SENTIMENT ANALYSIS OF EMPLOYEE REVIEWS WITH DEEP-LEARNING TRANSFER MODELS

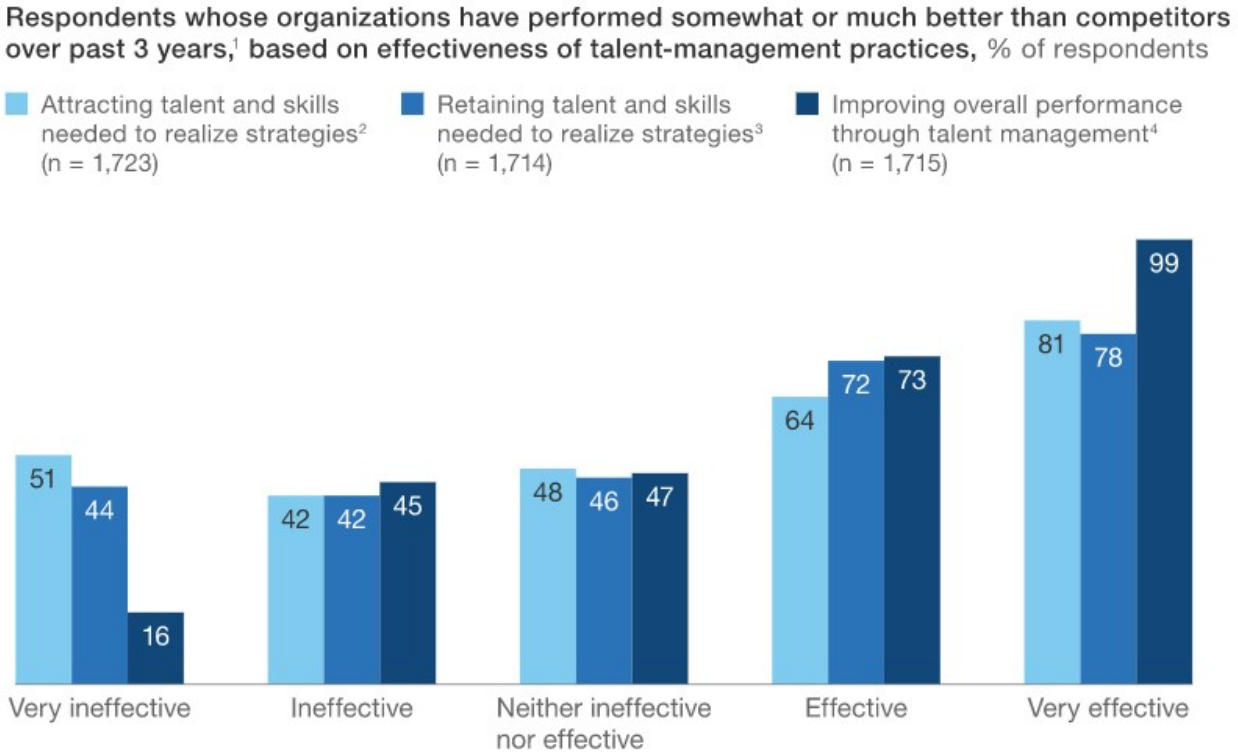
CHANTANEE MANONOM

AGENDA

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

OVERVIEW: TALENT MANAGEMENT

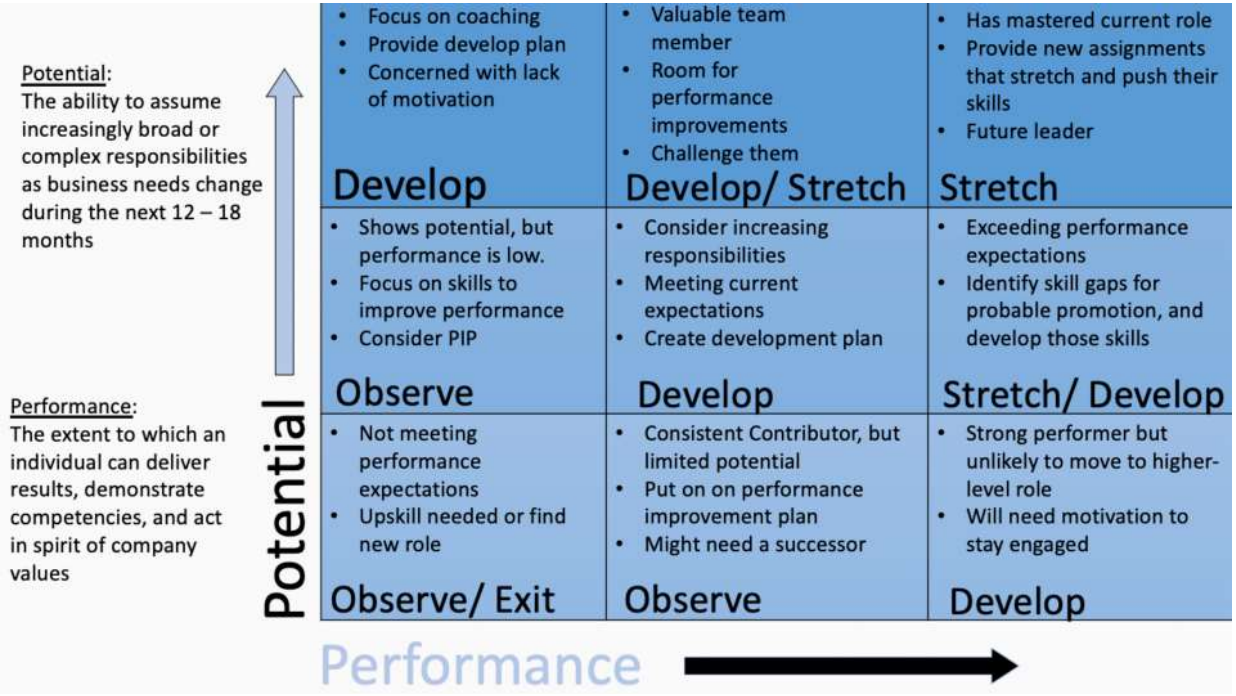
Well-performed companies with effective talent management strategies, company can **identify & retain** the **most talented employees**.



