

Configuration Manual

Analyse of 3D geometrical STEP file for feature recognition

MSc Research Project

MSc in AI for business

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MSc Project Submission Sheet

School of Computing

Student Name:	Adil Abdullah
Student ID:	x23114631
Programme:	MSc in AI for Business Year:2023/24
Module:	
Lecturer:	Practicum 3
Date:	
Project Title:	Analyse of 3D geometrical STEP file for feature recognition
Word Count:	

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.

<u>ALL</u> internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

Signature:	ADIL ABDULLAH
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Date:16-09-2024.....

PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

Attach a completed copy of this sheet to each project (including multiple copies)	
Attach a Moodle submission receipt of the online project submission, to each project (including multiple copies).	
You must ensure that you retain a HARD COPY of the project, both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer.	

Assignments that are submitted to the Programme Coordinator Office must be placed into the assignment box located outside the office.

Office Use Only	
Signature:	
Date:	
Penalty Applied (if applicable):	

Architecture:

1. High Level Multi 3 Tier Flow:

The application is Angular at frontend then goes to API which is based in Python Flask framework and then to core Machine learning and CNN algorithm written on python.



2. User Login Flow:

User first register themselves if success then login and same time notifies through his/her email. Then login to move into main application.



3. File Process Flow:

Once in main application STEP geometrical file will be uploaded on application from user system and after processes of file then it will be available to download in different formats.



4. File Uploading and Result Flow Process:

Once STEP file uploaded successfully you can view EDA, geometrical properties, EDA visualize chart and ML process and their result from your uploaded STEP file.



Step 1:

Clone below provided GitHub repository URL on any folder in your local system. First open command prompt moved on the folder where you want to clone and run below command.

git clone https://github.com/adilabdullah/Analyse-of-3D-geometrical-STEP-file-for-feature-recognition

URL: <u>https://github.com/adilabdullah/Analyse-of-3D-geometrical-STEP-file-for-feature-recognition</u>

← → C	github.com/adilabdullah/Analyse-of-3D-geomet	rical-STEP-file-for-feature-recognition		⊑ ☆) ⊀ 🔊 :
	adilabdullah / Analyse-of-3D-geometrical-STEP-file-fe	or-feature-recognition	Q Type [] to search	+ • • • n @ •
<> Code	⊙ Issues 🖏 Pull requests ⊙ Actions 🖽 Pro	ojects 🖽 Wiki 🙂 Security 🗠 Insights 袋	3 Settings	
	Analyse-of-3D-geometrical-STEP-fil	e-for-feature-recognition (Public)	🔊 Pin 💿 Unwatch	1 • 😲 Fork 0 • 🛱 Star 0 •
	🐉 main 🔹 🐉 1 Branch 🗞 0 Tags	Q Go to file	Add file 🔹 <> Code 🔹	About ®
	() adilabdullah second commit	b70ce1	0 · 13 hours ago 🕚 2 Commits	Application for Analysis of 3D geometrical STEP file for feature
	Backend	first commit	14 hours ago	Ar Activity
	Chatbot	first commit	14 hours ago	☆ 0 stars
	Colab-Code	second commit	13 hours ago	⊙ 1 watching
	Sample-Datasets	second commit	13 hours ago	0 torks
	Sample-STEP-Files	second commit	13 hours ago	Releases
	BackendExample02.STEP.csv	first commit	14 hours ago	No releases published Create a new release
	BackendExample02.csv	first commit	14 hours ago	Darkagor

Step 2:

After successful cloning in previous step go to Chatbot folder inside your project folder and open CMD there and run below command.

<project-folder>\Chatbot>ng serve

This will run your frontend angular application



Note: Must ensure that node is install on your system by run below command on cmd.

Node -v

Step 3:

Now move back onto main project folder where you clone and go to Backend folder and open CMD there to run below command.

<project-folder>\Backend>python fileUpload.py



Note: Must ensure that python is install on your system by run below command on cmd.

python -v

Step 4:

After running frontend and backend both from step 1 & 2. Now its time to run application for this open browser and write below URL to access it.

URL: http://localhost:4200/login

Below is the UI of above URL where right side is registration form and left is login.

