Depression Detection

- Week 12 & 13

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Duration of the presentation: ~15 minutes

Agenda

1. **Performance Analysis of Combined Chunks**

2. **Topic Modelling with LDA: Optimal Topic Number Selection**

3. **Topic Modelling with LDA: Results**

4. **Topic Modelling with LDA: Automatic Threshold selection**

5. **Reinforcement Learning Method**

6. **Analysis of reinforcement algorithm variables**

7. **Modification and comparison on reinforcement algorithm variables**

8. **Tentative Plan for next week**
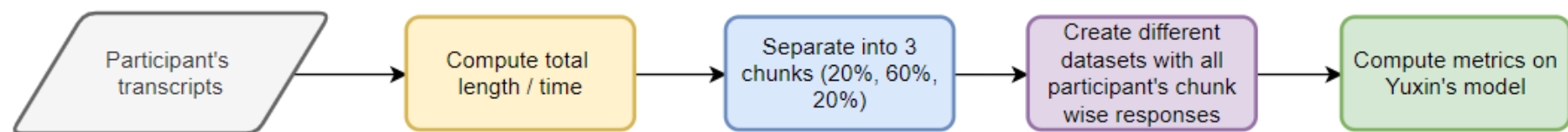
Performance Analysis of Combined Chunks

Fig 1: Steps to create 3 chunks from the interviews

	Accuracy	F1	Recall	Precision
Transcript	0.64	0.65	0.67	0.63

Table 1,2,3 (anticlockwise): Results from Yuxin's model for full transcript, length-based chunks and time-based chunks respectively

	Accuracy	F1	Recall	Precision
Chunk 1	0.45	0.38	0.33	0.44
Chunk 2	0.58	0.44	0.33	0.65
Chunk 3	0.50	0.40	0.33	0.50
Chunk 12	0.58	0.39	0.27	0.69
Chunk 13	0.68	0.64	0.58	0.73
Chunk 23	0.55	0.67	0.91	0.53

	Accuracy	F1	Recall	Precision
Chunk 1	0.42	0.24	0.18	0.35
Chunk 2	0.58	0.44	0.33	0.65
Chunk 3	0.58	0.50	0.42	0.61
Chunk 12	0.55	0.48	0.52	0.46
Chunk 13	0.45	0.33	0.27	0.43
Chunk 23	0.52	0.47	0.42	0.52

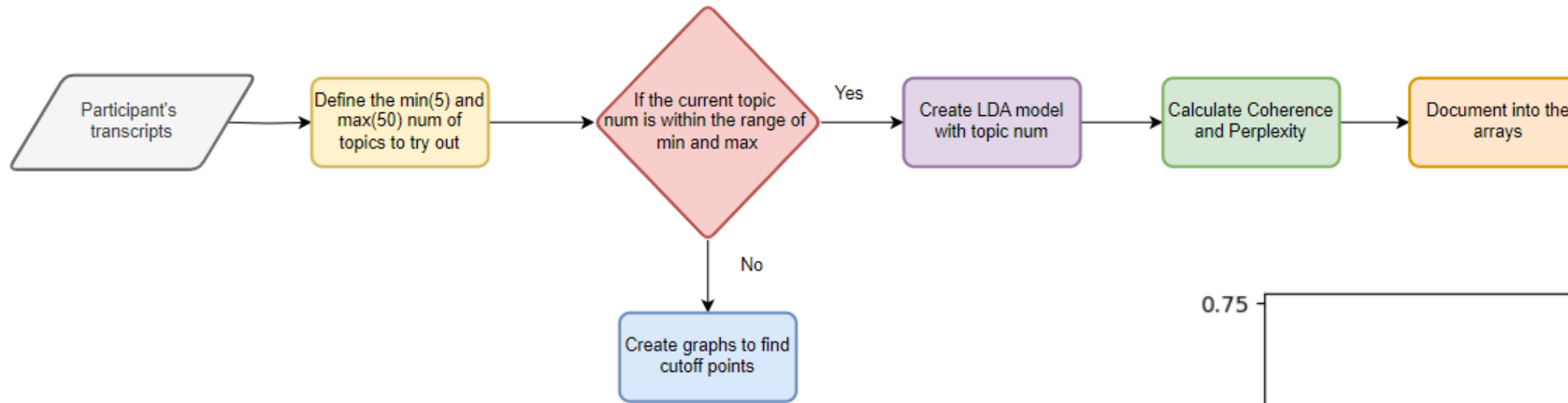# Topic Modelling with LDA: Topic Number Selection
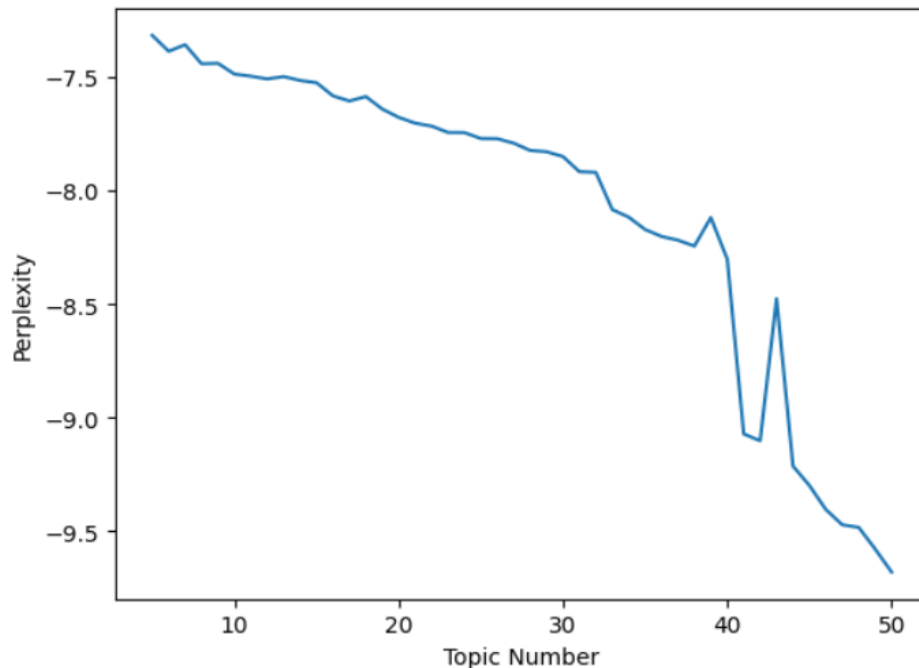