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.

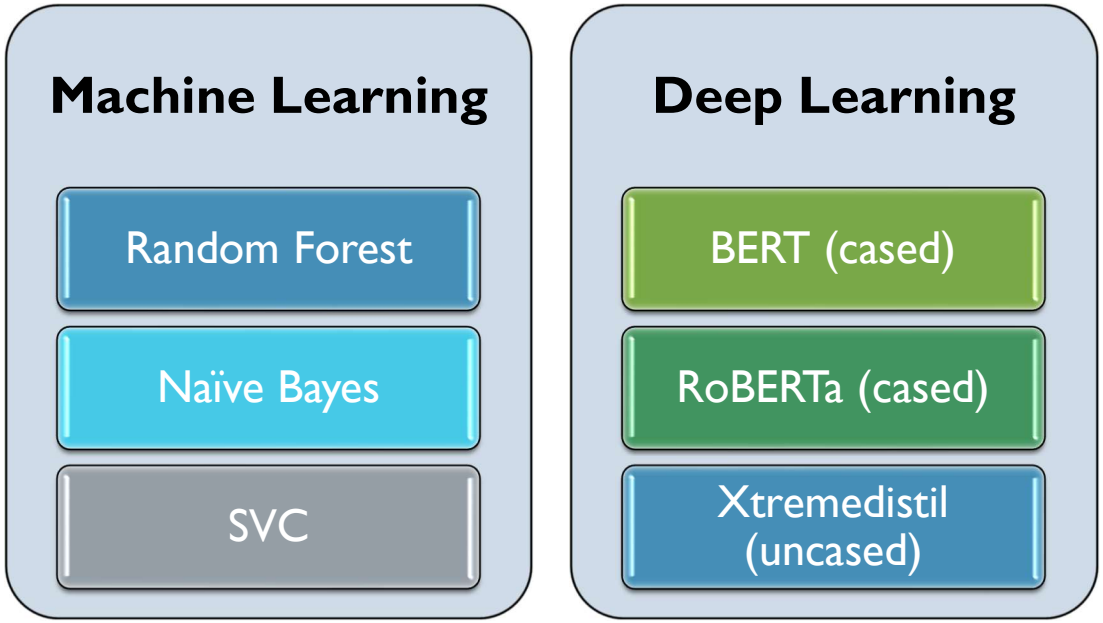
https://pingboard.com/blog/what-is-the-9-box-model-for-hr-how-to-use-it-template/

