

Assignment Brief

Item	Description
Programme	BSc (Hons) Computer Science
Module Code	KF5042
Academic Year / Semester:	2022-2023 / Semester 2
Module Title	Intelligent Systems
Module Tutor	Dr Bing Zhai (bing.zhai@northumbria.ac.uk)
Contact Email	Dr Bing Zhai (bing.zhai@northumbria.ac.uk) Dr Ammar Belatreche (ammar.belatreche@northumbria.ac.uk) Dr Fouad Khelifi (fouad.khelifi@northumbria.ac.uk) Dr Farah Ahmed (farah3.ahmed@northumbria.ac.uk) Dr Baqar Rizvi (baqar2.rizvi@northumbria.ac.uk)
Date of Handout to Students:	w/c 07/March/2023
Mechanism for Handout:	Module Blackboard Site & Seminar in Week 3
Submission Time and Date	To be submitted by 17:00 GMT on 08/May/2023
Mechanism for Submission:	Document upload to Module Blackboard Site
Word Limit	Part A-1500/Part B-1200. Total word limit should be below 2700 words, and must not exceed 2970 words (10% over the word limit)
Weighting	This coursework accounts for 100% of the total mark for this module. It is comprised of two components. Part A is worth 40%, and part B is worth 60%.
Submission of Assessment	Please upload your written report as a single PDF document. It is your responsibility to ensure that your assignment arrives before the submission deadline stated above. For more details see the University policy on late submission of work.

Learning Outcomes (LOs)

Knowledge & Understanding:

1. Demonstrate knowledge and critical understanding of the core AI concepts, tools and technologies used in building intelligent systems for solving practical problems.
2. Demonstrate critical understanding of the ethical, social, and legal issues involved in the development and application of intelligent systems.

Intellectual/Professional skills & abilities:

3. Critically evaluate available AI techniques, tools and technologies and assess their applicability in novel domains with contemporary research in the area of Computational Intelligence.
4. Critically analyse and evaluate the effectiveness and efficiency of intelligent systems through practical applications.

Personal Values Attributes:

5. Carry out independent research and effectively communicate the research findings.



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Assignment (Part A & B)

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Write a technical paper, in IEEE format, on a chosen AI technology domain with experimental results.

Dr Bing Zhai

January 2023

Introduction

The assignment is designed to enable you (the student) to demonstrate your understanding of how an AI technology can be applied to a specific application domain to improve the performance or enhance the tasks within that domain by producing an IEEE format paper that covers both a literature review and the implementation of an AI technology.

IMPORTANT:

The assessment is an individual piece of work. You **must not** assist each other in the development of the report and your answers should relate to what has been taught in the module.

Academic misconduct

Students are expected to observe University regulations, which define and proscribe cheating, plagiarism and other forms of academic misconduct. You are also required to take reasonable precautions to guard against unauthorised access by others to your work.

Details of Northumbria University's Academic Regulations for Taught Awards (ARTA) can be found on the University's website in the Quality and Teaching Excellence Assessment area - ARTA - Guidance for Students.

<https://www.northumbria.ac.uk/about-us/university-services/student-library-and-academic-services/quality-and-teaching-excellence/assessment/>

IMPORTANT:

The assessment is an individual piece of work. You **must not** assist each other in the development of the report.

Assignment submission

The paper must be submitted via 'TurnItIn'. A link is provided in the **assessments** area of the **blackboard** module. The date and time for the submission is highlighted on the front coversheet.

IMPORTANT:

Only electronic submissions will be accepted.
The submission must be in portable document format (**pdf**)

Word/Page limits

The paper *should not* exceed **2700 words** and **must not exceed 2970 words (10% over the word limit)**. Please consult the ARTA guidelines ([link to the guidelines](#)) for penalties etc.

The following sections **DO NOT** count towards the word count:

- In text citations e.g. [1]
- Title & contents page
- Tables, figures and illustrations
- Reference list

In addition to the above exception list, in-line code listings **DO NOT** count towards the word limit.

Paper format & requirements

Paper standard

You are required to write a paper in IEEE two column format. A guide for IEEE two column format can be found in the assessment area on Blackboard as well as a Latex and Microsoft Word template. **DO NOT** convert your document to image and submit, Turnitin will not work in this case.

The paper should be written in the 3rd person and should **not** refer to I or We. It should be written from the perspective of the 'project'.

Referencing standard

All referencing for this assignment must be in IEEE format. A guide for IEEE style can be obtained from the IEEE website (<https://ieeauthorcenter.ieee.org/wp-content/uploads/IEEE-Reference-Guide.pdf>). A format guide is also available in the assessment area of the module.

