

Developing a Data-Driven Learning Interest Recommendation System to Promoting Self-Paced Learning on MOOCs

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Abstract

This work proposes a learning-based energy management policy that takes into consideration the trade-off between the depth-of-discharge (DoD) and the lifetime of batteries. The impact of DoD on the energy management policy is often neglected in the past due to the inability to model its effect on the marginal cost per battery usage. In this work, a novel battery cost evaluation method that takes into consideration the DoD of each battery usage is proposed, and is utilized to devise the day-ahead energy management policy using reinforcement learning and linear value-function approximations. The policy determines the amount of energy to purchase for the next day in the day ahead market. A least-square policy iteration (LSPI) with linear approximations of the value function is used to learn the energy management policy. Simulations are provided based on real load profiles, pricing data, and renewable energy arrival statistics. The consideration of the battery cost due to DoD provides a more accurate evaluation of the actual energy cost and leads to an improved energy management policy.

Keywords -Smart grid, energy management system, reinforcement learning, battery, energy storage, depth-of-discharge.

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Chapter 1

Introduction

Massive Online Open Courses (MOOCs) refer to an open educational resources, which allows learners worldwide to take well-designed online courses of interest free of charge. On MOOCs, learners watch the high-quality instructional videos made by professors from prestigious universities, share their ideas and reflections on the discussion forum, and use the online exercise system to evaluate their learning outcome. Due to the fact that the MOOCs provide with high-quality self-directed learning environment without costing much for online learners, MOOCs have been thought of as a contemporary way of 21-century learning.

There are two type of MOOCs, cMOOCs (connectionism MOOCs) and xMOOCs (instructionism MOOCs). These two types of MOOCs are base on different philosophical positions underpinning, cMOOCs focuses on connections between participants in particular on strong content contributions from the participants themselves [1], xMOOCs, by contrast focus on instructor's design of the course. Many famous MOOCs platform such as Coursera[2], edX[3], and Udacity[4] are belong to xMOOCs.

For current xMOOCs, the instructional videos play a significant role in the on-line learning process [5,6]. In essence, the learning focuses in the form of visual and

audial presented in the instructional videos. Traditionally, video-based learning follows structured instructor-designed sequences for the better results. Owing to the technological nature of the online stream video, it is found that many students drag the play bar replaying specific concept in the video for consolidating their understanding. Therefore, many studies aim to improve the video-based learning environment by adding additional features in video-watching, such as embedded assessment, caption tool, as so on.

In view of the rapid development of data sciences, more and more studies on educational data mining and learning analytics take the advantages of the learners data to optimize learning process. For example, [7] develops a step-by-step annotations feature to improve the learning experience of existing how-to videos. Study [8] constructs a system that recommends students videos best on their forum post, making a self-solved confusion system and meanwhile reducing the teaching load. Therefore, considering the learning needs and the authentic learner data, this study develops a data-driven learning interest recommendation system to promote self-paced learning by integrating educational data mining and word segmentation in the Chinese-speaking MOOC environment. Videomark combines both the learning seek event counts and the subtitles of each video to automatically generate learning concepts for learners in friendly user interface. Through the huge amount of video watching/seeking log data, the Videomark helps learners to quickly identify popular video seek events for consolidating their concept of the learning focus in hope of promoting better self-paced video-based learning environment.

This thesis proposes a learning interest recommendation system on xMOOCs, the system generate keywords relative to lecture video content base on students' video watch activity records and lecture video transcripts. Moreover, each keyword

collects video segment about the specific keyword. We hope this system will help students sketch the course when they first come to the class, and review the whole course after the course.

The remainder of this thesis is organized as follows. In Section ??, we first introduce the Markov decision process and brief review the reinforcement learning algorithm which is called least-square policy iteration. In Section ??, the energy management problem at the consumer side is examined. We designed our system model by considering a EMS center which want to regulate energy flow such as day-ahead energy purchasing, real-time energy purchasing, and energy dumping to minimize marginal cost and prolong battery life. In Section ??, the reinforcement learning based energy management problem is examined. In Section ??, the performance of purposed algorithm is examined.



Chapter 2

Related Work

2.1 MOOCs

2.1.1 Overview

MOOCs refers to massive online open courses, which is a online course platform people can access through internet connection regardless of the limit of space and time. MOOCs is normally free, credit-less and is designed for massive people to enroll and learn. Base on different theories, there are two kinds of MOOCs, cMOOCs and xMOOCs, which will mentioned in following section.