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



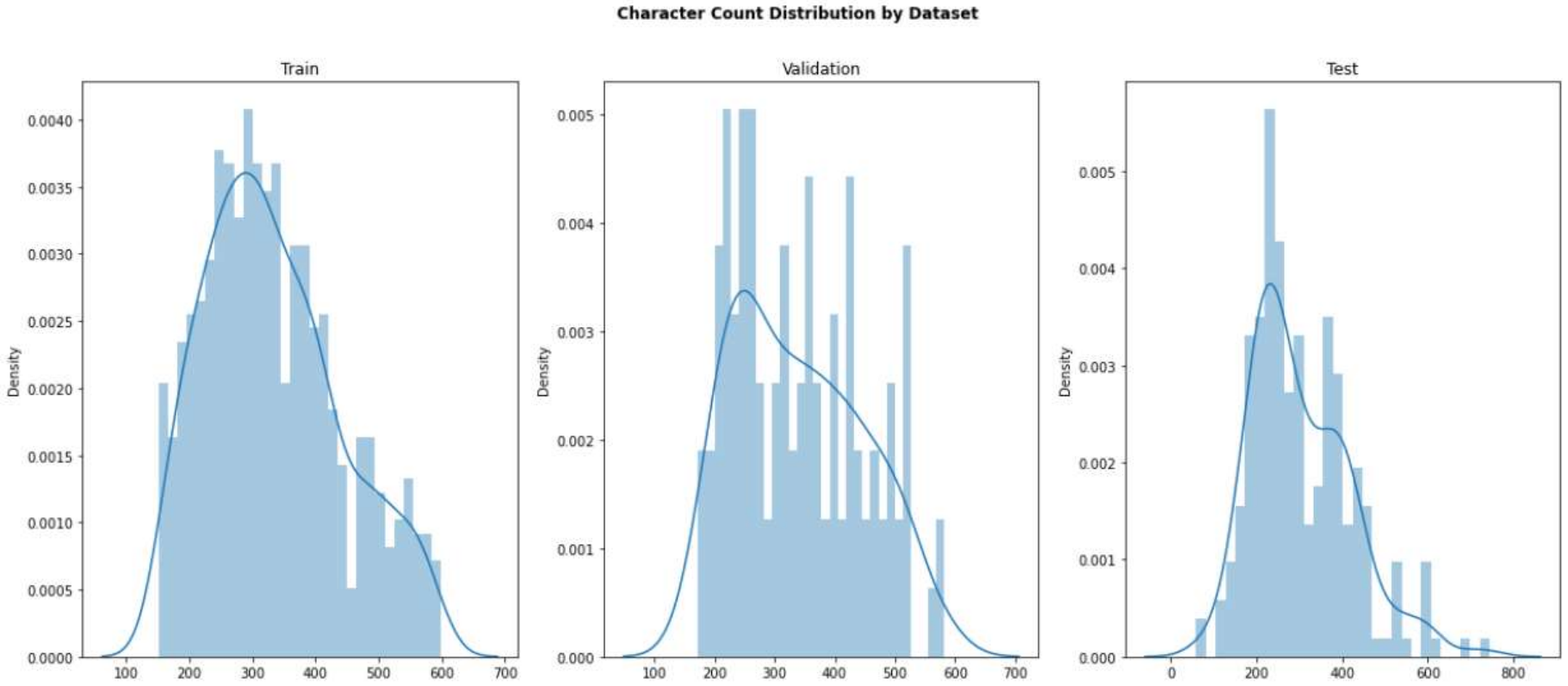
DATASET

- 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)

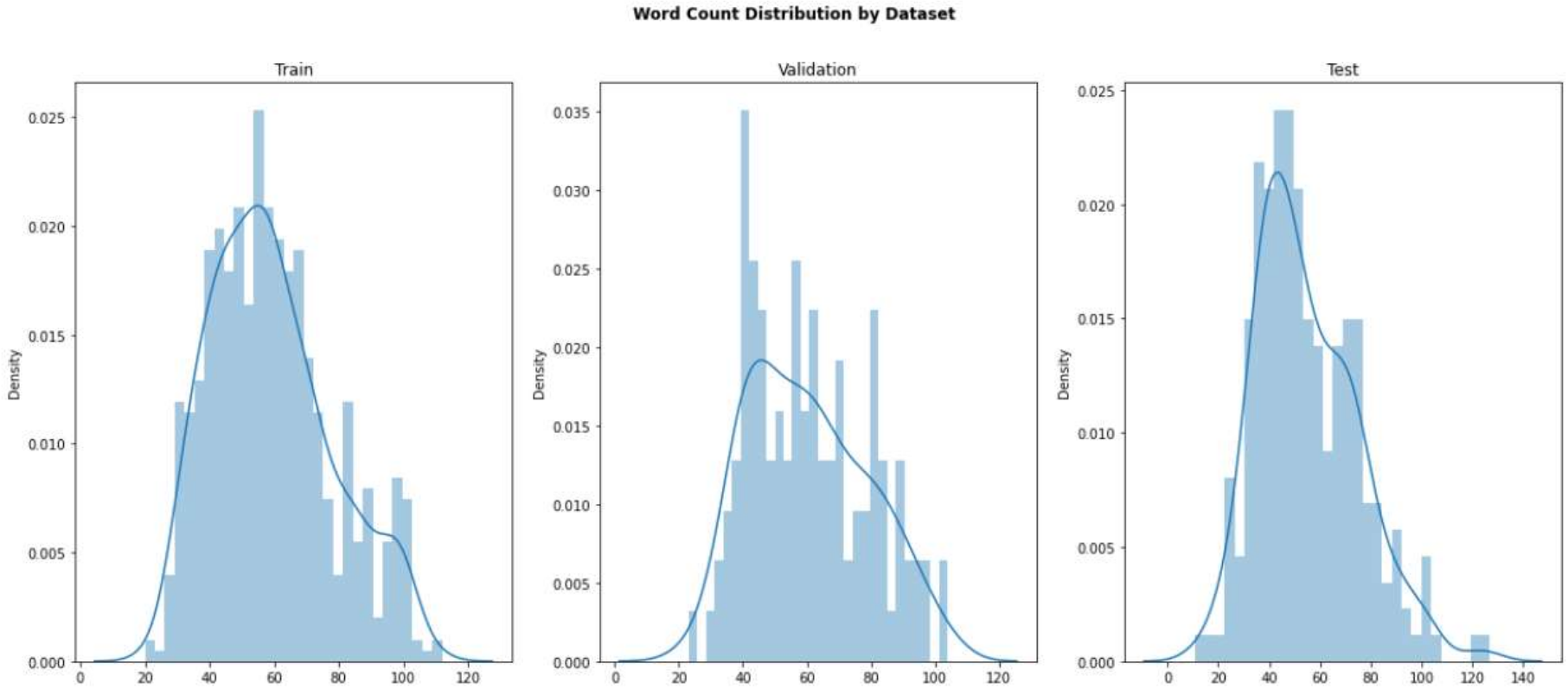
- Relevant data:
  - Employee Review
  - Potential Score
  - Performance Score

