
SENTIMENT ANALYSIS OF EMPLOYEE REVIEWS WITH DEEP-LEARNING TRANSFER MODELS

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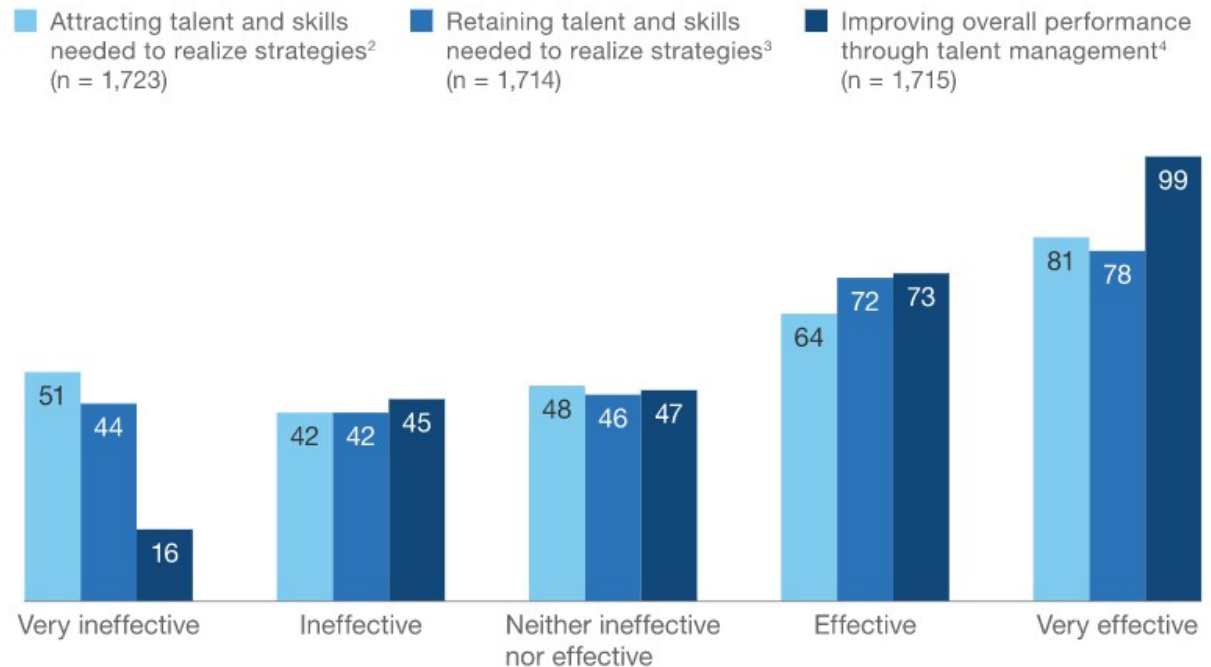
AGENDA

- Overview
- Business Problem
- Exploring Data Analysis
- Model Evaluation
- Model Deployment
- Conclusion

OVERVIEW: TALENT MANAGEMENT

Well-performed companies with effective talent management strategies, company can **identify & retain** the **most talented employees**.

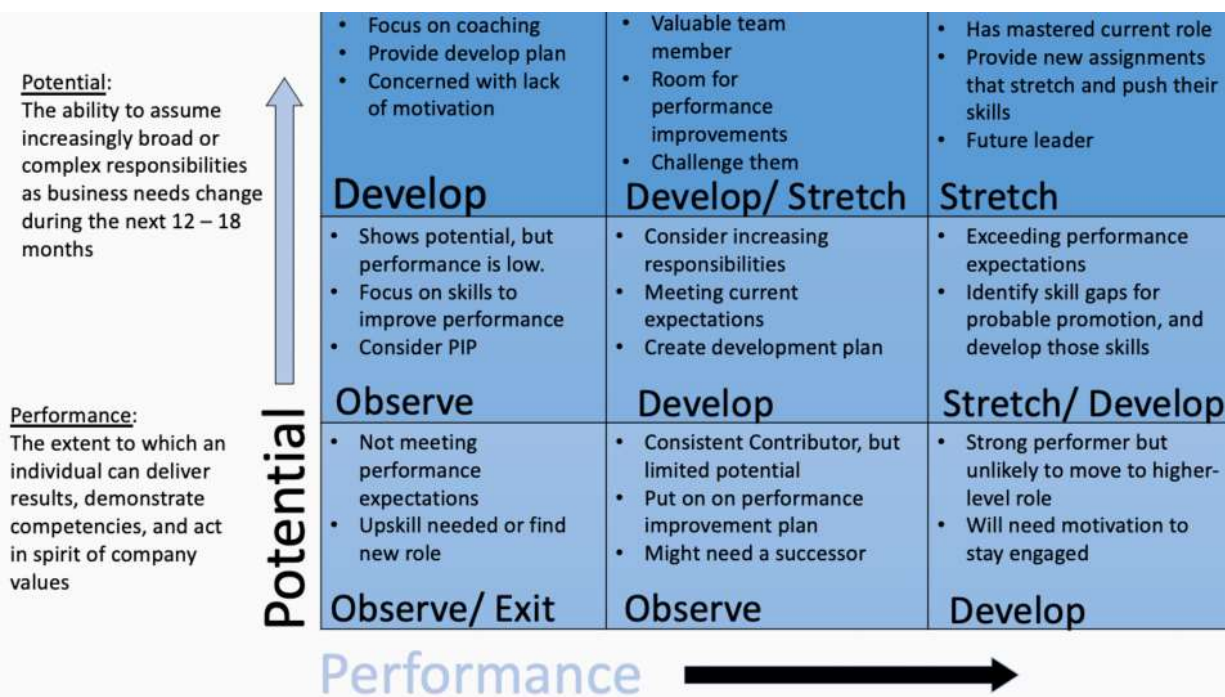
Respondents whose organizations have performed somewhat or much better than competitors over past 3 years,¹ based on effectiveness of talent-management practices, % of respondents



