

## **Big Data Analytical project for Climate Change Awareness**

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**Team Member :** Naravula Loganathan, Barath - 28

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### **Framework Specification**

#### **Objectives**

- **Project Objectives:**

The main objective of project is to create awareness for the climate change impact, presenting adaptation solution. This project provides science-based environmental education resource with credible information in form of 360 video and image with support of assistant which is trained to answer question related to environment and climate change, thereby creating in-depth experience in virtual reality for user.

- **Project Motivation:**

The climate-change awareness that have emerged in the wake of massive fossil-fuel based industrialization indicate the need for a transition to sustainable energy, but attempts to create awareness and encourage people to follow pro-environmental behavior often have been limited and narrow reach of people and achieve only limited success. This problem of limited success is due to lack of awareness in people about its risk and danger that directly connected to climate change to them ,upcoming generation and ecosystem.

This motivated us as create a big data analytics cum VR project for climate change awareness by bring all facts and its dangers effect on ecosystem to their own reality , so that they can feel it as if they are standing in melting glacier in Greenland, Sea-level rise or Extreme drought land in Africa and list is long.

*"This is not just Academic project , but The project to save our Earth"*

- **Significance / Uniqueness :**

1. Bringing Real-world Reality to our Virtual Reality
2. Interactive video presenting well-categorized section of Evidence, Cause, Effects, Scientific consequence, Vital Sign also with Remedies and Solution
3. Presenting Facts from well-published source in 360 video and Images where people can't go physically to create in-depth experience of facts.
4. Built-in Assistant to answer question related to climate change

- **Features: Use Case/Scenario**

Presenting data from well-published source in video and images where image and video are annotated. These annotated images are used to summarize into meaningful information , which is given to user via google home. In future increment we will present in the VR

## **Approach**

- **Data Sources**

Data Set - Global Warming data

Data Category - 4 category in Global Warming as Below

1. Deforestation
2. Ice sheet melting
3. Glacier Melting
4. Sea Level Rise

- **Analytic Tools**

The analytic tool used is the increment one of the project is **Spark** and **TensorFlow**

- **Analytical Tasks**

1. This we take dataset from Nasa Climate ([https://climate.nasa.gov/system/internal\\_resources/details/original/647\\_Global\\_Temperature\\_Data\\_File.txt](https://climate.nasa.gov/system/internal_resources/details/original/647_Global_Temperature_Data_File.txt)) and calculated training cost and plotted in Mplot using TensorFlow.
2. Also created own MINST dataset of global warming dataset and ran Softmax classification.
3. Created Google classification which interact with Clarifai API for image analysis and image annotation.

- **Expected: Inputs/Outputs**

Input: Video (mkv format)

Output: Speech conversation using Google API

- **Algorithms**

Random forest model is the algorithm used to train, test and predicate model for our global warming dataset