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

EXPLORING DATA ANALYSIS



EXPLORING DATA ANALYSIS



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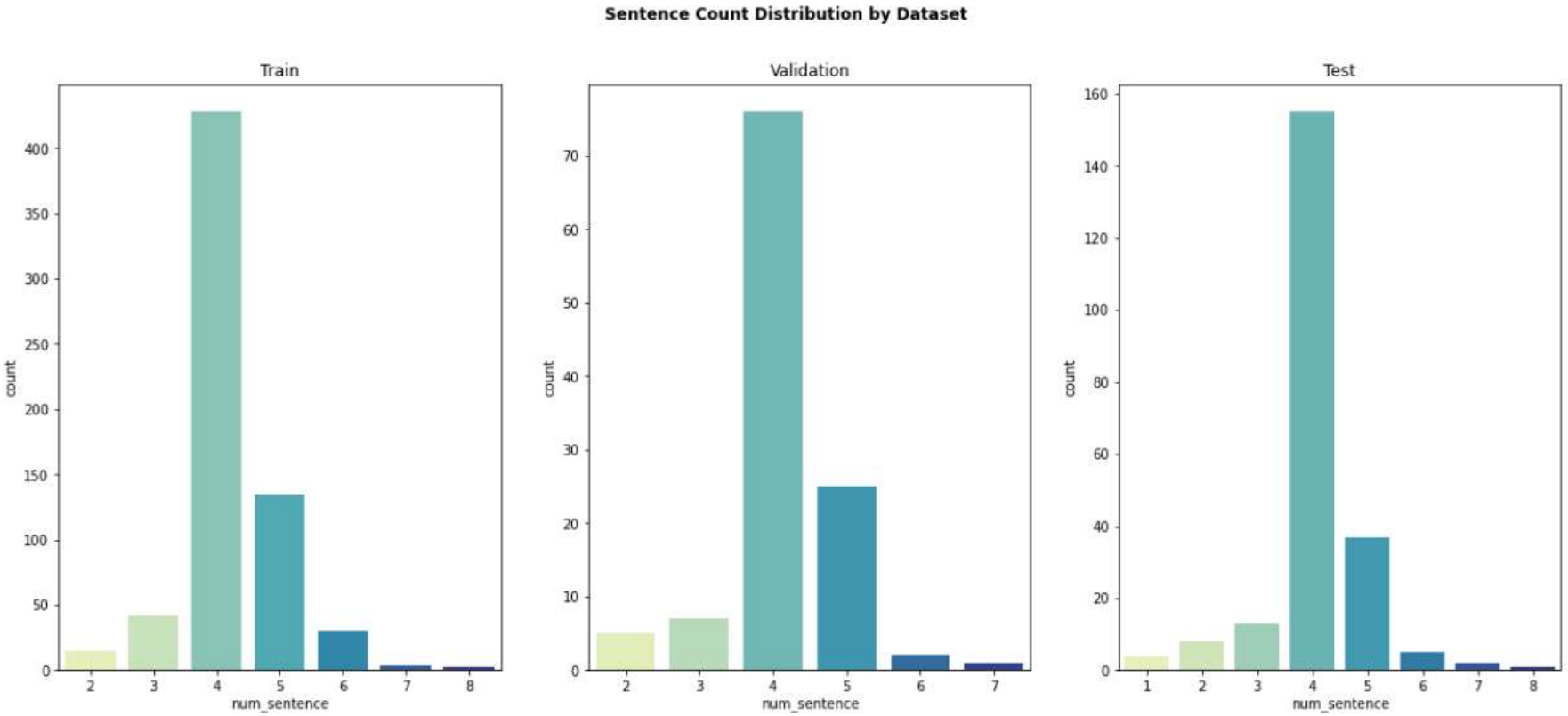

