

Performance Evaluation of Integrated Deep Learning Web Platform for Dataset Training

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Abstract

Along with the complexity of recent web site, many users cannot get the benefits. We developed Integrated Deep Learning Web Platform to help researcher to prepare dataset training for Tensorflow. However, the quality of a web site needs to be assessed. This paper proposes an implementation of WebQual 4.0 for evaluating Integrated Deep Learning Platform for Training Dataset (INDEF) quality. This method used the WebQual model that has some instruments. The instruments grouped the WebQual questions to be three main categories: usability, information and service interaction. From the research conducted can be evaluated that all respondents agreed Integrated Deep Learning Platform for Training Dataset web site met all the WebQual characteristics.

Keywords: dataset training, web platform, webqual.

1. INTRODUCTION

In recent years, there has been a rapid increase in building an object detection model with Tensorflow Object Detection API [1] for many smart applications. Instead of using a model provided by public dataset, many practitioners made their classifier. A model that is built with Tensorflow Object Detection API needed to pass a few steps to reach the best model. It consists of dataset download, image annotation, label map preparation, TF Record Creation, Pipeline Configuration, OMP Parameter Configuration, Training and Inference. Still, the processes are done with a separated different tool.

The first two steps which we called it dataset preparation is done using an image annotation tool where it's desktop version and not portable. And then the rest, training process, the program and configuration should be built by ourselves. INDEF (Integrated Deep Learning Platform for Training Dataset) provides all of those things and makes it be an integrated system. But, with the complexity of the recent web site, the quality of the website becomes the main goal for users who use it to feel the benefits.

WebQual [2] is a method for evaluating the quality of Web sites, developed by Baner & Vidgen (2003). WebQual 4.0 is an extended version from WebQual 3.0 where usability replaced site quality categories. WebQual has been used by many researchers and becomes the most popular method for assessing the quality of web sites (Baner & Vidgen, 2005).

The section in this paper has five purposes: Section 1 present the introduction about background problem, the related works and previous study of the research presents in section 2. Section 3 offers the methodology of the research was conducted. Section 4 presents the results and discussion of our study. And finally, we closed this paper with Section 5 the conclusion.

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2. RELATED WORKS

2.1 TENSORFLOW MACHINE LEARNING DETECTION MODEL

The study and previous works have developed many models for object detection and machine learning using TensorFlow library. This solution has several steps to do which consist of eight steps: (1) Dataset Download, (2) Image Annotation, (3) Label Map Preparation, (4) TF Record Creation, (5) Pipeline Configuration, (6) OMP Parameter Configuration, (7) Training and (8) Inference. Several applications that used object detection from Tensorflow library and previously they have to create dataset training model in their own computer. The example of Object detection applications are Vehicle as a Mobile Sensor Networks (VaaMSN) [3][4][5], Smart Environment Monitoring and Analytic in Real-time System (SEMAR)[6][7], Classification[8], and also fruit detection[9].

2.2 INTEGRATED DEEP LEARNING WEB PLATFORM FOR DATASET TRAINING

Integrated Deep Learning Web Platform for Dataset Training (INDEF) is a web application that run on Docker Engine[10]. It consists of several parts such as web service run on NginX webserver[11], Golang RESTful API[12] to control and run Tensorflow engine, Python RESTful API[13] to communicate between WebApps and also mongoDB [14]as a database server. The architecture can be seen on Figure 1.

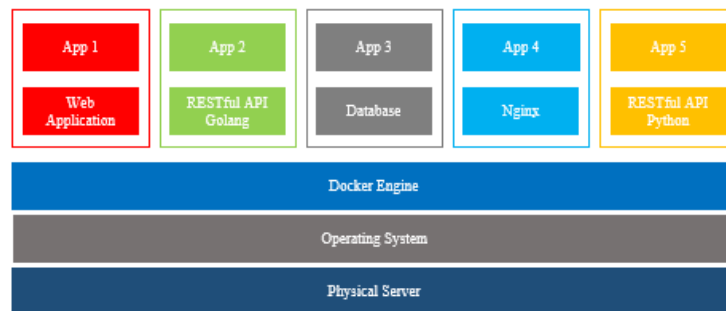


Figure 1. Architecture of Integrated Deep Learning Web Platform.