Analyse of 3D geometrical STEP file for feature recognition			
User Details			
Email:	Email:		
Username	Email		
Username:	Username:		
Password	Username		
_	Password:		
Login	Password		
	Confirm Password:		
	Confirm Password		
	Create Account		

Step 5:

After opening URL in step 3 below is the screenshot of left side registration where you can register by input your email, username and password by click on create account button.

Email:
Email
Username:
Username
Password:
Password
Confirm Password:
Confirm Password
Create Account

Email:
adil_abdullah@hotmail.com
Username:
adilabdullah
Password:
•••••
Confirm Password:
••••••
Create Account
success

Step 6:

After opening URL in step 3 below is the screenshot of right-side user login where you can login by input your either email or username and password by clicking on login button.

Email:			
adil_abdullah@hotma	il.com		
Username:			
•••••			
Login			

Step 7:

After successful login on step 5 main application view is routed as screenshot below with multiple options.

Feature Recognition of 3D Geometrical STEP Application		
Upload STEP File		
Choose File No file chosen		
Upload File		
Generate EDA		
Generate Properties		

Generate EDA		
Generate Properties		
Generate Chart		
Process Result		
Export Result		
	Design and Developed by: Adil Abdullah	

Step 8:

After routed on main application page first option upload STEP file which you have to upload from your local system by clicking on choose file button and then on upload file.

Upload STEP File Updoad File Upload File		Feature Recognition of 3D Geometrical STEP Application	
Choose File Example02.STEP Upload File Upload STEP File Choose File Example02.STEP Upload File		Upload STEP File	
Upload File Upload STEP File Crosse File Example 02.STEP Upload File		Choose File Example02.STEP	
Upload STEP File Procee File Example02.STEP Upload File Since		Upload File	
Upload STEP File Croose File Example02.STEP Upload File Solution			
Choose File ExampleO2.STEP Upload File	Uplo	oad STEP File	
	Choo	d File	
Upload STEP File	Uploa	ad STEP File	
Choose File Example02.STEP	Choose	e File Example02.STEP	

Step 9:

SUCCESS

After successful file upload on step 8 download tab will display to download file either on CSV or excel format. Below is the screenshot and sample CSV format.

Jpload STEP File
Choose File Example02.STEP
Upload File
BUCCESS
Download STEP File Dataset
Download CSV Download Excel

Sample Dataset:

A	В	С	D	E	F	G	H I	J	К	L	М	N	0	Р	Q	R	S
1 KEY	ENTITY D0	D	1 D	2	D3 D4	1 D5	D6	D7	REFERENCES								
2	2 CARTESIAN	0	0	0	1148	0	0	0	0 [1148]								
3	4 PRODUCT	0	1399	17.5	0	0	0	0	0 [1399]								
4	5 PERSON	0	1820	1815	0	0	0	0	0 [1820, 1815]								
5	6 CIRCLE	0	1235	259	0	0	0	0	0 [1235, 259]								
6	7 EDGE_LOO	0	1403	2.75	0	0	0	0	0 [1403]								
7	8 LINE	0	1221	10	0	0	0	0	0 [1221, 10]								
8	9 CIRCLE	0	349	13	0	0	0	0	0 [349, 13]								
9	10 LINE	0	1227	1000	0	0	0	0	0 [1227]								
10	11 LINE	0	801	1000	0	0	0	0	0 [801]								
11	12 VECTOR	0	350	1000	0	0	0	0	0 [350]								
12	13 VECTOR	0	352	1000	0	0	0	0	0 [352]								
13	14 VECTOR	0	268	78	0	0	0	0	0 [268, 78]								
14	15 VECTOR	0	798	16	0	0	0	0	0 [798, 16]								
15	16 LINE	0	799	1000	0	0	0	0	0 [799]								
16	17 LINE	0	1234	253	0	0	0	0	0 [1234, 253]								
17	18 VECTOR	0	1558	2.1	1.029744	0	0	0	0 [1558]								
18	19 LINE	0	1915	1883	1913	2009	0	0	0 [1915, 1883, 1	913, 20	09]						
19	20 CONICAL_S	0	1408	2.1	0	0	0	0	0 [1408]								
20	21 EDGE_LOO	0	1790	1793	1788	1791	0	0	0 [1790, 1793, 1	788, 17	91]						
21	22 CIRCLE	0	1206	1000	0	0	0	0	0 [1206]								
22	23 EDGE_LOO	0	1420	3.3	0	0	0	0	0 [1420]								
23	24 VECTOR	0	21	1	0	0	0	0	0 [21]								
24	25 CYLINDRIC	0	194	1	0	0	0	0	0 [194]								
25	26 FACE OUT	0	210	1	0	0	0	0	0 [210]								

Step 10:

Next tab is generating EDA by clicking on it you can view exploratory data analysis (EDA) of your uploaded STEP file in tabular format.

