SEI Rubric Creator

Executive Summary

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Student Development Team
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Background

The Software Engineering Institute (SEI) is a not-for-profit Federally Funded Research and Development Center (FFRDC) at Carnegie Mellon University, specifically established by the U.S. Department of Defense (DoD) to focus on software and cybersecurity. (http://www.sei.cmu.edu/about/organization/index.cfm). As an FFRDC, the SEI functions like consultants to primarily government agencies by providing objective and unbiased support for research and development of software systems, as well as providing services such as training, certifications, and advice & guidance.

Project Description

Project Opportunity

The SEI is already deep into a project where they are using machine learning and computer vision to automate testing of employees for the Department of Defense (DoD). There are tests users must take to become certified in a given area that are several hours and recorded screencasts. Grading requires a lot of staff hours and is neither sustainable in the long term nor efficient in the short term, so the solution needs to be self-proficient and automated. So, the SEI would like a solution the automatically scores employee's performance in testing scenarios, aka an "auto grader." Before this can happen, the computer vision system must be trained what to look for. We were tasked with discovering a solution that could allow them to painlessly and quickly create training data for the evaluation system. By allowing users to mark what parts of the video demonstrate proficiency in certain skills, and then allow them to organize these skills into standardized layouts readable by a machine learning system, the computer vision evaluation system will one day be able to automate this task based off the training data.

Project Vision

Based on the need of the client, we envision a solution that allows the intuitive creation of evaluation rubrics to be used as machine learning training data. Simply, this solution should allow people to tag appropriate skills demonstrated in videos, and chain those skills into larger sets of skills. The narrative, as informed by our conversations with the client, demonstrates that the creation of these KSA rubrics is imperative to enable the eventual functionality of their computer vision-enabled evaluation tool.

Project Outcomes

We have developed an air-gapped web application that can be used to create training data to provide to the SEI's Computer Vision Machine Learning System. Graders can access the application and create rubrics for different tasks and skills to be exported to the Machine Learning System so it can then identify the same tasks in the assessment recordings.

Project Deliverables

The final deliverables include training materials, documentation on design decisions, and the GitHub repository of the Node.JS application. We will also be having a final meeting with the client to ensure they have all the resources they need to understand the application and continue its development when they have time.

Recommendations

Since our team focused all of our efforts on building a reliable minimum viable product by the end of the semester, we were unable to incorporate all the additional functionality discussed with Josh and Rotem (the technical lead for this SEI Project) that they would have liked to see implemented in the Rubric Creator. We advise future development teams to develop more administrative controls and a user account system if it is still needed in the future. This would allow the admins more fine-tuned control of the system, and a cleaner interface for the users.

Student Development Team

Westin Lohne was the lead UI/UX designer. He is a Junior majoring in Information Systems. He will be working at Facebook this summer.

Arun Marsten served as a backend developer focusing on image saving and KSA interactions. He is a Senior in the BXA Program, majoring in Information Systems and Music Technology. He will be working at Deeplocal this summer.

Donovan Powers served as a backend developer focusing on video player and chapter marker interactions. He is a Junior majoring in Information Systems. He will be interning as a developer at Spiceworks this summer.

Aamer Rakla served as project manager. He is a Senior in the BXA Program, majoring in Information Systems and Drama: Production Technology & Management. He will be working at West Monroe Partners as a Security and Infrastructure Consultant beginning in August 2016.