## Related Work

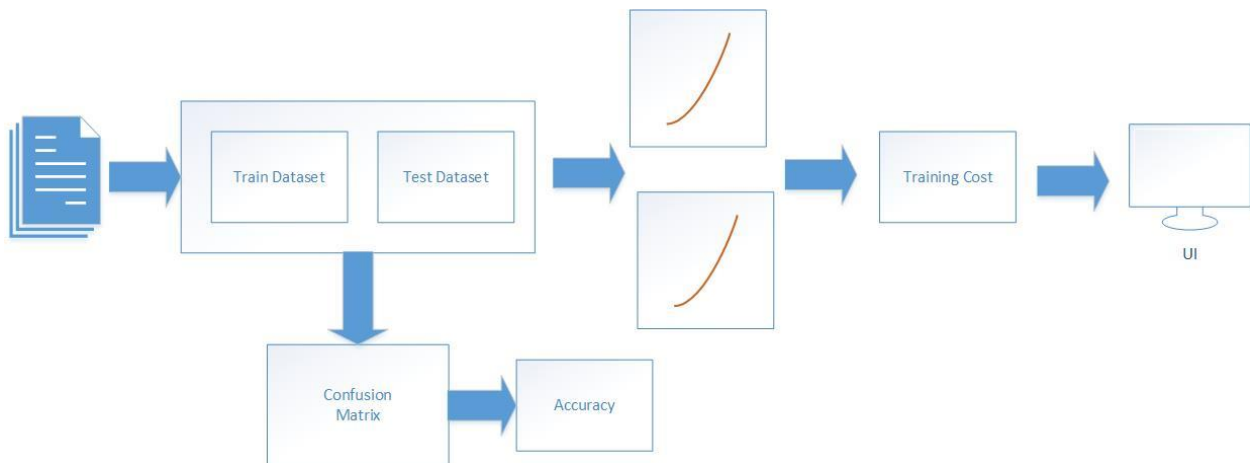
- **Open Source Projects**

The Scientists Using VR to Tackle Climate Change

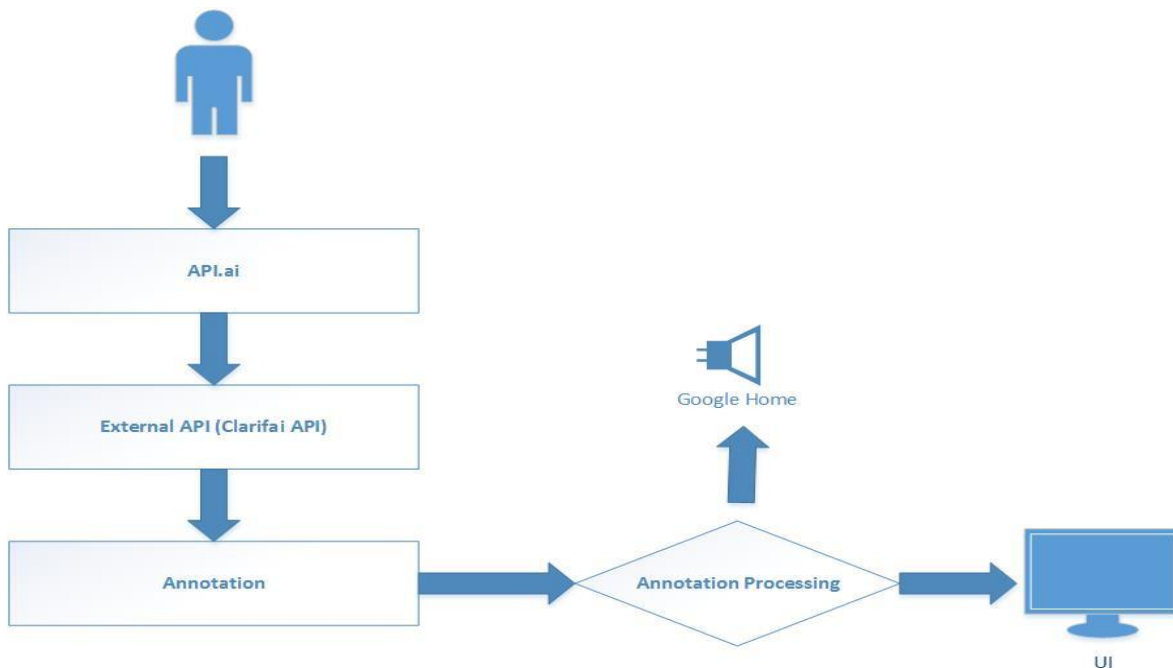
<http://thecreatorsproject.vice.com/blog/climate-change-vr-scientists>

## Application Specification

### Software Architecture



### Activity Diagram



## System Features

- 3D view, 360 spin support
- Detailed description about climate changes based on user preference
- Interactive user interface for user convenience
- Voice assistant support (By training data on climate change facts and information)

## Existing Application/Service Used:

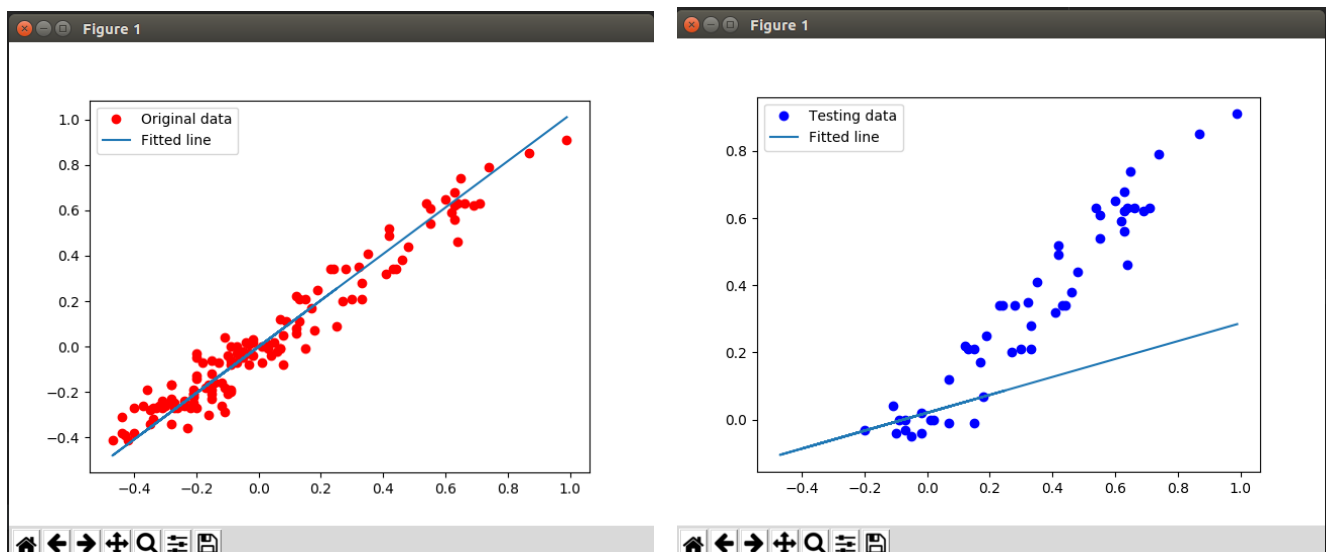
- Service Name: Clarifai
- Service Description: Clarifai automatically tags all your images and video so you can quickly organize, manage, and search through your content.
- Service URL: <https://www.clarifai.com/>

## Implementation

First, We took our dataset of global warming dataset from Nasa Climate ([https://climate.nasa.gov/system/internal\\_resources/details/original/647\\_Global\\_Temperature\\_Data\\_File.txt](https://climate.nasa.gov/system/internal_resources/details/original/647_Global_Temperature_Data_File.txt)) and calculated training cost and plotted in mplot using TensorFlow. Also created own MINST dataset of global warming dataset and ran Softmax classification. Created Google classification which interact with Clarifai API for image analysis and image annotation.

