CRITICAL ALGORITHMS COURSE OUTLINE

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I. Course Background

Critical Algorithms is a final year course based on electrical engineering honours degree. Critical Algorithms deals with interconnection between culture, society and algorithmic systems. Even though the course is self-standing, it relates to field such as Computer-Science and Sociological-Science.

II. Course Objectives

Critical Algorithm study is concerned with studying and analysing of the algorithms from critical theory position. The objective of this course is to equip students with knowledge necessary to understand the impact of Algorithms on everyday lives and how humans are responsible for creation of this Algorithms and later hold them accountable for their effects.

III. Course Outcomes

On successful completion of this course, the students is able to:

1) Observe how the capitalist society shape the search engines.
2) Describe and explain how the Algorithms took over human jobs, market and the world.
3) Critically evaluate the accountability of Algorithms for the fourth industrial revolution.
4) Understand what is algorithmic culture and how it alters the origin culture.
5) The consequences of Algorithmic filter on social life.

IV. Course Content (Knowledge areas)

The knowledge areas in Critical Algorithms course are summarised as follows:

1) **Distinct implications of algorithms:** Embedded values, biases in algorithms, social sorting, discrimination, Personalization, accountability, policy and law.
2) **Ethnics and Algorithms:** Algorithm fairness, mapping the debate.
3) **Culture, Society and Algorithms:** Surveillance, Privacy and data.

V. Prior Knowledge Assumed

It is assumed that the student commencing this course has the general knowledge on of the following:

1) Critical Thinking (1^{st} year of study).
2) Knowledge on Data Structures and Algorithms (2^{nd} year of study).
3) Existence of social networks and their basic impact.

VI. Assessment

A. Formative Assessment Element

TABLE I

Summative assessment contribution

Summative Assessment Contribution	**Duration (h)**	**Method and Weight %**
Tutorial	10	20
Course Project	30	30
Examinations	3	50

B. Assessment Methods

1) ***Examination****:* During the examination, the student should showcase the strength of critical thinking and application of suitable knowledge and skills to give practical solutions to a problems given. The exam contributes 50%.

VII. Satisfactory Performance (SP) Requirements

With considerations to Rule G.13 *satisfactory performance in the work of the class* implies class and lecture attendance, submission of assignments and writing of exams are compulsory.

VIII. Teaching and Learning Process

A. Teaching and Learning Approach

The fundamental information of the course is covered in lectures. The lectures are structured in a mode that accelerate student's understanding to given chapters in the course. Extra course material will be issued in lectures. Students are expected to perform self-study within this course, which allow them full understanding of the concepts. The course project will allow students to develop practical skills related to Critical Algorithm. All the concept covered in lectures ans the class project will be examined.

B. Learning Activities and Arrangements

1) ***Lectures****:* There is a single and double lecture each week. The venue and the timetable can be obtained from the school reception.

2) ***Tutorials****:* There will be a tutorial section each week after lunch for which the questions a posted a day before on Wits SAKAI website.

3) ***Assignment****:* The course assignment contribute 30% into the year mark and I will be released on SAKAI on the 3^{rd} week of first block.

CRITICAL ALGORITHMS SAMPLE LECTURE

1. INTRODUCTION

Algorithms are components of the computer software responsible for generation of information.They are beneficial in sorting large amount amount data and have the ability to deliver the information that is resourceful. Automated algorithms make us of proper structured commands to create levels for filtration of the information based on certain motives and the desired outcomes [1].

2. DETAILED TOPIC DESCRIPTION

Can any problem be solved using an algorithm? The political, social and cultural effect of an algorithmic solution constitute side effects that are real issues [2].

Does an algorithm designed to solve existing technical issues counteract or overstate the mitigation of social, political and ethical issues? It was found through a study that Google's adverts algorithm automatically suggests possible arrest ads for racial associated names [3].

How can this association destruct someone's someone job or rental applications? Negative impact advert are more likely to get clicks than clean positive adverts due to involving a person name. High clicks increases the value of those adverts which increases their appearance thus increasing the prejudice it imposes.

Class discussion questions:

- The discrimination produced in search results is done on purpose but do companies need to correct the resulting prejudice?
- If an algorithm that provides solutions is being provided, is it necessary to observe how it execute and solve a problem?
- It is possible to develop an algorithm that is bias-free or that has correction measures build within it for explicit biases? there any methods rather than reverse-engineering, to access prejudicial results?

