

PROJECT REPORT ON RESALE VALUE PREDICTION USING WATSON AUTO AI

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1. INTRODUCTION

1.1 Overview

In this project we will predict the resale value of cars using Watson Auto AI. We will be using IBM Cloud Services (Watson Auto AI, Node-Red) to deliver an effective web based UI through which we can predict the price of the cars.

Project Requirements : IBM Cloud, IBM Watson Auto AI, Node-Red, Node JS.

Functional Requirements : IBM Cloud.

Software Requirements : Watson Auto AI, Node-Red.

Project deliverables : Resale value prediction using Watson Auto AI

Project team : Prathiksha, Tanishka kohli and Bharath Chandra.

1.2 Purpose

The purpose of this project is to predict price of used cars as it is difficult with this economic condition to predict. The sale of second hand imported cars and used cars will increase and there will be lease between buyer and seller. After the lease is over, the buyer has possibility of buying the car at its residual value so it is important to predict the residual value of the cars.

2. LITERATURE SURVEY

2.1. Existing problem:

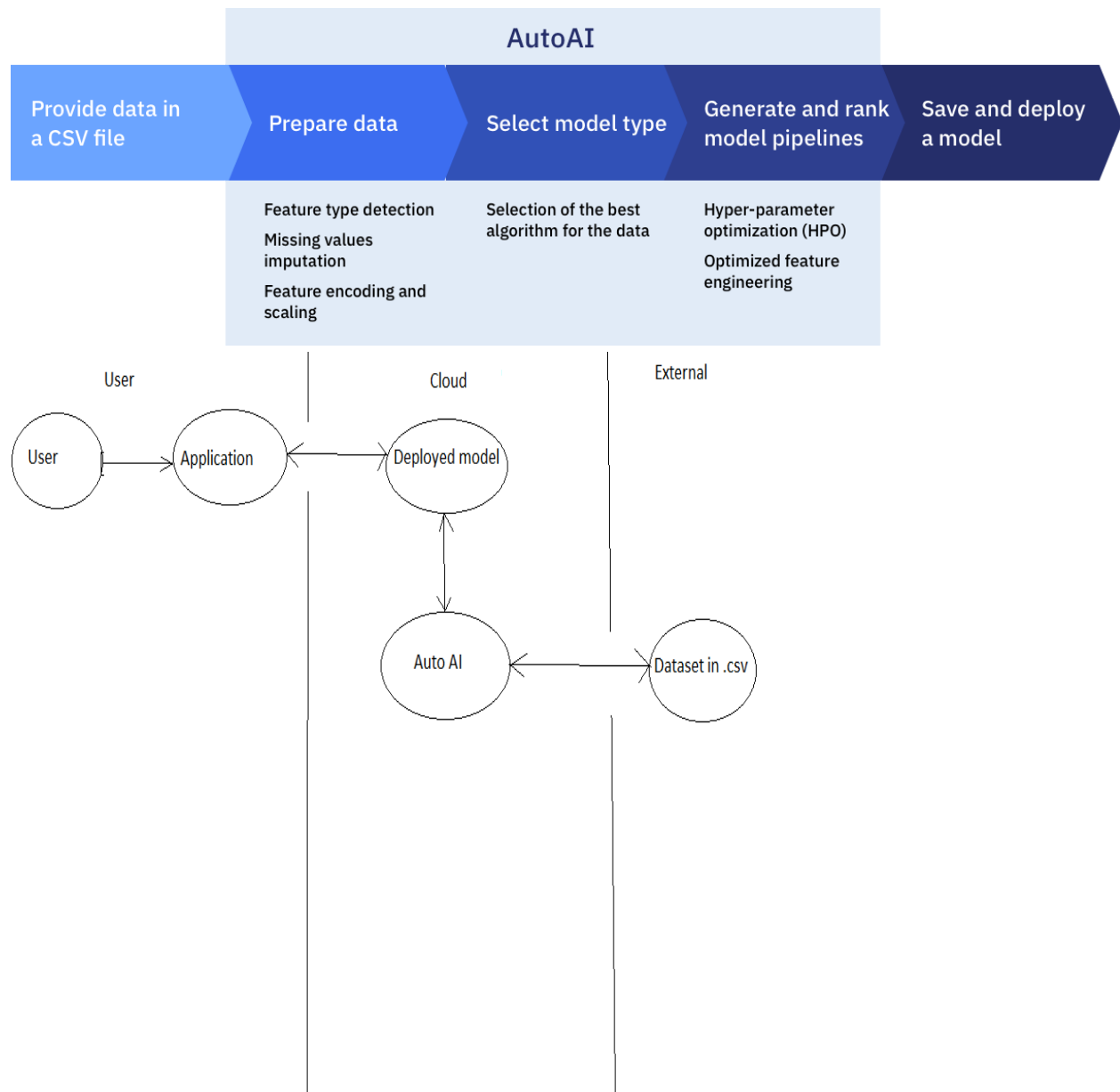
With difficult economic conditions, it is likely that sales of second-hand imported(reconditioned) cars and used cars will increase. In many developed countries, it is common to lease a car rather than buying it outright. A lease is a binding contract between a buyer and a seller (or a third party – usually a bank, insurance firm or other financial institutions) in which the buyer must pay fixed instalments for a pre-defined number of months/years to the seller/financer. After the lease period is over, the buyer has the possibility to buy the car at its residual value, i.e. its expected resale value. Thus, it is of commercial interest to seller/financers to be able to predict the salvage value (residual value) of cars with accuracy.