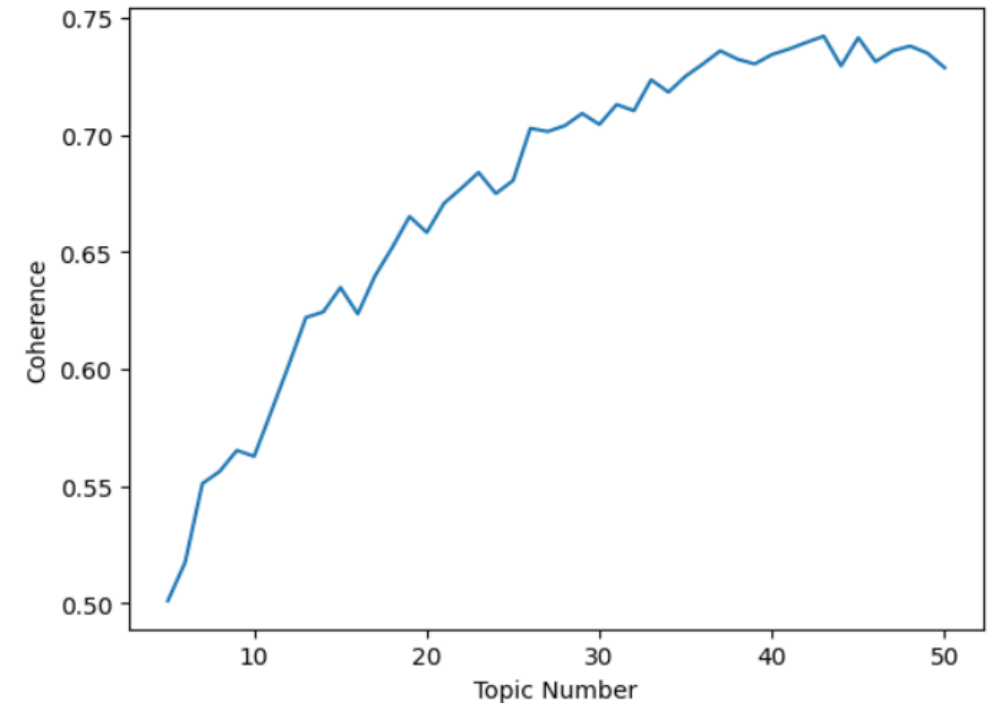Fig 2: Steps to find optimal topic number with LDA

Fig 3: Graph showing the coherence score variation

Fig 4: Graph showing perplexity variation

Topic Modelling with LDA: Results

Table 4: Results of running Topic-based on Yuxin's Model

	Accuracy	F1	Recall	Precision
29 topics	0.67	0.56	0.42	0.82
43 Topics	0.65	0.60	0.52	0.71

Table 5: Results of running selected topics where 70% of topics with highest coherence scores on Yuxin's Model

	Accuracy	F1	Recall	Precision
29 topics (70%)	0.61	0.65	0.73	0.59
43 topics (70%)	0.65	0.68	0.73	0.63

