IT4010 – Research Project - 2023

Topic Assessment Form

Project ID : TMP-23-383

1. Topic (12 words max)

Vehicle auto parts originality identification and usage Prediction

2. Research group the project belongs to

Machine Learning and Soft Computing (MLSC)

3. Research area the project belongs to

Machine Learning (ML)

4. If a continuation of a previous project:

Project ID	
Year	

5. Team member details

Student Name	Student ID	Specialization
Leader: S.L.D.P Pramodya	IT20219598	IT
Member 2: A.M. K. A. P. Amarasingha	IT20257040	IT
Member 3: D.M.D.H Dissanayaka	IT20261764	ISE
Member 4: P. U. Rathnasooriya	IT20156206	DS

6. Brief description of the research problem including references (200 – 500 words max) – references not included in word count

The topic that we have selected for our research project "Vehicle auto parts originality identification and Prediction on usage" provides a solution to an issue faced by people who do not have any knowledge in the automobile engineering domain to identify the mechanical issues in a vehicle that an individual is going to purchase a vehicle.

The problem that we have identified is that when an individual tries to purchase a vehicle (Motorbike) he will not be able to identify the defects, auto parts fixed as an alternative to original parts, engine defects, usage of the current tyres, vehicle details and the registration paper details comparison.

This problem is mainly faced by individuals mostly when they are purchasing a motorbike for the first time without any experience where they cannot identify the defects straightly by looking at it at once, therefore they will need to get the knowledge of an expert after purchasing in order to identify the malfunctions, altered auto parts.

When identifying the initial scope for our research project we have used the following mechanisms since the vehicle industry is a huge industry in the present world.
The scope that we have selected is only for Indian Motorbikes because it is the most widely sold type of motorbike. In future, we are planning to extend to all the other vehicles.

Origin	Indian				Malaysian	Japan
Model	Dio/Pleasure/pept	Bajaj Pulsar	CT 100	FZs	Demak	
The number of bikes to be sold in ikman.lk, Riyasewana (Bikes to be sold in 1st three pages)	20	13	19	8	4	4

Note: -

Analysis of the scope selection has been done by referring to all these mentioned websites and getting a summary of the motorbikes to be sold.

[1]J.R. Parker "Algorithms for Image Processing and Computer Vision, Second Edition." Computer Vision, Graphics, and Image Processing, Published by Wiley Publishing, Inc. 10475 Crosspoint Boulevard Indianapolis, IN 46256 Copyright 2011 Published by Wiley Publishing, Inc., Indianapolis, Indiana Published simultaneously in Canada www.wiley.com

[2]Goddard, William. "Speech Recognition Algorithm." ITChronicles, 4 Apr. 2022, itchronicles.com/artificial-intelligence/speech-srecognition-algorithms.

[3]Ilminen, Gary. "Top 6 Strange Motorcycle Noises | What They May Mean." Ultimate Motorcycling, 29 Mar. 2016, ultimatemotorcycling.com/2016/03/29/top-6-strange-motorcycle-noises-what-they-may-mean.

[4]"How Does Speech Recognition Work? Which Algorithm Is Used in Speech Recognition? – IndianTTS Blog." How Does Speech Recognition Work? Which Algorithm Is Used in Speech Recognition? – IndianTTS Blog, indiantts.com/blog/how-speech-recognition-synthesis-work-which-algorithm-used-voice-recognition. Accessed 1 Feb. 2023.

[5] https://d-nb.info/1159675910/34

[6] https://www.researchgate.net/profile/Ashfaq-Shafin/publication/344519283_Automatic_Environmental_Sound_Recognition_AESR_Using_Convolutional_Neural_Network/links/5f7de369458515b7cf6f22d7/Automatic-Environmental-Sound-Recognition-AESR-Using-Convolutional-Neural-Network.pdf

[7] Tokozume, Yuji, and T. Harada. "Learning environmental sounds with end-to-end convolutional neural network," 2017 IEEE International Conference on Acoustics,

[8]"How Optical Character Recognition Algorithms Redefine Business Processes

&Mdash; ITRex." ITRex, 6 Apr. 2022, itrexgroup.com/blog/how-ocr-algorithms-redefine-business-processes.

[9]Speech, and Signal Processing (ICASSP), pp. 2721-2725. IEEE, 2017.

