STYLE CHANGE DETECTION 2019

Can we uncover how many authors a document has?

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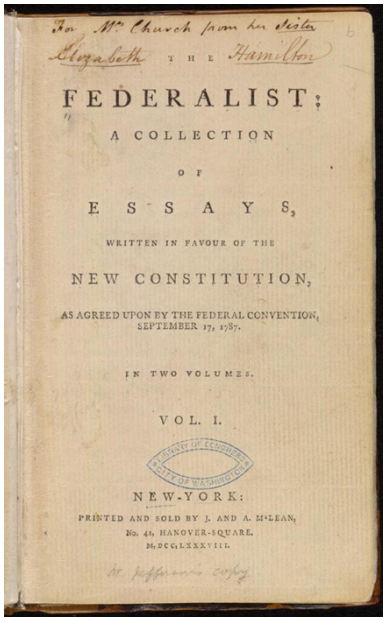
Computer Science Department
Université de Neuchâtel

CONTENTS

WHAT IS STYLE CHANGE DETECTION (SCD)?

Detect number of authors by determining unique writing styles of each author



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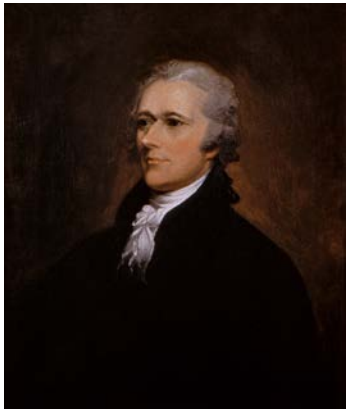

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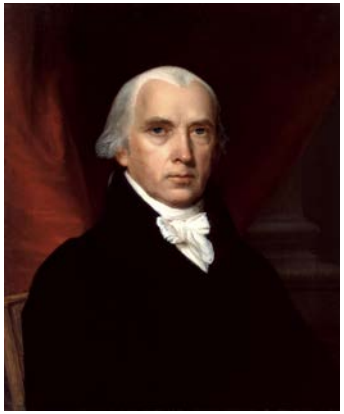

Madison

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USE CASES

- Establishing the authenticity of a document, fraud detection/ prevention
- Plagiarism detection
- Determine authorship of anonymous posts at forums
- Fake news detection
- Aid automatic speech transcription using transcripts

