Capstone Session - 1
Facial Emotion Detection

Agenda

1) Facial Emotion Detection Problem Statement
2) Solution Steps Walkthrough
3) General Best Practices
4) Q&A

Malaria Detection Dataset

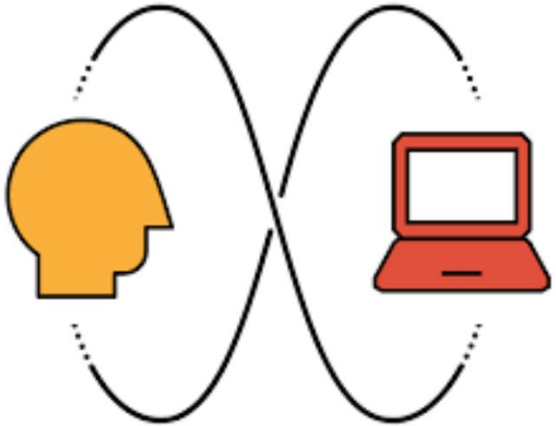
- This dataset consists of four classes of images, each representing a particular **emotion**, that is to be detected by our Deep Learning Models:
  - **Happy**
  - **Sad**
  - **Neutral**
  - **Surprise**

- The dataset contains a total of **15,109 train, 4,977 validation, and 128 test images.**

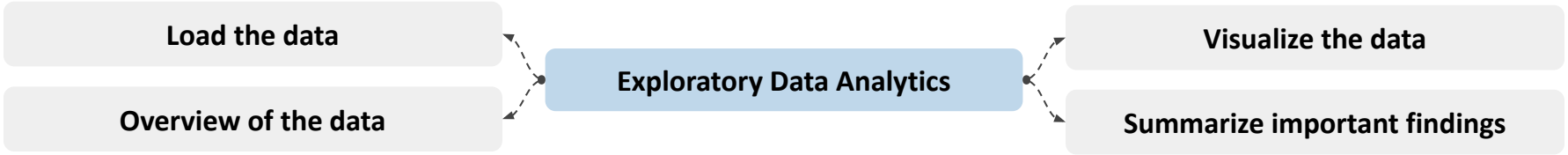



Problem Definition and Objective

- Deep Learning has found applications in many predictive tasks relating to more unstructured forms of data over the last few years, such as images, text, audio and video. Many of these tasks seem to be in the vein of a larger direction of predictive modeling that aims to match human-level performance on such tasks, because humans have evolved to specialize in performing intelligent actions on such unstructured data.
- In the field of human-machine interaction, facial expression recognition is critical. From recent research, it has been found that as much as 55% of communication of sentiment takes place through facial expressions and other visual cues.
- Therefore, training a model to identify facial emotions accurately is an important step towards the development of emotionally intelligent behavior in machines with AI capabilities. Hence, we shall be building a Deep Learning model to try and detect Facial Emotion.



Solution Step 1



Example of questions that can be answered by EDA:

1. What is the shape of the dataset?
2. Is there imbalance in the classes of the target variable?
3. Are there visual distinctions between the 4 classes?
4. What color_mode should we go for with respect to each models? Does ‘rgb’ colormode provide any significant advantage over ‘grayscale’, or is the vice versa true?

Solution Step 2

Example of questions that can be answered by Model-Building:

1. Is the performance satisfactory? Is the model performing decently on test data?
2. What Architectural modifications can be done to improve Model Performance and what are the intuitions behind those architectural modifications?
3. Which color_mode is giving better results?
4. Do we need to train for more number of epochs or has the performance already reached its plateau?

Solution Step 3

Example of questions that can be answered by modifying pre-built architectures:

1. What layers are we inheriting from the pre-built Architectures?
2. How many layers are we adding to the pre-built Architectures?
3. Why does the color_mode for these Transfer Learning Architectures have to be ‘rgb’?
4. Are we training all the layers of our Transfer Learning Architectures, or are we only training our additional layers?

Solution Step 4

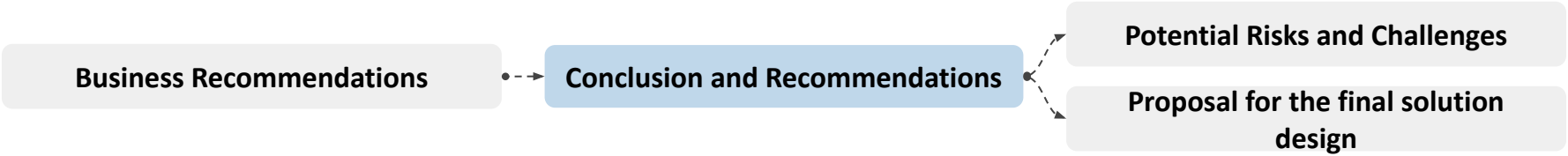
Great Learning
POWER AHEAD

Building Complex CNN Architecture → **Training and Testing the model** → **Fine-Tuning this Architecture**

Example of questions that can be answered by building a Complex CNN Architecture:

1. Why do we need to build the Complex CNN Architecture?
2. Is it advantageous to have an architecture as large as the Transfer Learning Architectures while still being able to use ‘grayscale’ color_mode?
3. Is the performance up to our standards, or do we need to make small architectural changes in order to get better results?

Solution Step 5



Example of questions that can be answered by Conclusions and Recommendations:

1. What are the refined insights from building all these models?
2. What observations and insights can be drawn from the confusion matrix and classification report?
3. Is the model performance good enough for deployment in production?
4. What is proposal for final solution design? What are expected benefits and costs (assume numbers) of this solution design?

General Best Practices

Some of the best practices for submission:

- **Address all key questions in the rubric**: Make sure to read the rubric carefully and understand all the requirements. Address all the key questions asked in the rubric in your submission.
- **Provide observations and insights**: Provide observation and insight for each output, such as plots, summary statistics, missing values detection and treatment. This will help to make your work more understandable and actionable.
- **Explain your design steps**: Explain the steps you took to design your solution approach. This will help the reader to understand the overview of your solution approach and how you arrived at your final model.
- **Document the performance benchmarks:** Write down the performance benchmarks for all the Models you have trained and tested.

General Best Practices

- **Experiment with both kinds of color_mode**: Try to get a General Understanding as to which color_mode is performing better and what may be the reason.
- **Select the performance metric that best fits the business objectives**: Choose the performance metric that best fits the business objectives. This will help to ensure that your model is relevant and useful to the business.
- **Interpret potential benefits from the model**: Provide an interpretation of potential benefits from the model. This will help the business to determine the next steps and make informed decisions based on your work.

Q&A