**Phil Feain** - Hello and welcome to the VCE Algorithmics Implementation on-demand video on the new Algorithmics Study Design for 2023-2026. The purpose of this video is to introduce the background to the Unit 4 Outcome 3 School-assessed Coursework task for Algorithmics. My name is Phil Feain and I'm the Curriculum Manager for Digital Technologies with the VCAA. This presentation will cover: the study design, the area of study statement, the outcome statement, the assessment task, key knowledge, key skills, the draught performance descriptors and the Advice for teachers. This is the new 2023-2026 study design. This is available on the Algorithmics study page right now. The Unit 4 Outcome 3 is now a School-assessed Coursework task. If you are planning on teaching the study next year it would be good to have a look at this now and become familiar with the new study. The third area of study in Unit 4 is Area of Study 3 - Computer science: past and present.

In this area of study, students examine the emergence of computer science as a field and the philosophical and technical ideas that support the emergence of modern artificial intelligence. They explore how the quest to develop methods for mathematical proof led to the proof that there exist problems that may not be computed automatically. Students investigate how machine learning algorithms learn from data and engage with several conceptions of artificial intelligence and whether it is possible. They examine and discuss some of the ethical issues posed by the application of data-driven algorithms. Students are not required to produce proofs or formal explanations concerning undecidability. Let's have a look at the Unit 4 Outcome 3 statement.

On completion of this unit the student should be able to explain the historical context for the emergence of computer science as a field and discuss modern machine learning techniques and the philosophical issues they raise. This slide shows the assessment task for Unit 4 Outcome 3. This task is a School-assessed Coursework task. The task for Unit 4 Outcome 3 is: Select at least one task from the following: a response to a case study or stimulus material, a written report, an annotated visual report, an oral report or structured questions. This is worth 50 marks. Here's the key knowledge for the Unit 4 Outcome 3 SAC:

- the historical connections between the foundational crisis of mathematics in the early 20th century and the origin of computer science, including Hilbert and Ackermann's Entscheidungsproblem and its resolution by Church and Turing

- characteristics of a Turing machine

- the concept of decidability and the Halting Problem as an example of an undecidable problem

- implications of undecidability for the limits of computation

- philosophical conceptions of artificial intelligence, including the Turing Test, weak AI and strong AI

- Searle's Chinese Room Argument, including standard responses both for and against

- the concept of training algorithms using data

- the concepts of model overfitting and underfitting

- support vector machines as margin-maximising linear classifiers, including: - the geometric interpretation of applying SVM binary classification to one- or two- dimensional data

- the creation of a second feature from one-dimensional data to allow linear classification

- neural networks, including: - the structure of multi-layer perceptron neural networks

- the evaluation of outputs using forward propagation

- training neural networks by using iterative improvement of the edge weights to reduce the output error

- the factors leading to a resurgence in neural networks in the late 20th century

- ethical issues related to artificial intelligence and data-driven algorithms, including transparency, accountability, bias and machine ethics. And here are the key skills:

- explain the historical context for the emergence of computer science as a field

- describe the general structure of a Turing machine

- demonstrate the existence of hard limits of computability using the Halting Problem

- describe and compare the Turing Test, strong AI and weak AI as conceptions of artificial intelligence

- describe the Chinese Room Argument and mount an argument for or against it

- explain, at a high level, how data-driven algorithms can learn from data

- explain the optimisation objectives for training SVM and neural network binary classifiers

- explain how higher dimensional data can be created to allow for linear classification

- describe the structure of a multi-layer perceptron neural network

- evaluate the output of a small multi-layer perceptron neural network using forward propagation

- explain the consequences of model overfitting or underfitting

- explain and discuss ethical issues related to artificial intelligence and data-driven algorithms. We are currently developing the VCAA Performance descriptors in the Advice for teachers for Unit 4 Outcome 3. This is a draught of the performance descriptors as they currently look to provide some idea of how the assessment task can be assessed. Just be aware that this may change. The Advice for teachers will be published, hopefully later this year. To help you prepare for 2023 and to support teachers during the lifetime of the next study design, there'll be a new Advice for teachers on the Algorithmics study page. This advice has been written by several experienced teachers of the study. The Advice for teachers will include the following support for Unit 4 Outcome 3:

- An overview of Unit 4: Principles of algorithmics

- Unit 4 Outcome 3:

- Teaching and learning activities These are based on the key knowledge.

- Detailed examples that relate to one of the teaching and learning activities.

- Sample approaches to developing an assessment task This provides guidance in the development of an assessment task.

- Performance descriptors to help you develop a rubric to assess the task.

- And a Unit 4 Sample weekly planner. The weekly planner is a sample course outline to help new or inexperienced teachers of the study to plan their course for Unit 4. Thank you for following this presentation. If you have any questions regarding this presentation, you could contact Phil Feain, the Digital Technologies Curriculum Manager, at the contact details below.

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