## Documentation:

### TensorFlow Linear Regression:



```

/usr/bin/python3.5 /home/barath/Spring_2017/CS5542_BDAA/Project/TensorFlow-LinearRegression/Linear_Regression.py
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use SSE3 instructions, but
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use SSE4.1 instructions, b
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use SSE4.2 instructions, b
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use AVX instructions, but
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use AVX2 instructions, but
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use FMA instructions, but
Epoch: 0050 cost= 0.638465464 W= -1.93722 b= 0.698411
Epoch: 0100 cost= 0.473084390 W= -1.79415 b= 0.45192
Epoch: 0150 cost= 0.388353199 W= -1.65628 b= 0.301031
Epoch: 0200 cost= 0.335727662 W= -1.52421 b= 0.20818
Epoch: 0250 cost= 0.297095299 W= -1.39815 b= 0.150591
Epoch: 0300 cost= 0.265563369 W= -1.27812 b= 0.114446
Epoch: 0350 cost= 0.238396198 W= -1.16399 b= 0.0913683
Epoch: 0400 cost= 0.214404106 W= -1.05557 b= 0.0762725
Epoch: 0450 cost= 0.192995757 W= -0.952659 b= 0.0660735
Epoch: 0500 cost= 0.173004760 W= -0.854995 b= 0.0580979
Epoch: 0550 cost= 0.156568640 W= -0.762234 b= 0.0536066
Epoch: 0600 cost= 0.141076460 W= -0.674431 b= 0.0495061
Epoch: 0650 cost= 0.127147049 W= -0.591055 b= 0.0461738
Epoch: 0700 cost= 0.114620931 W= -0.511974 b= 0.043351
Epoch: 0750 cost= 0.103356592 W= -0.432676 b= 0.0400784
Epoch: 0800 cost= 0.093226098 W= -0.365848 b= 0.0386577
Epoch: 0850 cost= 0.084115289 W= -0.298391 b= 0.0366269
Epoch: 0900 cost= 0.075921483 W= -0.234418 b= 0.0347465
Epoch: 0950 cost= 0.068552427 W= -0.173748 b= 0.032991
Epoch: 1000 cost= 0.061925095 W= -0.116213 b= 0.0313429
Optimization Finished!
Training cost= 0.0619251 W= -0.116213 b= 0.0313429

```

## Google Conversations API :

The image shows two side-by-side browser windows. The left window is the Google Developers Web Simulator, displaying the 'Web Simulator' page with a 'Dialog' section showing a conversation with 'Genie'. The right window is a local web application running on localhost:3000, featuring a grid background and the text 'I'm your personal assistant - 'Genie!'. Below this text is a prompt 'Ask me a question...' and a list of sample questions: 'Hey Genie, Show me Cinnole Change pictures?', 'Show me warring oceans pictures?', 'Show me acid rain pictures?', 'Show me ice sheet melting pictures?', 'Go to clarita API page', and 'Clear the screen'.

**Web Simulator Dialog:**

Request

```

{
  "query": "hey genie",
  "accessToken": "ya29.GLOUBF-vEhH8B:
wI2y0PGL1r245kaps1c3DnACxcvWebauZIN3hka38W
q3ou0kqpcK2aLad50TPTXtoPhguyr3GPFP0P_177822u0u0M
k8-40F13tq",
  "debugInfo": {
    "assistantToAgentDebug": {
      "assistantToAgentJson": {
        "user": {
          "user_id":
"uTg3N2ZFcwt1g0MqCLpOKN62K75pWmx3NcQ3hPQ~",
          "conversation": {
            "conversation_id":
"1490045136704",
            "type": 1
          },
          "inputs": [
            {
              "intent":
"assistant.intent.action.MAIN",
              "raw_inputs": [
                {
                  "input_type": 2,
                  "query": "hey
genie",
                  "annotation_sets":
[]
                }
              ],
              "arguments": []
            }
          ]
        }
      }
    }
  }
}

