Depression Detection

- Week 11

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Undergraduate 4th year

Duration of the presentation: ~12 minutes

Agenda

1. **UMAP visualization for linguistic attributes**
2. **Alternative Dataset details**
3. **Transcript Segmentation: Fixed Length and Time Based**
4. **Transcript Segmentation: Topic-based with LDA**
5. **Insights from papers**
    1. Review Paper: NLP techniques for mental illness detection
    2. Reinforcement Learning on Social Media data
6. **Tentative plan for next week**

UMAP visualization for linguistic attributes

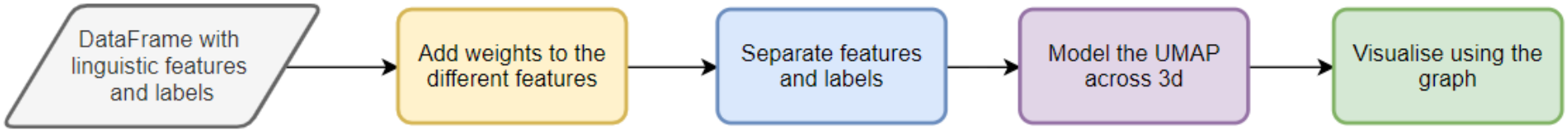


Fig 1: Steps to create 3 component UMAP graph

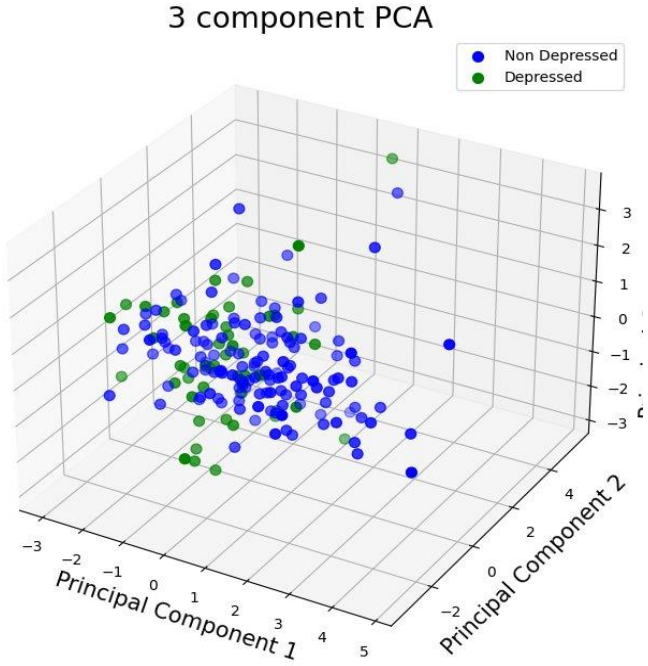
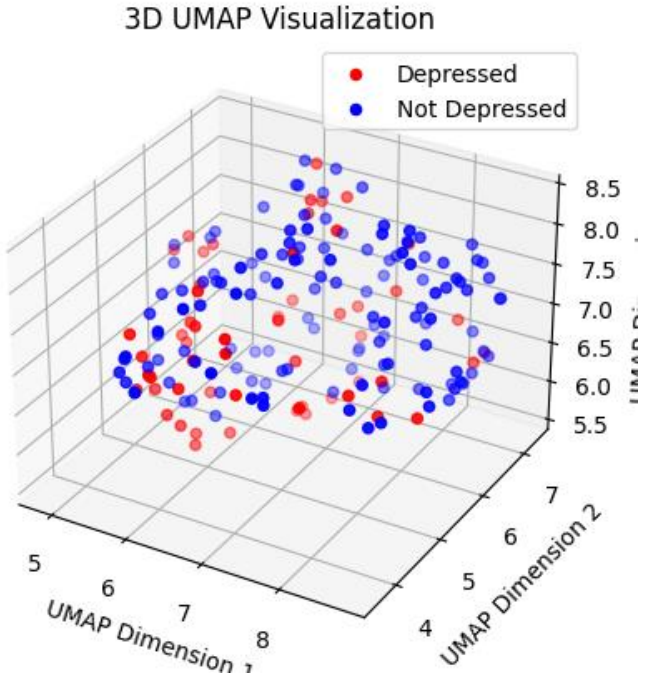


Fig 2: 3 component PCA graph

Fig 3: 3 component UMAP graph



Alternative Dataset details

Dataset	Tasks	Type	Distribution	Availability
AVEC 2013-14	NorthWind + Freeform QnA (in German)	Video Recordings 20-50 mins	84 subjects (300 recordings	Link (Not accessible)
Pittsburg 2018	Clinical Interviews	Video recordings	130 subjects 57 depressed	Link (UA)
BD 2018	Interview in Turkish	Video interviews for BD	95 subjects 46 with BD	NA
MODMA 2020	NorthWind, Interviews, Image description	Audio only	52 subjects 23 depressed	Link (UA)

