Repository Entry – CS 146
Embedded EthiCS @ Harvard Teaching Lab

Overview

Course: CS 146: Computer Architecture

Course Level: Lower-level undergraduate

Course Description: Review of the fundamental structures in modern processor design. Topics include computer organization, memory system design, pipelining, and other techniques to exploit parallelism. Discussion of modern topics including GPU architectures, datacenter architecture, mobile/embedded SoC architectures, and machine learning acceleration as time permits. Emphasis on a quantitative evaluation of design alternatives and an understanding of performance and energy consumption issues.

Module Topic: Contractualism and Carbon Emissions

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Semesters Taught: Spring 2023

Tags: Architecture [CS], Design [CS], Hardware [CS], Optimization [CS], Stakeholders [CS] Climate change [phil], Cost-benefit analysis [phil], Economic rights [phil], Ethical design principles [phil], Morally significant stakeholder interests [phil]

Module Overview: This module introduces T.M. Scanlon's contractualism, and uses that theory to discuss and debate what constitutes ethical rules for carbon emissions. The module problematizes the convention wherein companies prioritize advancement to the exclusion of climate friendly standards.

Connection to Course Material: The students learn about the processes, benefits, and costs associated with computer manufacturing. We consider the ethical ramifications of carbon emissions as it relates to those companies.

The topic was chosen in collaboration with the professor, who is particularly concerned with conventions in the technology industry, where companies maximize efficiency and advancement without properly considering the ramifications to the environment.

Goals

Module Goals:
1. Introduce T.M. Scanlon's contractualism
2. Introduce example cases to solidify the students' understanding of contractualism, particularly the concept of a 'reasonable rejection'
3. Use contractualism to debate various rules for regulating carbon emissions

Key Philosophical Questions:
1. What is T.M. Scanlon's contractualism?
2. How can contractualism help us solve everyday issues?

The module has a relatively simple setup. First, we understand contractualism and then, we use

	3. How can contractualism help us solve environmental issues, e.g. regulating carbon emission standards for technology companies?	that theory to interrogate an existing ethical problem – carbon emission standards for technology companies.

Materials		
Key Philosophical Concepts:	● T.M. Scanlon's contractualism ● Reasonable rejection ● Weighing the burdens of various parties	We can understand that global warming places burdens on a multitude of parties, and restrictions on carbon emissions places burdens on technology companies. Contractualism offers one way of discussing the variety of burdens placed on various parties, so that we may attempt to reconcile them and offer rules that look importantly 'moral'.
Assigned Readings:	"Contractualism and Utilitarianism" by T.M. Scanlon, Pages 109-119	The reading introduces Scanlon's theory of contractualism. The pages were specifically chosen because it introduces a formulation of what constitutes wrongness and what constitutes a reasonable rejection – both tools that are very important to the class lecture.

Implementation		
Class Agenda:	1. Contractualism Part 1: What is it? 2. Contractualism Part 2: Why it is uniquely positioned to address carbon emission standards? 3. Exercise 1: applying contractualism to create ethical rules for dorm room students 4. Exercise 2: applying contractualism to create ethical rules for technology companies on carbon emissions	
Sample Class Activity:	The students are asked to consider a carbon emissions tax. First, they are split into groups and assigned a 'party' (technology company, third-world citizen, senator, etc.). They are asked to consider the unique burdens that the carbon rule places upon their party. Then, we had a classroom discussion weighing the burdens imposed on various parties to determine if any party could make a 'reasonable rejection' to the proposed rule.	Many of the activities functioned in this way, where the central goal was to determine whether any party could raise a reasonable rejection to the proposed rule.
Module Assignment:	Consider a new carbon emissions rule (one that we did not go over in class). Choose a party and claim that this party can	This is an extension of the class session, where we

	reasonable reject the rule. On what grounds do you reasonably reject the rule?	considered various flawed ethical rules and offered reasonable rejections from the standpoint of various parties.
Lessons Learned:	1. The students were excited to learn about contractualism, although they were skeptical about the robustness of 'reasonable rejection' as a philosophical concept. 2. The students recognize the difficulty of determining ethical rules for carbon emissions, but still offered compelling takes on both sides when prompted. 3. The students enjoyed discussing contractualism, but remain unsure that it is the best tool for designing ethical rules for carbon emissions.	