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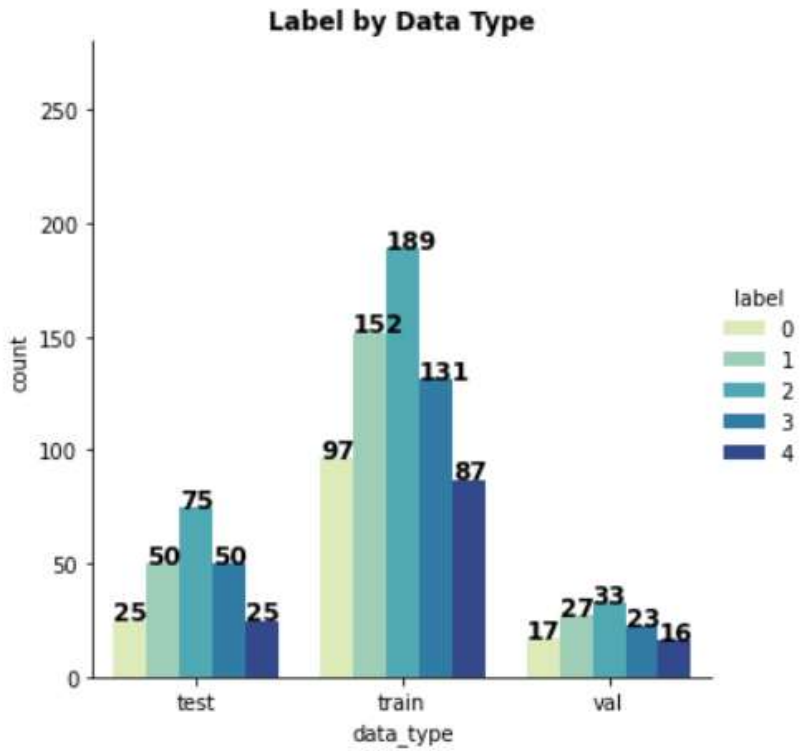