12: AVEC2013 [22] (2013)	A+V	292	BDI-II	Self-report	Public
13: AVEC2014 [23] (2014)	A+V	292	BDI-II	Self-report	Public
14: Crisis Text Line [149] (2014)	T	–	Manual annotation	–	Public
15: DAIC-WoZ [107] (2014)	A+V+T	110	PHQ-9 (DPRD = PHQ-9 > 10)	Self-report	Public
16: Rochester [96] (2015)	V	27	Manual annotation	Self-report	Private
17: CHI-MEI [150] (2016)	V	53	DSSS, HAMD	Clinical assessment	Private
18: Pittsburgh [151] (2018)	A+V	57	DSM-IV, $HAMD > 15$	Clinical assessment	Public
19: BD [152] (2018)	A+V	46	DSM-V	Clinical assessment	Public
20: MODMA [153] (2020)	A+EEG	EEG-128(53),	PHQ-9	Clinical assessment	Public

[1] Deep learning for depression recognition with audiovisual cues: A review (He et al, 2022) | Paper

Transcript Segmentation: Fixed Length and Time Based

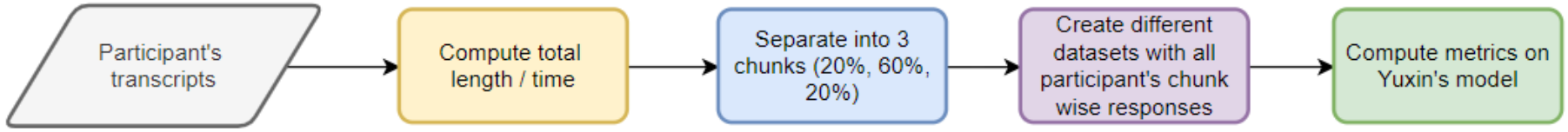