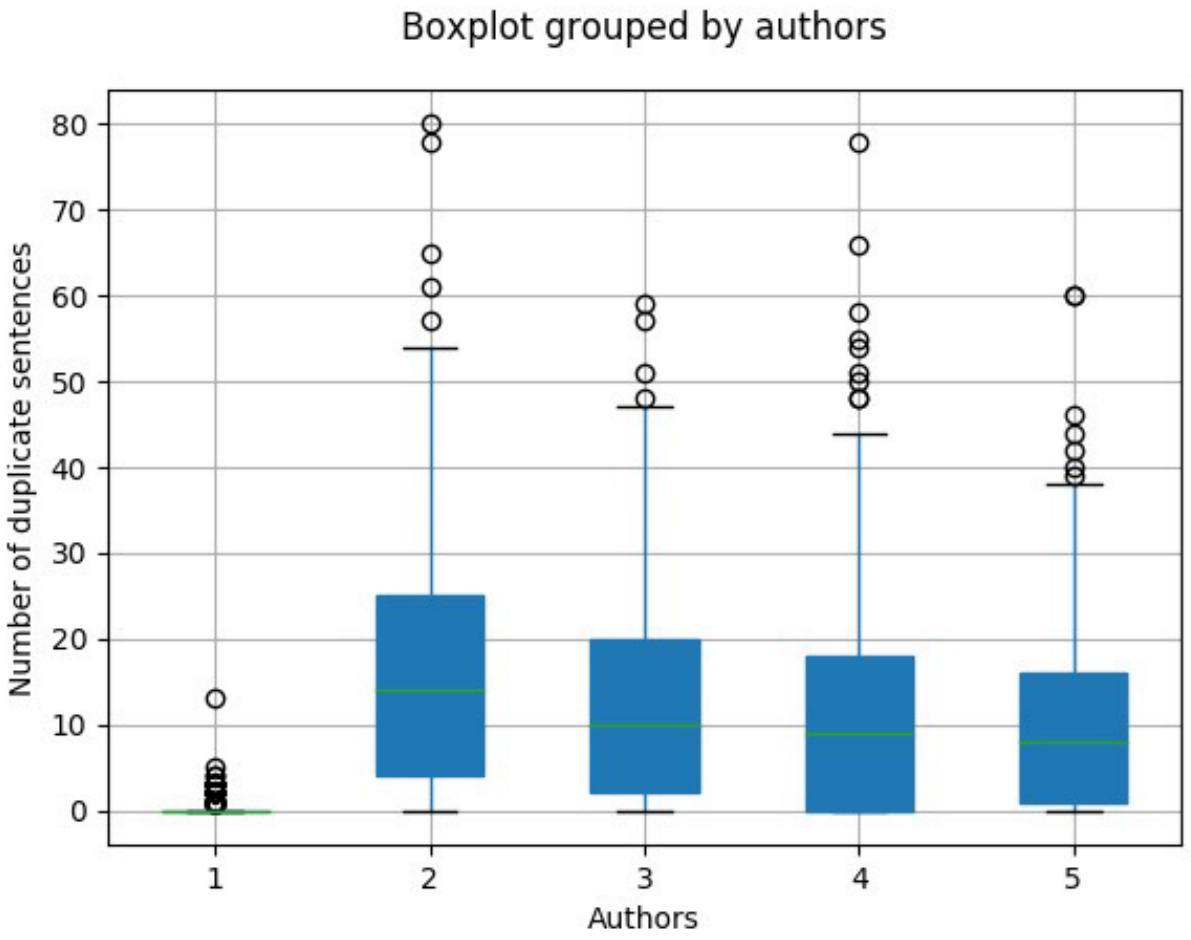
CHALLENGES

- No prior text sample for each author
- Some authors have contributed little
- Hard to determine style change boundaries

DATASET DESCRIPTION

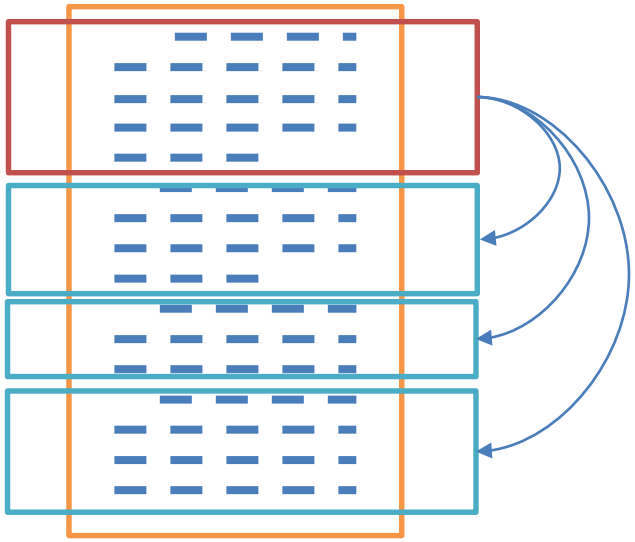
- StackOverFlow Forum threads
- 2546 (training) / 1272 (validation) documents
- 1-5 authors
- Mean number of tokens: 1570

DUPLICATE SENTENCES



STRATEGY

– Divide the text into paragraph sized windows
– Compare windows among each other using Most Frequent Words (MFW) and measure distance (e.g. Matusita)



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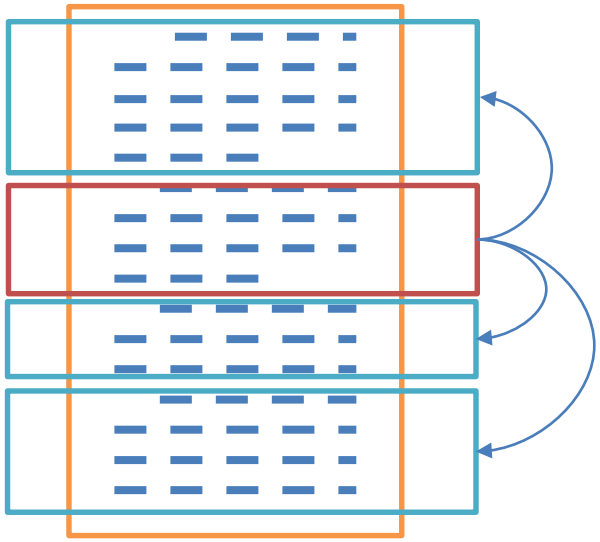