2.2 Proposed Solution:

Considering the main factors which would affect the resale value of a vehicle a regression model is to be built that would give the nearest resale value of the vehicle. The main factors are the time in which vehicle got registered, number of kms it drove, power, type of gear box, model of the car, any damage or repair, fuel type etc. and the model processing is been done in Auto AI services in IBM cloud and then the deployment is been done in Watson studio.

3. Theoretical Analysis

3.1 Block/flow diagram



3.2 Hardware /Software designing

Step 1:Create IBM Cloud account and create IBM Watson Studio .

Step 2:Build and Train the experiment

2.1 Specify basic experiment details

- 1.From the Assets page of your project, click Add to project and choose Auto AI Experiment.
- 2.In the page that opens, fill in the basic fields:
Specify a name and optional description for your new experiment.
Confirm that the IBM Watson Machine Learning service instance that you associate with your project is selected in the machine learning service selection.
- 3.Click Create.

2.2 Add training data

Upload the training data file, auto.csv, from your local computer by dragging the file onto the data panel or by clicking browse and then following the prompts.

2.3 Train the model

Choose the column you want to predict and also in add experiment select the columns with the data that supports prediction column save it and select run the experiment

eu-gb.dataplatform.cloud.ibm.com/ml/auto-ml/4e298b37-55f2-4006-8ad8-29ecd24fde57/configure?projectId=db90a63d-8182-4716-81db-1558cbc53e0e&mlinstan...

IBM Watson Studio Upgrade Prathiksha Bhandary's Acc... PB

Prediction column price Column data type Integer Data source autos.csv

Experiment settings

Data source settings

Select columns to include 8 / 22

Select columns with data that support the prediction column.

Search columns

<input type="checkbox"/>	Column name	Type
<input checked="" type="checkbox"/>	model	String
<input checked="" type="checkbox"/>	kilometer	Integer
<input type="checkbox"/>	monthOfRegistration	Integer
<input checked="" type="checkbox"/>	fuelType	String

Cancel Save settings

eu-gb.dataplatform.cloud.ibm.com/ml/auto-ml/93c10f9d-0d94-4dea-adfa-a1663072a992/train?projectId=e03214de-93f7-4f5e-83c3-e827f49c0be48/mlInstanceGuid...

IBM Watson Studio Upgrade Prathiksha Bhandary's Acc... PB

My projects / Resale value prediction / Resale value prediction

Experiment summary Pipeline comparison Rank by: Root mean squared err... Score: Cross validation Holdout

Relationship map

Prediction column: price

Progress map

Swap view

Experiment completed ✓

8 PIPELINES GENERATED

8 pipelines generated from algorithms. See pipeline leaderboard below for more detail.

