This question paper consists of 4 printed pages each of which is identified by the Code Number (COMP377101)

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School of Computing

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COMP3771

User Adaptive Intelligent Systems

Answer all 3 questions

Time allowed: 2 hours

Question 1

Learning4Life is a newly set up education provider aiming for learners aged over 21. The vision is to use MOOCs (Massive Open Online Courses) to recruit learners and to deliver learning materials, support and assessment. While the resources are open-access, the business model relies on the value-added personalised support for learning and certification. This will be attractive to learners who aim to acquire specific knowledge and skills to improve their employability.

To provide illustrations in your answers use any one of the following examples t: 1) a foreign language graduate wanting to work as a translator in EU or UN organisations; or 2) a self-employed music teacher wanting to further his/her portfolio of music-related services (such as public performance, private tuition, composition and arrangement of music scores); or 3) an IT professional wanting to pick up some artistic / creative skills to improve their user interface design.

(a) Use Jameson's schema, which was introduced in this module, to explain how a learner's subscription information can be used to offer personalised recommendation of courses.

[10 marks]

(b) Suggest one explicit and one implicit method to collect user information for adaptation, in addition to the subscription information from learners. For each method, state how the collected information can be used to influence the output of recommendation.

[4 marks]

(c) Imagine that a learner has picked and started two courses. Explain what is a 'scrutable learner model' in this context, how it can be applied for further recommendations and what benefits it may bring. You may draw inspiration from the paper by Wasinger et al (2013) that was discussed in lectures.

[6 marks]
[question 1 total: 20 marks]

Question 2

A charity for carers has an idea of developing an online resource that promotes an all-round healthy lifestyle for its members. The aim is to encourage the carers to make wise choices for a balanced lifestyle and not to overlook their own needs while caring for others. The following aspects have been identified as important - emotional state, social relationships and physical fitness (including a right level of activity, relaxation and an appropriate diet).

(a) In preparation for a 'personalised reading recommender', the charity plans to start constructing user models for its online members. Illustrate a suitable vector representation for a member Alice who is interested in gardening and yoga, but not others such as cooking, walking and so on. Extend it to a matrix representation that will be suitable for User-User Collaborative Filtering algorithm.

[3 marks]

(b) As there are a number of health oriented mobile apps available on the market, the charity also aims to provide on its website a recommender service for health apps based on the use of stereotypes. Appropriate apps will be recommended to each of the charity's members depending on their profiles.

Imagine that the charity maintains a profile of each member that includes: `gender, age, marital status, list-of-interests`, where `list-of-interests` is a subset of `{outdoor-sports, indoor-activities, food, special-hobbies}`.

Three stereotypes are identified below.

I. FITNESS-FANATIC:
(age>21) and (age<35) and (list-of-interests includes outdoor-sports, indoor-activities)
   P=0.7

Facet	Degree of interest	Rating (out of 100)
Have a smartphone	high	70
Use health app A	high	10
Use health app A	no	60
Use health app B	high	80
Gardening	moderate	60

II. YOUNG-CARER:
(age>14) and (age<24) and single and (list-of-interests includes outdoor-sports, indoor-activities, food, special-hobbies)
   P=0.8

Facet	Degree of interest	Rating
Use health app A	high	20
Use health app A	no	40
Use health app B	no	40
Gardening	low	80

III. FOODIE:
(age>18) and (age<60) and (list-of-interests includes indoor-activities, food)
   P=0.9

Facet	Degree of interest	Rating
Have a smartphone	moderate	30
Use health app A	high	70
Use health app A	no	10
Use health app B	high	50

(i) In the stereotype `FITNESS-FANATIC`, what does the value of the rating for the facet "Have a smartphone" mean?

[2 marks]

(ii) Provide an example from the above stereotypes to illustrate a case of contradiction in stereotypes.

[3 marks]

(iii) Consider a member who is a 19-year-old female, interested in food and indoor-activities. Should she be recommended health app A or health app B? Present your working step-by-step.

[12 marks]
[question 2 total: 20 marks]

Question 3

This question relates to a hypothetical online museum system which enables users to browse through a collection of digital images of paintings. A recent customer survey has shown that users are often lost in the digital space and unable to find interesting items in the collection. The IT team that maintains the online museum system has decided to integrate appropriate personalisation techniques.

(a) There are log files from the last two years recording every user click on a painting. There is no additional information about the users. The database of paintings stores additional details, such as author, art style (e.g. impressionism, cubism, modernism), year, country of origin. Following these conditions, identify a recommender algorithm that will be suitable for the online museum and describe how it will be applied.

[4 marks]

(b) In a further extension of the museum system, users are asked to indicate whether they would like to see the real painting when they visit the museum exhibiting this painting. The matrix R below indicates for each user $u_1, \ldots, u_5$ which paintings $p_1, \ldots, p_8$ he/she would like to see (value 1 indicates that the user would like to see the real painting).

$$R = \begin{bmatrix} & u_1 & u_2 & u_3 & u_4 & u_5 \\ p_1 & 1 & 1 & 0 & 1 & 1 \\ p_2 & 0 & 0 & 0 & 0 & 1 \\ p_3 & 0 & 1 & 0 & 1 & 0 \\ p_4 & 1 & 1 & 1 & 1 & 0 \\ p_5 & 1 & 1 & 0 & 0 & 1 \\ p_6 & 1 & 0 & 1 & 0 & 1 \\ p_7 & 1 & 0 & 0 & 1 & 1 \\ p_8 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

User u_3 visits the Tate gallery in London where painting p_1 is exhibited. Apply item-item filtering with 3-nearest neighbours to find out whether user u_3 may like to see painting p_1. Show your working. Illustrate one problem with this algorithm with an example.

[8 marks]

(c) The recommendation algorithm has to be assessed. The first criterion considered is <u>accuracy</u>. Suggest one method that can be used to evaluate the accuracy of the recommendation and describe how the method can be applied in this specific application (i.e. online museum system). Indicate <u>another criterion</u> that can be used to evaluate the recommendation algorithm, and justify why you have chosen this criterion.

[4 marks]

(d) The recommendations derived with the algorithm from (c) will be used to offer a user a PDA (personal digital assistant) with a user-adaptive guide which gives descriptions of paintings when the user visits the physical gallery (e.g. the Tate gallery in London). For this, it uses a representation of the current context. Suggest two parameters that should be considered for modelling context in the personal museum guide and justify your suggestion.

[4 marks]
[question 3 total: 20 marks]

THE END