The process of web platform can be seen on Figure 2. First Data Labeling, this platform is built to give label to each image on dataset for Tensorflow Training process. The interface of data labeling is by draw a box on an image by click and drag the mouse, then user give a text label on that box. Second are Dataset Training, in this process web interface use RESTful API to run Tensorflow training process by Golang and Python scripts. Then the Tensorflow engine will run in the background process and periodically send a log message to a console and read it by web application interface.

Beside controlling the training process, this web platform also provide a management service for user administration, project administration and also batch controlling process. The functional requirement for the web application are: 1) Authentication, 2) Profile, 3) Home, 4) Create Project, 5) Edit, 6) Annotate, 7) Export, 8) Membership, 9) Upload, 10) Generate TFRecord for Tensorflow, 11) Train, 12) Stop, 13) Show Tensorboard, 14) Stop Tensorboard, and 15) Model result. The Functional diagram can be seen on *Figure 3*.

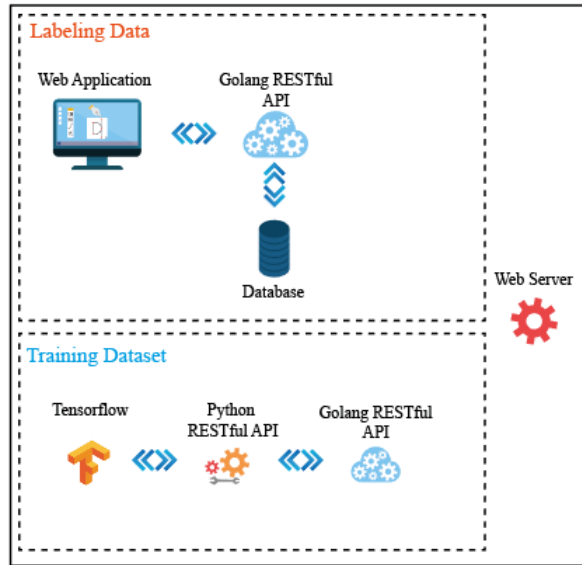


Figure 2. System Detail.

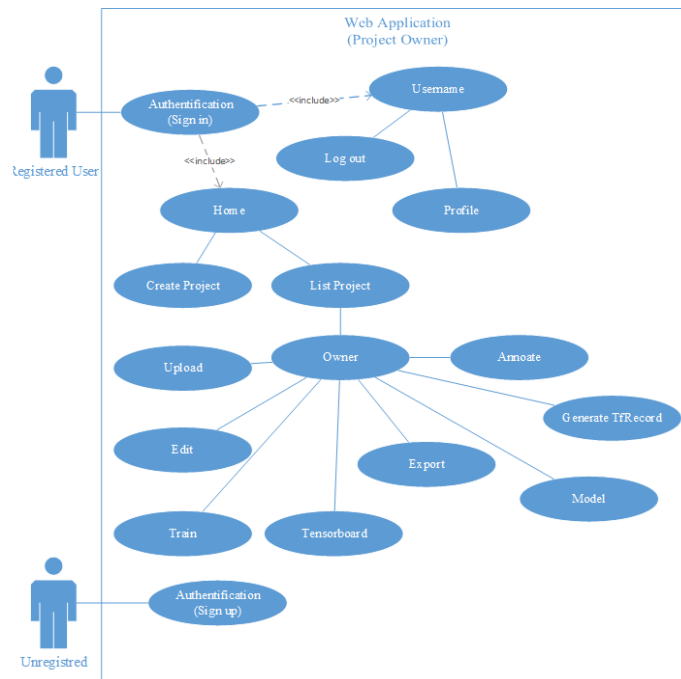


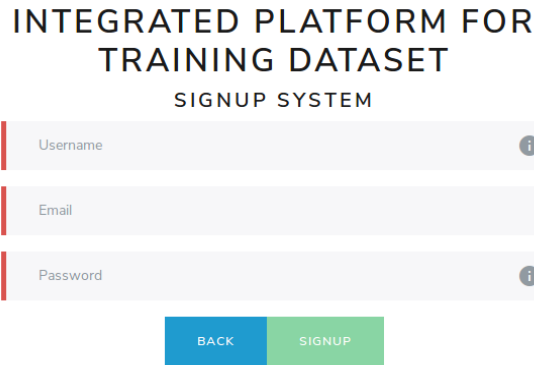
Figure 3. Use case diagram.