```

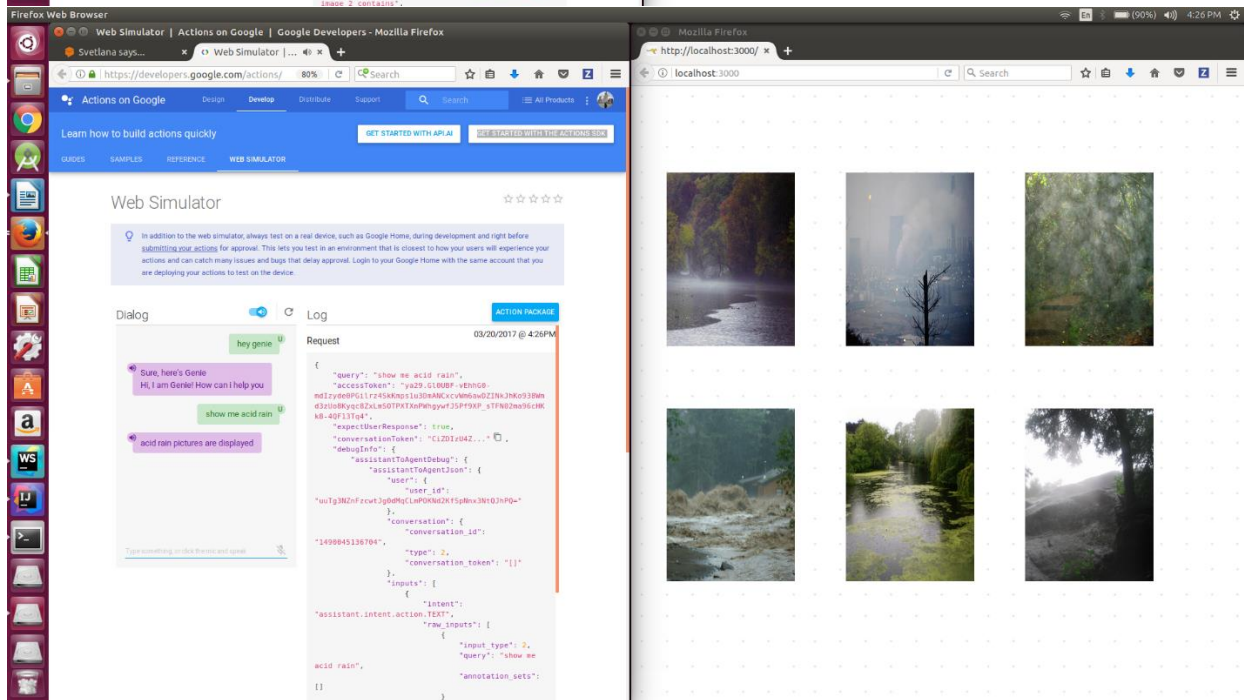
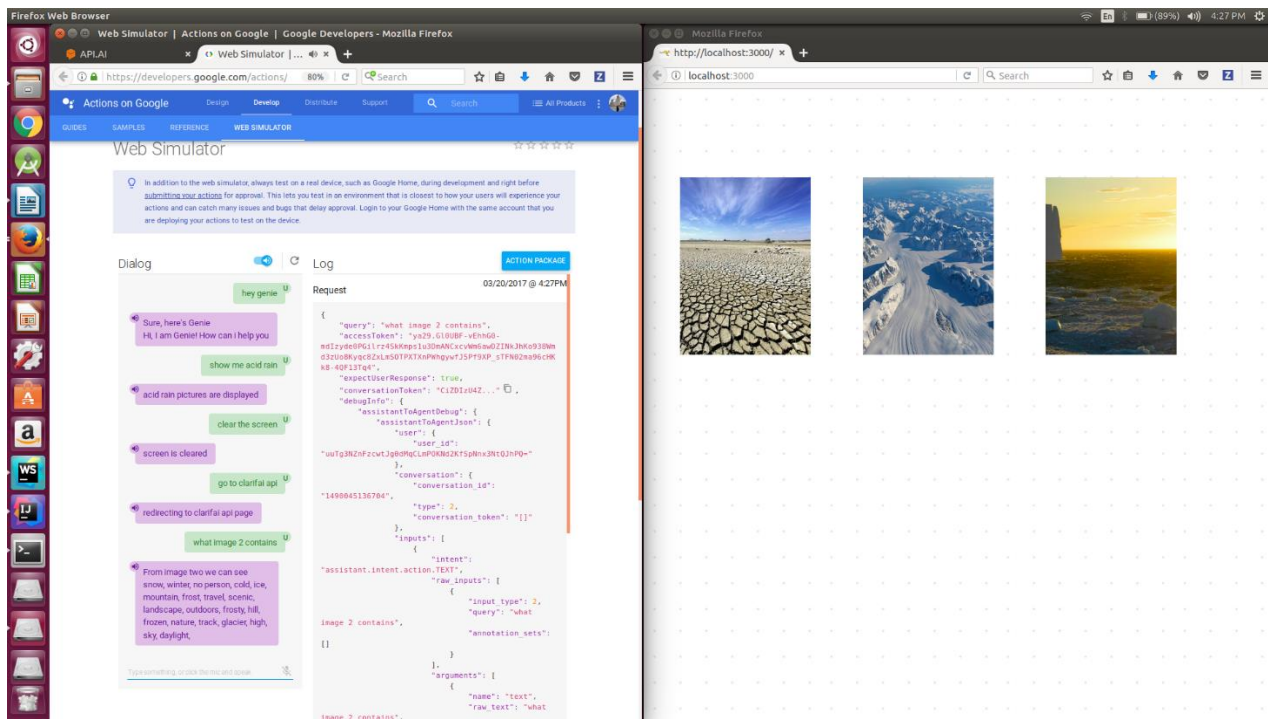
**Local Web Application:**

I'm your personal assistant - 'Genie!'

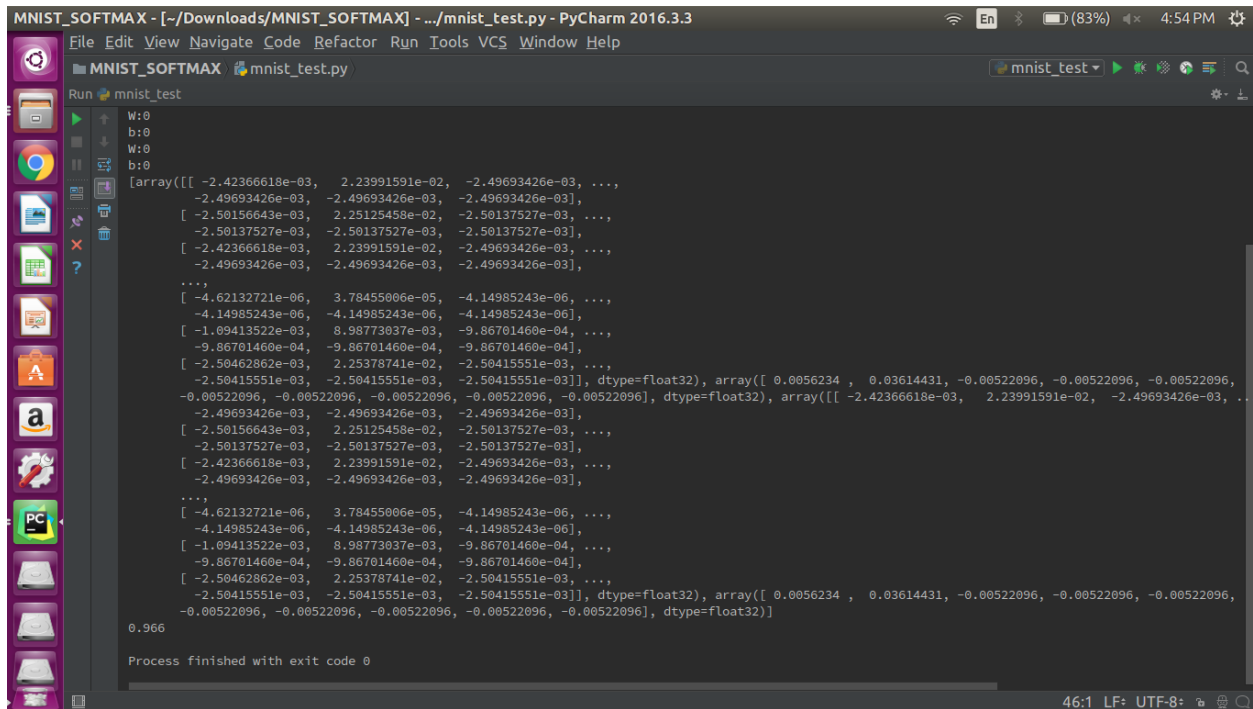
Ask me a question...