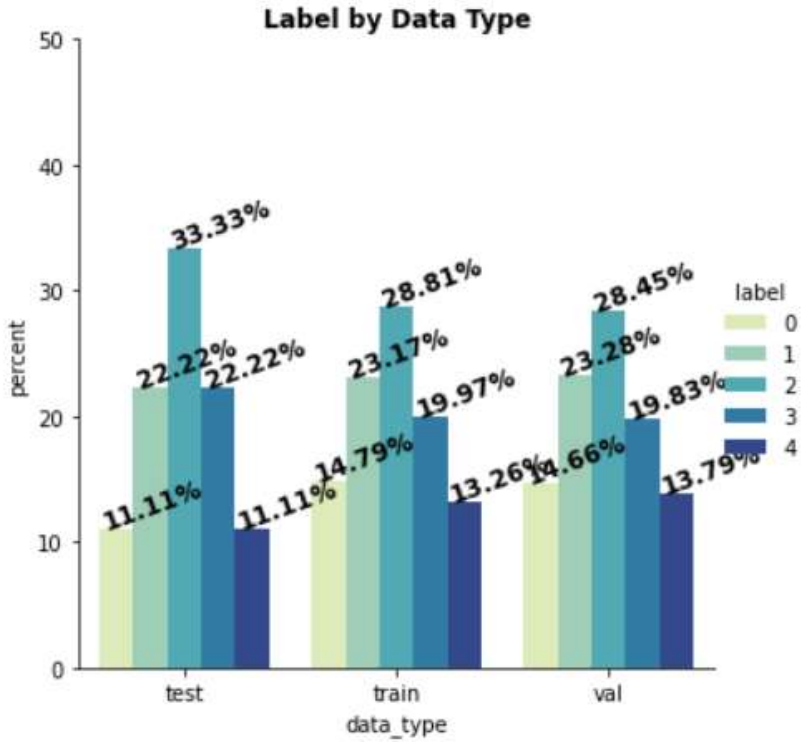
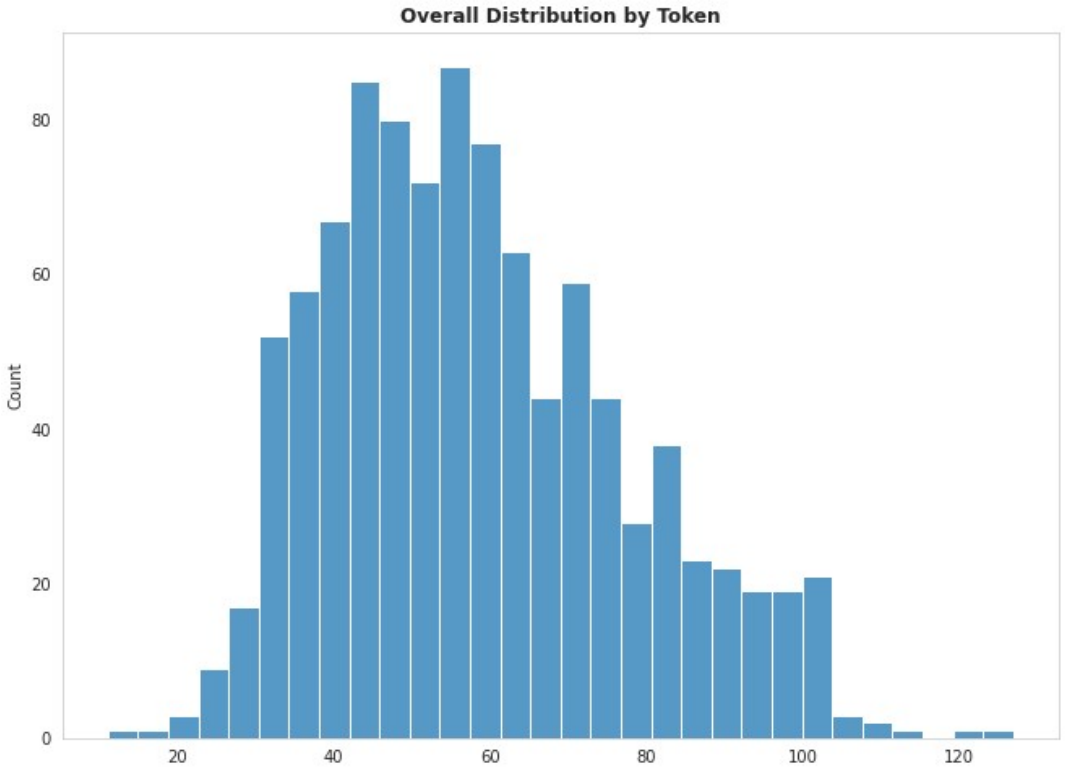
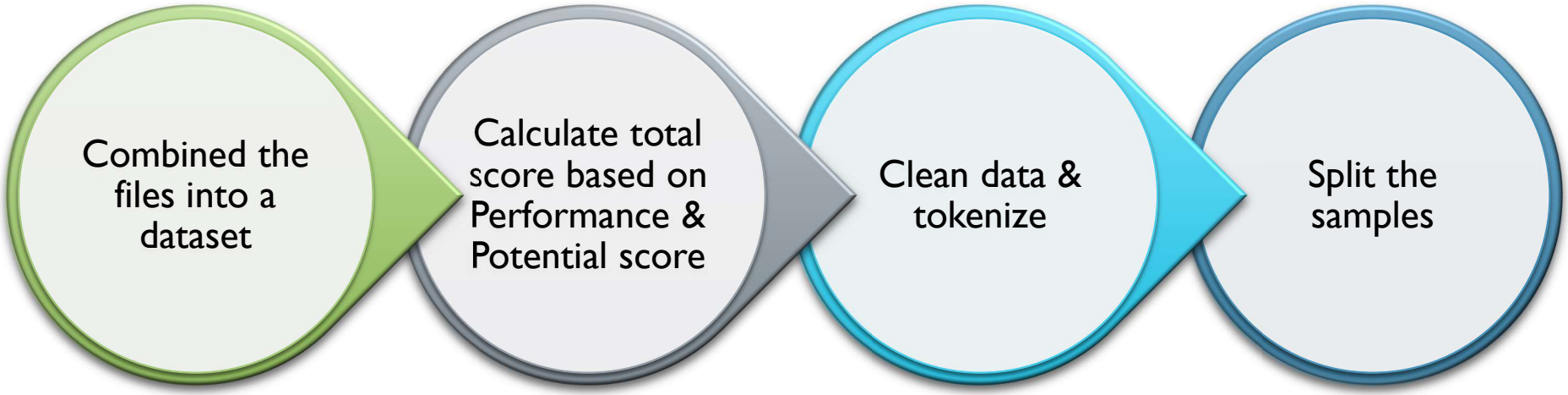