<https://www.indeed.com/career-advice/career-development/what-is-talent-management>

<https://www.mckinsey.com/business-functions/people-and-organizational-performance/our-insights/winning-with-your-talent-management-strategy>

9-BOX GRID & 5 POSSIBLE PROFILES



Underachiever – Observe/Exit

- Should receive a **“last chance”** for improvement

Average contributor – Observe

- Should hold average tasks and Job positions with **performance improvement plan**

Core performer – Develop

- Companies should try to **maintain** their good Performance with career development plan

Rising star – Develop/Stretch

- Top performer who may be **ready for more**

Star Leader – Stretch

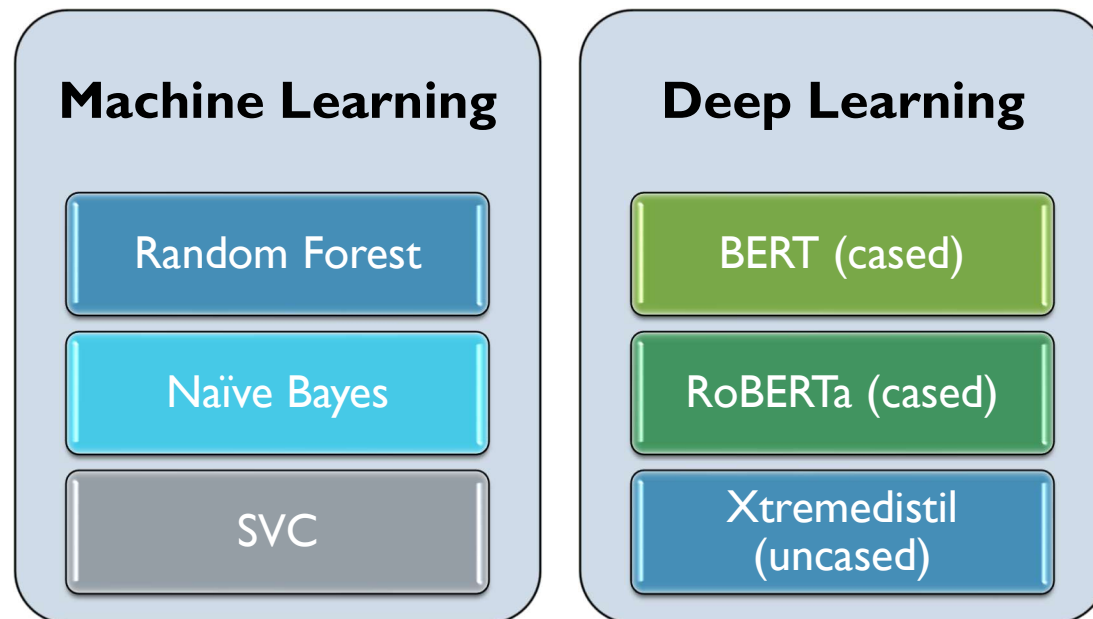
- Should be in **Top Management** positions.

BUSINESS PROBLEM

- Calibration and career development plan determination is **not** an exact science
 - Combination of **tangible** & **intangible** indicators
 - Rely heavily on **intuitions** of manager, talent panel, and HR
 - Nevertheless, this is vital to **business continuity**

FOCUS

- Goal: To develop a **sentiment analysis** model that could facilitate the proposal of employee's development plan type based on observation