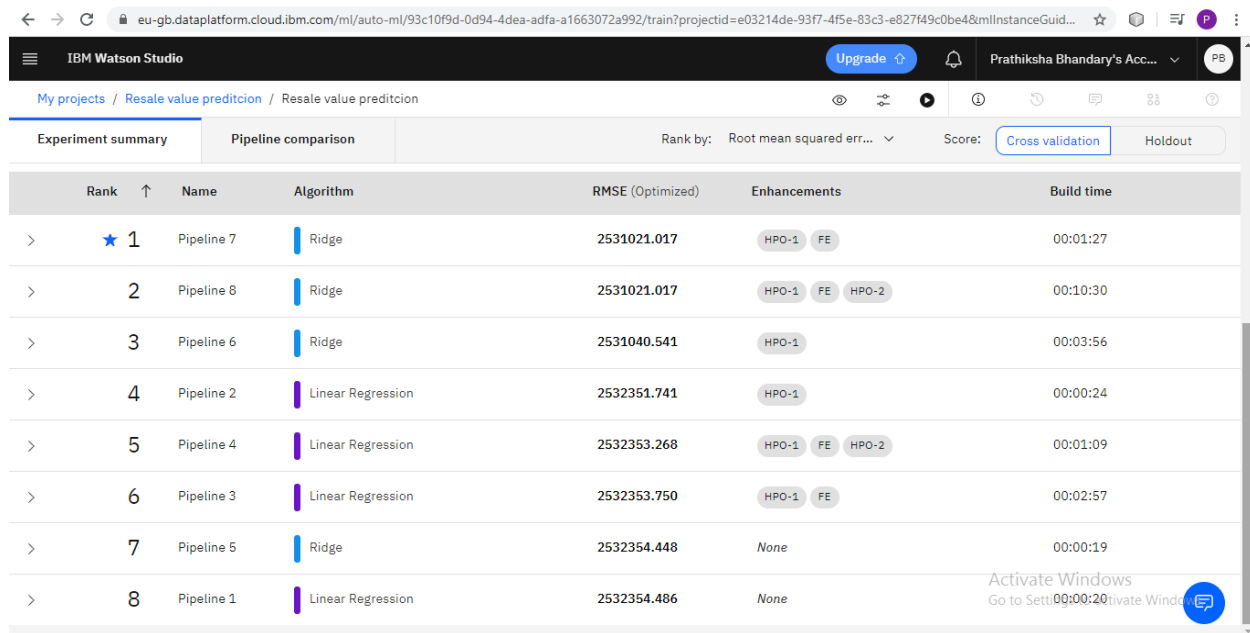
Time elapsed: 49 minutes

View full log

As the model trains, you will see an infographic that shows the process of building the pipelines.

2.4 Choose a pipeline

Once the pipeline creation is complete, you can view and compare the ranked pipelines in a leaderboard.



The screenshot shows the IBM Watson Studio interface with a 'Pipeline comparison' tab selected. It displays a leaderboard of 8 pipelines ranked by RMSE (Optimized). Pipeline 7 is the top performer with an RMSE of 2531021.017. The interface includes tabs for 'Experiment summary' and 'Pipeline comparison', a 'Rank by' dropdown set to 'Root mean squared err...', and buttons for 'Cross validation' and 'Holdout'.

Rank	↑	Name	Algorithm	RMSE (Optimized)	Enhancements	Build time
>	★ 1	Pipeline 7	Ridge	2531021.017	HPO-1 FE	00:01:27
>	2	Pipeline 8	Ridge	2531021.017	HPO-1 FE HPO-2	00:10:30
>	3	Pipeline 6	Ridge	2531040.541	HPO-1	00:03:56
>	4	Pipeline 2	Linear Regression	2532351.741	HPO-1	00:00:24
>	5	Pipeline 4	Linear Regression	2532353.268	HPO-1 FE HPO-2	00:01:09
>	6	Pipeline 3	Linear Regression	2532353.750	HPO-1 FE	00:02:57
>	7	Pipeline 5	Ridge	2532354.448	None	00:00:19
>	8	Pipeline 1	Linear Regression	2532354.486	None	00:00:20

Choose Save model from the action menu for Pipeline 7. This saves the pipeline as a Machine Learning asset in your project.

