



Machine Learning Demo Wednesday

Prioritizing Inspections using ML

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Agenda

- Metrics Update
- Overview of Study Experiments
- Demonstration of End-to-End Jupyter Notebook

Diversity Metric Update

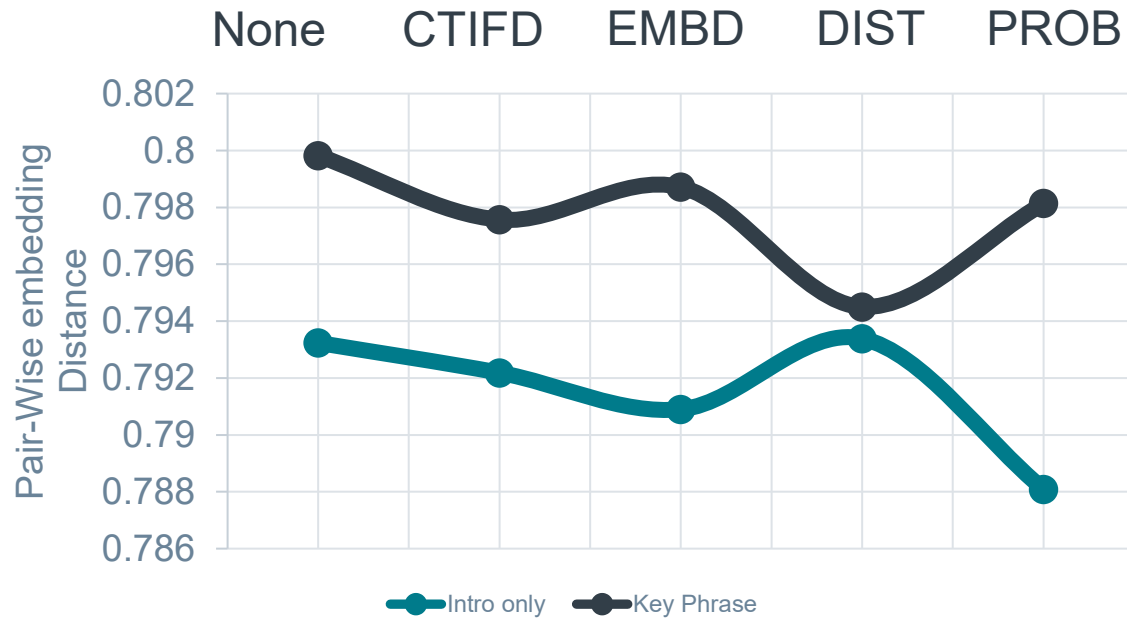
Bi-grams and Tri-grams

- The two metrics that we have been using are the coherence metric and the pair-wise embedding distance diversity metric
- We have been giving both metrics bi-grams and tri-grams where spaces are replaced with “_”
- Nuclear Energy => Nuclear_Energy
- This was the correct format for the coherence metric but incorrect for the diversity metric
- The following slides contains recalculations of the diversity metrics with the original spaces still intact

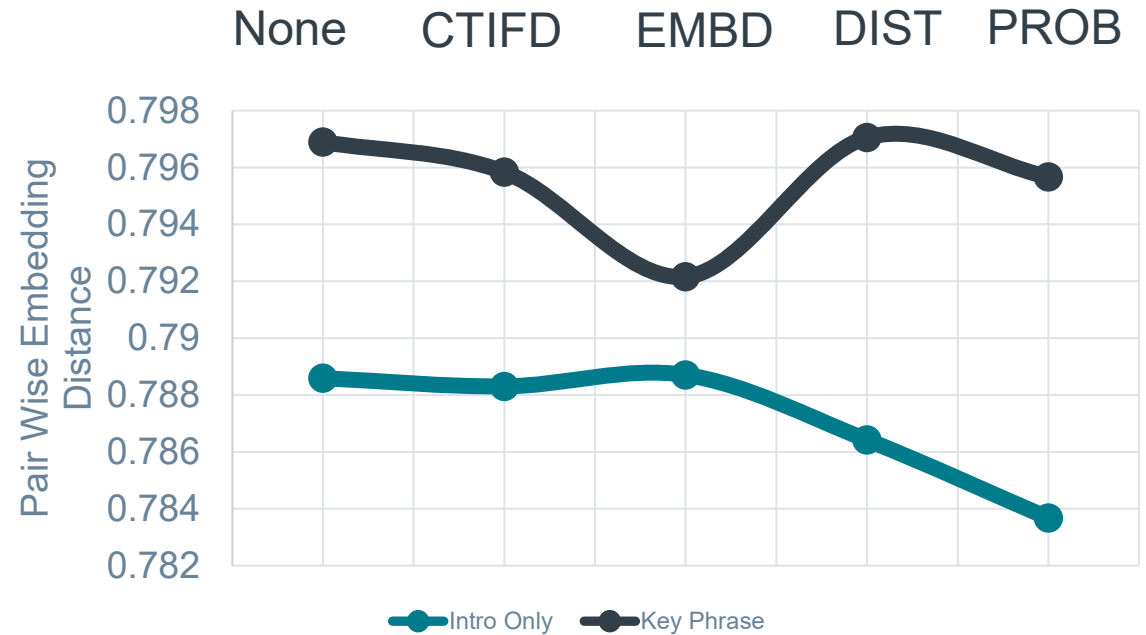
Diversity of outlier (Recalculation)