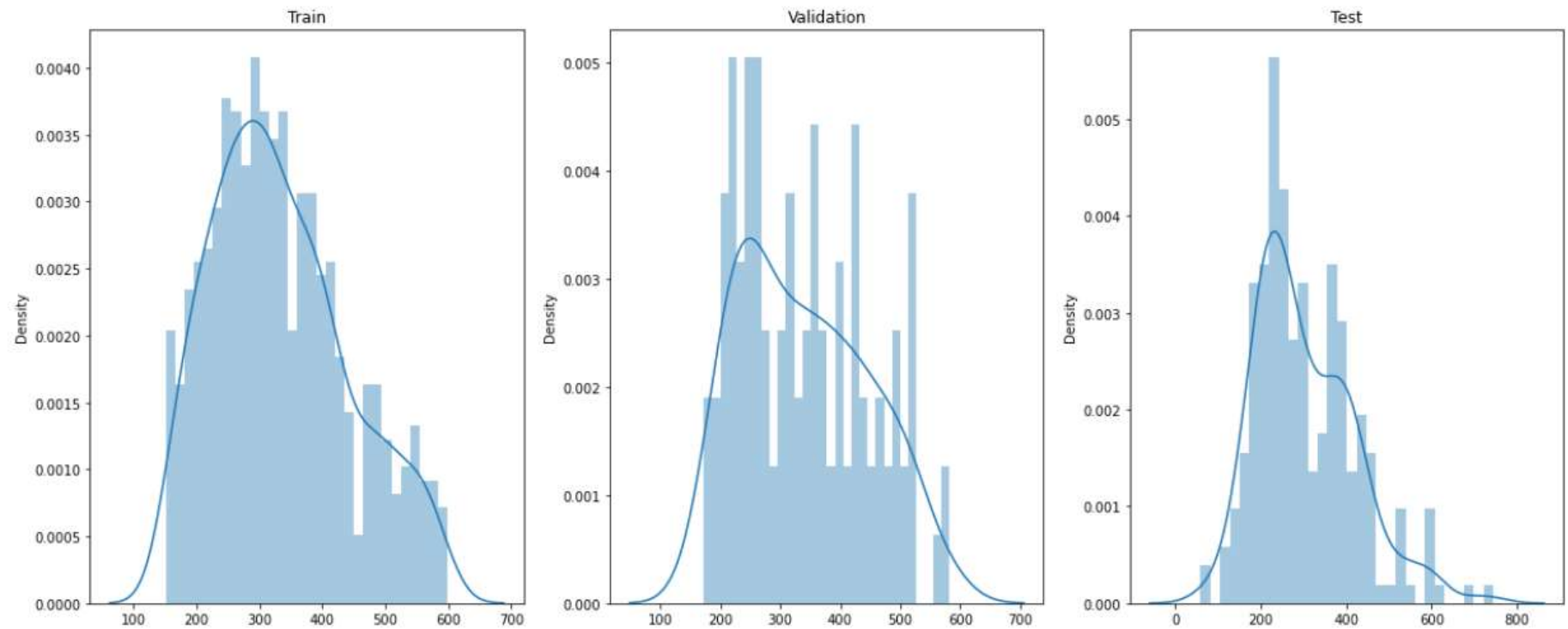
DATASET

- Employee Review dataset by Fiodar Ryzhykau (Kaggle)
- Consisted of 3 csv files (total of 997 samples):
 - Train (656 samples)
 - Validation (116 samples)
 - Test (225 samples)
- Relevant data:
 - Employee Review
 - Potential Score
 - Performance Score