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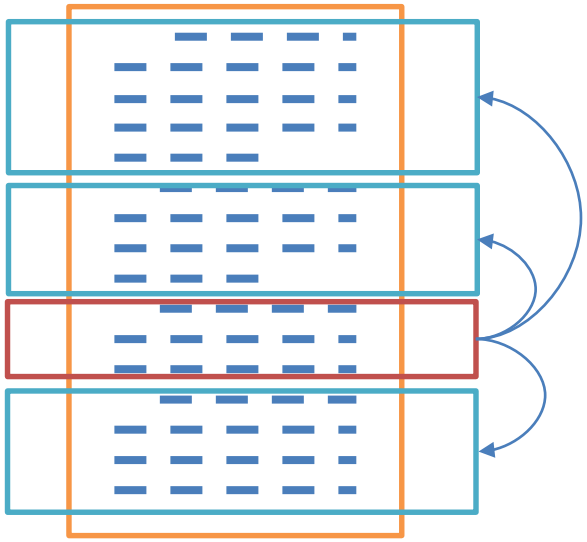

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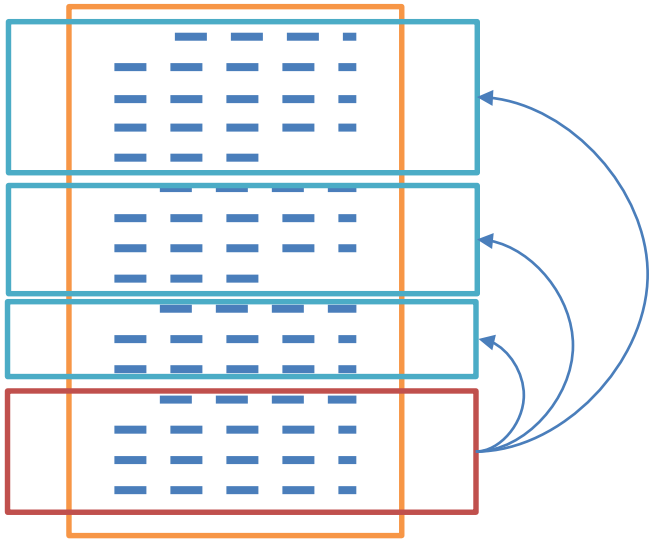
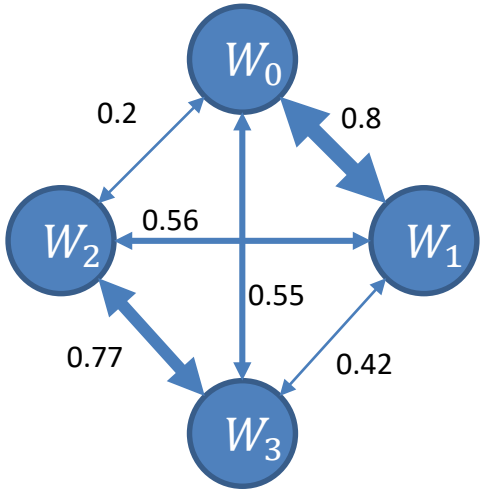


STRATEGY

	W0	W1	W2	W3
W0	0	0.8	0.2	0.55
W1	0.8	0	0.56	0.42
W2	0.2	0.56	0	0.77
W3	0.55	0.42	0.77	0

Distance Matrix



Graph representing distances between windows

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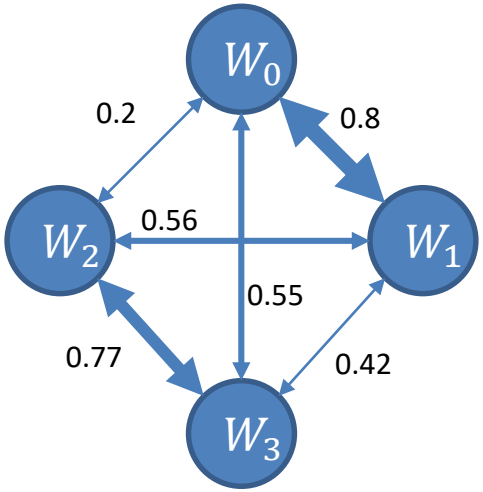