Step 3 :Deploy the Model

Before you can use your trained model to make predictions on new data, you must deploy the model. Clicking on the model name in the notification displayed when you save the model

From the model details page:

- Click the Deployments tab.

- Click Add Deployment.

- In the page that opens, fill in the fields:

- Specify a name for the deployment.

- Click Save.

After you save the deployment, click on the deployment name to view the deployment details page.

Step 4: Test the Deployed model

You can test the deployed model from the deployment details page:
On the Test tab of the deployment details page, either fill out the form with test values, or enter the following JSON test data.
Click predict to predict the price .

The screenshot shows the IBM Watson Studio interface for a deployment named 'Price'. The 'Test' tab is active, displaying an 'Enter input data' form on the left and a JSON test data editor on the right. The form contains fields for 'yearOfRegistration' (2011), 'gearbox' (manuell), 'powerPS' (190), and 'model' (navara). A 'Predict' button is at the bottom of the form. The JSON editor shows a test payload with a predicted value of 16338.6689453125. The browser address bar shows the URL: eu-gb.dataplatform.cloud.ibm.com/ml/deployments/e1887efa-4a63-4d46-a7be-1f2ce312215c/test?projectId=db90a63d-8182-4716-81db-1558cbc53e0e&mlInstanceGuid=...

IBM Watson Studio

My projects / Resale value prediction / Resale value prediction Using Wa... / Price

Price

Overview Implementation **Test**

Enter input data

yearOfRegistration
2011

gearbox
manuell

powerPS
190

model
navara

Predict

```
{
  "predictions": [
    {
      "fields": [
        "prediction"
      ],
      "values": [
        [
          16338.6689453125
        ]
      ]
    }
  ]
}
```

Activate Windows
Go to Settings to activate Windows

4. Experiment Investigation

← → ↻ <https://node-red-resale-value.eu-gb.mybluemix.net/ui> ⋮

Resale Value Prediction

Resale value prediction

dateCrawled
03/24/2016

name
Golf_3_1.6

seller
privat

offerType
Angebot

abtest
test

vehicleType

yearOfRegistration *
1993

gearbox *
manuell

powerPS *
1500

model *
golf

kilometer *
10000

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← → ↻ <https://node-red-resale-value.eu-gb.mybluemix.net/ui> ⋮

Resale Value Prediction

monthOfRegistration

fuelType *
diesel

brand
volkswagen

notRepairedDamage

dateCreated
02/01/2010

nrOfPictures

postalCode

lastSeen
06/06/2010

PREDICT CANCEL

Price **16732.345703125**

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← → ↻ https://node-red-resale-value.eu-gb.mybluemix.net/ui

Resale Value Prediction

Resale value prediction

dateCrawled	03/24/2016
name	Skoda_Fabia_1.4_TDI_PD_Classic
seller	privat
offerType	Angebot
abtest	test
vehicleType	kleinwagen
yearOfRegistration *	2008
gearbox *	manuell
powerPS *	69
model *	fabia
kilometer *	90000

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← → ↻ https://node-red-resale-value.eu-gb.mybluemix.net/ui

Resale Value Prediction

monthOfRegistration	
fuelType *	diesel
brand	skoda
notRepairedDamage	nein
dateCreated	02/01/2010
nrOfPictures	
postalCode	
lastSeen	06/06/2010