Measuring Algorithm accountability have side effect for which it requires the knowledge of who or which group is responsible for regulating the distribution of information and private realms [4].

What would supervising or designing ethical algorithms look like? Algorithms are design to function within a given datasets. It uses conditions, expectations of the culture, models of the business etc. Focusing on the algorithm as an inducer for both advantages and disadvantages of the data-driven world. The design of algorithms allows them to learn through neural networks and allows the code to be altered. Some critical questions should ask regarding the accountability for which some of them are stated below:

- Is it discussion about algorithmic accountability more helpful compared to the discussion about party being accountable for the results of their method?
- What kind of data protection can be helpful for diagnosing any violation?

3. CASE STUDY 1: PREDICTIVE POLICING

Philadelphia and Baltimore police adopted to the us of predictive algorithm to determine after release the parolees capability to commit murder. Jon Doe was young when he was arrested for possession of drugs. After parole, the algorithm selected him as possible murder even though he was not capable of that. The algorithm does not consider the nature of the crime, age and gender, when predicting the future, it is purely predictive.

It is an issue that the parole of John Doe is imposed to supervision. This mechanism undermines the due process. This raise the question of how does an algorithm decide the way a person is assessed to pay for the crimes they did?

In the United States, "stop-and-frist" program have been an issue. Even though the police state that they are not targeting black men, black men are stopped at unrepresentative rate in United States. Arguments arise when the journalist try to display discriminate behaviour of the algorithm. This gives rise to another question.

How can the journalist challenge owners of the algorithms. Human can be decision markers, the technology responsible for generation of the information to alert the decision-maker is actually difficult to study.

4. CASE STUDY 2: VISIBILITY OR INVISIBILITY OF ONLINE CONTENT

Germany is one of the countries that imposed Google to have a change in their algorithm such that it removes abusive incomplete word suggestions automatically. The exam of this is query name for "George Wilson" which associate it with the White Supremacist. Also the wife of the former German president Christian Wulff, was associated with being a former prostitute. People with same names with criminals are at risk of his algorithm generated data.

Should the algorithm be held responsible for the false data presented? What if the Christian Wulff was a former prostitute the other person sharing her name is now being affected? How can one appeal such act to minimize the false data produced by the algorithm?

Even though the companies may change the behaviour of their algorithms due to lawsuits, media is another factor which amplifiers the visibility of the issue. This effect is observed from Wulff as she is amongst the top articles for suing Google for deformation of character. This effect give rise to another two questions.

What does it mean to point the blame on the algorithm whereas the media makes the problem more visible? Is there a private way the problem can solve?

5. CASE STUDY 3: DISCRIMINATORY BLACK BOX

It is known that insurance providers are not supposed to discriminate or base the selection of their clients using classes. This implies one cannot be declined insurance due to their classes such as blacks. This case is mostly violated by insurance companies and this makes them a source of discrimination. Insurance companies companies always try to increase their profit by avoiding risks. Economically marginalized groups are seen as risky to insure, due to how prejudice and stigmatization has in the past made it difficult for them to obtain quality education, healthcare privilege and the luxury houses in safe neighbourhoods. The ensurers maximize their profit and reduce risk by not providing cover for economically marginalized groups.

Since insurance covers are processed by algorithms, it becomes tedious to obtain if the person being discriminated is correct or not. The programmers of the algorithm may have no intentions of producing discriminatory outcomes.

6. QUESTIONS TO CONSIDER

- What are the key social, cultural, and ethical anxiousness that occur when imagining of algorithmic accountability? To justify what happened, what needs to be understood?
- How are the advantages and disadvantages of algorithm accountability different for different domains such as marketing, healthcare and criminal justice ?
- What are extra important case studies that high spot the anxiousness, opportunity cost, and concerns?
- Who is responsible for holding algorithms accountable? What role does the government play? What role does data providers play? What role does technologies and tools play? What role does educational institutions play? What role does the media play?
- Who should be responsible for data protection? Which part does the government play in protecting data keepers?
- Who can oppose algorithmic systems? What kind of skills they require to perform that?
- Does algorithms influence the distribution of information in new ways,? who is affetced by the results?

REFERENCES

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[2] T. Striphas. "Algorithmic culture." *European Journal of Cultural Studies*, vol. 18, no. 4-5, pp. 395–412, 2015.

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[4] E. Bozdag. "Bias in algorithmic filtering and personalization." *Ethics and information technology*, vol. 15, no. 3, pp. 209–227, 2013.