EXPLORING DATA ANALYSIS



DATA CLEANSING & FEATURE ENGINEERING

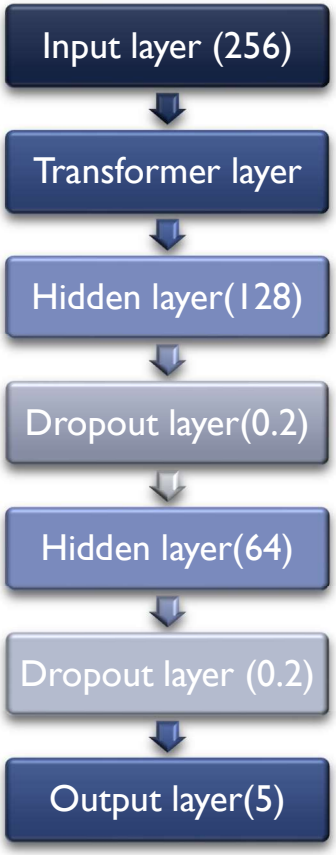


MACHINE LEARNING MODEL: ACCURACY SCORE

- 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

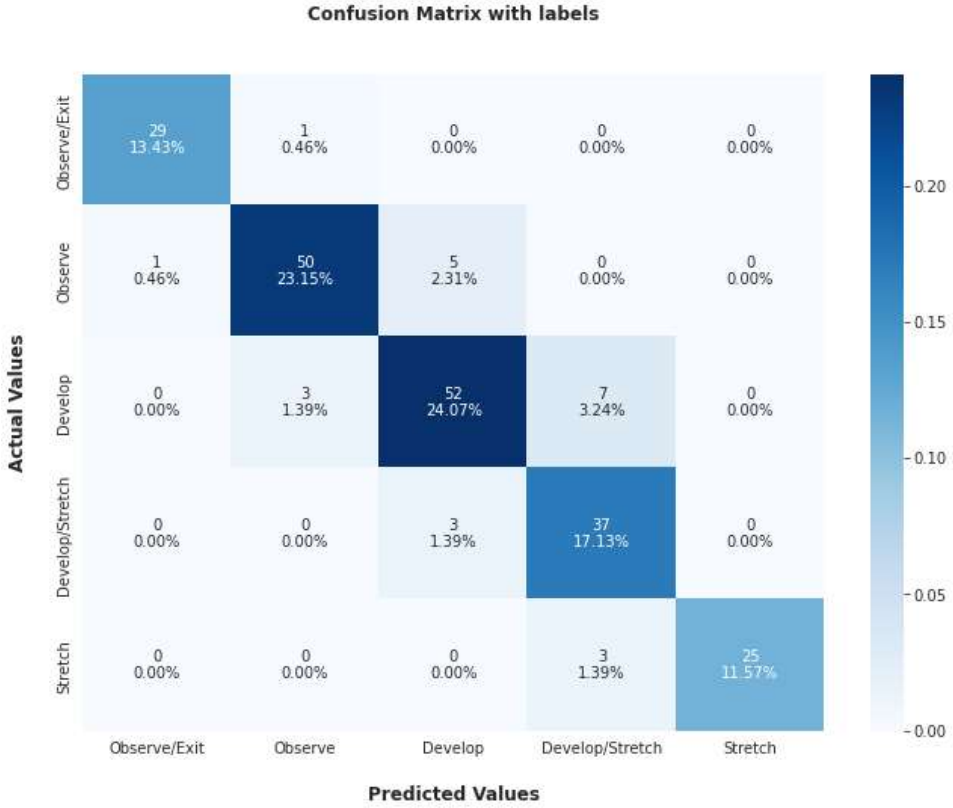
DEEP LEARNING MODEL: ACCURACY SCORE



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

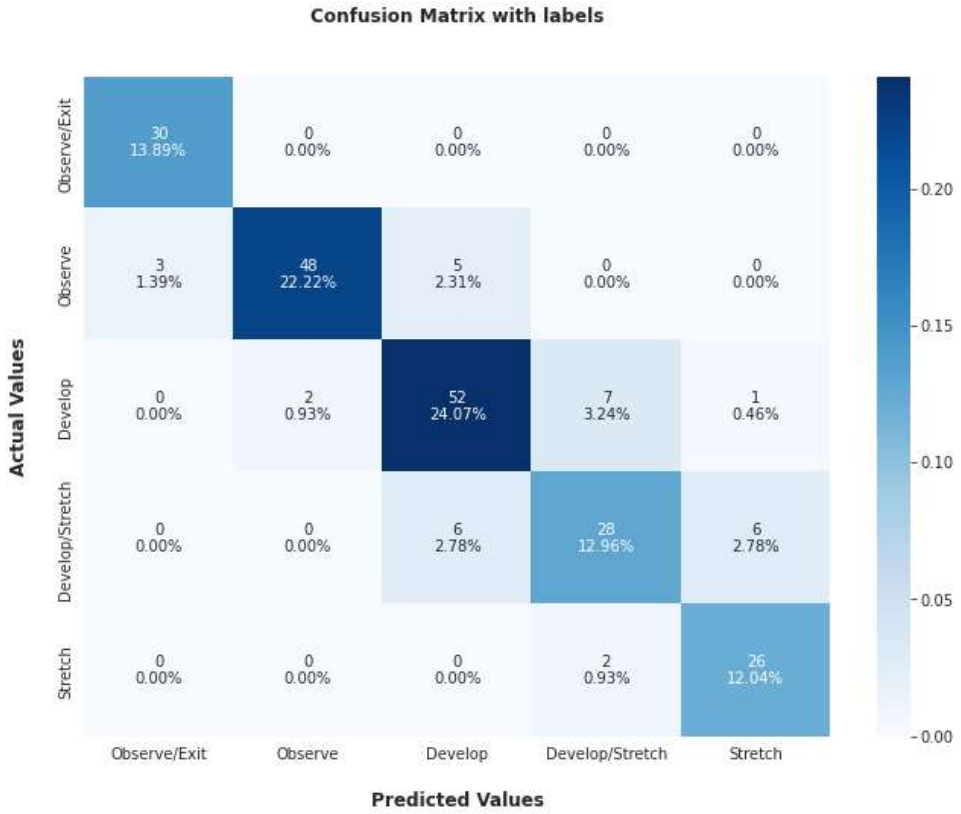
Model	Epoch	Train	Validation	Test
BERT (cased)	**13**	**0.924**	**0.883**	**0.894**
RoBERTa (cased)	8	0.866	0.842	0.852
XtremeDistil (uncased)	11	0.831	0.808	0.819

