The BRITISH UNIVERSITY IN EGYPT Informatics and Computer Science	**Coursework Brief Proofing & Printing Confirmation Sheet**	
Module Title	Deep Learning (ANN is a prerequisite)	Module Code 22CSAI08H
Module Leader	**Prof. Andreas Pester**	Semester **Two**
Proofed by	**Prof. Vladimir Geroimenko**	

I hereby confirm that:

- This coursework brief has been proof-read (spelling and grammar) [x]
- This coursework brief assesses the ILOs for the module [x]
- This coursework brief follows the approved template [x]
- All questions (and sub questions) have their marks specified [x]

Signed (Proof Reader): Vladimir Geroimenko

Signed (Module Leader) Andreas Pester

The BRITISH UNIVERSITY IN EGYPT Informatics and Computer Science	**22CSAI08H** **Project and Report** **2022-2023** **Assignment I**
Module Title **Deep Learning (ANN is a prerequisite)**	
Module Leader **Prof. Andreas Pester**	Semester **Two**
Assessment Weight **30 % of the total module mark**	Due Date **Week 7**

Report Specification:
You are required to deliver a group assignment (2 students per group).

Project Deliverables

Date	**Deliverable**	**Marks**
Week 4	Report Proposal and Specification	Not Marked
Week 7	Final Report	60%
Week 8	Presentation	20 %
Week 8	Discussion	20%

Specific details of each of this report deliverables will be given in due time

Assessment and Feedback:
- Marking criteria will be attached to each phase specification
- Discussion feedback will be given to the report proposal and specification
- Written specific feedback to the final report will be sent to each person and discussed during sessions dedicated to submissions review

Marking and Feedback Schedule:

Due Day	Deliverable	Marked by	Submission review
Week 4	Report proposal and specifications	Week 4	Week 4
Week 7	Final Report	Week 9	Week 9
Week 8	Discussion	Week 8	Week 8

Along with the submitted assignment, you need to submit: a fully completed and signed *Coursework submission form* and a *Statement of Academic Honesty Form*.

You can only submit your own work. Any student suspected of plagiarism will be subject to the procedures set out in the GAR

Guidelines:

- It is up to you to choose an appropriate outline for the report and the literature used. If you use information from the internet, GitHub, GitLab etc., please specify, when accessed last time. Justify your choices in the project's initial plan. The report must not exceed 1000-1200 words.
- You should present the most important findings from the studied literature in a 5 min presentation and answer to the questions during the following discussion.
- The proposal and the report should contain information about the individual contribution of the authors. During the discussion every group member will be assessed also individually.
- Templates must be used to present your work. Please use the IEEE templates for this report.
- The report is a literature report (minimum 7 different sources) about **one** of the proposed Deep Learning algorithms in the list 1 below and its specifics. You should analyse:
    - What kind of learning is assessed with the specific model?
    - Description of the architecture of the model, used activation functions, specific layers.
    - Loss function of this algorithm, if applicable.
    - The statistics used for the optimization process (Maximum Likelihood Estimation or Maximum a posteriori estimation) if this can be identified.
    - The metrics for the evaluation of the chosen algorithm.
    - Specific properties.
    - Examples for the evaluation of the chosen network architecture.

You can choose **one** of the following network models for your analysis (list 1)

1. ResNet networks
2. Inception networks
3. Autoencoder and Variational Autoencoder
4. U-Nets
5. Generative Adversarial networks
6. LSTM and GRU for a sequential (recurrent) network
7. Attention networks and Transformer
8. Diffusion networks and Latent Diffusion Models
9. Graph Neural Networks – Message passing
10. Graph Neural Networks – Application in Computer Vision
11. Convolutional Graph Neural Networks
12. Deep Learning and use for Metaverse technologies
13. Deep Learning and Time series

The marks for Assignment I are distributed as follows:

a) Report **[60 marks]**
b) Presentation **[20 marks]**
c) Discussion **[20 marks]**

[Assignment I Total: 100 marks]

Marking Scheme:

Section	Evaluated	Marks	Total Marks
(a)	Report - Content - Form - Literature	 30 10 20	60
(b)	Slides Time Engagement with the audience	8 7 5	20
(c)	Discussion (individually marked)	20	20

Marking Rubric see attachment

The BRITISH UNIVERSITY IN EGYPT Informatics and Computer Science	**22CSAI08H** **Project and Report** **2022-2023** **Assignment II**
Module Title **Deep Learning (ANN is a prerequisite)**	
Module Leader **Prof. Pester**	Semester **Two**
Assessment Weight **30 % of the total module mark**	Due Date **Week 11**

Instructions to students:

1. This is a group assignment.
   You are required to form a group of two students. It can be the same group as for the first project. Each student in the team will play the following two roles:
   a) Manager for data-processing, manager for algorithm implementation and version control, manager for evaluation and algorithm improvement.
   b) The role of a team member, who implements the foreseen tasks according to the asks of the manager.
2. Submission: The submission of the report + code is only on E-Learning server. Presentation and discussion will be done during one of the in-lab sessions, if the teaching is offline or as a virtual presentation in a synchronous learning environment if the learning is online.
3. Assessment: Assessment will be based on the materials submitted to E-Learning and the presentation in the class or online.
4. Feedback: Feedback will be provided on the E-Learning module site two weeks after the submission.
5. Along with the submitted assignment, you need to submit: a fully completed and signed *Coursework submission form* and a *Statement of Academic Honesty Form*. You can only submit your own work. Any student suspected of plagiarism will be subject to the procedures set out in the GAR.