Graph representing distances between windows

GOAL

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W2			0	0.77
W3				0

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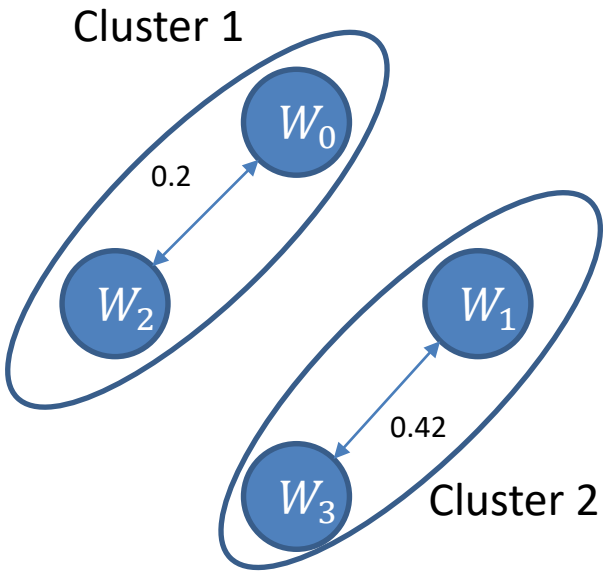

Clusters representing authors

THRESHOLD BASED CLUSTERING ALGORITHM

Select the smallest distance from the distance matrix iteratively and use the corresponding windows to either

A	B	0.2

1. Create a new cluster

2. Add a node to an existing cluster
(subject to Add Node Threshold)

3. Merge two clusters
(subject to Merge Clusters Threshold)

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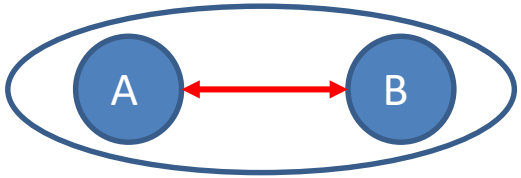

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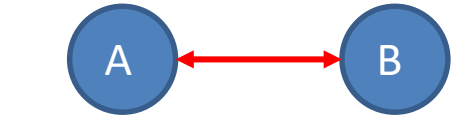

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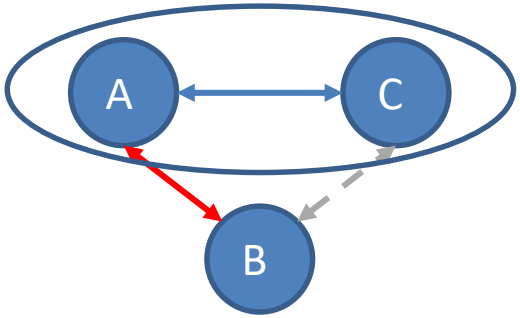

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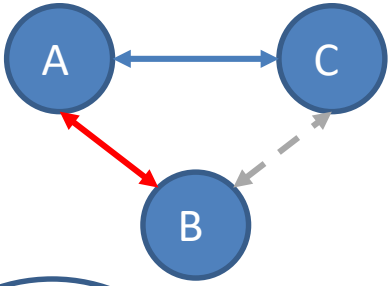

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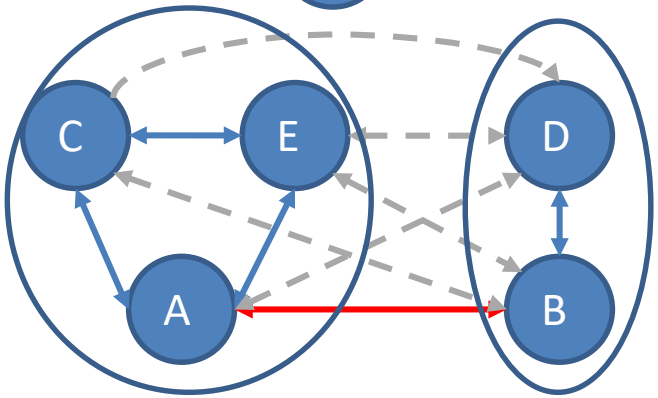
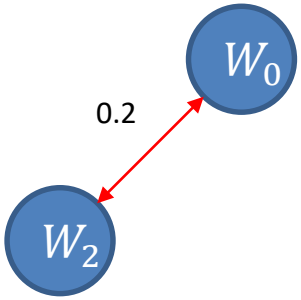


THRESHOLD BASED CLUSTERING ALGORITHM (EXAMPLE)

	W0	W1	W2	W3
W0	0	0.8	**0.2**	0.55
W1		0	0.56	0.42
W2			0	0.77
W3				0



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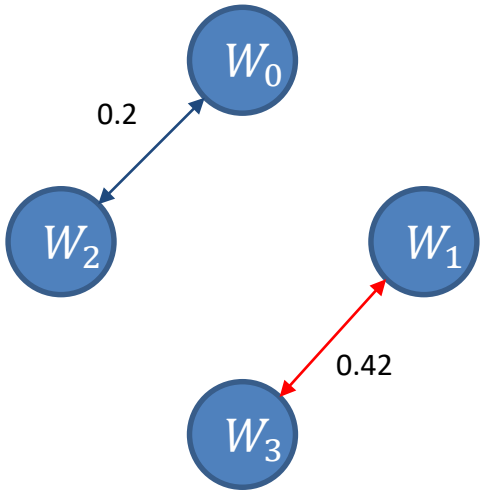
	W0	W1	W2	W3
W0	0	0.8	0.2	0.55
W1		0	0.56	**0.42**
W2			0	0.77
W3				0