[10] D. Barchiesi, D. Giannoulis, D. Stowell and M. D. Plumbley, "Acoustic Scene Classification: Classifying environments from the sounds they produce," in IEEE Signal.

7. Brief description of the nature of the solution including a conceptual diagram (250 words max)

   As a solution, our team has come up with a mobile application which is based on the sub-section of Machine Learning (ML) which is called Image Processing and a vast database with all the necessary data regarding auto parts to solve this issue.
   Some of the major functions of our mobile application will be;

   - Capture images of the auto parts in the vehicle and compare them with the original parts and provide a summary regarding the altered parts.
   - Capture the sound of the engine and provide a summary of the engine's current condition and a prediction of future fault occurrences.
   - Capture an image of the Registration paper and compare it to the bike's original details.
   - Capture the images of tyres and predict the usage and possible life expectation.

   Using this mobile application, the buyer can get full output whether it is a modified motorbike or it is in its original condition and in a condition to be used without getting any major repairs at the moment of purchase.

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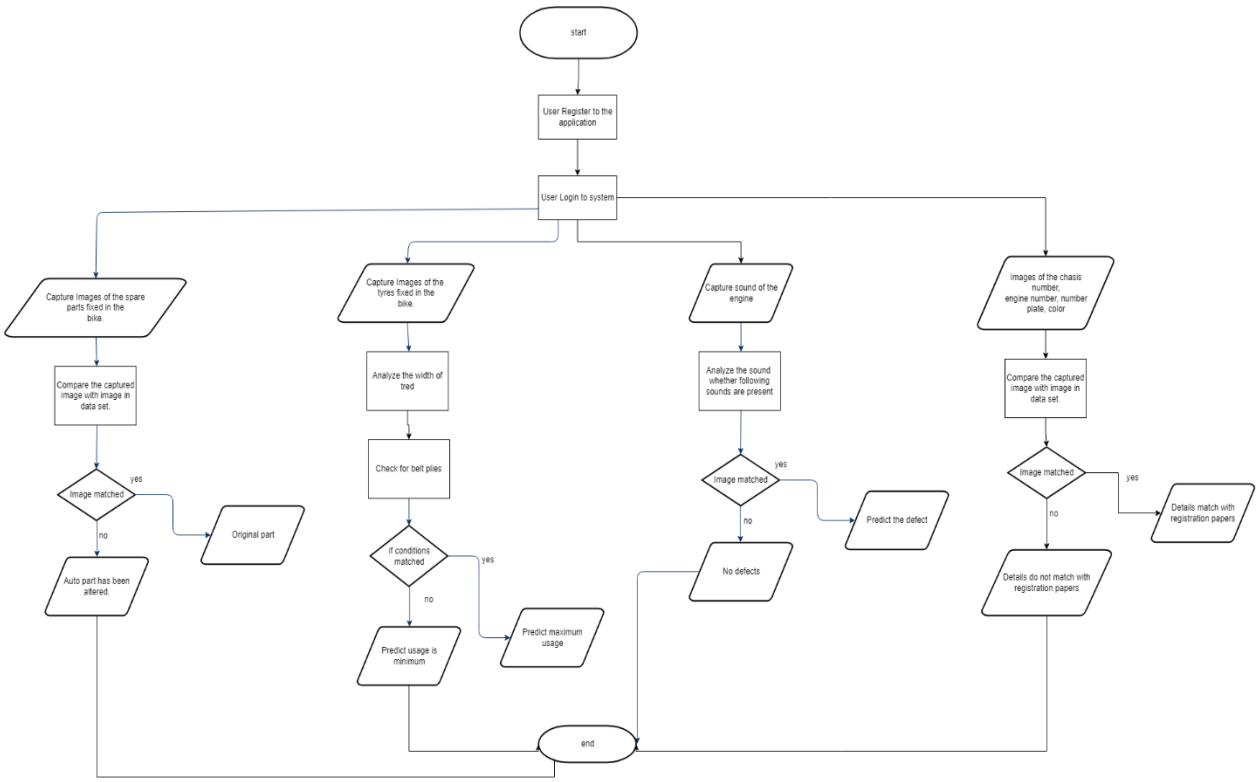

8. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

In order to collect the necessary data requirements for our database and training purposes we could get the knowledge from experts in auto mobile engineering from other universities, lecturers that we have our contacts with. Also, the necessary images of the auto parts for training model could be collected through the spare parts shops and other manufacturing industries. The industries such as DSI tyres, Bajaj spare parts, Honda bike agents are willing to provide us with all the necessary data requirements including permission to capture images.