<https://www.kaggle.com/datasets/fiodarryzhykau/employee-review>

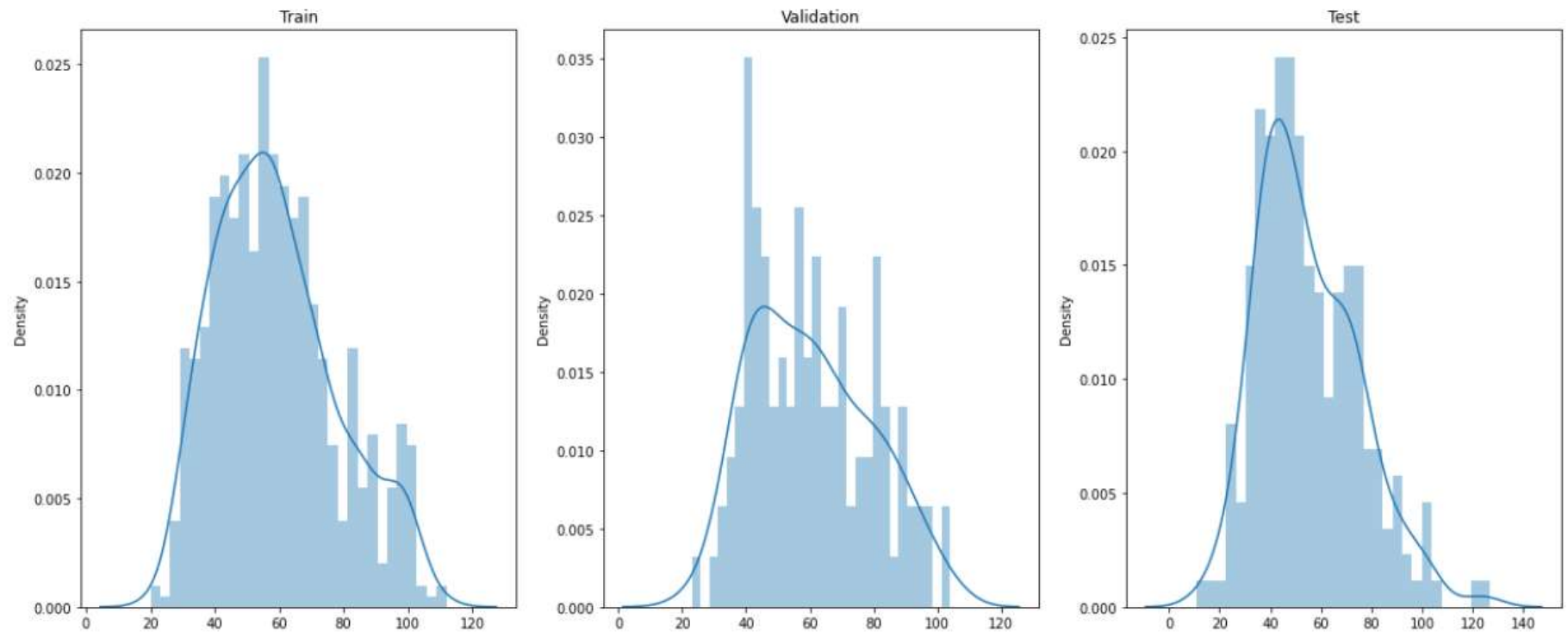
EXPLORING DATA ANALYSIS

Character Count Distribution by Dataset