PREDICT **CANCEL**

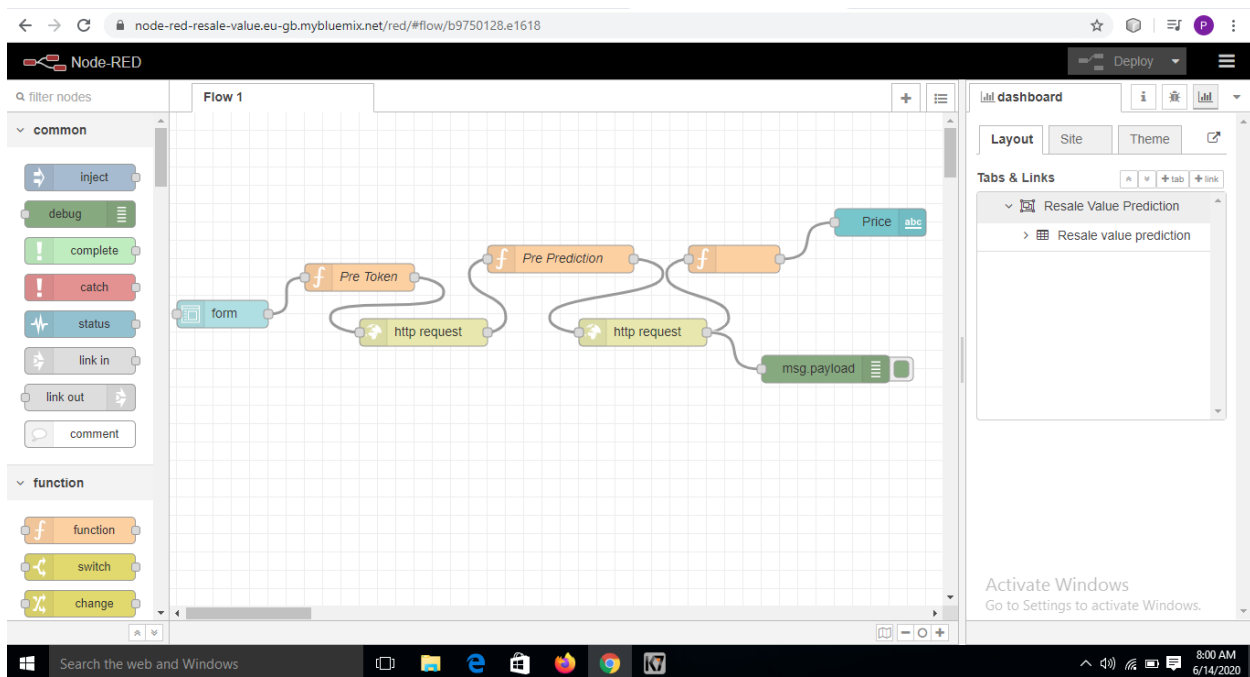
Price **16283.9404296875**

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5. Flowchart

Insert the following nodes into the flow in Node-Red.

- ui_Form
- Input
- Function
- Http request
- Text
- Debug



6. Result

Web based UI was developed by integrating all the services using NODE-RED
URL for UI dashboard : <https://node-red-resale-value.eu-gb.mybluemix.net/ui>

Resale Value Prediction

Resale value prediction

dateCrawled

03/24/2016

name

Golf_3_1.6

seller

privat

offerType

Angebot

abtest

test

vehicleType

yearOfRegistration *

2010

gearbox *

manuell

powerPS *

0

model *

golf

kilometer *

100

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← → ↻ 🔍 https://node-red-resale-value.eu-gb.mybluemix.net/ui

Resale Value Prediction

monthOfRegistration

fuelType *

diesel

brand

volkswagen

notRepairedDamage

dateCreated

02/01/2010

nrOfPictures

postalCode

lastSeen

06/06/2010

PREDICT

CANCEL

Price

16303.6904296875

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7. Advantages and Disadvantages

Advantages

1. Reduces Humans work
2. Faster decisions
3. Reduction in human errors
4. Cost efficient

Disadvantages

1. Error susceptible
2. Utilizes resource to build

8. Applications

- Buyer and Seller (or a third party – usually a bank, insurance firm or other financial institutions) can deploy this to predict price.
- Can be used in second hand/ used car Showrooms.

9. Conclusion

A Resale value prediction is created using Watson Auto AI and application is built using Node-RED

10. Future Scope

As future work, we intend to collect more data and to use more advanced techniques like artificial neural networks, image recognition, fuzzy logic and genetic algorithms to predict cars.

