracy and stability of brain tumor MRI image classification is significant for the healthcare system, but the traditional models have the defects of difficulty in handling complex features and unstable classification. In this paper, we propose a novel brain tumor classification model based on residual neural network, and use three different data enhancement algorithms: geometric transformation, mixup, and SamplePairing to process a dataset containing four different types of brain tumor images, and finally evaluate the classification effect of our proposed model. Among them, the best results were achieved by using geometric transformations for data enhancement.**

***Keywords*—Brain tumor image classification, residual neural networks, data enhancement, mixup, SamplePairing**

I. INTRODUCTION

As medical technology continues to evolve, brain tumours have become one of the most common diseases worldwide, posing a significant threat to human health. According to the American Cancer Society's Cancer Statistics 2021 report, approximately 24,000 people in the United States will develop brain tumours in 2021, and 18,600 deaths are expected. With the increased use of mobile phones and computers, the disease is becoming equally common in children. The different types of tumours, which vary in shape and size, and the complex structure of the brain, make it more difficult to classify brain tumour images. In this context, the accurate classification of brain tumours has become a very important task, which requires the involvement of a large number of medical experts and technicians. However, due to the wide variation in the morphology and size of brain tumours, traditional medical diagnostic methods are no longer sufficient to meet current the subjective judgment of the physician in terms of recognition accuracy. The current model[2] applied to brain tumour images utilises the autonomous learning feature of deep learning to extract a large number of features from MRI images in a batch and adaptively to achieve the classification task. However, there are still some difficulties and challenges in practical applications due to the limited size, uneven distribution and variable sample quality of brain tumour datasets.

To address these issues, we propose a method for brain tumour classification based on Residualneural Network (ResNet), which uses three data enhancement techniques, namely geometric transformation, SamplePairing and mixup, to improve the diversity and quality of the dataset, thereby improving the classification accuracy and stability. This paper will expand the dataset around these data augmentation techniques, while using residual neural networks for feature extraction and classification to classify different types of brain tumours[3]. We also list the factors that affect classification performance in order to give potential researchers ideas for building new models or architectures. We also hope that by exploring existing deep learning models, we gain insight into more gaps and loopholes that can be filled, providing medical professionals with a more accurate and reliable diagnostic tool. The strengths and innovations of the model proposed in this study are as follows.

1. a residual neural network is chosen for training instead of the traditional convolutional neural network, which is more suitable for problems with complex features and eliminates the phenomenon of network degradation.

2. choosing three different data enhancements to train the

优秀论文录用通知：

2022 2nd International Conference on Big Data Analysis and Computer Science

06/17/2022 - 06/19/2022 Nanjing • China

Acceptance Letter

Dear Author(s):

Congratulations! Your manuscript has passed the peer review (the reviewers' comments are available in the attached file on AIS) and has been accepted by the 2022 2nd International Conference on Big Data Analysis and Computer Science. The conference will be held in Nanjing • China from 06/17/2022 - 06/19/2022. We are glad to invite you to attend the conference and make an oral report.

Manuscript No.: YFRUEYHQMF

Author name(s): Hao Ding, JiaYing Feng, YongYi Wang

Manuscript title: Stock trend prediction based on a fusion of alternative text and multiple features

Your manuscript, after presented in the oral report or poster in the conference, will be published on conference proceedings, after which it will be submitted for index in EI, Scopus.

2022 2nd International Conference on Big Data Analysis and Computer Science

AEIC Academic Exchange Information Center

05-23-2022

Notices:

1. Authors need to revise the manuscript as per the reviewers' comments before re-uploading the final version (in Word or PDF) to the AIS system.
2. Authors need to ensure that the submitted manuscript is an original paper with a similarity lower than 30%. Once the manuscript is submitted to AIS, the authors are not allowed to re-submit it to other journals for publication.
3. Authors need to confirm their attendance one week before the conference is held. If the authors are not able to be present on the conference after agreeing to attend the conference, the authors need to reach the conference secretary for re-arrangement.

Again, congratulations and we look forward to meeting you in Nanjing • China

优秀论文成果展示：

Stock trend prediction based on a fusion of alternative text and multiple features

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Singapore
tteoh@ntu.edu.sg

***Abstract*—Stock price prediction has always been a prominent research field. How to predict stock price more accurately is very important for financial research. In this paper, the Shanghai Composite Index of 2020 is taken as the data set and the alternative text represented by news public opinion is used to predict the overall stock trend according to the efficient market hypothesis. This model crawls the news text of a specific financial website, mines the emotional information contained in the text with Word2Vec and LSTM, and scores the public opinion on a specific date. Then, the traditional stock price features are combined with the public opinion scoring features to form a multi-feature input matrix. Finally, the CNN-LSTM neural network is used to predict the future stock trend with high accuracy. Experimental results show that the proposed model is superior to the traditional time series model and machine learning model.**

***Keywords*—Alternative data, Deep learning, Multiple features**

I. INTRODUCTION

Stock price forecasting has always been a topic of great interest. Stock forecasting research is also an essential part of financial research, and how to predict stock prices more and big data, providing the financial sector with a large amount of relevant data in real-time, such as logistics data and social network information. News is one type of alternative data.