- Below are the pair-word embedding distance calculations from the mmr-pos representation (higher means more diverse)
 - Unfortunately, due to time constraints only the top 40 topics and top 10 words from each topic could be used

Outlier Reduction Techniques (old results)



Outlier Reduction Techniques (new results)



- The recalculation still shows that diversity of the topics does not change much after performing outlier reduction

Outlier Reduction of Custom Representations (Recalculation)

Coherence Scores

Introduction Input	Vocab	Key Phrases	Vocab + Key
No Reduction	-1.201	-0.801	-0.804
Probability Outlier Reduction	-1.207	-0.685	-0.686

Key Phrases Input	Vocab	Key Phrases	Vocab + Key
No Reduction	-1.453	-0.886	-0.877
Probability Outlier Reduction	-1.298	-0.711	-0.717

(Old) Diversity Scores

Introduction Input	Vocab	Key Phrases	Vocab + Key
No Reduction	0.809	0.809	0.809
Probability Outlier Reduction	0.805	0.801	0.804

Key Phrases Input	Vocab	Key Phrases	Vocab + Key
No Reduction	0.808	0.810	0.812
Probability Outlier Reduction	0.803	0.796	0.799

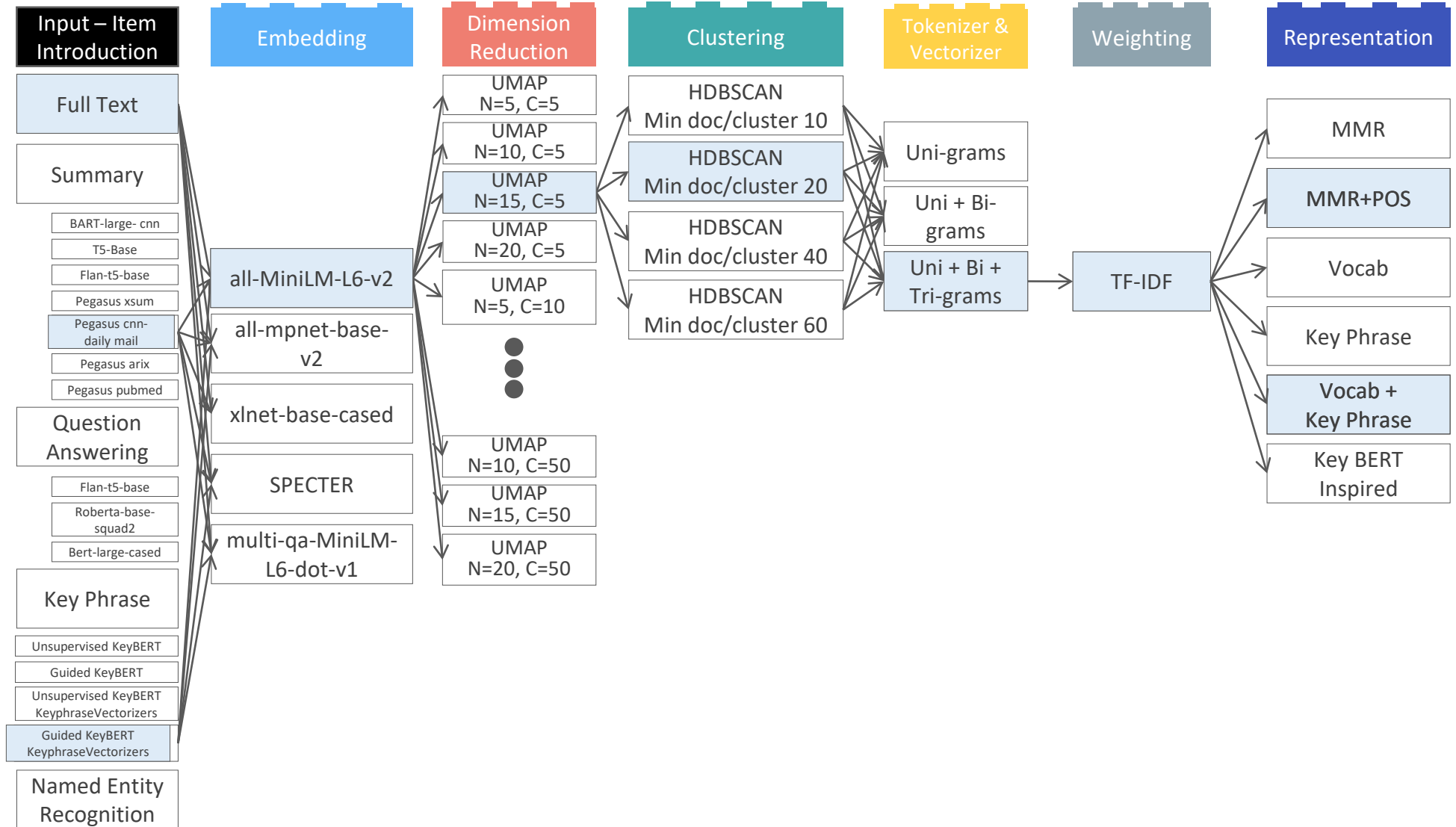
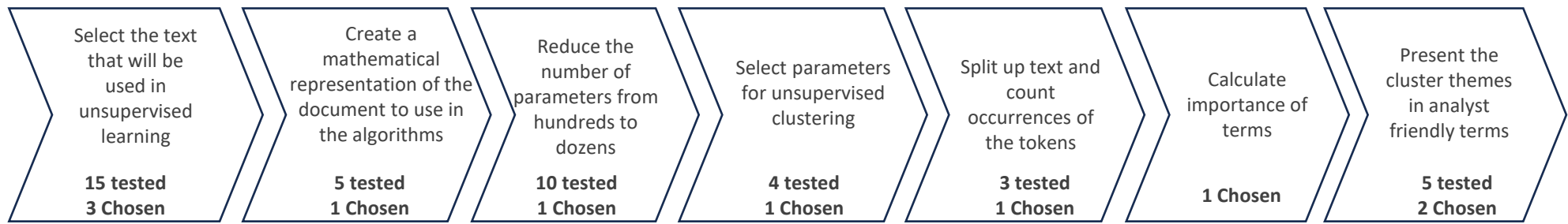
(New) Diversity Scores