2.3 MEASURE WEB QUALITY USING WEBQUAL

The previous study show the implementation of WebQual 4.0 as a method for assessing web site quality from the research conducted by Warjiyono and Corie Mei Hellyana explained that WebQual measurement is based on perception from the last user [15]. Meanwhile, the study published by Stuart J. Barnes and Richard T. Vidgen on an integrative approach to the assessment of e-commerce quality shows that this method can build a profile of qualities of an individual web site through WQ index. The quality of each category can be visualized with a radar chart which contains several categories.

3. EXPERIMENT

The key to getting a clear view of the quality of web site, qualitative and quantitative approaches were needed. The screenshot from Integrated Deep Learning Platform for Training Dataset can be seen from Figure 4 until Figure 10.



INTEGRATED PLATFORM FOR
TRAINING DATASET

SIGNUP SYSTEM

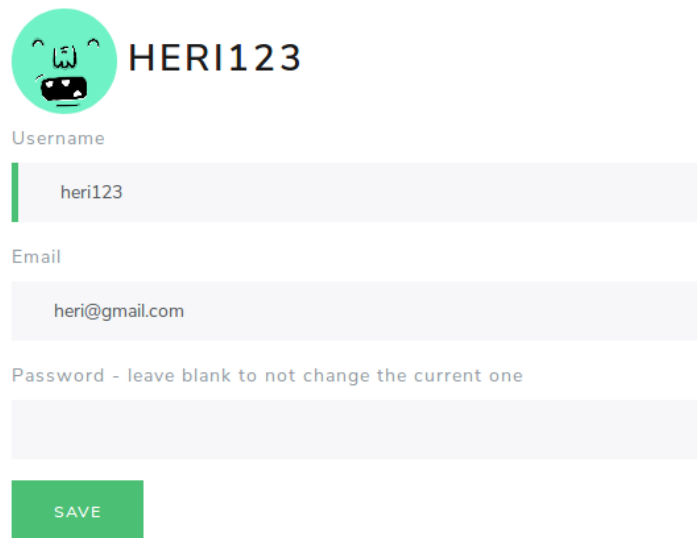
Username

Email

Password

BACK SIGNUP

Figure 4. Signup form.



HERI123

Username

heri123

Email

heri@gmail.com

Password - leave blank to not change the current one

SAVE

Figure 5. Profile page.

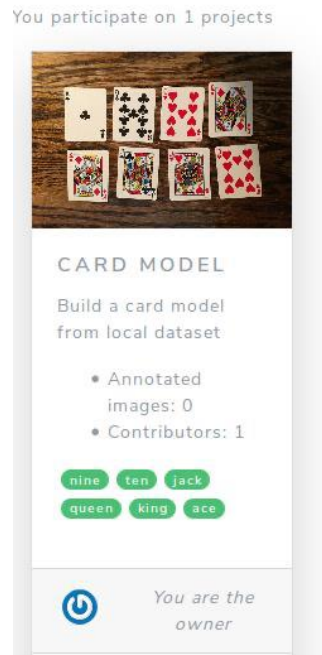


Figure 6. Project menu.

CREATE PROJECT

Project name

Illustration image for your project

No file selected.

Applicable tags for annotation

Description text

Choose an image provider that will fetch image to annotate

You'll be able to share the project with other user as soon as you

Figure 7. Create Project.


EDIT PROJECT

Project name

Card Model

Illustration image for your project

Browse... No file selected.



Applicable tags for annotation

ace,nine,ten,jack,queen,king

Figure 8. Edit Project.

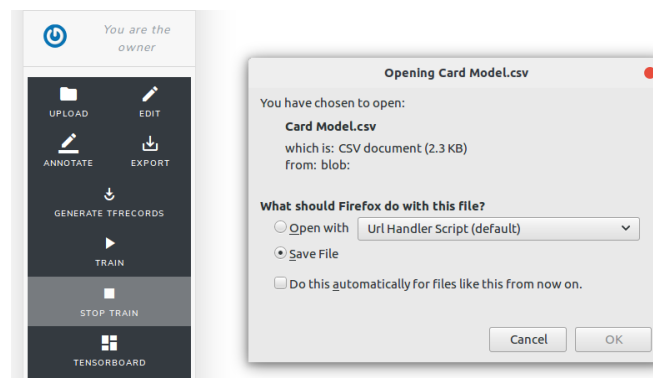


Figure 9. Export model from dataset training and Tensorflow training controls.



