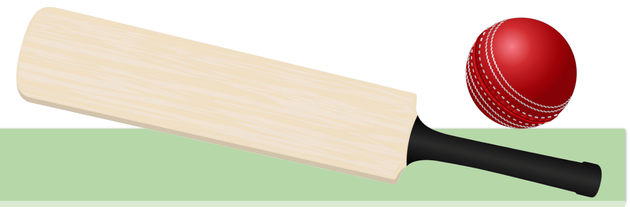
Automating Sports Commentary

36118 Applied Natural Language Processing – Assignment 2A: Project Summary

Team name: “Skynet”



PROJECT OBJECTIVE

The project objective is to develop a Python script that generates a real-time, informative sports commentary for televised cricket matches. The script will offer a user the functionality to select between an “emotive narration” of each significant cricket event or a simplified alternative. This will be carried out by analysing visual data from the field and the on-board statistics. The commentary will also provide a text-to-speech conversion, with additional translation access for conversion into common Indo-European languages.

The project was selected as it presented a genuine challenge. In achieving these goals, the final product may aid in communicating a cricket match to an audience unable to observe a live feed, where the translation feature could help expand the popularity of Cricket to countries where existing commentary is not provided. The final product may also aid in mitigating common barriers experienced by individuals with communication disabilities.

PROJECT OUTCOMES AND INSIGHTS

Following considerable conceptual and feasibility discussions, the project’s outcomes may provide an entirely functional or semi-functional model that offers an alternate means of communicating a Cricket broadcast.

Full functionality model: In understanding the project’s objective, the overarching goal targets resolving accessibility barriers present in specific existing cricket audiences. These may be present in the form of environmental impediments (such as driving), disability impediments (such as mobility limitations, vision and hearing impairment, and information processing limitations), newcomers to the sport (such as understanding events as they take place) and language barriers (as existing commentaries are not accessible for all countries). Cricket may furthermore benefit from a prospective wider and more inclusive audience while providing an alternate means to grant efficient commentary in the absence of a commentator. The success of the model will deliver a proof of concept for possible application expansion into other sports events, meaning the model’s significance could reform the way particular spectators receive sporting broadcasts. With the existing positive reception and integration of AI into modern lifestyles, the reality of acceptance and application is realistic.

Semi-functional model: As the project’s objective endeavours to provide a simplistic commentary alongside a detailed “emotive” commentary, the completion of a simple model is determined as semi-functional. Such a model will still be acknowledged as a successful outcome, as it resolves accessibility barriers recognised in the initial project goal. The significance of the following may additionally provide similar benefits to Cricket, creating a proof of concept for application within other sports.

NLP TECHNIQUES

As the project objective intends to challenge, engagement with particular methodology is subject to variation.
The proposed approach will involve an exploration of the following key resources and discerning the most fitting use-cases based on outcomes:

OpenCV (Computer Vision) – Analysis and interpretation of visual data for translating televised events, such as a ball hitting a boundary, to form the basis of the data input. OpenCV offers tools to recognise objects, faces, and movements, all important features relevant for the generation of sports commentary.

NLTK (Natural Language Toolkit) – A suite of text-processing libraries applied in the fundamental processing of ordinary language. The NLTK package will enable text to be tokenised, stemmed, and tagged, alongside offering the capacity to classify and gauge sentiment. By breaking down existing commentary data, determining word frequencies and appropriate use cases, for example, can assist in creating an organic output that imitates the commentary style.

Words2vector – An NLP toolset that converts words into numerical vectors to derive contextual meaning and association. This toolset will help break down existing cricket commentary for analysis to generate a comparable output that mimics a professional commentator.

LSTM (Long Short-Term Memory) – A neural network framework typically applied in deep learning (using vanishing gradients) for processing sequenced speech data. Applying LTSM here is indispensable for generating a natural-sounding commentary after language modelling. Following training, the framework can also be applied to interpret key events.

BERT (Bidirectional Encoder Representations from Transformers) – A pre-trained language model with a transformer-based framework. BERT may be applied to understand contextual associations of words in a sentence when fed existing cricket commentary transcripts. Bert will offer another layer of fine-tuning during the text classification phase.

Seq2Seq (Sequence to sequence) – An architecture consisting of an encoder and decoder network. As the generated sports commentary will facilitate a translation functionality, we are able to take a fixed input sequence and transform it into a fixed-length vector representation to ultimately generate an output sequence in another language.