Below questions are supported for now.

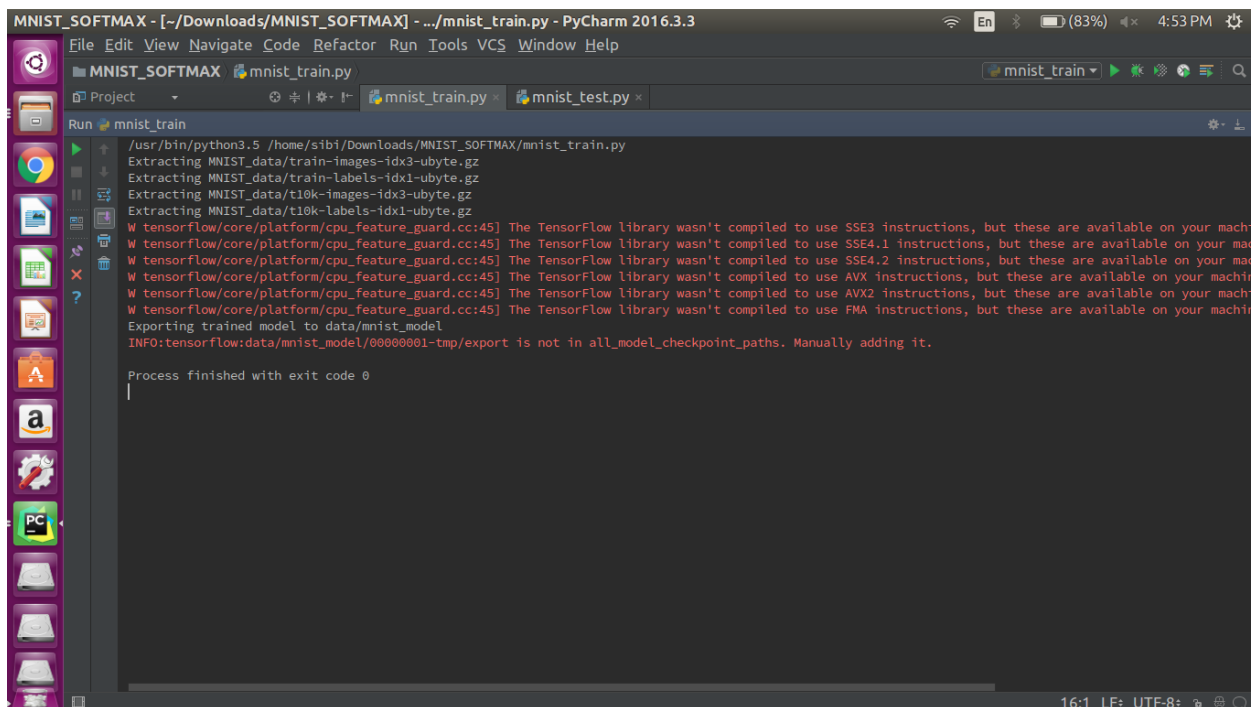
- Hey Genie, Show me Cinnole Change pictures?
- Show me warring oceans pictures?
- Show me acid rain pictures?
- Show me ice sheet melting pictures?
- Go to clarita API page
- Clear the screen