Fig 4: Method to create Chunk wise data

Table 1: Complete Transcripts – Yuxin's model

	Accuracy	F1	Recall	Precision
Transcript	0.64	0.65	0.67	0.63

Table 2: Length based chunks – Yuxin's model

	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

Table 3: Time based chunks – Yuxin's model

	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

Transcript Segmentation: Topic-based with LDA

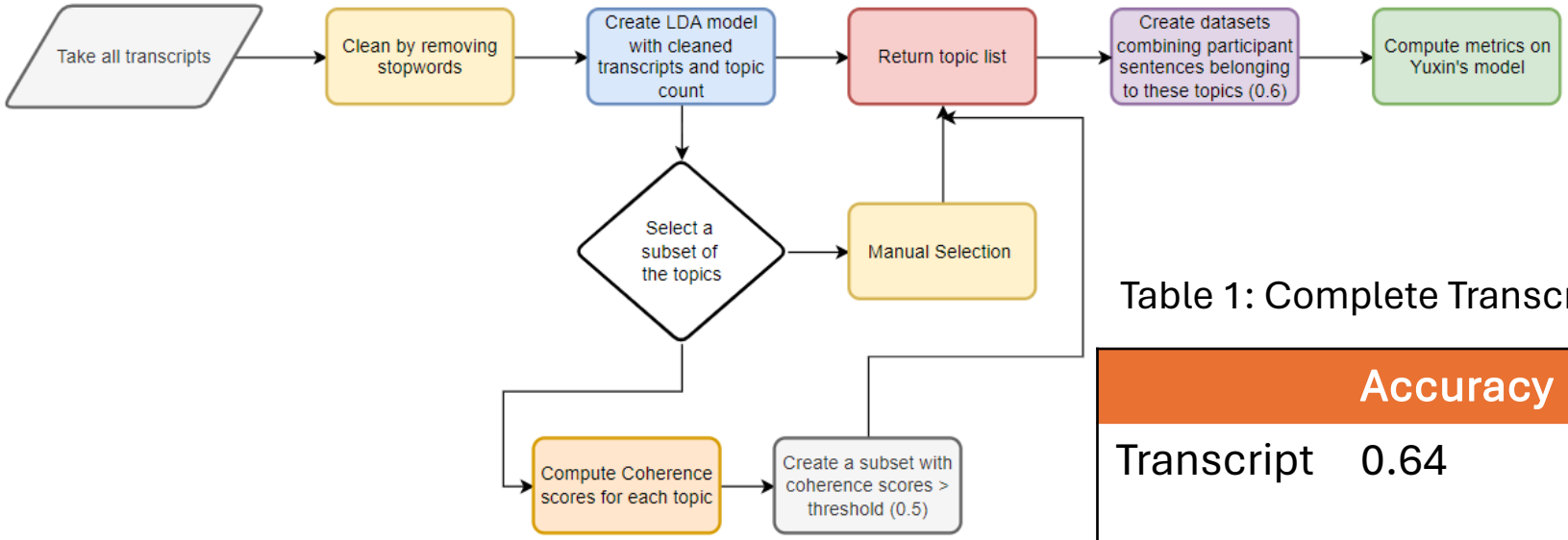


Fig 5: Method to create Topic based Chunk wise data

Table 1: Complete Transcripts – Yuxin's model

	Accuracy	F1	Recall	Precision
Transcript	0.64	0.65	0.67	0.63

Table 4: Topic based chunks – Yuxin's model

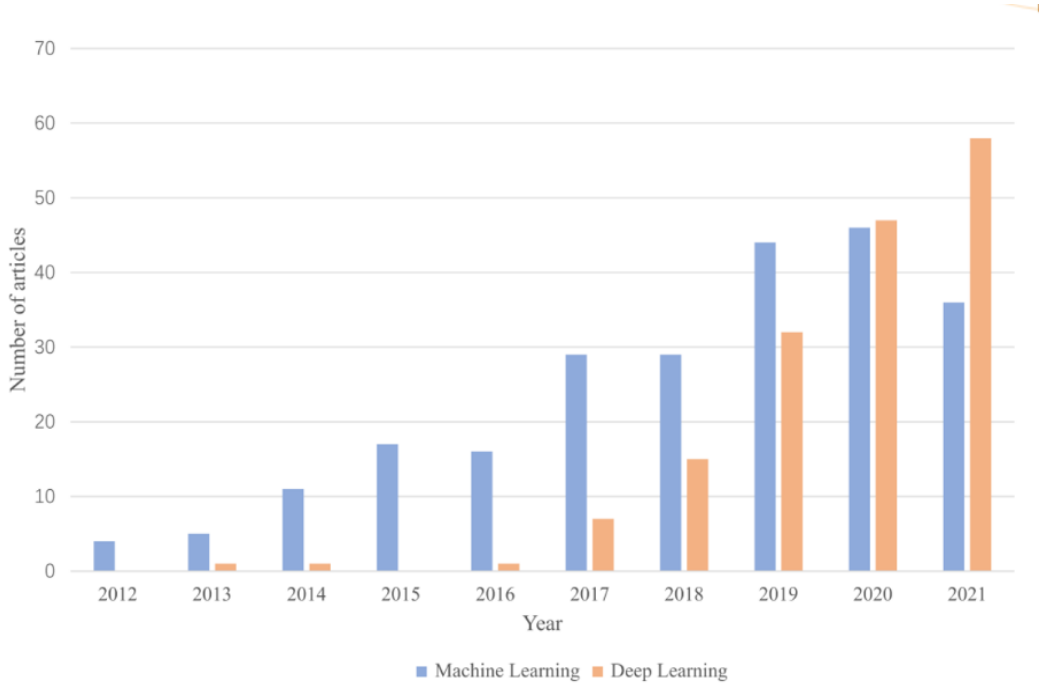
	Accuracy	F1	Recall	Precision
8 topics	0.62	0.39	0.24	1.00
10 Topics	0.59	0.57	0.55	0.60
15 Topics	0.52	0.38	0.30	0.53