CONFUSION MATRIX & CLASSIFICATION REPORT: BERT



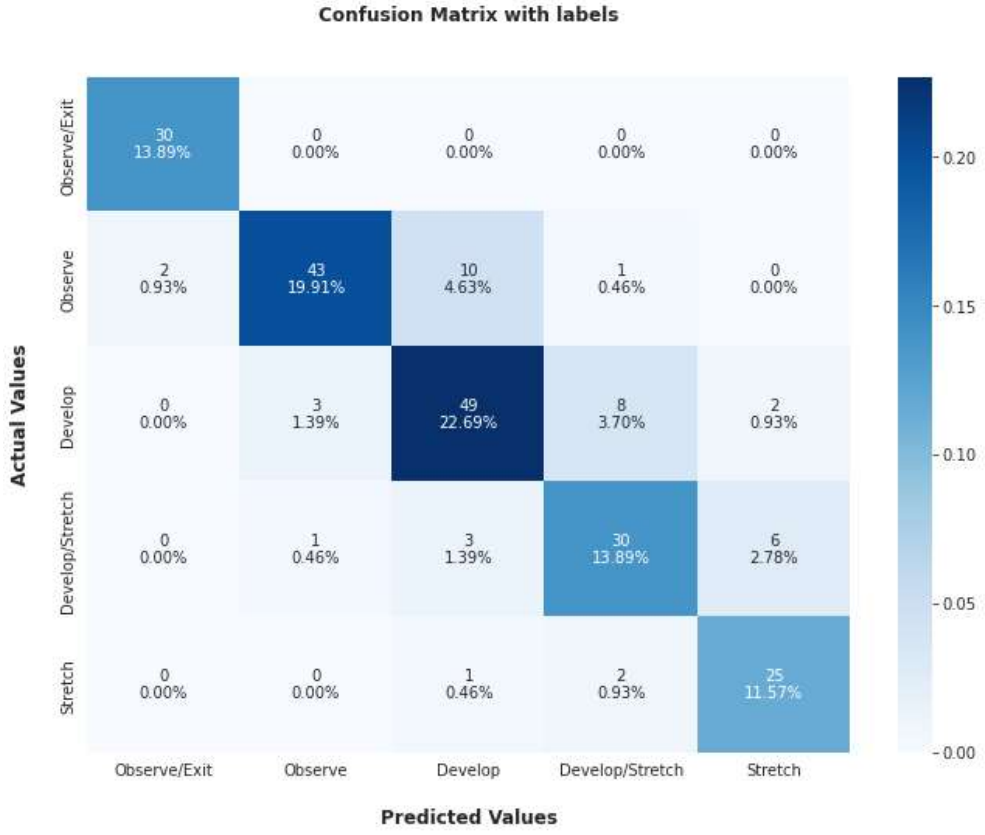
	precision	recall	f1-score	support
Observe/Exit	0.97	0.97	0.97	30
Observe	0.93	0.89	0.91	56
Develop	0.87	0.84	0.85	62
Develop/Stretch	0.79	0.93	0.85	40
Stretch	1.00	0.89	0.94	28
accuracy			0.89	216
macro avg	0.91	0.90	0.90	216
weighted avg	0.90	0.89	0.89	216

CONFUSION MATRIX & CLASSIFICATION REPORT: ROBERTA



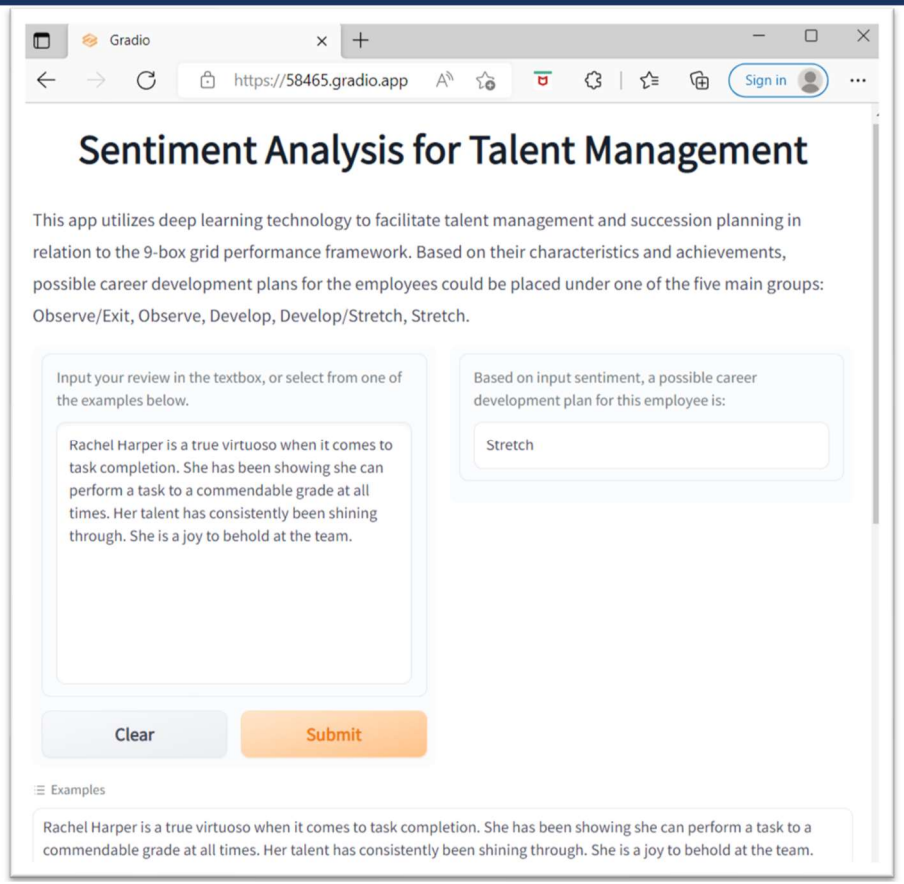
	precision	recall	f1-score	support
Observe/Exit	0.91	1.00	0.95	30
Observe	0.96	0.86	0.91	56
Develop	0.83	0.84	0.83	62
Develop/Stretch	0.76	0.70	0.73	40
Stretch	0.79	0.93	0.85	28
accuracy			0.85	216
macro avg	0.85	0.86	0.85	216
weighted avg	0.85	0.85	0.85	216

CONFUSION MATRIX & CLASSIFICATION REPORT: XTREMEDISTIL



	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



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