## SoftMax:

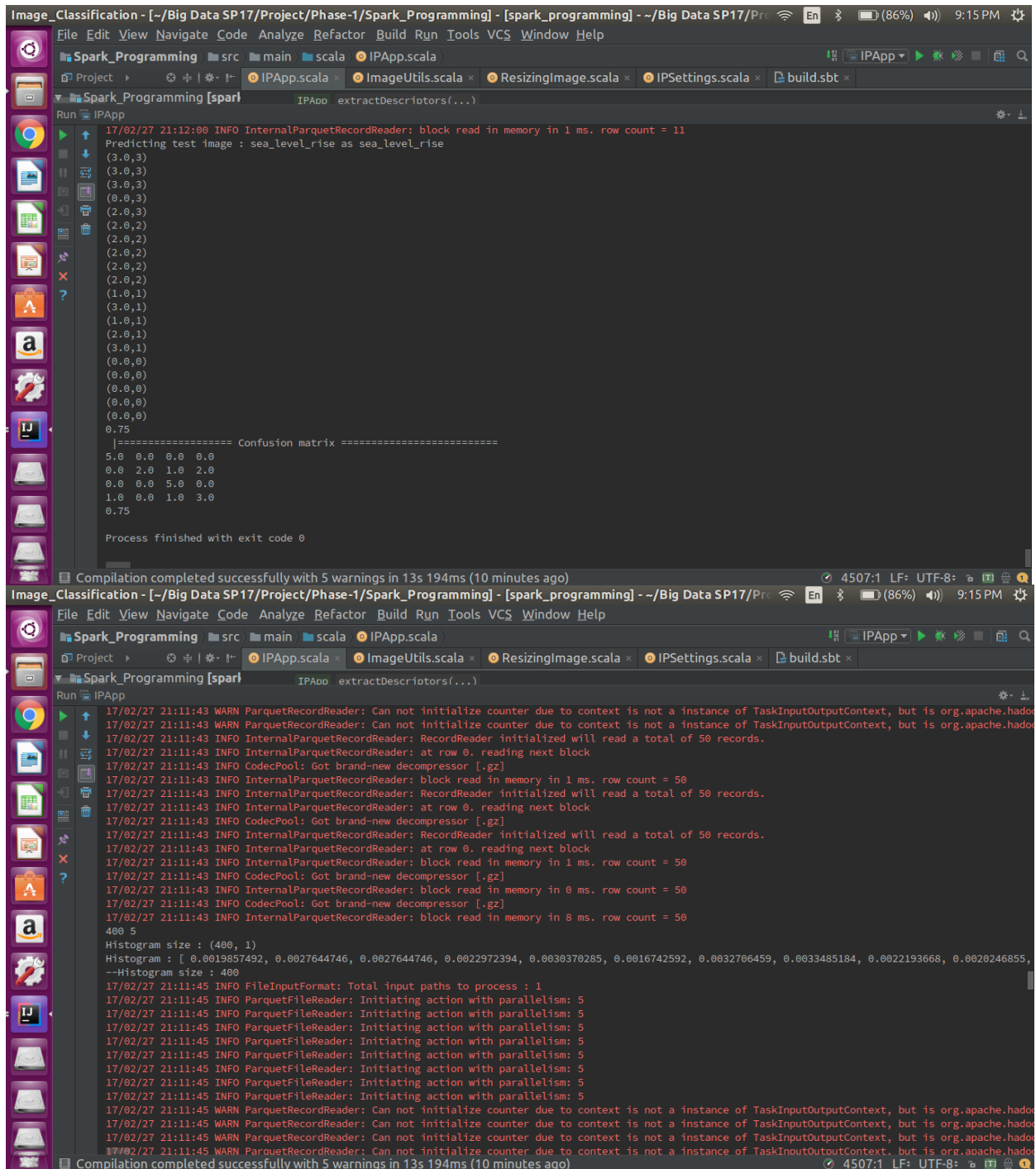


```
File Edit View Navigate Code Refactor Run Tools VCS Window Help
MNIST_SOFTMAX mnist_test.py
Run mnist_test
W:0
b:0
W:0
b:0
[array([[ -2.42366618e-03,  2.23991591e-02, -2.49693426e-03, ...,
        -2.49693426e-03, -2.49693426e-03, -2.49693426e-03], ...,
        [ -2.50156643e-03,  2.25125458e-02, -2.50137527e-03, ...,
        -2.50137527e-03, -2.50137527e-03, -2.50137527e-03], ...,
        [ -2.42366618e-03,  2.23991591e-02, -2.49693426e-03, ...,
        -2.49693426e-03, -2.49693426e-03, -2.49693426e-03], ...,
        [ -4.62132721e-06,  3.78455006e-05, -4.14985243e-06, ...,
        -4.14985243e-06, -4.14985243e-06, -4.14985243e-06], ...,
        [ -1.09413522e-03,  8.98773037e-03, -9.86701460e-04, ...,
        -9.86701460e-04, -9.86701460e-04, -9.86701460e-04], ...,
        [ -2.50462862e-03,  2.25378741e-02, -2.50415551e-03, ...,
        -2.50415551e-03, -2.50415551e-03, -2.50415551e-03], ...,
        [-0.00522096, -0.00522096, -0.00522096, ...,
        -2.49693426e-03, -2.49693426e-03, -2.49693426e-03], ...,
        [ -2.50156643e-03,  2.25125458e-02, -2.50137527e-03, ...,
        -2.50137527e-03, -2.50137527e-03, -2.50137527e-03], ...,
        [ -2.42366618e-03,  2.23991591e-02, -2.49693426e-03, ...,
        -2.49693426e-03, -2.49693426e-03, -2.49693426e-03], ...,
        [ -4.62132721e-06,  3.78455006e-05, -4.14985243e-06, ...,
        -4.14985243e-06, -4.14985243e-06, -4.14985243e-06], ...,
        [ -1.09413522e-03,  8.98773037e-03, -9.86701460e-04, ...,
        -9.86701460e-04, -9.86701460e-04, -9.86701460e-04], ...,
        [ -2.50462862e-03,  2.25378741e-02, -2.50415551e-03, ...,
        -2.50415551e-03, -2.50415551e-03, -2.50415551e-03], ...,
        [-0.00522096, -0.00522096, -0.00522096, ...,
        -2.50415551e-03, -2.50415551e-03, -2.50415551e-03], dtype=float32)], dtype=float32), array([[ 0.0056234,  0.03614431, -0.00522096, -0.00522096, -0.00522096,
        -0.00522096, -0.00522096, -0.00522096, -0.00522096, -0.00522096,
        -2.42366618e-03,  2.23991591e-02, -2.49693426e-03, ...
        -2.49693426e-03, -2.49693426e-03, -2.49693426e-03], dtype=float32)], dtype=float32)]
0.966
Process finished with exit code 0
```



```
File Edit View Navigate Code Refactor Run Tools VCS Window Help
MNIST_SOFTMAX mnist_train.py
Project mnist_train.py mnist_test.py
Run mnist_train
/usr/bin/python3.5 /home/sibi/Downloads/MNIST_SOFTMAX/mnist_train.py
Extracting MNIST_data/train-images-idx3-ubyte.gz
Extracting MNIST_data/train-labels-idx1-ubyte.gz
Extracting MNIST_data/t10k-images-idx3-ubyte.gz
Extracting MNIST_data/t10k-labels-idx1-ubyte.gz
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use SSE3 instructions, but these are available on your machine
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use SSE4.1 instructions, but these are available on your machine
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use SSE4.2 instructions, but these are available on your machine
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use AVX instructions, but these are available on your machine
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use AVX2 instructions, but these are available on your machine
W tensorflow/core/platform/cpu_feature_guard.cc:45] The TensorFlow library wasn't compiled to use FMA instructions, but these are available on your machine
Exporting trained model to data/mnist_model
INFO:tensorflow:data/mnist_model/00000001-tmp/export is not in all_model_checkpoint_paths. Manually adding it.
Process finished with exit code 0
```