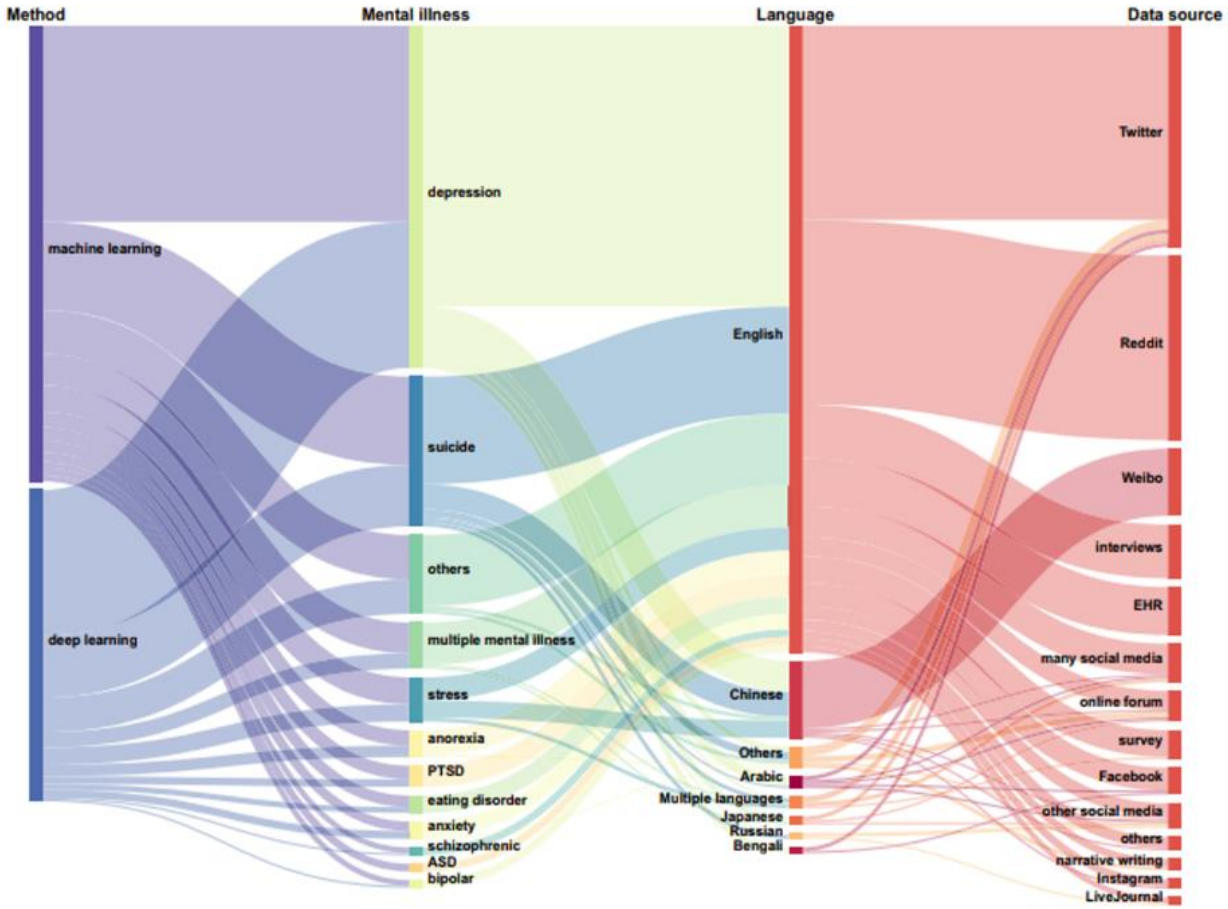
Table 5: Selected Topic based chunks – Yuxin's model

	Accuracy	F1	Recall	Precision
Manual Selection	0.62	0.58	0.52	0.65
Coherence based	0.61	0.52	0.42	0.67

Review Paper: NLP techniques for mental illness detection

[2] Natural language processing applied to mental illness detection: a narrative review (Zhang et al, 2022) | Paper





Reinforcement Learning on Social Media data

[3] Depression Detection on Social Media with Reinforcement Learning (Gui et al, 2019) | Paper

Dataset		# Users	# Tweets
D_1	Depressed	1,402	292,564
	Non-depressed	5,160	3,953,183
D_2	Candidate	36,993	35,076,667

- Use a reinforcement learning method to select posts from a set of posts of each user
- Reward is the performance of a classifier (accuracy).

Methods	Accuracy	Precision	Recall	F1
NB	0.724	0.727	0.728	0.728
MSNL [13]	0.818	0.818	0.818	0.818
WDL [11]	0.768	0.769	0.768	0.768
MDL [12]	0.848	0.848	0.850	0.849
CNN [19]	0.843	0.843	0.843	0.844
CNN + Random sampling	0.789	0.789	0.788	0.785
CNN + SDP-attention [16]	0.836	0.836	0.836	0.837
CNN + MPSDP-attention [7]	0.849	0.850	0.849	0.849
CNN + RL	**0.871**	0.871	**0.871**	**0.871**
LSTM	0.828	0.830	0.828	0.828
LSTM + Random sampling	0.760	0.760	0.757	0.756
LSTM + SDP-attention [16]	0.847	0.848	0.847	0.847
LSTM + MPSDP-attention [7]	0.850	0.850	0.850	0.850
LSTM + RL	0.870	**0.872**	0.870	**0.871**

Tentative Plan

Plan for next week

1. Experimenting with alternative automatic topic selection techniques
2. Finding and reading good literature that uses reinforcement learning
3. Exploring a reinforcement technique for response selection

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

End