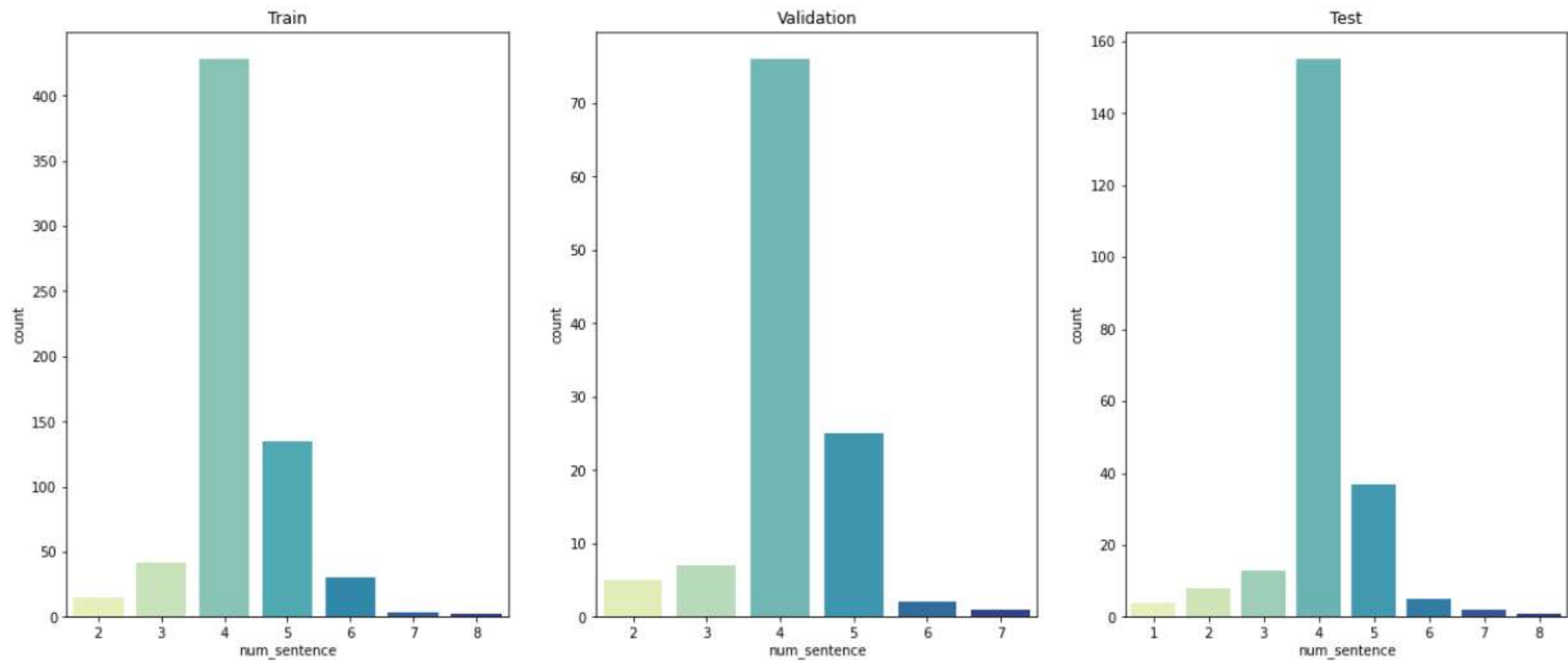
EXPLORING DATA ANALYSIS

Word Count Distribution by Dataset

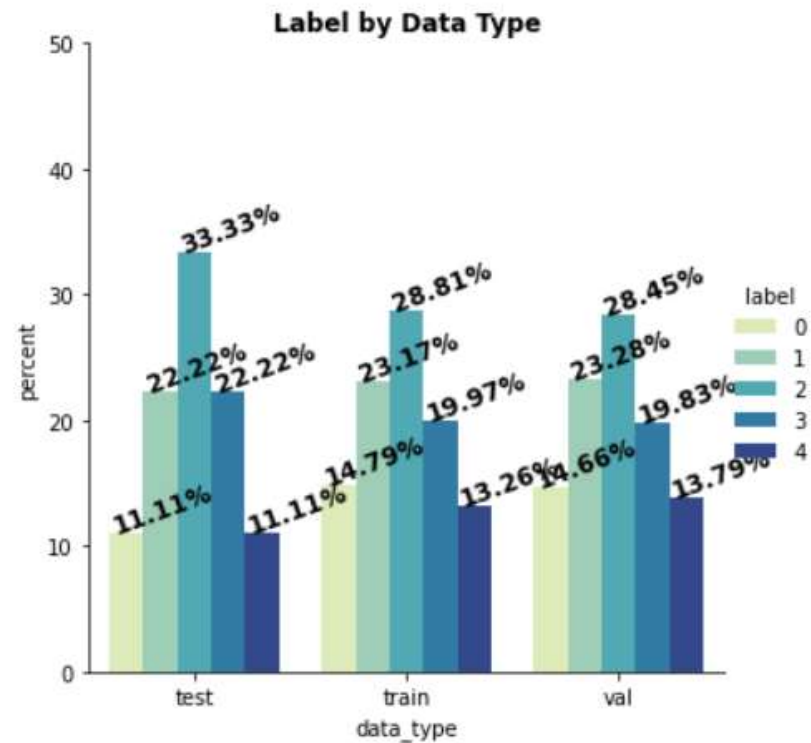
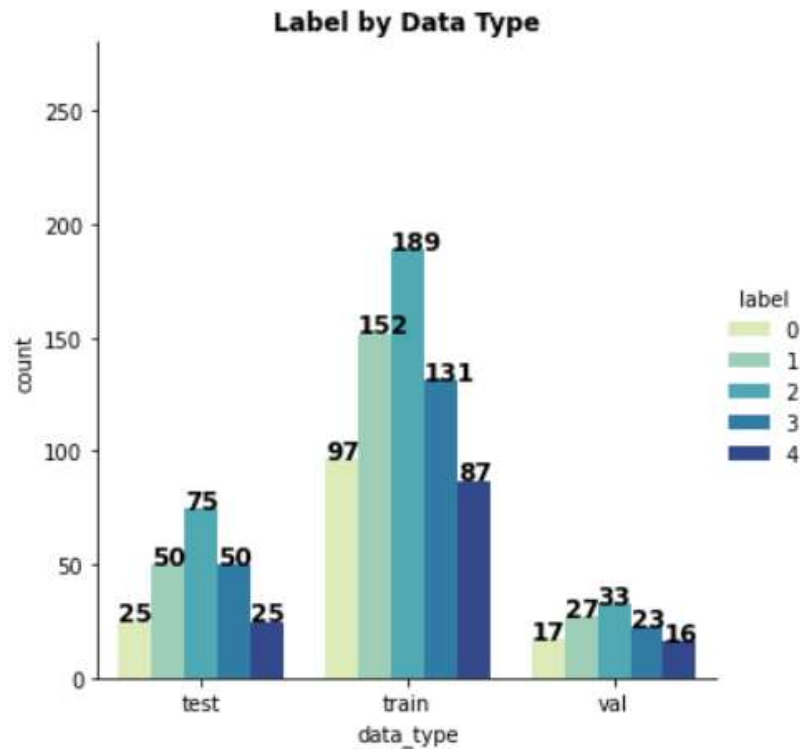