Fama proposed the Efficient Market Hypothesis[3] in 1965, which argued that the stock market is an "efficient information" market, where stock prices reflect events that have already occurred and those that have not yet occurred but are not. He argued that the stock market is an "efficient information" market, where stock prices reflect events that have occurred, as well as the impact on stock prices of events that have not yet occurred but are expected to do so. It means that stock price trends are not regular results based on past data but rather predictive results based on events for the company. As news reports contain essential information about a company's current financial situation and forecasts about its future operations, many people will analyze and make decisions based on the sentiment conveyed by the News. Sentiment analysis has been well regarded and used in stock market forecasting in the past, with sentiment analysis of online commentary often yielding more convincing results

优秀论文录用通知：

2022 International Conference on Artificial Intelligence, Big Data and Computer Application
2022 人工智能、大数据与计算机应用国际会议

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AIBDCA2022

Acceptance Letter

Dear authors,

Congratulations!

The review process of your paper for the 2022 International Conference on Artificial Intelligence, Big Data and Computer Applications (AIBDCA2022) has been completed. We are pleased to inform you that your following paper has been formally accepted by AIBDCA2022 for publication in in the International Conference Proceedings Series which will be sent to EI database for indexing.

You are cordially invited to present the paper at AIBDCA2022 held on November 4-5, 2022 in Huanggang, China. This notification serves as our formal acceptance of your paper as well as an invitation to attend AIBDCA2022.

Paper ID: A20221115802697
Paper title: Alzheimer Classification Based on Image Smote and Two-level Cascaded Style Transfer
Authors: Ziming Wang, Manyue Hu, Chengjun Jin, Shiyang Song, Teoh Teik Toe

Should you have any questions, please feel free to let us know by quoting your Paper ID and any future inquiries. Thank you for your contribution and we are looking forward to your future participation!

AIBDCA

Organizing Committee of AIBDCA2022

优秀论文成果展示：

Alzheimer Classification Based on Image Smote and Two-level Cascaded Style Transfer

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***Abstract*—Alzheimer's Disease (AD) is a neurodegenerative disease with insidious onset and progressive development. Clinically characterized by comprehensive dementia manifestations such as memory impairment, aphasia, apraxia, agnosia, impaired visual and spatial skills, executive dysfunction, and personality and behavioral changes, the etiology is still unknown. As the disease advances, symptoms can include problems with language, disorientation (including easily getting lost), mood swings, loss of motivation, self-neglect, and behavioral issues. In this study, with the help of Deep Learning Methods, we diagnose the Alzheimer Magnetic Resonance Imaging (MRI) which is classified into 4 types (Moderate Demented, Mild Demented, Very Mild Demented and NonDemented). First, use Residual Network (Resnet50) to get the baseline. Then, make images binarized and make it promoted to 90. Next, use Smote Algorithm to balance the dataset. Finally, use Two-level Cascaded Style Transfer (TCST) to augment the dataset. The accuracy reaches 93%. The result is a clear image that can be used to effectively diagnose Alzheimer's disease.**

Keywords-Alzheimer; image classification; Smote; Resnet50; Tranfer Learning.

worldwide will suffer from AD[1]. Despite the incidence and severity of the disease, the diagnostic tests currently available do not provide definitive results over the patient's lifetime and often rely on a detailed understanding of the patient's medical history and medical information[2]. AD-induced brain changes may begin decades before clinical symptoms of AD appear, leading to the emergence of a preclinical phase of dementia called Mild Cognitive Impairment (MCI). According to statistics, 10%-15% of the elderly over the age of 65 are MCI patients, and about 44% of them will convert to AD after 3 years. The calculated average annual conversion rate is about 15%[3]. AD patients generally have a certain degree of cerebral cortex atrophy, the number of neurons decreased, ventricular enlargement, and early AD is mainly manifested by hippocampal atrophy[4].

In recent years, with the advancement of medical technology, Magnetic resonance imaging (MRI) has become increasingly used in medical treatment. It can non-invasively capture subtle changes in brain structure and has the penetration rate of the device. Under the influence of AD, the brain structure changes. These abnormal changes can be

导师寄语：Dear All, thank you for all your hard work in the last few weeks. It was not easy. I hope you have learn something and hope the experience can help you in your future. Please remember your final project and let me know if you are facing any problem. Also please keep in touch.

-- Dr. T.T. Teoh, Associate Director, NTU Business AI Lab