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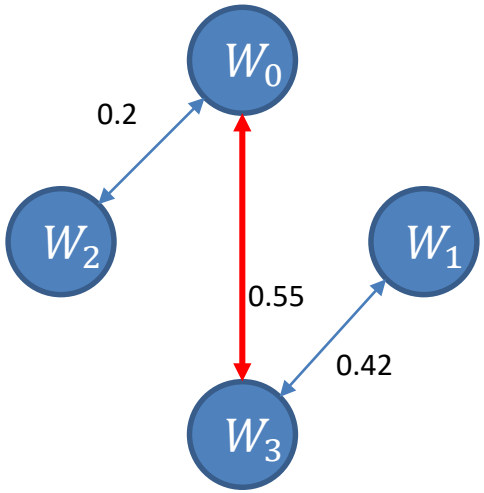

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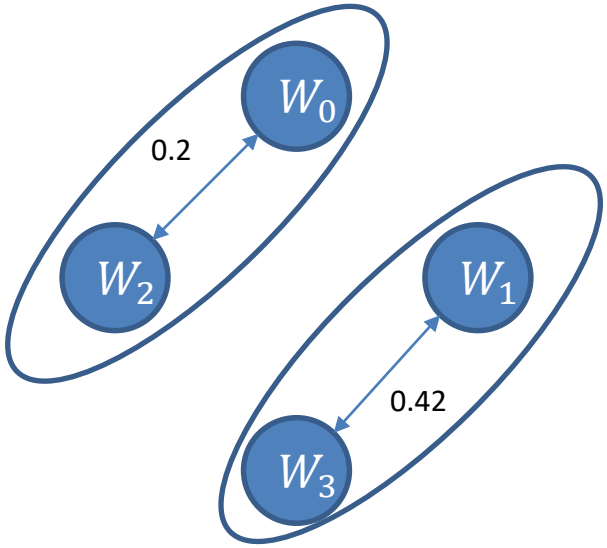


WINDOW MERGE CLUSTERING ALGORITHM

1

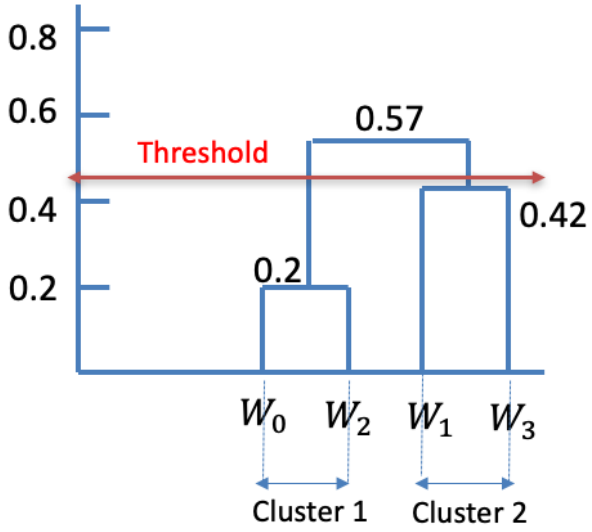
	W0	W1	W2	W3
W0	0	0.8	0.2	0.55
W1		0	0.56	0.42
W2			0	0.77
W3				0