11. Bibilography

11. Bibliography

1.Auto AI with IBM Watson studio :

<https://www.ibm.com/in-en/cloud/watson-studio/autoai>

2.Node-RED starter application :

<https://developer.ibm.com/tutorials/how-to-create-a-node-red-starter-application/>

12. Appendix

Our github repository :

<https://github.com/tkohli/Resale-value-prediction-Using-Watson-Auto-AI>

[tkohli/Resale-value-prediction-Using-Watson-Auto-AI](#)

URL for UI dashboard :

<https://node-red-resale-value.eu-gb.mybluemix.net/ui>

A. Source Code

Node-RED Flow code

```
{
  "id": "b9750128.e1618",
  "type": "tab",
  "label": "Flow 1",
  "disabled": false,
  "info": "",
  "id": "4caa8268.26f83c",
  "type": "ui_form",
  "z": "b9750128.e1618",
  "name": "",
  "label": "",
  "group": "1d84a555.18b5fb",
  "order": 1,
  "width": 0,
  "height": 0,
  "options": [
    {
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      "value": "dc",
      "type": "date",
      "required": false,
      "rows": null
    },
    {
      "label": "name",
      "value": "na",
      "type": "text",
      "required": false,
      "rows": null
    },
    {
      "label": "seller",
      "value": "se",
      "type": "text",
      "required": false,
      "rows": null
    },
    {
      "label": "offerType",
      "value": "ot",
      "type": "text",
      "required": false,
      "rows": null
    },
    {
      "label": "abtest",
      "value": "ab",
      "type": "text",
      "required": false,
      "rows": null
    },
    {
      "label": "vehicleType",
      "value": "vt",
      "type": "text",
      "required": false,
      "rows": null
    },
    {
      "label": "yearOfRegistration",
      "value": "ye",
      "type": "number",
      "required": true,
      "rows": null
    },
    {
      "label": "gearbox",
      "value": "gb",
      "type": "text",
      "required": true,
      "rows": null
    },
    {
      "label": "powerPS",
      "value": "ps",
      "type": "number",
      "required": true,
      "rows": null
    },
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    },
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      "rows": null
    },
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      "rows": null
    },
    {
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      "required": false,
      "rows": null
    },
    {
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      "type": "text",
      "required": false,
      "rows": null
    },
    {
      "label": "dateCreated",
      "value": "dce",
      "type": "date",
      "required": false,
      "rows": null
    },
    {
      "label": "nrOfPictures",
      "value": "npc",
      "type": "number",
      "required": false,
      "rows": null
    },
    {
      "label": "postalCode",
      "value": "pc",
      "type": "number",
      "required": false,
      "rows": null
    },
    {
      "label": "lastSeen",
      "value": "ls",
      "type": "date",
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      "rows": null
    }
  ],
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    "se": "",
    "ot": "",
    "ab": "",
    "vt": "",
    "ye": "",
    "gb": "",
    "ps": "",
    "md": "",
    "km": "",
    "mr": "",
    "ft": "",
    "bd": "",
    "rd": "",
    "dce": "",
    "npc": "",
    "pc": "",
    "ls": ""
  },
  "payload": "",
  "submit": "Predict",
  "cancel": "cancel",
  "topic": "",
  "x": 70,
  "y": 220,
  "wires": [