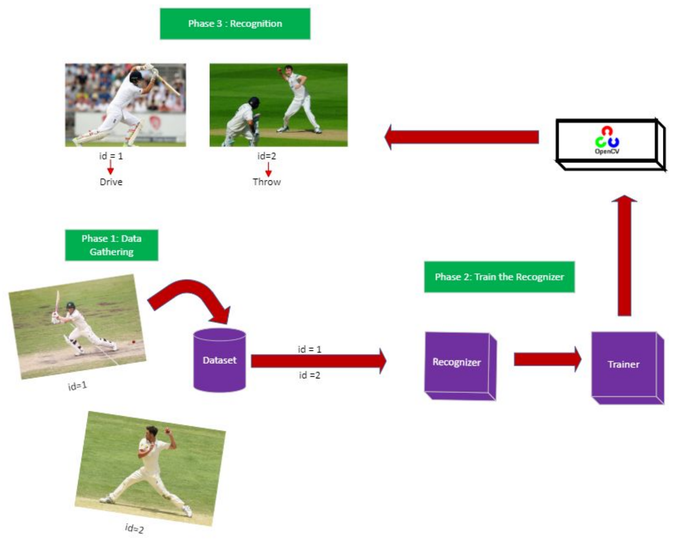


Figure 1: A flow chart representing OpenCV’s analysis and interpretation of visual data.

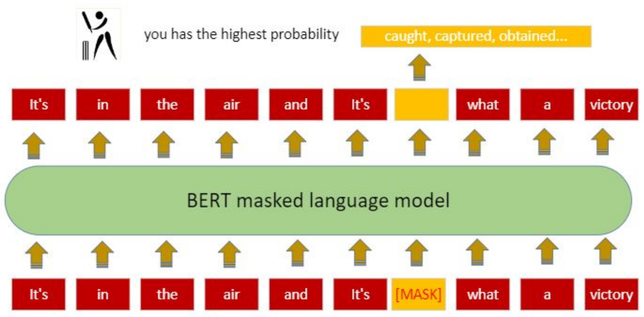


Figure 2: A visual representation of a BERT model, to determine word choice based on highest probability.

PROJECT PROGRESS

Progress overview: Early Stages

In order to satisfy the project objective, completion remains contingent on merging large code segments provided by different participants, each with varying levels of complexity. To track progress across a 14-day timeframe, preliminary planning with a Gantt chart has been conducted by assigning responsibilities and deadlines based on each member’s strengths and comforts. The structure will cover a reviewing process of each submission by peers should coding difficulty be encountered. Using MIRO sticky notes, the project was broken up into achievable steps under a concentrated CRISP-DM framework. Lastly, GitHub comments detailing the rationale for clarifying coding tangents will be implemented for convenience.

Following the initial crucial deliberation on the project’s feasibility, the group set out to explore existing projects and studies to conceptualise a coding procedure. Once practicality was discerned through the production of a proof of concept model, preliminary data was sourced and scraped from cricket archives, Kaggle data frames and YouTube posts. The initial phase of constructing the video processing code is presently underway using OpenCV. Each member will be responsible for composing their portion of the final report, with exceptions for some of the more complicated coding segments, out of workload fair mindedness.

DATA ACQUISITION

To achieve the project objective, two raw data types will be required:

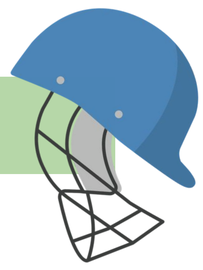
- **Videography** of player actions, umpire decisions and match statistics.
- Ball-by-ball **commentary** for each event (such as, “no ball”, “out”, “wide”, “boundary 4” and “boundary 6”).

To meet the first requirement, videos have been sourced from YouTube uploads and official broadcasts. “Video pools” were then created, each representing different events in order to annotate the dataset for efficiently training the model. Ball-by-ball commentary on the other hand employs speech-to-text techniques to generate transcripts. These transcripts were scrapped from “Cricbuzz” & “ESPN Cricinfo”, with additional commentary datasets extracted from Kaggle and further sources following consideration. All commentary transcripts utilised in the project were compared against video sources of the live cricket feed to validate accuracy. The primary interest here resides in providing a model with an existing emotive structure for automated generation of human-like commentary, while individual video sources provide the visuals for OpenCV processing.

TEAM MEMBER ROLES

While each group member endeavours to achieve a degree of participation in all aspects of the project’s development, the initial planning phase has allocated key responsibilities.

Group Member	Assigned Role	Deliverables
Nathan Collins	Lead Coordinator Writing Lead Developer Quality Assurance	• Planning/tracking milestones and deliverables. • Report writing, composition and proofreading. • Examining existing studies, techniques, and research. • Exploration of the dataset using the nltk library. • Constructing translation features using Seq2seq • Testing product.
Naveen Muralidharan	Lead Developer Quality Assurance	• Examining existing studies, techniques and research. • Structuring primary coding framework. • Implementing machine learning through LSTM and BERT. • Testing product.
Aman S. Dalal	Business Analyst Developer Quality Assurance	• Examining existing studies, techniques, and research. • Initial data scraping and sourcing, implementing W2V. • Data cleaning, annotation, processing and preliminary exploratory analysis. • Report writing and proofreading. • Testing product.
Yasaman Mohammadi	Business Analyst Developer Quality Assurance	• Examining existing studies, techniques, and research. • Construction of video processing code using OpenCV • Report writing and proofreading. • Testing product.



APPENDIX

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