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**SINGAPORE POLYTECHNIC  
SCHOOL OF COMPUTING**

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**DIPLOMA IN APPLIED AI AND ANALYTICS (DAAA)**

Module Code	: ST1516
Module Name	: DEVOPS AND AI AUTOMATION (DOAA)
Semester	: 2023/2024 Semester 2
Assignment Title	: CA1 – DevOps for ML Web Application
Assignment Type	: Individual
Weighting	: 40%
Deadline	: 4 Dec 2023 (Monday), 09:00 hrs
Mode of Submission	: Online Submission via Brightspace. Please follow the instructions on Brightspace on how to submit.

**LATE SUBMISSION**

50% of the marks will be deducted for assignments that are received within ONE (1) calendar day after the submission deadline. No marks will be given thereafter.

Exceptions to this policy will be given to students with valid LOA on medical or compassionate grounds. Students in such cases will need to inform the lecturer as soon as reasonably possible. Students are not to assume on their own that their deadline has been extended.

**PLAGIARISM**

No marks will be awarded, if the work is copied or you have allowed others to copy your work. SP's academic policy on Copyright and Plagiarism applies. Please refer to this link: <https://www.sp.edu.sg/sp/student-services/osc-overview/student-handbook/intellectual-property-copyright-and-plagiarism>

## DEVOPS FOR MACHINE LEARNING WEB APPLICATION

### BACKGROUND

DevOps is a set of practices and tools that increases an organization's ability to deliver business value in the form of products or services at a high velocity. In this assignment, the following best practices will be demonstrated:

- Infrastructure as Code – a practice in which infrastructure is provisioned and managed using code and software development techniques, as such version control and continuous integration
- Continuous Delivery – a software development practice where code changes are automatically built, tested and prepared for a release to production
- Continuous Integration – a software development practice where developers regularly merge their code changes into a central repository, after which builds and tests are run

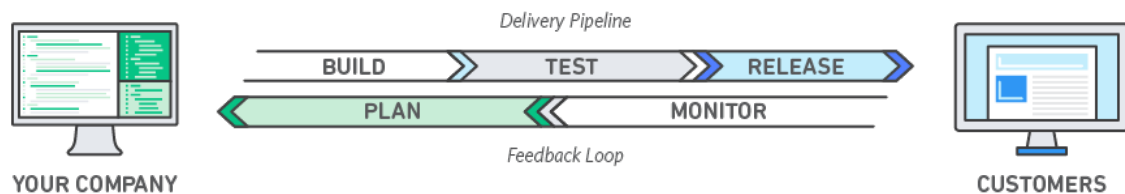


Image Credit: AWS (<https://aws.amazon.com/devops/what-is-devops/>)

### OBJECTIVE

To develop a Machine Learning (ML) web application using GitLab and Flask Framework, incorporating the 3 DevOps best practices mentioned in the Background section. This is an open-ended assessment.

### DATASET

You are to use one dataset from the following Kaggle site:

- Car Price Prediction - <https://www.kaggle.com/datasets?search=regression+car>
- Supervised Learning – Regression

Note:

- For simple and trivial dataset chosen, lower mark will be awarded.
- If a group of students is found to be using the same dataset with very similar ML model(s), 5 marks will be deducted for Model Development.

## TASKS

### Part 1 (GitLab and SCM)

For this part, you are required to do the following:

1. Set up a GitLab project using your GMail account.
  - a. The naming convention for your project is: CA1-[class]-[AdminID]-[Name].
  - b. The class naming convention is: DAAA2B0X.
2. Set up a SCRUM board for your development process
3. Setup 6 branches in the GIT repository
4. The Main branch must be merged after each branch is completed

### Part 2 (Web Application Development)

For this part, you are required to do the following:

1. Develop a Machine Learning (ML) technique to produce an appropriate model based on the selected dataset
2. Perform model training using Jupyter notebook; Provide appropriate level of documentation in the Jupyter notebook
3. Design and create wireframe(s) for your web application
4. Make use of Flask Framework to deploy your ML model as web application
5. Store the prediction history using SQLite
6. Present the prediction history with a good level of information in a table form
7. Create a simple login credential to secure your web application

### Part 3 (Automatic Testing)

For this part, you are required to do the following:

1. Unit testing should cover at least 3 of the following:
  - a. Validity testing
  - b. Range testing
  - c. Consistency testing
  - d. Unexpected failure testing
  - e. Expected failure testing
2. Create REST APIs for crucial operations and prediction functionalities
3. Testing on all the REST APIs created

#### Part 4 (Presentation)

You are required to perform the following for the presentation:

1. Create a Powerpoint presentation (maximum slide: 25)
2. Do a 10-minute presentation using PowerPoint slides
3. Demonstrate the key features of your web application
4. Demonstrate the proper setup of SCRUM board and the 6 branches in GIT

Note: You must present your work and demo to ascertain the authenticity of your work is in order. Zero marks will be awarded for all other components if the authenticity of your work cannot be ascertained.

#### Part 5 (Internet Deployment – Optional)

This part is optional and served as bonus. You are to research and find out how to deploy your web application to the internet using one of the following platforms:

- Render - <https://render.com>
- Any other platform that offers free tier and doesn't require credit card information for registration.

#### **SUBMISSION**

1. Submit a ZIP file containing the following deliverables with the naming convention: CA1-[class]-[AdminID]-[Name].zip - the class naming convention is: DAAA2B0X.
  - Powerpoint slide in PPTX and PDF format
  - Jupyter Notebook and its HTML exported version
  - Source code in zipped format, excluding the env folder content
2. Submit your assignment using the assignment link under the Assignment folder in Brightspace. Please remember to include your student name and admission number on the top of your Jupyter Notebook and in the title slide of your Powerpoint.

## EVALUATION CRITERIA

This is an open-ended assessment, where there is more than one way to develop the web application. You are encouraged to use your creativity and apply the concepts in this assignment. If you simply clone or adapt the web application from the module practicals, low mark will be awarded.

No	Category	Description	Marks
1	DevOps Process	<ul style="list-style-type: none"> <li>• Gitlab and branches setup</li> <li>• Setup of Scrum Board</li> </ul>	10
2	Model Development	<ul style="list-style-type: none"> <li>• Feature Engineering</li> <li>• Model development</li> </ul>	10
3	Frontend Development	<ul style="list-style-type: none"> <li>• Wireframe Design</li> <li>• UI Creation and Development</li> </ul>	20
4	Backend Development	<ul style="list-style-type: none"> <li>• Prediction history setup</li> <li>• Login credential</li> </ul>	25
5	Automatic Testing	<ul style="list-style-type: none"> <li>• Setup of relevant test test cases</li> <li>• Web API setup for testing</li> </ul>	20
6	Presentation	<ul style="list-style-type: none"> <li>• Powerpoint slide submission</li> <li>• Presentation &amp; demonstration</li> </ul>	15
7	Deployment (Bonus)	<ul style="list-style-type: none"> <li>• Deployment to internet</li> </ul> Note: total mark capped at 100	10
		TOTAL	100