    [
      "7c42ae1.81dd15"
    ]
  ],
  "id": "7c42ae1.81dd15",
  "type": "function",
  "z": "b9750128.e1618",
  "name": "Pre Token",
  "func": "global.set(\"dc\",msg.payload.dc)\nglobal.set(\"na\",msg.payload.na)\nglobal.set(\"se\",msg.payload.se)\nglobal.set(\"ot\",msg.payload"
```



```
.ot)\nglobal.set(\"ab\",msg.payload.ab)\nglobal.set(\"vt\",msg.payload.vt)\nglobal.set(\"ye\",msg.payload.ye)\nglobal.set(\"gb\",msg.payload.gb)\nglobal.set(\"ps\",msg.payload.ps)\nglobal.set(\"md\",msg.payload.md)\nglobal.set(\"km\",msg.payload.km)\nglobal.set(\"mr\",msg.payload.mr)\nglobal.set(\"ft\",msg.payload.ft)\nglobal.set(\"bd\",msg.payload.bd)\nglobal.set(\"rd\",msg.payload.rd)\nglobal.set(\"dce\",msg.payload.dce)\nglobal.set(\"npc\",msg.payload.npc)\nglobal.set(\"pc\",msg.payload.pc)\nglobal.set(\"ls\",msg.payload.ls)\nvar
apikey=\"DtV2w_p5MNtfcU040ub-S621uHM0YjlrPkU7k3B2P4qT\"\nmsg.headers={\"Content-Type\":\"application/x-www-form-urlencoded\"}\nmsg.payload={\"grant_type\":\"urn:ibm:params:oauth:grant-type:apikey\", \"apikey\":apikey}\nreturn
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Prediction\",\"func\":\"var dc=global.get('dc')\nvar na=global.get('na')\nvar se=global.get('se')\nvar ot=global.get('ot')\nvar ab=global.get('ab')\nvar vt=global.get('vt')\nvar ye=global.get('ye')\nvar gb=global.get('gb')\nvar ps=global.get('ps')\nvar md=global.get('md')\nvar km=global.get('km')\nvar mr=global.get('mr')\nvar ft=global.get('ft')\nvar bd=global.get('bd')\nvar nd=global.get('nd')\nvar dce=global.get('dce')\nvar npc=global.get('npc')\nvar pc=global.get('pc')\nvar ls=global.get('ls')\nvar token=msg.payload.access_token\nvar
instance_id=\"ba33b218-b91c-4d6a-a425-7c72f12e50be\"\nmsg.headers={
'Content-Type': 'application/json','Authorization':
'Bearer'+token,'ML-Instance-ID': instance_id}
\nmsg.payload={\"input_data\": [{\"fields\": [\"dateCrawled\", \"name\",
\"seller\", \"offerType\", \"abtest\", \"vehicleType\", \"yearOfRegistration\",
\"gearbox\", \"powerPS\", \"model\", \"kilometer\", \"monthOfRegistration\",
```

```

\"fuelType\", \"brand\", \"notRepairedDamage\", \"dateCreated\",
\"nrOfPictures\", \"postalCode\", \"lastSeen\", \"Unnamed: 20\", \"Unnamed:
21\"], \"values\":
[[dc,na,se,ot,ab,vt,ye,gb,ps,md,km,mr,ft,bd,nd,dce,npc,pc,ls]]]}\nreturn
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3-4d46-a7be-1f2ce312215c/predictions\", \"tls\": \"\", \"persist\": false, \"proxy\": \"\", \"auth
Type\": \"\", \"x\":530, \"y\":240, \"wires\":[[\"91696764.f1add8\", \"b4176e7.e180c9\"]], {\"id\":
\"b4176e7.e180c9\", \"type\": \"debug\", \"z\": \"b9750128.e1618\", \"name\": \"\", \"active\": true
, \"tosidebar\": true, \"console\": false, \"tostatus\": false, \"complete\": \"payload\", \"targetT
ype\": \"msg\", \"x\":730, \"y\":280, \"wires\":[]}, {\"id\": \"91696764.f1add8\", \"type\": \"function\",
\"z\": \"b9750128.e1618\", \"name\": \"\", \"func\": \"msg.payload=msg.payload.predictio
ns[0].values[0][0][0]\nreturn
msg;\", \"outputs\":1, \"noerr\":0, \"x\":630, \"y\":160, \"wires\":[[\"44908edc.1ffee\"]], {\"id\": \"4
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prediction\", \"tab\": \"254012f8.5c13be\", \"order\":1, \"disp\": true, \"width\": \"6\", \"collapse\":
false}, {\"id\": \"254012f8.5c13be\", \"type\": \"ui_tab\", \"z\": \"\", \"name\": \"Resale Value
Prediction\", \"icon\": \"dashboard\", \"disabled\": false, \"hidden\": false}]

```