2.1.2 cMOOCs v.s. xMOOCs

Since “The year of MOOCs” [9], MOOCs have become increasingly robust and diverse in last few year. There are many websites provide MOOCs for different group in various way. Based on different learning theory, we classify MOOCs into cMOOCs and xMOOCs. cMOOCs are base on the learning theory of Connectivism, this kind of MOOCs focus on network between individuals in course. students may use any digitle platform such as Facebook, Google+, blog to make connections with other learners to create and construct knowledge. The partic-

ipants in cMOOCs act as teacher and learner at the same time as they share knowledge with each other. Instead of being structured as an open online community of learners, xMOOCs are much more like traditional classroom environment. xMOOCs are centered around class instructor, instructor usually will provide series of lecture video, where learners mainly get knowledges. Besides, exercises, quizzes, assignments are also used during the course. Most of the popular MOOC websites in recent year are belong to xMOOCs such as Coursera, edX, Udacity, etc.

2.1.3 Coursera

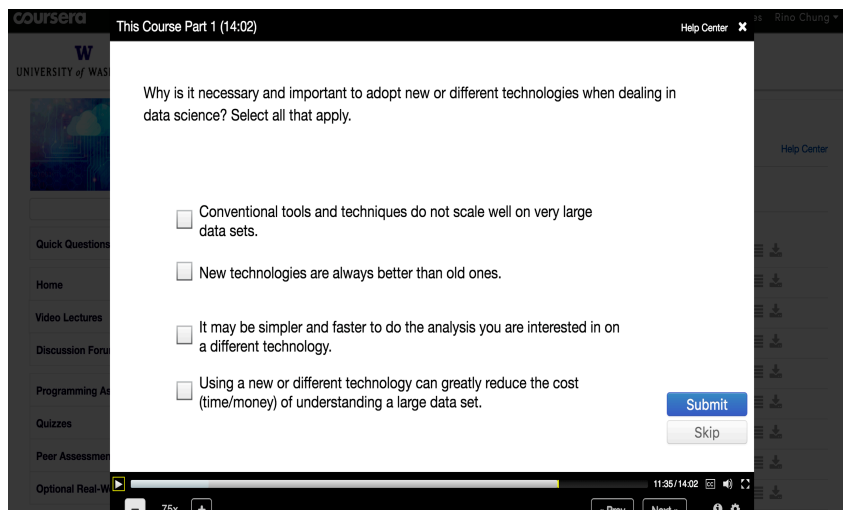


Figure 2.1: Coursera pop-up question in lecture video

Coursera [2] started in 2012 founded by Stanford University. It provides courses from renowned universities like Stanford University, Princeton University, University of Michigan, etc. Taking course on Coursera is free, learners can enroll courses that interest them at will. Applying for hard copy certification of course, how-

ever, will charge for some money. As a xMOOC platform, lecture videos are the major teaching material of courses with transcripts in many different language; moreover forum, exercises, assignments and other traditional xMOOC functions are also provide on Coursera. To make sure learners focusing on the lecture video, there is a pop-up question about current video in every lecturevideo see Figure 2.2. The question will let you submit three times, and if all the answers are wrong in three submission system will tell you the answer but learners can chose to continue the video without answering the question. Coursera also has iOS, Android, and Kindle Fire apps.

2.1.4 edX

edX [3] is also a xMOOC platform, which founded by Harard University and MIT at 2012 offering high-quality courses from universities and intuitions to learners. On edX Besides the majority of courses are taught in english, edX also provides some foreign language courses.

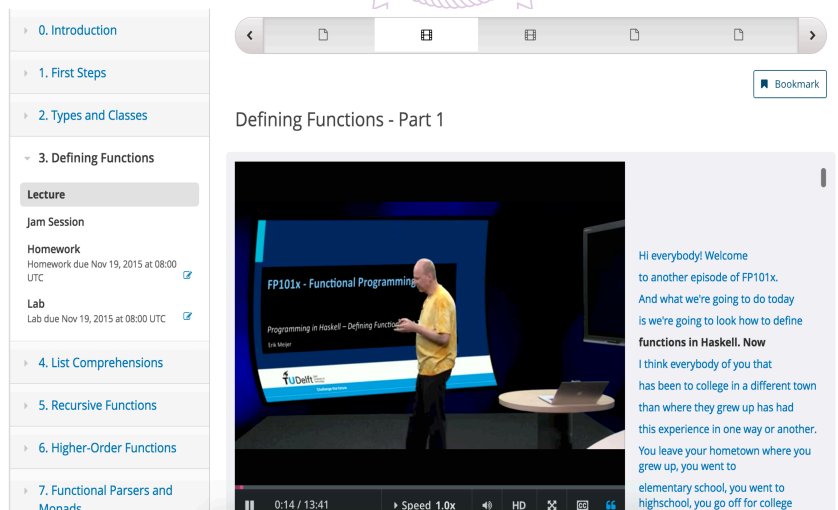


Figure 2.2: edX: a MOOC platform

Similar to Coursera, edX has certificate system, which you can apply for hard copy proof when you pass the course; it will charge you certificate fee, however, the price is cheaper than Coursera.

2.2 Researchs improve MOOCs learning

hello



Chapter 3

Architecture

hello im architecture



Chapter 4

Implementation

hello im sys implementation



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