Figure 10. Annotate - dataset labeling.

However, WebQual was adopted. The model of WebQual used is about getting the primer data from survey through a questionnaire. This survey can be achieved, whether it's offline or online. This research used the WebQual model, which consists of three instruments; usability,

information and service interaction. The questionnaire was designed using google form and Likert scale. The questionnaire questions translated to Bahasa and distributed to 30 people who used the INDEF Platform. The WebQual 4.0 categories and questions can be seen as shown in **Table 1**.

Table 1. The instrument of WebQual 4.0 (source: Barnes and Vidgen, 2000).

Category	WebQual 4.0 Questions	Code
Usability	Is easy to use	USA1
	Has things where you expect to find them	USA2
	Is easy to find your way around	USA3
	Has fast navigation to pages	USA4
	Has useful links to other sites	USA5
	Is easy to find	USA6
	Facilitates return visits	USA7
Information	Has an attractive appearance	INF1
	Has an appropriate style of design for site type	INF2
	Provides quick and easy access to finding information	INF3
	Provides relevant information	INF4
	Provides information at an appropriate level of detail	INF5
	Provides information content that is easy to read	INF6
	Communicates information in an appropriate format	INF7
	Provides information content that is easy to understand	INF8
	Has information that is updated regularly	INF9
	Has reliable information	INF10
	Has reasonable loading time	INF11
	Creates an experience	INF12
Service Interaction	Conveys a sense of community	SER1
	Keeps the user's attention	SER2
	Is a site that feels secure	SER3
	Makes it easy to give feedback	SER4
	Makes it easy to contact the organization	SER5

We run our web application on LAN 1Gbps and 802.11ac WLAN, we used server with specification Xeon 48 Core CPU, 96 GB RAM, NVIDIA GTX1060 GPU, and 3TB HDD. On the clients side, users used i5 CPU with 4GB with Chrome Browser web client.

In the Figure 11 shows that the different between labelling tool from labeling[16] application and labelling from Integrated platform. The conventional way is labeling, user have to create dataset label in their PC and re-manage all the images and send all the data to Tensorflow server or PC, but with our platform all of images already in the server and user able to directly run Tensorflow engine from web interface.

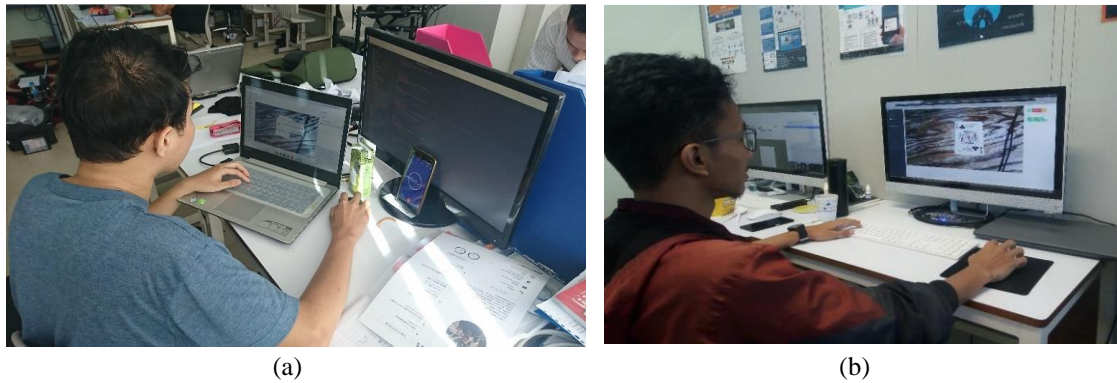


Figure 11. Implementations: (a) using labeling, (b) using INDEF Platform.