Introduction Input	Vocab	Key Phrases	Vocab + Key
No Reduction	0.836	0.812	0.813
Probability Outlier Reduction	0.826	0.803	0.806

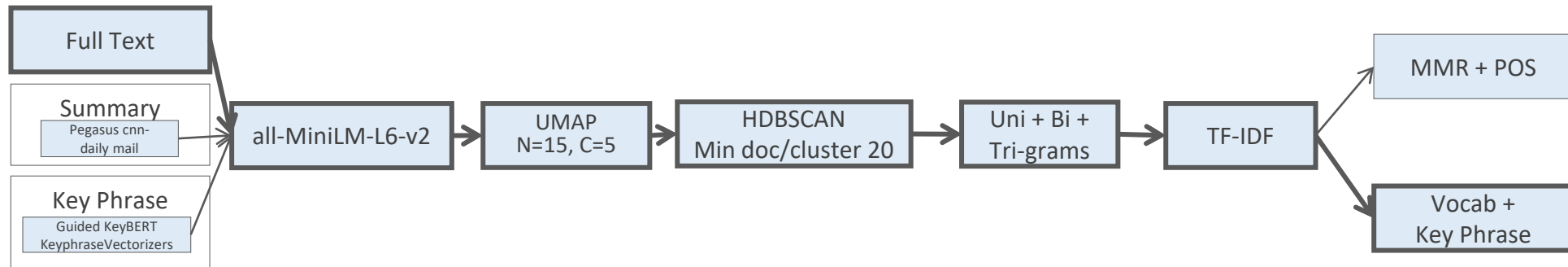
Key Phrases Input	Vocab	Key Phrases	Vocab + Key
No Reduction	0.836	0.817	0.820
Probability Outlier Reduction	0.828	0.802	0.804

- We still see a small decrease in diversity after outlier reduction. However, now the custom vocab representation provides the most diverse response.
- Given these results, we still think outlier reduction is worth the decrease to diversity

Overview of Study Experiments



Final Pipeline and Demo Content



Demonstration of End-to-End Jupyter Notebook

Progress

SOW Task Status

Phase I: March 6, 2023 - April 9, 2023

	Status
Describe the Problem	Complete
Search the Literature	Complete
Select Candidates	Complete
Select Evaluation Factors	Complete
Develop evaluation factor weights	Complete
Define evaluation factor ranges	Complete
Perform assessment	Complete
Report Results	Complete
Deliver Trade study report	Complete

Phase II: March 20, 2023 - May 7, 2023

	Status
Platform/system selection and installation	Complete
Data acquisition and preparation	Complete
Feature pipeline engineering	Complete
Clustering method experimentation & selection	Complete
Cluster pipeline engineering	Complete
Anomaly detection (as needed)	Not needed
Model Development, Training, Evaluation	Complete
Test harness development	Complete
PoC integration and demonstration	Complete
Trial runs and evaluation	Complete
Demonstrate PoC capability	Complete

Phase III: April 19, 2023 - June 16, 2023

	Status
Live data ingestion	Complete
Model execution	Complete
Cluster evaluation	Complete
Critical Method documentation	Complete
Technical Report Document	In progress
Deliver final report with findings	Not started