2

	W0W2	W1	W3
W0 W2	0	0.72	0.65
W1		0	0.42
W3			0

3

	W0W2	W1W3
W0 W2	0	0.57
W1 W3		0

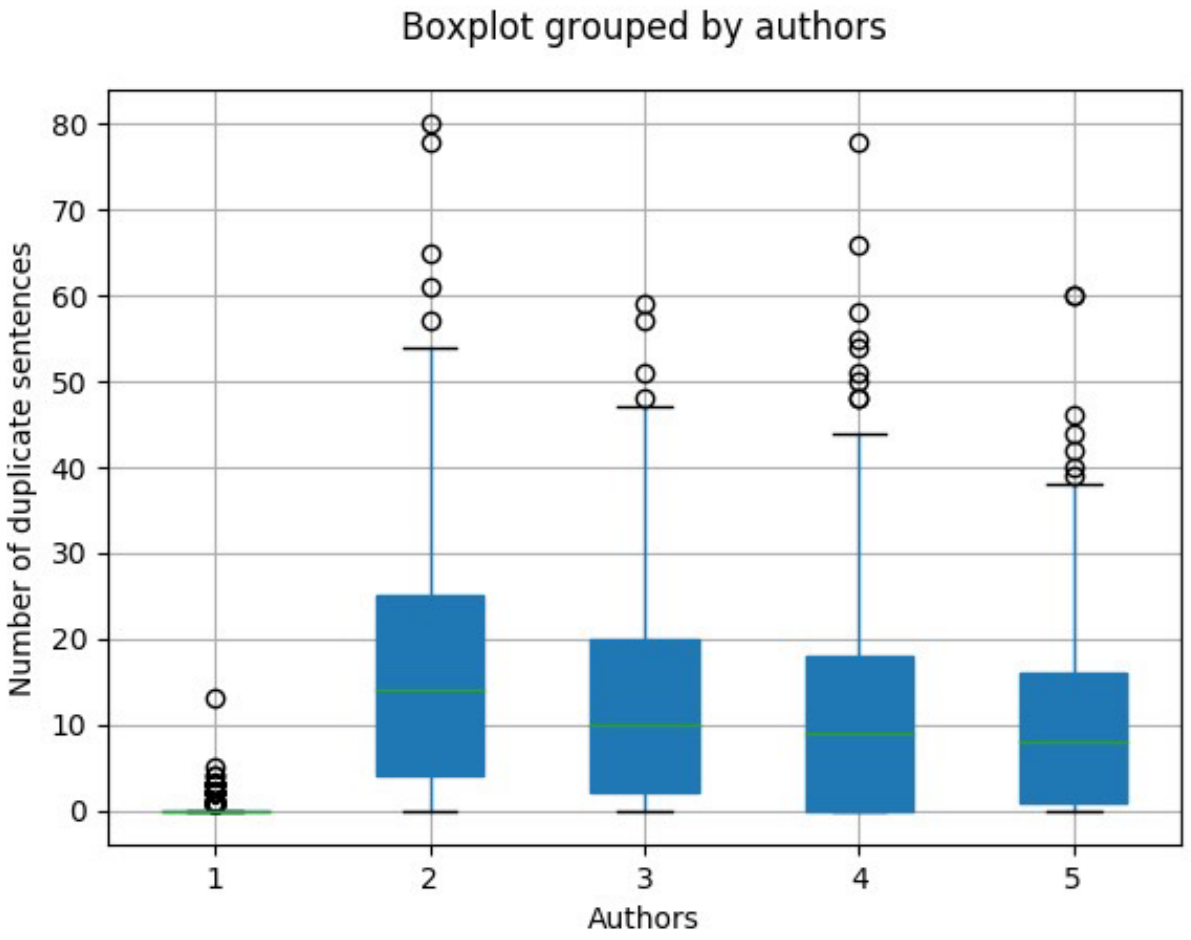


EVALUATION

Initial Evaluation Results

	Training set			Validation set		
Algorithm	**Acc.**	**OCI**	**Rank**	**Acc.**	**OCI**	**Rank**
TBC	**0.66**	**0.83**	**0.42**	**0.65**	**0.82**	**0.42**
WMC	0.62	0.91	0.35	0.63	0.88	0.37
Combined Min.	0.65	0.92	0.36	0.66	0.9	0.38

DUPLICATE SENTENCES



EVALUATION

Final Evaluation Results (using duplicates filter)

	Training			Validation			Official Test		
Algorithm	**Acc.**	**OCI**	**Rank**	**Acc.**	**OCI**	**Rank**	**Rank**	**Acc.**	**OCI**
TBC	**0.83**	**0.87**	**0.48**	**0.83**	**0.85**	**0.49**	**0.85**	**0.87**	**0.49**
WMC	0.72	0.93	0.4	0.74	0.9	0.42	-	-	-
Combined Min.	0.70	0.93	0.39	0.72	0.91	0.41	-	-	-

CONCLUSION AND FUTURE WORK

- Demonstrated that it is possible to detect style changes in a text when no prior dataset is available
- Threshold Based Clustering algorithm performed the best out of the three models
- Splitting of Windows may be improved
- Measure cluster quality for improvement.

THANK YOU FOR YOUR ATTENTION!

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