4. RESULT AND DISCUSSION

The data that was taken from questionnaire is qualitative data, and for the result, descriptive approached is used. The next step is to examine whether the factors are valid or not in order to measure the construction. In the measurement points above, maybe there is a point that not valid or reliable. Therefore, it should be removed or replaced by other questions. Validation is done by looking at a corrected item-total correlation in the analysis factor. Corrected item-total correlation number was from product-moment correlation between each question that will be test and sum of questions.

Table 2. WebQual questioner results.

Code	WebQual Questions	Result (%)				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
USA1	Is easy to use	3.3	3.3	6.7	73.3	13.3
USA2	Has things where you expect to find them	0	0	23.3	53.3	23.3
USA3	Is easy to find your way around	0	3.3	20	70	6.7
USA4	Has fast navigation to pages	0	0	10	63.3	26.7
USA5	Has useful links to other sites	0	3.3	23.3	60	13.3
USA6	Is easy to find	0	0	23.3	56.7	13.3
USA7	Facilitates return visits	0	6.7	16.7	63.3	13.3
INF1	Has an attractive appearance	0	0	6.7	3.3	26.7
INF2	Has an appropriate style of design for site type	0	0	10	66.7	23.3
INF3	Provides quick and easy access to finding information	0	0	10	76.7	13.3

INF4	Provides relevant information	0	0	16.7	76.7	6.7
INF5	Provides information at an appropriate level of detail	0	0	26.7	56.7	16.7
INF6	Provides information content that is easy to read	0	0	10	76.7	13.3
INF7	Communicates information in an appropriate format	0	0	16.7	50	26.7
INF8	Provides information content that is easy to understand	0	0	26.7	73.3	13.3
INF9	Has information that is updated regularly	0	3.3	30	46.7	20
INF10	Has reliable information	0	0	30	53.3	16.7
INF11	Has reasonable loading time	0	3.3	23.3	53.3	20
INF12	Creates an experience	0	3.3	16.7	56.7	23.3
SER1	Conveys a sense of community	0	0	23.3	53.3	23.3
SER2	Keeps the user's attention	0	3.3	16.7	66.7	13.3
SER3	Is a site that feels secure	0	0	20	66.7	6.7
SER4	Makes it easy to give feedback	0	0	40	53.3	6.7
SER5	Makes it easy to contact the organization	0	13.3	20	56.7	10
	SUM-AVG=	0,14	1,80	19,45	59,45	16,25

As shown in Table 2, the average of strongly disagree and disagree are 0.14% and 1.8% it means that very small number that users doesn't agree. And for neutral average is 19.45%. The percentage for agree and strongly agree are 59.45% and 16.25%, it means that more than 75% users are agree. Therefore, the highest score is agreed.

It can be seen from **Error! Reference source not found.** that all the questions were grouped into three categories. The average of 24 question responses above, the results can be seen in Figure 12.

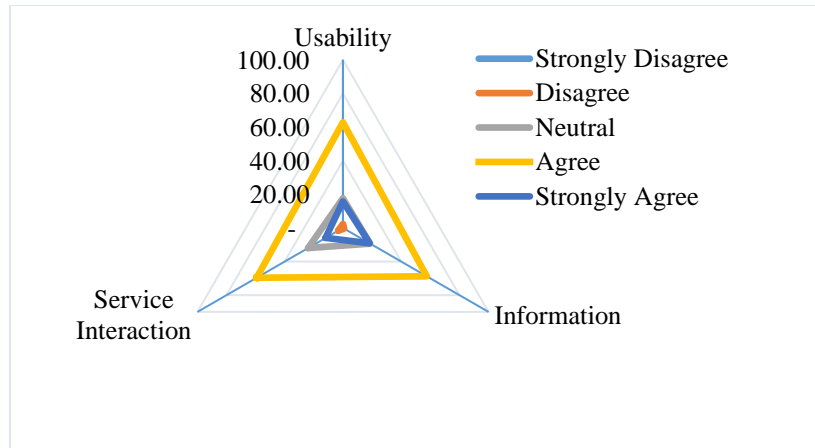


Figure 12. Results of measurement from Webqual 4.0 questionnaire

5. CONCLUSION

Based on Table 2 and Figure 12 can be concluded that all respondents agreed Integrated Deep Learning Platform for Training Dataset met all WebQual characteristics, which are usability, information quality and service interaction.

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