For extra knowledge in mechanical area, we are planning to contact several motor bike repairing places. The initial steps of contacting them and getting their knowledge has already been started by our team, also the individuals are willing to provide their full efforts in providing us with the necessary information.

Institutions such as hero Honda service center, Bajaj service center, R & D Bike modification center are willing to provide us with extra knowledge and support in our project.

Furthermore the team has made all the necessary arrangements to build up data sets contingent upon a denial of data gathering from one of the mentioned institution or individual. Due to the accuracy level issues from the built up data sets we would using maximum number of images in training the models.

9. Objectives and Novelty

Main Objective Mobile application which can identify the altered parts fixed instead of original parts of a motorbike, analyse tyre usage, identify engine defects by the sound of the engine, comparing vehicle details with the registration paper details.			
Member Name	Sub Objective	Tasks	Novelty
S.L.D.P Pramodya	Identify the altered parts from the original parts.	Capture images of parts of the motorbike, then compare those images with the trained data set and conclude whether the part is original or has been altered.	Get an accurate output of the auto part used instead of the original part from the spare part analyzed using image enhancement and pattern identification. Furthermore, we are expected to apply appropriate color models

			like HSV (Hue, Saturation and Value).
A.M.K.A.P Amarasingha	Identify defects in the engine by the sound of the engine.	Capture the sound of the engine, use voice recognition techniques to differentiate the sounds and provide an analysis of the defects of the engine.	Differentiate these common engine defects that could occur in motorbikes: - Tick, tick tick, Bump & grind, Creepy krink, Boo hiss, Snap, crackle, pop.
D.M.D.H Dissanayaka	Compare the vehicle details with the registration paper details	Capture images of the chassis number, engine number, colour, and number plate and compare them with registration paper details	This comparison is done by enhancing the quality of images to clearly identify whether these details match with registration paper details if these areas are worn out or rusted.
P. U. Rathnasooriya	Tyre usage prediction along with the life expectation	Capture images of the tyres fixed in the bike, then analyze the width of tread, and belt plies and provide a prediction from the analysis.	Predict the life expectancy of the tyres based on the analyzed data using the ML model.

10. Supervisor checklist (supervisors should fill sections 10 and 11)

a) Is this research problem valid?

Yes	✓	No	

b) Is the proposed research group correct?

Yes	✓	No	

c) Is the proposed research area correct?

Yes	✓	No	

d) Do the proposed sub-objectives match the students' specialization?

Yes	✓	No	

e) Is the required domain expertise, knowledge, and the data available either through the supervisor or external supervisor?

Yes	✓	No	

f) Is the scope of the solution practical?

Yes	✓	No	

g) Do all sub-objectives have sufficient novelty?

Yes	✓	No	

11. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Dr.	Amitha	Caldera	
Co-Supervisor	Mr.	Supipi	Karunathilaka	

Do the proposed External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

Summary Sheet

The topic evaluation panel will use the summary sheet to evaluate the suitability of the project

1. Brief description of research problem including references (200 – 300 words max)

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This problem is mainly faced by individuals mostly when they are purchasing a motor bike for the first time without any experience where they cannot identify the defects straightly by looking at it at once, therefore they will need to get the knowledge of an expert after purchasing in order to identify the malfunctions, altered auto parts.

When identifying the initial scope for our research project we have used the following mechanisms since vehicle industry is a huge industry at present world. The scope that we have selected is only for Indian Motorbikes because it is the most widely sold type of motorbike. In future, we are planning to extend to all the other vehicles. For the specific scope selection, we have analyzed first 3 pages of advertising websites to get a count of the specific bikes to be sold. Out of them most were Indian motor bikes. Thus the scope was selected.

2. Brief description of the nature of the solution (150 words max)

As a solution, our team has come up with a mobile application which is based on the sub-section of Machine Learning (ML) which is called Image Processing and a vast database with all the necessary data regarding auto parts to solve this issue.

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Topic Assessment Form

<u>This part to be filled by the Topic Screening Panel members</u>

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor)*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

Important:

1. According to the comments given by the panel, do the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.
2. If the project topic is rejected, identify a new topic, and request the RP Team for a new topic assessment.
3. The form approved by the panel must be attached to the **Project Charter Form**.