## Shallow Learning – Spark – Video Classification

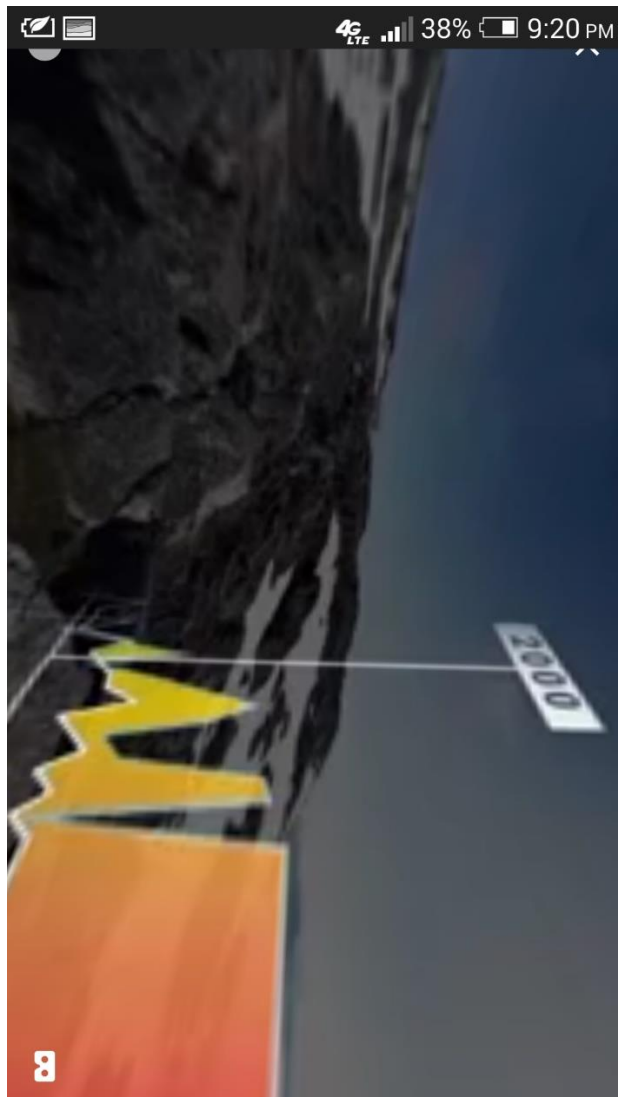


```
Image_Classification - [~/Big Data SP17/Project/Phase-1/Spark_Programming] - [spark_programming] - ~/Big Data SP17/Pr...
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Spark_Programming src main scala IPApp.scala
Project IPApp.scala ImageUtils.scala ResizingImage.scala IPSettings.scala build.sbt
Spark_Programming [spark] IPApp extractDescriptors(...)
Run IPApp
17/02/27 21:12:00 INFO InternalParquetRecordReader: block read in memory in 1 ms. row count = 11
Predicting test image : sea_level_rise as sea_level_rise
(3.0,3)
(3.0,3)
(3.0,3)
(0.0,3)
(2.0,3)
(2.0,2)
(2.0,2)
(2.0,2)
(2.0,2)
(1.0,1)
(3.0,1)
(1.0,1)
(2.0,1)
(3.0,1)
(0.0,0)
(0.0,0)
(0.0,0)
(0.0,0)
(0.0,0)
0.75
===== Confusion matrix =====
5.0 0.0 0.0 0.0
0.0 2.0 1.0 2.0
0.0 0.0 5.0 0.0
1.0 0.0 1.0 3.0
0.75
Process finished with exit code 0
Compilation completed successfully with 5 warnings in 13s 194ms (10 minutes ago)

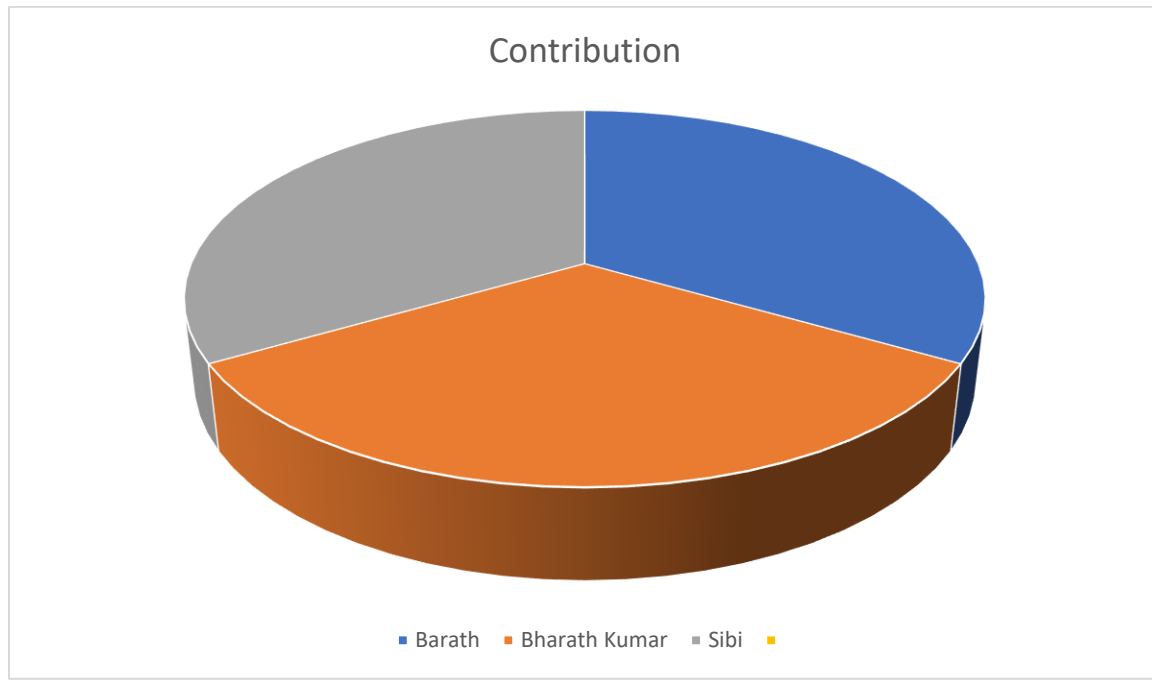
Image_Classification - [~/Big Data SP17/Project/Phase-1/Spark_Programming] - [spark_programming] - ~/Big Data SP17/Pr...
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Spark_Programming src main scala IPApp.scala
Project IPApp.scala ImageUtils.scala ResizingImage.scala IPSettings.scala build.sbt
Spark_Programming [spark] IPApp extractDescriptors(...)
Run IPApp
17/02/27 21:11:43 WARN ParquetRecordReader: Can not initialize counter due to context is not a instance of TaskInputOutputContext, but is org.apache.hadoop
17/02/27 21:11:43 WARN ParquetRecordReader: Can not initialize counter due to context is not a instance of TaskInputOutputContext, but is org.apache.hadoop
17/02/27 21:11:43 INFO InternalParquetRecordReader: RecordReader initialized will read a total of 50 records.
17/02/27 21:11:43 INFO InternalParquetRecordReader: at row 0. reading next block
17/02/27 21:11:43 INFO CodecPool: Got brand-new decompressor [.gz]
17/02/27 21:11:43 INFO InternalParquetRecordReader: block read in memory in 1 ms. row count = 50
17/02/27 21:11:43 INFO InternalParquetRecordReader: RecordReader initialized will read a total of 50 records.