IMPORTANT:

NO WIKIPEDIA REFERENCES!

That said, you can use Wikipedia to find potentially reliable sources. **Never cite Wikipedia**, but you can certainly use it as part of your research strategy! Try to cite published papers.

Coding standards

All experiments in **PART B** of the paper **must** be conducted using MATLAB. The code is not included in the word count. All code listings should be presented in a Mono Space font 10pt, as shown below, and must **NOT** be images:

```
function val = distance(data,p1,p2)
val = sqrt((x1- x2)^2 + (y1-y2)^2);
end
```

You can find the link for the font at <https://www.fontsquirrel.com/fonts/list/classification/monospaced>, please consider use the “Monospace Typewriter” font. Also, you **need** to add comments in the code.

Cover sheet

- The submission should include a **Cover sheet** which includes:
 - Name
 - User Id
 - Course
 - Module code
 - Module title
 - Submission Date
 - Word Count

IEEE paper

- The IEEE paper submission should consist of the following sections:
 - Title
 - Author
 - Abstract
 - Introduction
 - Literature review
 - Methods
 - Results & Discussion
 - Conclusion and future work
 - References

NOTE:

Where possible you should use your **own** diagrams to highlight and enhance your assignment. If you do use **other** author’s diagrams, **please reference**.

TASK

Your task is to undertake a critical piece of research and to produce an IEEE paper. The final paper should include a paper-based **literature review** and a **technical implementation** of an AI technology. The review should be of the *current state* of the AI methods in that domain, and a write up of experimental results, **produced by yourself**, that *demonstrate* an AI technology being used in that domain.

Below is a list of possible domains for you to investigate:

- AI in Fraud and Crime detection
- AI in Automatic Translation
- Phishing attacks and countermeasures
- Email Spam and Malware Filtering
- Brain Computer Interface
- AI for sports performance monitoring
- AI for Health (e.g., human activity recognition, sleep monitoring)
- AI in Banking and financial applications
- Intelligent transportation systems
- Sentiment analysis
- Medical Diagnostics
- Automated object tracking in digital videos
- Video surveillance
- Video analytics
- Bio-metric security
- Multimedia forensic analysis
- Autonomous car parking
- Driver-less cars
- AI in Social media analysis
- Intelligent noise cancellation systems
- Flight path planning
- Cost effective planning of urban utility distribution
- Planning of connected networks

Some sample papers can be found in the final Sample Papers Section

NOTE:

Other topics can be suggested but can only be included at the discretion of the tutor.

Assignment pass mark

To pass the assignment you must achieve at least 40% of the total marks.

- For PART A, the total score is 40.
- For PART B, the total score is 60.

Feedback

Formative (non-assessed) feedback will be provided on your progress throughout the workshops as you develop your paper. *Summative* (assessed) feedback will be provided as a proforma 4 weeks after submission of the assignment.

Grade Descriptors

Grade descriptors are an essential tool in helping you to understand the marks that are awarded for your assignment and inform you as to what you need to do in order to achieve higher marks.

Grade	Description
Pass 90 - 100% Outstanding work which:	<ul style="list-style-type: none"> • Demonstrates analytical and critical acumen • Demonstrates the ability to develop and sustain a critical judgement which is well rounded in leading current research • Demonstrates the ability to present a clear, structured, articulate and persuasive argument) • Demonstrate the ability to develop novel algorithms to improve existing model performance using production/research-grade code.
Pass 80 - 89% Exceptional work which:	<ul style="list-style-type: none"> • Demonstrates thorough, critical understanding of current knowledge • Demonstrates a critical awareness of the principles and practices of the discipline • Demonstrate the ability to combine multiple models, machine learning tools to improve performance using production/research-grade code.
Pass 70 - 79% Excellent work which:	<ul style="list-style-type: none"> • Demonstrates a thorough and comprehensive understanding of the discipline • Shows evidence of extensive, relevant reading which includes up-to-date research • Reveals originality and insight • Demonstrates ability to critically evaluate complex ideas • Demonstrate the ability to evaluate multiple models using production/research-grade code.
Pass 60 - 69% Very good work which:	<ul style="list-style-type: none"> • Demonstrates a sound understanding of the discipline • Shows effective and competent use of literature • Demonstrates a clear understanding of complex ideas • Demonstrates the ability to analyse, interpret and organise information effectively • Demonstrates a wide reading base • Is a clear, concise, and well-structured presentation • Demonstrates the ability to perform evaluation on multiple models using toolbox/code