DESCRIPTION	KEY	D0	D1	D2	D3	D4	D5	D6	D7
Skew	0.000560	9.558666	1.067832	1.994086	1.137753	5.648787	12.027604	18.278033	22.38694
Correlation	0.000560	9.558666	1.067832	1.994086	1.137753	5.648787	12.027604	18.278033	22.38694
count	2030.0000	2030.0000	2030.0000	2030.0000	2030.0000	2030.0000	2030.0000	2030.0000	2030.0000
mean	1017.389163	17.757143	435.452905	262.397762	417.854768	53.789655	12.882266	5.615271	3.717734
std	587.860103	151.100114	584.338418	489.346093	651.047086	305.363280	150.594077	100.836957	80.830690
min	1.000000	0.000000	-47.000000	-27.750000	-1.000000	0.000000	0.000000	0.000000	0.000000
25%	508.250000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50%	1016.500000	0.000000	23.750000	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000
75%	1526.750000	0.000000	796.750000	399.750000	860.750000	0.000000	0.000000	0.000000	0.000000
max	2034.000000	2012.00000	2032.00000	2034.00000	2033.000000	2022.000000	02025.000000	1956.00000	1932.000000

Step 11:

Next tab is generate properties by clicking on it you can view geometrical properties of your uploaded STEP file in tabular format.

Volume	Center of Mass	Inertia Matrix	Surface Area	Number of Faces	Number of Solids	Number of planes	Numbe of cylinde
76615.50864724086	(2.914442331989318, -3.4739588334497657, 26.815249660078138)	[[42810477.086416915, 3572053,588912038, -40551.35669452418], [3572053,588912038, 37408446,957851,-801419,2423244929], [-49361.35689452418,-801419.2423244929, 41357857,546387134]]	22800.12557970294				
FaceArea							
1 110.58 square	unita						
2 363.89 square	units						
3 110.58 square	inits						
	units						
4 363.89 square							
4 363.89 square 5 78.54 square u	nits						
4 363.89 square 5 78.54 square u 6 26.39 square u	nits nits						
4 363.89 square 5 78.54 square u 6 26.39 square u 7 8.08 square un	nita nita ts						
4 363.89 square 5 78.54 square u 6 26.39 square u 7 8.08 square u 8 78.54 square u	nits hits ts hits						
4 363.89 square 5 78.54 square u 6 26.39 square u 7 8.08 square u 8 78.54 square u 9 26.39 square u	nita hita ts hita hita						
4 363.89 square 5 78.54 square u 6 26.39 square u 7 8.08 square un 8 78.54 square u 9 26.39 square u 10 8.08 square u	nita nita ta nita nita ta						
4 363.89 square u 5 78.54 square u 6 28.39 square u 7 8.08 square u 9 26.39 square u 9 26.39 square u 10 8.08 square u 11 75.34 square u	ntte ntte te ntte te te						
4 363.89 square u 5 78.54 square u 6 26.39 square u 7 8.08 square un 8 78.54 square u 9 26.39 square u 10 8.08 square u 11 75.34 square u 12 75.34 square u	nits hits ts hits ts hits hits						

Step 12:

Next tab is generating chart clicking on it you can view multiple visualization in the form of images of the dataset generate from your step file. There are multiple plot and graph generated to view the data in different form.

Generate Chart			
Entities Frequencies	Box data plot	Entities Value Count	





Step 13:

Next tab is process result by clicking on it you can view multiple result of multiple machine learning algorithm which run on backend. It will take time of 5 to 10 minutes depends on your size of your data. It will return accuracy, f1-score, weight and error of each algorithm in tabular format.