EXPLORING DATA ANALYSIS

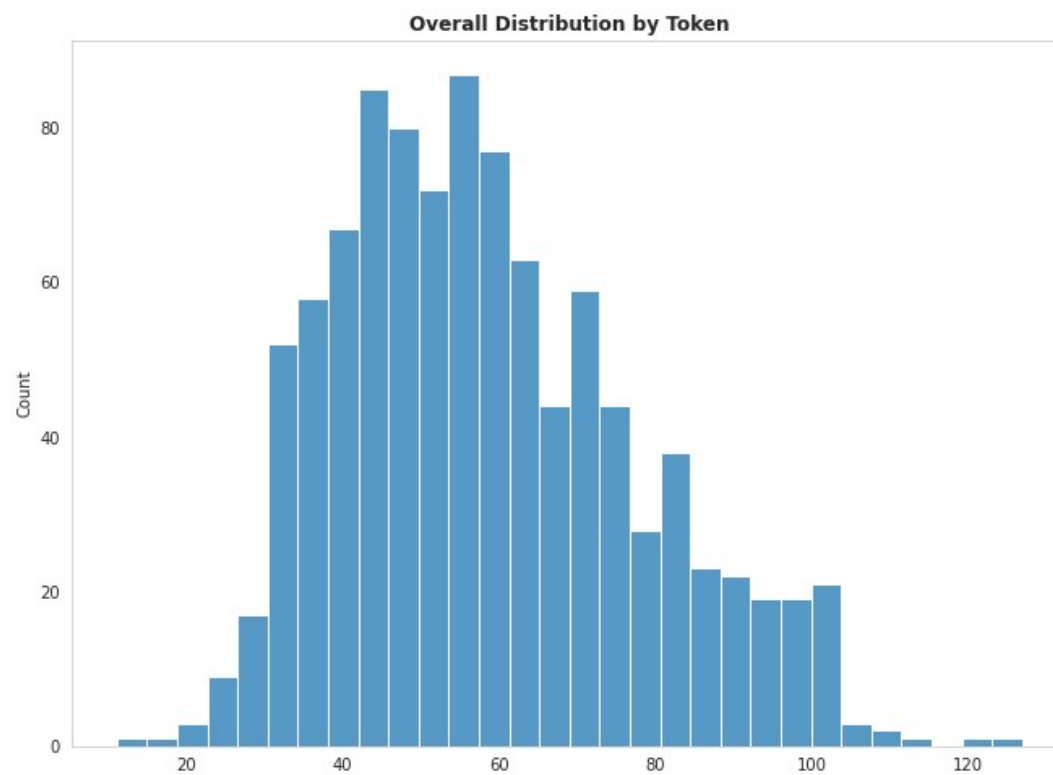
Sentence Count Distribution by Dataset



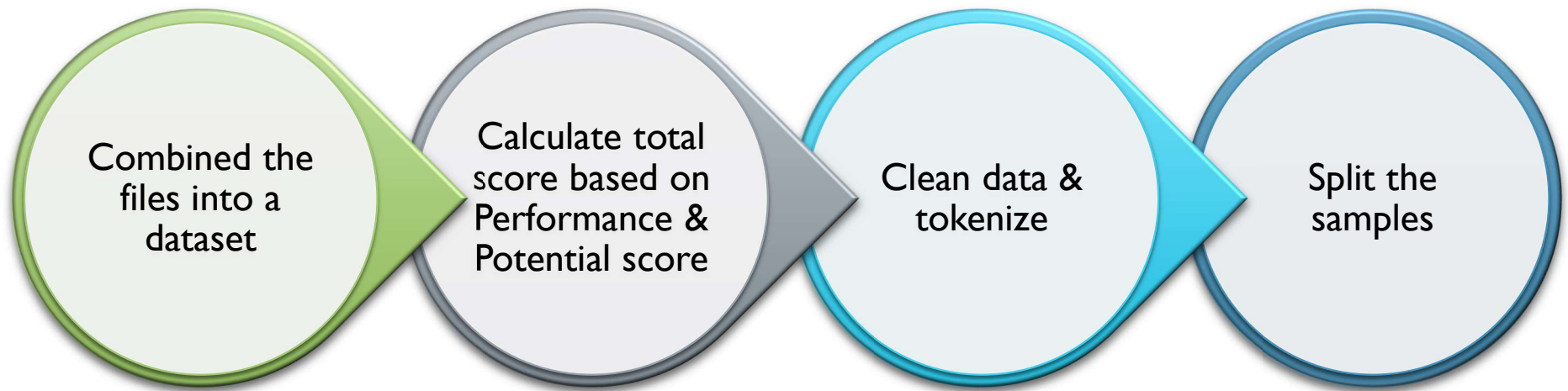
EXPLORING DATA ANALYSIS



EXPLORING DATA ANALYSIS



DATA CLEANSING & FEATURE ENGINEERING

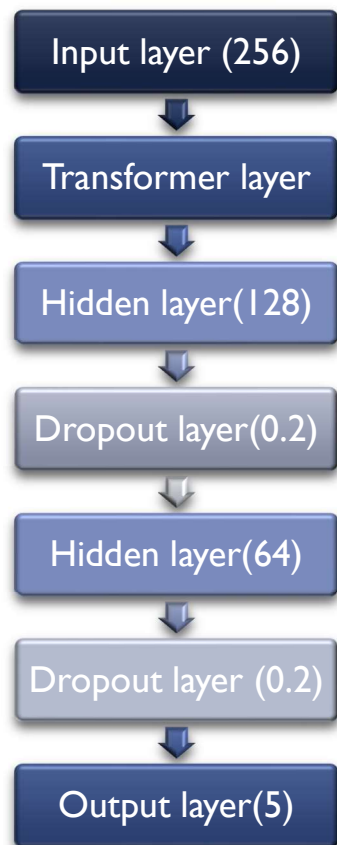


MACHINE LEARNING MODEL: ACCURACY SCORE

- Pipeline for GridSearch
 - Train/Validation/Test ratio 65:15:20
 1. TF-IDF Vectorizer
 2. Random Forest | SVC | Naïve Bayes

Model	Train	Validation	Test
Naïve Bayes	0.983	0.621	0.538
Random Forest	0.992	0.388	0.391
SVC	0.684	0.414	0.347