The Assignment: Deep Learning Neural Network

The aim of this assignment II to gain insight into the management of a neural network system for deep learning. The objective is to work on the design and analysis of a deep learning convolutional or recurrent neural network using Python with Keras 2.x and Tensorflow 2.x.

Marking and Feedback Schedule:

Due Day	Deliverable	Marked/approved by	Submission review
Week 8	Project proposal and specifications	Week 9	Week 9
Week 11	Final Report and code	Week 11	Week 11
Week 12	Presentation and discussion	Week 12	Week 12

You are required to submit your program as a commented jpyter Notebook running in Colab. Additional write a report.

The requirements are as follows:

- Investigate a deep learning architecture, like CNN, RNN, GAN, Autoencoder, Graph Neural network, Diffusion etc. or any combination. The choice of the dataset and the architecture is up to the group but should be agreed at week 8.
- You should test at least two variations of your model (explore the results of changing the learning rates, number of layers, number of units in the layers, activation functions etc.). Investigate the influence of parameters and hyperparameters on the model performance.
- Choose different metrics and evaluate your models with learning curves. Use TensorBoard.
- In the report justify your choices and give a critical analysis of your findings. In the proposal and in the report, you had to describe the individual contribution of each group member.
- The presentation (12 min – not more than 10 slides) should include your main findings. It should be not a repetition of the theory, but a presentation of your own work.
- During the discussion every student will be assessed also individually.
- Report+Code+Slides should be submitted to the E-Learning server.

The marks for Assignment II are distributed as follows:

a) Data pre-processing **[15 marks]**
b) Network **[35 marks]**

c) Learning analytics of the system **[30 marks]**

d) Presentation and discussion **[20 marks]**

[Assignment Total: 100 marks]

Marking Scheme:

Section	Evaluated	Marks	Total Marks
(a)	Data choice Data cleaning Data normalization or other pre-processing	5 5 5	15
(b)	Code Program structure commenting	13 12 10	35
(c)	Learning curves Metrics TensorBoard	13 12 5	30
(d)	Slides Time Discussion	7 5 8	20

Marking rubric see attachment

The discussion is aimed at ensuring the students understand the code and the code presented is the student's own work.

Module Code: 22CSAI08H	**Title:** Deep Learning	
Level: 6	**Modular weight:** 10	**Faculty/Dept:** ICS
Pre-requisite modules: CSCI05I, SCIB07P, SCIB03C, CSAI03H, CSAI02I , CSAI01I		
Reassessment: No restriction-		
Module Leader:		
Semester taught: One		
Date of latest revision: April 2019		

Aims

The aim of this module is to provide the students with the theoretical basis for Artificial Neural Networks and the Deep Neural Network architectures and algorithms. Students will also gain practical hands on experience on the main deep learning frameworks and deep learning applications; for example computer vision, word embeddings, natural language processing, reinforcement learning, etc.

Intended Learning Outcomes

On completion of this module students should be able to:

Knowledge and Understanding

1. Describe the core theoretical and conceptual frameworks for deep neural networks. [A1, A11**,** A12]
2. Explain the properties and functions of a range of different deep neural network architectures, algorithms and their applications. [A3, A11, A12]

Intellectual Skills

3. Explain the difference between deep learning architectures and their applications [B10, B11, B12].
4. Design and execute experiments with deep neural networks for different applications in computer vision and natural language processing, and reflect on the results [B11, B12].
5. Recognize potential real-world applications of deep neural networks and evaluate the suitability for a given application. [B1, B5, B11]
6. Asses the performance of deep learning models [B10, B12].

Practical and Professional Skills

7. Appropriately apply recent deep learning frameworks. [C2, C4, C6, C11, C12]

General and Transferable skills

8. Develop interpersonal and team work skills. [D2, D6, D8]

Employability

This module will provide opportunities for students to:

1. Understand the importance of being self-motivated in order to progress the area of work. [A.1, A.5]
2. Design and apply appropriate deep learning models to solve complex problems. [B.1.1]
3. Demonstrate effective time management to manage time effectively so as to prioritise tasks and to work to deadlines. [C.1.5]

Indicative Content

Artificial Neural Nets and their architectures, deep neural networks, back propagation algorithm, convolution and recurrent neural networks, recent topics in deep neural networks. Applications include computer vision, natural language processing, and others.

Methods of Learning, Teaching and Assessment

Total student effort for the module: 100 hours on average over 1 semester.

Type of session	ILOs Assessed	Typical Student Effort		
		Typical number in the semester/s	Typical hours per week	Total hours
Lecture	1-6	12	2	24
Tutorial	-	-	-	-
Laboratory	4-9	12	2	24
Private study	1-8			52

Assessment

Assessment Type	Weight %	ILOs Assessed	Exam Semester	Exam/ Written Coursework Length
Two group projects , weight of each is 30%	60	1-9	1	N/A
Unseen written exam.	40	1-6	1	2 Hours

Methods of Feedback

In response to assessed work:

- Developmental feedback generated through teaching activities.
- Feedback will be provided for each assessed component in written form as appropriate.
- Generic exam feedback will be given on the e-learning system.

Developmental feedback generated through teaching activities:

- Dialogue between students and staff in workshops and Labs

Indicative Reading List

- E. Charniak Introduction to Deep Learning, MIT Press, 2019.
- I. Goodfellow, Y. Bengio, A. Courville: Deep learning - 2016
- http://www.tensorflow.org/ , http://torch.ch/