17/02/27 21:11:43 INFO InternalParquetRecordReader: at row 0. reading next block
17/02/27 21:11:43 INFO CodecPool: Got brand-new decompressor [.gz]
17/02/27 21:11:43 INFO InternalParquetRecordReader: RecordReader initialized will read a total of 50 records.
17/02/27 21:11:43 INFO InternalParquetRecordReader: at row 0. reading next block
17/02/27 21:11:43 INFO InternalParquetRecordReader: block read in memory in 1 ms. row count = 50
17/02/27 21:11:43 INFO CodecPool: Got brand-new decompressor [.gz]
17/02/27 21:11:43 INFO InternalParquetRecordReader: block read in memory in 0 ms. row count = 50
17/02/27 21:11:43 INFO CodecPool: Got brand-new decompressor [.gz]
17/02/27 21:11:43 INFO InternalParquetRecordReader: block read in memory in 8 ms. row count = 50
400 5
Histogram size : (400, 1)
Histogram : [ 0.0019857492, 0.0027644746, 0.0027644746, 0.0022972394, 0.0030370285, 0.0016742592, 0.0032706459, 0.0033485184, 0.0022193668, 0.0020246855,
--Histogram size : 400
17/02/27 21:11:45 INFO FileInputFormat: Total input paths to process : 1
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 INFO ParquetFileReader: Initiating action with parallelism: 5
17/02/27 21:11:45 WARN ParquetRecordReader: Can not initialize counter due to context is not a instance of TaskInputOutputContext, but is org.apache.hadoop
17/02/27 21:11:45 WARN ParquetRecordReader: Can not initialize counter due to context is not a instance of TaskInputOutputContext, but is org.apache.hadoop
17/02/27 21:11:45 WARN ParquetRecordReader: Can not initialize counter due to context is not a instance of TaskInputOutputContext, but is org.apache.hadoop
17/02/27 21:11:45 WARN ParquetRecordReader: Can not initialize counter due to context is not a instance of TaskInputOutputContext, but is org.apache.hadoop
Compilation completed successfully with 5 warnings in 13s 194ms (10 minutes ago)
```



## Android VR



## **Project Management**



### **Contribution in Project:**

Naravula Loganathan, Barath – 28

- Documentation
- TensorFlow Linear Regression
- VR Google Cardboard Application

Natesan Arumugam, Bharath Kumar – 29

- Google Conversation API
- Implementation of clarifai API

Ramesh, Sibi Chakravarthy – 34

- SoftMax
- Image Classification using Apache Spark