DEEP LEARNING MODEL: ACCURACY SCORE

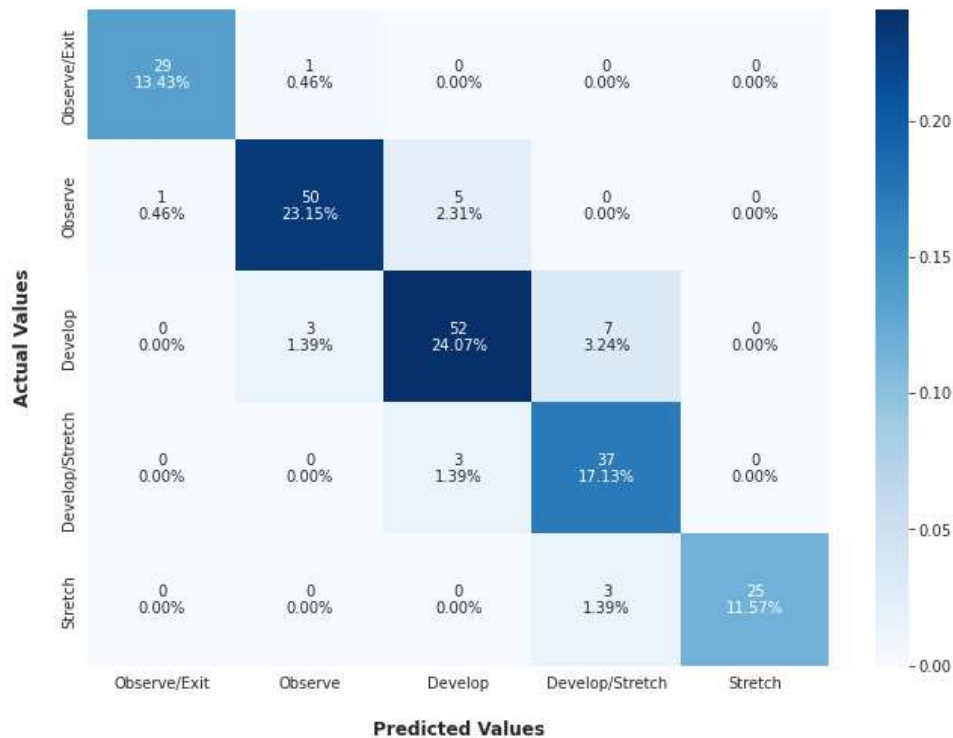


- TensorFlow | Transformers | Keras
 - Train/Validation/Test ratio 65:15:20
 - Optimizer: Adam

Model	Epoch	Train	Validation	Test
BERT (cased)	13	0.924	0.883	0.894
RoBERTa (cased)	8	0.866	0.842	0.852
XtremeDistil (uncased)	11	0.831	0.808	0.819

CONFUSION MATRIX & CLASSIFICATION REPORT: BERT

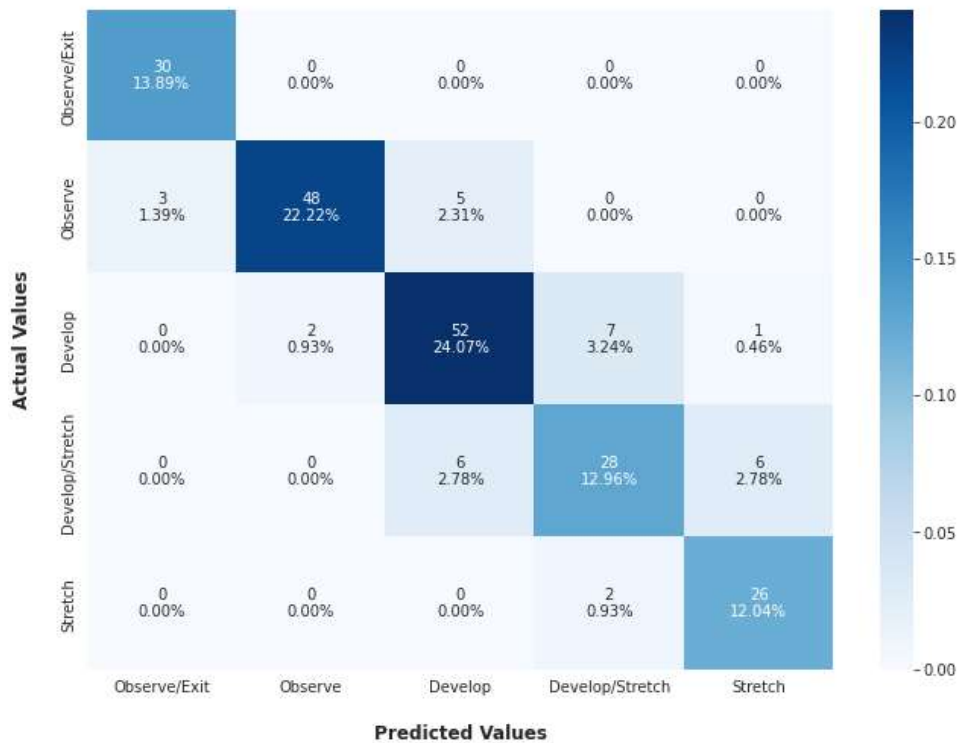
Confusion Matrix with labels



	precision	recall	f1-score	support
Observe/Exit	0.97	0.97	0.97	30
Observe	0.93	0.89	0.91	56
Develop	0.87	0.84	0.85	62
Develop/Stretch	0.79	0.93	0.85	40
Stretch	1.00	0.89	0.94	28
accuracy			0.89	216
macro avg	0.91	0.90	0.90	216
weighted avg	0.90	0.89	0.89	216