Table 6: Results of running raw transcripts on Yuxin's code

	Accuracy	F1	Recall	Precision
Transcript	0.64	0.65	0.67	0.63

Topic Modelling with LDA: Threshold selection

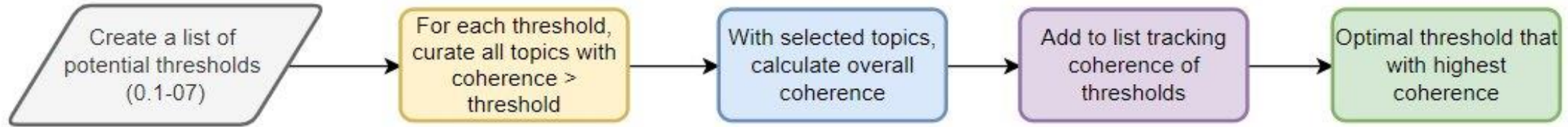| Create a list of potential thresholds (0.1-07) | For each threshold, curate all topics with coherence > threshold | With selected topics, calculate overall coherence | Add to list tracking coherence of thresholds | Optimal threshold that with highest coherence |

Fig 5: Steps in method to select optimal threshold

Expected Behaviour: Returns different thresholds which are optimal

Actual Behaviour: Returns the first threshold always – irrespective of value
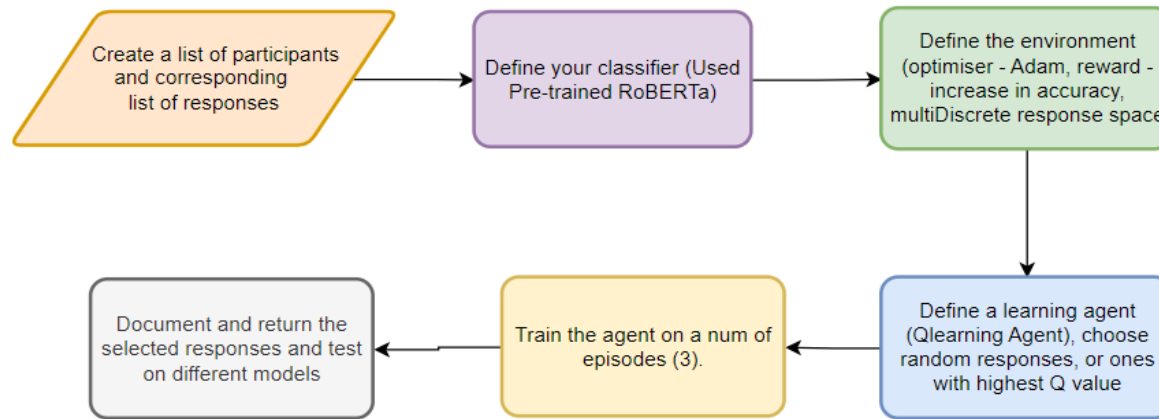
Reinforcement Learning Method

Fig 6: Steps in reinforcement algorithm to select responses of participants

	Accuracy	F1	Recall	Precision
Reinforcement texts	0.56	0.65	0.82	0.54
Full transcript	0.64	0.65	0.67	0.63

Table 7: Comparing results of reinforcement responses and raw transcripts with Yuxin's model

Analysis of reinforcement algorithm variables

Variable	Choice	Pros and Cons	Alternatives
Classifier	RoBERTa	**Pros:** Pretrained so easier, used in many NLP tasks **Cons:** Computationally expensive	LSTMs, CNNs, models pretrained for mental health tasks.
Reward	Increase in accuracy	**Pros:** Relies on increase in accuracy **Cons:** Accuracy is not the only metric	Using num of responses, other metrics
Episodes	3	**Pros:** A small number showing good result **Cons:** Might be a very small number	Using a high number with early stopping
Learning Agent	Q-Learning agent	**Pros:** Simpler and easier **Cons:** Might be slightly slower	Proximal Policy Optimisation, Deep-Q networks

Table 8: Variables in the reinforcement algorithm and alternatives

Modification and comparison on reinforcement variables

Table 9: Results showing variations on modifications to reinforcement algorithm

	Accuracy	F1	Recall	Precision
Full transcript	0.64	0.65	0.67	0.63
Reinforcement texts	0.56	0.65	0.82	0.54
Reward Modification	0.53	0.65	0.88	0.52
PPO Agent	0.55	0.59	0.67	0.54

Modification Tried:
- Reward: Increase in accuracy with least number of responses
- Learning Agent: Proximal Policy Optimisation Agent

Tentative Plan

Plan for next week
1. Work on correcting the topic threshold selection method
2. Modify other aspects of the reinforcement algorithm and document changes in performance
3. Read good literature that uses reinforcement-based techniques for depression detection to improve methodology
4. Work more on the literature review

Relevant Links
1. Overall project plan and timeline: Link
2. Analysis and notes from relevant papers: Link
3. GitHub documenting everyone's presentations and codes: Link
4. Overleaf document for the literature review: Link

End