Table 3: KF5042 Grade Descriptor

Grade	Description
Pass 50 - 59% Good work which:	<ul style="list-style-type: none"> • Demonstrates a generally sound understanding of the disciplines • Makes good use of relevant literature • Demonstrates ability to synthesis information into a clear, well-structured account / argument • Demonstrates the ability to perform evaluation on multiple models using toolbox/code
Pass 40 - 49% Fair work which:	<ul style="list-style-type: none"> • Demonstrates an understanding of the discipline • Shows evidence of relevant reading • Demonstrates ability to work towards tasks set, but more descriptive than analytical • Demonstrates the ability to organise work appropriately • Demonstrates the ability to perform single model evaluation using toolbox/code
Fail 30 - 39% Inadequate work which:	<ul style="list-style-type: none"> • Demonstrates little to partial understanding of the discipline • May demonstrate some evidence of reading • Limited focus on set tasks • Weaknesses may be identified in one or more of the following: <i>fragmentary coverage; errors and omissions; organisation and presentation; misconceptions; inclusion of irrelevant information; misinterpretation of instructions.</i> • Demonstrated the ability to get some code to work but not be able to finish the entire evaluation
Fail 0 - 29% Poor work which:	<ul style="list-style-type: none"> • Demonstrates little understanding of the discipline • Weaknesses may be identified in one or more of the following: <i>basic misunderstanding or misinterpretations; inability to meet the requirements of the assessment; poor organisation and presentation; inclusion of inappropriate material.</i> • Unable to perform model evaluation using toolbox/code.

Table 4: KF5042 Grade descriptor

Marks allocation

Your paper should be divided into sections highlighted below as **PART A** and **PART B**.

PART A

Section	Description	Max Mark
Title:	This should be no more than 15 words in length and highlight the domain and the AI technology.	0
Author:	This should be your full name and in brackets after your name your student number e.g., Fred Bloggs (W123456789).	0
Format & References:	The paper should follow the IEEE 2 column format.	5
Abstract:	The abstract should be a summary of the whole paper and include the results/conclusion. NOTE: There should not be any references in the abstract.	5
Introduction:	This should be a background to the domain and the AI technologies that are in use within that domain in terms of what the AI is being used to achieve. This chapter should also list the details of how the paper is organised.	10
Literature Review (Related Work):	There should be a statement alluding to what AI you are going to use and what you hope to achieve when using it. This should include a review of the current AI technologies that are used in a similar way to the experiments that you are going to carry out for the second half of the paper. This chapter should also describe the various stages of an AI system; give a diagram of the various stages and clearly describe the purpose of each stage. Please remember to cite the papers you reviewed. You should also review the ethical, social, and legal issues involved in your chosen field.	20
		40

Table 1: KF5042 Marks Allocation - Part A

PART B

Section	Description	Max Mark
Methods:	This should be a breakdown of the experimental pipeline you propose to carry out and the evaluation metrics, in effect a test plan. There should also be a discussion of the algorithm and parameters you propose and a justification for using them.	20
Results & Discussion:	<p>Discussion of tools used to analyse the performances by paying particular importance to the chosen algorithms/methods in relation to the application</p> <p>Critical discussion, reflection and analysis of the application</p> <p>Clear evidence of excellent critical reviewing and analysis of the performance and significance of the application</p> <p>Scope: use Tables and Figures to reflect and analyse the performance; discuss their significance by giving a comparative study of the chosen AI algorithms in relation to the application at hand. You should also discuss potential ethical, social, and legal issues related to predictive performance if it is used in real-world scenarios.</p>	25
Conclusions and Future Work:	This should be a breakdown of the results explaining what you have can concluded for the results.	5
Code	As part of this you will have developed or modified code to execute the experiments. This should be supplied as an external link in the paper to a repository and it should also be attached to the end of the paper as an addendum. The code listings do not count towards the word count.	10
		60

