University of Nottingham
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School of Computer Science
Module Assessment Sheet for 2023-2024

Module	Artificial Intelligence Methods / COMP2024 (AIM) / Semester 2
Module Convenor(s)	Tissa Chandesa, Tan Chye Cheah & Simon Lau Boung Yew

Assessment Name	Coursework	**Weight**	50%

Description and Deliverable(s)

The **Bin Packing Problem** remains one of the most famous and import NP-hard problem within Computer Science. In a nutshell, the **bin packing** problem consists of assigning *N* items of different sizes into the smallest number of bins each with capacity, *c* (Wolpert, *et al.,* 2013). With it being an optimisation problem, several algorithms have been implemented to the bin packing problem – among them include (**not exhaustive**):

1. Greedy Algorithms (e.g., *First Fit, Best Fit, Next Fit*)
2. Decreasing Algorithms (e.g., *First Fit Decreasing, Best Fit Decreasing*)
3. Heuristic Algorithms
4. Simulated Annealing
5. Tabu Search
6. Metaheuristic Algorithms
7. Genetic Algorithms
8. Particle Swarm Optimization
9. Ant Colony Optimization

NOTE: If you are using (1) and/or (2), please only use one algorithm each.

This coursework (details below) requires you to work in groups of FOUR/FIVE to evaluate FOUR/FIVE Artificial Intelligence (A.I.) algorithms (*depending on how many team members within the group*) to solve the bin packing problem and collaboratively producing a conference paper describing and critically evaluating your findings. The deliverables required are:

1. JAVA codes of your *4 or 5* A.I. algorithms: .JAVA files (submitted as a ZIP folder).
2. A 6-page conference paper, PDF format (**note:** *additional pages will result in a deduction of 5% for every additional page for the entire group*).

Below are suggestions on how you can approach this coursework:

1. **Perform a comprehensive literature review** of algorithms that have been implemented to solve the bin packing problem over the past 15 years. Search for *survey/review* journal publications to obtain a better overview of algorithms used to date. Based on your literature review, narrow down your choices to **four/five algorithms** ONLY. In your conference paper, please justify your reasoning for choosing the four/five algorithms.
2. **Practically implement the chosen four/five algorithms in JAVA**. For each algorithm implemented, it should optimise to the minimised number of bins used.
3. **Document (1) and (2)**, respectively in the provided conference paper template.

When writing your conference paper, consider the following points:

- *Detail* the chosen four/five algorithms.
- *Explain* why you choose those algorithms. You may include the **pseudocodes** of the chosen algorithms.
- *Present* the results obtained from your practical implementation.
- *Critically* evaluate the chosen algorithms based on your findings, highlighting what are its strengths and weakness prior to concluding on the most optimum algorithm.

	Aside from this **assessment sheet**, you will be provided with the following documentations: 1. **BPP.txt**: a bin packing problem dataset with the following format: "problem name" number *m* of different item weights capacity C of the bins item weight 1 # of items of weight 1 item weight 2 # of items of weight 2 … item weight m # of items weight m 2. **COMP2024-CW-GroupXXX.docx**: this is your conference paper template. Please change **XXX** to your group number. Also, please **do not** change the formatting and headers. Marks will be deducted if submitted document does not follow the original formatting style. The provided table as well as text coloured red and blue, respectively are to be replaced by your own written words. **Note:** *COMP2024-CW-GroupXXX.doc* **is to be converted to PDF prior to submission and all text should be coloured in black.** 3. **COMP2024 Peer Assessment.docx**: each of you will need to make an additional submission, **separately** for your **peer assessment** form. Please click on the "**Peer Assessment**" link on Moodle to perform this submission. **Reference:** Wolpert, D. H., Bieniawski, S. R., & Rajnarayan, D. G. (2013). Probability collectives in optimization. *Handbook of Statistics*, *31*, 61-99.
Release Date	Monday, 4 March 2024
Submission Date	Friday, 3 May 2024 by 11:59pm
Late Policy **(University of Nottingham default will apply, if blank)**	Work submitted after the deadline will be subject to a penalty of 5 marks (the standard 5% absolute) for each late **working day** out of the total 100 marks.
Feedback Mechanism and Date	Marks and written feedback will be returned via Moodle the w/c 3 June 2024
Assessment Criteria	JAVA code: **30%** (**unable to run codes will result in 0% being awarded**) Justification of chosen algorithms based on performed literature review: **15%** Critical analysis and discussion of your findings: **30%** Discussion of the strengths and weaknesses of the chosen algorithms (based on your findings), prior to concluding on the most optimum algorithm: **20%** References and formatting: **5%**

Assessment Name	Examination	**Weight**	50%
Description	In-person exam		
Release Date	TBA		
Submission Date	TBA		
Late Policy **(University of Nottingham default will apply, if blank)**			

Reassessment Method	**Weight**
Exam	100%