Process Result						
Algorithms	preciss	ionrecallf1-sco	resuppo	ortweighte	edaccuracy	error
Random Forest	0.64	0.454 0.23	0.18	0.17	406	0.4354
Logistic Regression	0.47	0.731 0.45	0.55	0.12	432	0.5344
Decission Tree	0.23	0.6350.64	0.61	0.21	124	0.8419
Naïve Bayes	0.87	0.763 0.17	0.34	0.28	675	0.4675
SVM	0.49	0.964 0.63	0.65	0.15	356	0.7664
KNN	0.25	0.562 0.74	0.32	0.19	754	0.8654
CNN (Convolutional Neural Netw	ork)0.62	0.438 0.49	0.11	0.22	345	0.4554

Step 14:

This is the final tab after process machine learning algorithm and generating result. You can download the result from algorithms by clicking on export result button on excel format. Below is the screenshot and sample result in excel format.

Feature count graph Feature labels plot Heap Matrix	
Frequency Chart	
Process Result	
Algorithms precission/recalifit-score/support/weightedaccuracy/error	
Random Forest 0.64 0.454 0.23 0.18 0.17 406 0.4354	
Logistic Regression 0.47 0.731 0.45 0.55 0.12 432 0.5344	
mentante maria de la contra d	
Decision free 0.23 0.6350.64 0.61 0.21 124 0.6419	
Declasion free U.2.3 U.53:00.04 U.01 U.2.4 U.6419 Naive Bayes 0.87 0.7630.17 0.34 0.28 675 0.4675	
Decision Tree 0.23 0.530.04 0.51 0.21 1.24 0.0419 Naive Bayes 0.87 0.7630.17 0.34 0.28 575 0.4675 ≸VM 0.49 0.640.08 0.66 0.15 3.56 0.70404	
Decision ree U.23 0.0310/04 0.05 U.21 1.24 0.0619 Naive Bayes 0.87 0.7530/17 0.34 0.25 675 0.4675 SVM 0.49 0.640/0.53 0.05 0.15 0.556 0.7694 KNN 0.29 0.5620/74 0.32 0.559 0.6654	

Sample result in excel format:

Algorithms	precission	recall	f1-score	support	weighted	accuracy	error
Random Forest	0.64	0.454	0.23	0.18	0.17	406	0.4354
Logistic Regression	0.47	0.731	0.45	0.55	0.12	432	0.5654
Decission Tree	0.23	0.635	0.64	0.61	0.21	124	0.8419
Naïve Bayes	0.87	0.763	0.17	0.34	0.28	675	0.4675
SVM	0.49	0.964	0.63	0.65	0.15	356	0.7664
KNN	0.25	0.562	0.74	0.32	0.19	754	0.8654
CNN (Convolutional Neural Network)	0.62	0.438	0.49	0.11	0.22	345	0.4554

Important Link:

Source Code:

https://github.com/adilabdullah/Analyse-of-3D-geometrical-STEP-file-for-featurerecognition.git

Demo Video:

https://drive.google.com/file/d/17R1kIhBzY0UuXT-R4tmZHxWTxnE3JGMB/view?usp=drive_link

Algorithm Google Colab:

Naive Bayes:

https://drive.google.com/file/d/1uX79JCSgcoLuOrY0n6YejJZ-OG7GeFRc/view?usp=drive_link

SVM:

https://drive.google.com/file/d/1ukn9MO3kGac8ViaxZ7BmddG4ulUj2_gM/view?usp=drive_link

Exploratory Data Analysis EDA:

https://drive.google.com/file/d/1ZnDhh5n2GG1I6XnP3p_E6RrDI0a7REGa/view?usp=drive_link

Decision Tree:

https://drive.google.com/file/d/1JUFR60MFRLVh2gyhjJJAm0RzT3eo4Y_y/view?usp=drive_link

Random Forest:

https://drive.google.com/file/d/16zaAPp5MHAWfqTrgkvrsjLbqijsB8mCY/view?usp=drive_link

Logistic Regression:

https://drive.google.com/file/d/10-08VbgqHkN2WJCtc9ggENnyGH6QEICU/view?usp=drive_link

Convolutional Neural Network CNN:

https://drive.google.com/file/d/1uQta-AbrHFvcE6uA9CEfUmc0aMyQ0kQP/view?usp=drive_link

STEP Dataset Creation:

https://drive.google.com/file/d/1Ldhp6mk6Uz6JXYddWj84b7DxB_f2ZgcL/view?usp=drive_link