Table 2: KF5042 Marks Allocation-Part B

Sample Papers

- Zhai, B., Perez-Pozuelo, I., Clifton, E.A., Palotti, J. and Guan, Y., 2020. Making sense of sleep: Multimodal sleep stage classification in a large, diverse population using movement and cardiac sensing. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, 4(2), pp.1-33.
- Zhai, B., Guan, Y., Catt, M. and Plötz, T., 2021. Ubi-SleepNet: Advanced Multimodal Fusion Techniques for Three-stage Sleep Classification Using Ubiquitous Sensing. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, 5(4), pp.1-33.
- Ahmed, F., Khelifi, F., Lawgaly, A. and Bouridane, A., 2019, January. Comparative analysis of a deep convolutional neural network for source camera identification. In *2019 IEEE 12th International Conference on Global Security, Safety and Sustainability (ICGS3)* (pp. 1-6). IEEE.
- Mistry, K., Rizvi, B., Rook, C., Iqbal, S., Zhang, L. and Joy, C.P., 2020, July. A Multi-Population FA for Automatic Facial Emotion Recognition. In *2020 International Joint Conference on Neural Networks (IJCNN)* (pp. 1-8). IEEE.
- M. J. Rho et al., "Dr. Answer AI Software for Prostate Cancer: Explainable Variable Importance of Predicting T Stage," *2020 International Conference on Computational Science and Computational Intelligence (CSCI)*, 2020, pp. 725-730, doi: 10.1109/CSCI51800.2020.00133.
- G. Zhan et al., "Applications of Spiking Neural Network in Brain Computer Interface," *2021 9th International Winter Conference on Brain-Computer Interface (BCI)*, 2021, pp. 1-6, doi: 10.1109/BCI51272.2021.9385361.
- M. N. Choudhary and J. Connolly, "Artificial Intelligence in Medicine Discovery: AI in Virtual Screening," *2021 32nd Irish Signals and Systems Conference (ISSC)*, 2021, pp. 1-6, doi: 10.1109/ISSC52156.2021.9467865.
- P. Agarwal, "Redefining Banking and Financial Industry through the application of Computational Intelligence," *2019 Advances in Science and Engineering Technology International Conferences (ASET)*, 2019, pp. 1-5, doi: 10.1109/ICASET.2019.8714305.
- E. Indriasari, F. L. Gaol and T. Matsuo, "Digital Banking Transformation: Application of Artificial Intelligence and Big Data Analytics for Leveraging Customer Experience in the Indonesia Banking Sector," *2019 8th International Congress on Advanced Applied Informatics (IIAI-AAI)*, 2019, pp. 863-868, doi: 10.1109/IIAI-AAI.2019.00175.
- Q. Luo, B. Liu, J. Yan and Z. He, "Research of a Spam Filtering Algorithm Based on Naïve Bayes and AIS," *2010 International Conference on Computational and Information Sciences*, 2010, pp. 152-155, doi: 10.1109/ICCIS.2010.43.
- D. G. Kumar, M. K. Rao and K. Premnath, "A Recurrent Neural Network Model for Spam Message Detection," *2020 5th International Conference on Communication and Electronics Systems (ICCES)*, 2020, pp. 1042-1045, doi: 10.1109/ICCES48766.2020.9137940.
- Q. Rao and J. Frtunikj, "Deep Learning for Self-Driving Cars: Chances and Challenges," *2018*

IEEE/ACM 1st International Workshop on Software Engineering for AI in Autonomous Systems (SEFAIAS), 2018, pp. 35-38.

- A. R. Fayjie, S. Hossain, D. Oualid and D. Lee, "Driverless Car: Autonomous Driving Using Deep Reinforcement Learning in Urban Environment," *2018 15th International Conference on Ubiquitous Robots (UR)*, 2018, pp. 896-901, doi: 10.1109/URAI.2018.8441797.
- T. Zhu-Mei and W. Ai-Zhen, "The Research of Adaptive Noise Cancellation Technology Based on Neural Network," *2012 International Conference on Computing, Measurement, Control and Sensor Network*, 2012, pp. 144-147, doi: 10.1109/CMCSN.2012.37.
- M. R. Hasan, M. Maliha and M. Arifuzzaman, "Sentiment Analysis with NLP on Twitter Data," *2019 International Conference on Computer, Communication, Chemical, Materials and Electronic Engineering (IC4ME2)*, 2019, pp. 1-4, doi: 10.1109/IC4ME247184.2019.9036670. • S. M. Qaisar, "Sentiment Analysis of IMDb Movie Reviews Using Long Short-Term Memory" *2020 2nd International Conference on Computer and Information Sciences (ICCIS)*, 2020, pp. 1-4, doi: 10.1109/ICCIS49240.2020.9257657.
- J. Xiao-Ting, X. Hai-Bin, Z. Li and J. Sheng-De, "Flight Path Planning Based on an Improved Genetic Algorithm," *2013 Third International Conference on Intelligent System Design and Engineering Applications*, 2013, pp. 775-778, doi: 10.1109/ISDEA.2012.184.