CONFUSION MATRIX & CLASSIFICATION REPORT: ROBERTA

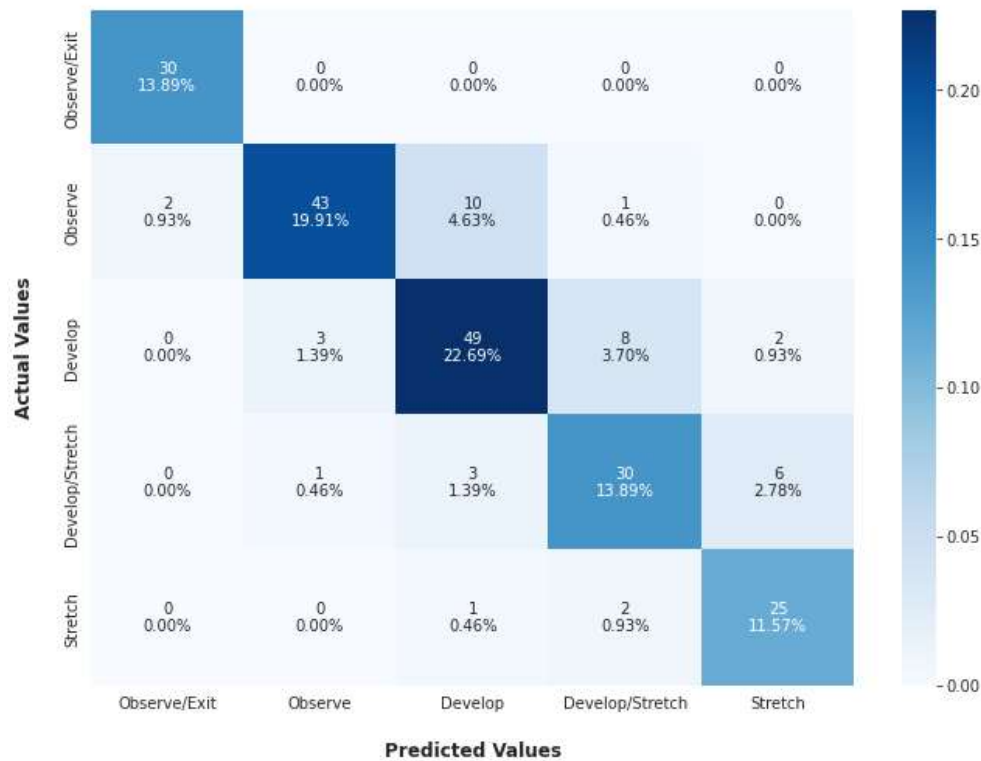
Confusion Matrix with labels



	precision	recall	f1-score	support
Observe/Exit	0.91	1.00	0.95	30
Observe	0.96	0.86	0.91	56
Develop	0.83	0.84	0.83	62
Develop/Stretch	0.76	0.70	0.73	40
Stretch	0.79	0.93	0.85	28
accuracy			0.85	216
macro avg	0.85	0.86	0.85	216
weighted avg	0.85	0.85	0.85	216

CONFUSION MATRIX & CLASSIFICATION REPORT: XTREMEDISTIL

Confusion Matrix with labels



	precision	recall	f1-score	support
Observe/Exit	0.94	1.00	0.97	30
Observe	0.91	0.77	0.83	56
Develop	0.78	0.79	0.78	62
Develop/Stretch	0.73	0.75	0.74	40
Stretch	0.76	0.89	0.82	28
accuracy			0.82	216
macro avg	0.82	0.84	0.83	216
weighted avg	0.82	0.82	0.82	216

MODEL DEPLOYMENT: GRADIO

Gradio

https://58465.gradio.app

Sentiment Analysis for Talent Management

This app utilizes deep learning technology to facilitate talent management and succession planning in relation to the 9-box grid performance framework. Based on their characteristics and achievements, possible career development plans for the employees could be placed under one of the five main groups: Observe/Exit, Observe, Develop, Develop/Stretch, Stretch.

Input your review in the textbox, or select from one of the examples below.

Rachel Harper is a true virtuoso when it comes to task completion. She has been showing she can perform a task to a commendable grade at all times. Her talent has consistently been shining through. She is a joy to behold at the team.

Based on input sentiment, a possible career development plan for this employee is:

Stretch

Clear Submit

Examples

Rachel Harper is a true virtuoso when it comes to task completion. She has been showing she can perform a task to a commendable grade at all times. Her talent has consistently been shining through. She is a joy to behold at the team.

INFERENCE

- Though expensive, transformer models are better choices for multiclass text classification
 - Models perform better in identifying the extreme classes (Observe/Exit & Stretch)
 - BERT is a 'bigger' model; hence, better performance is not unexpected
- The model qualifies as an 'enabler' tool to facilitate talent management & succession planning activities
 - Not machine dictate, but rather sanity check
- This development could be adapted for other usage such as 360° feedback

NEXT STEP

- Enhance with more fine-tuning of transformers | other DL algorithms | optimizer adjustments
- Consider bigger dataset or oversampling techniques
- Deploy the model with libraries that offer more flexibilities for customization (e.g. Flask, Streamlit)

“Development accelerates in the presence of difficulties that stretch people beyond where they are today.”

Julie Winkle Giulioni

THANK YOU