

Depression Detection

- Week 14

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Undergraduate 4th year

Duration of the presentation: ~10 minutes

Agenda

- 1. Topic Modelling with LDA: Automatic Threshold selection**
- 2. Ideas for Small Test Set**
 1. Modifying Metric Calculation
 2. Bayesian Network
- 3. Reinforcement Learning Method: Modification and Results**
- 4. Insights from review papers: Reinforcement Learning**
- 5. Tentative Plan for next week**

Topic Modelling with LDA: Threshold selection

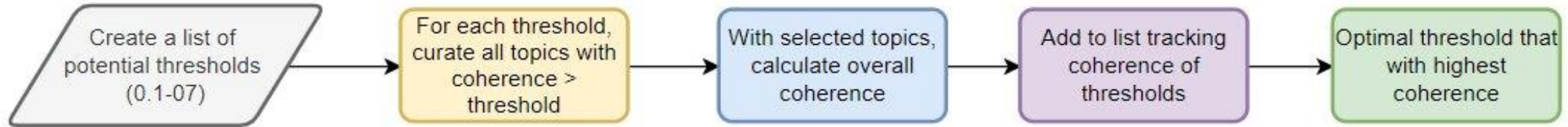


Fig 1: Steps in method to select optimal threshold

Threshold List	29 Topics	43 Topics
[0.1,0.2,0.3,0.4,0.5,0.6,0.7, 0.8]	0.6	0.6
[0.6, 0.2, 0.3, 0.4, 0.5, 0.1, 0.7, 0.8, 0.62, 0.57, 0.65, 0.67, 0.59]	0.62	0.65

Table 1: Optimal threshold from list for 29 and 43 topics

Ideas for Small Test Set - Bootstrapping

Idea: To create multiple simulated datasets (Bootstrap samples) from the original dataset

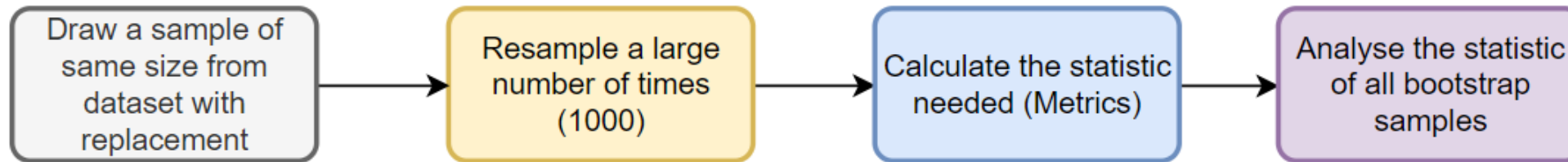


Fig 2: Steps in Bootstrapping

[1] Correcting for Optimistic Prediction in Small Data Sets (Smith et al, 2014) | [Paper](#)

Ideas for Small Test Set – Bayesian Networks

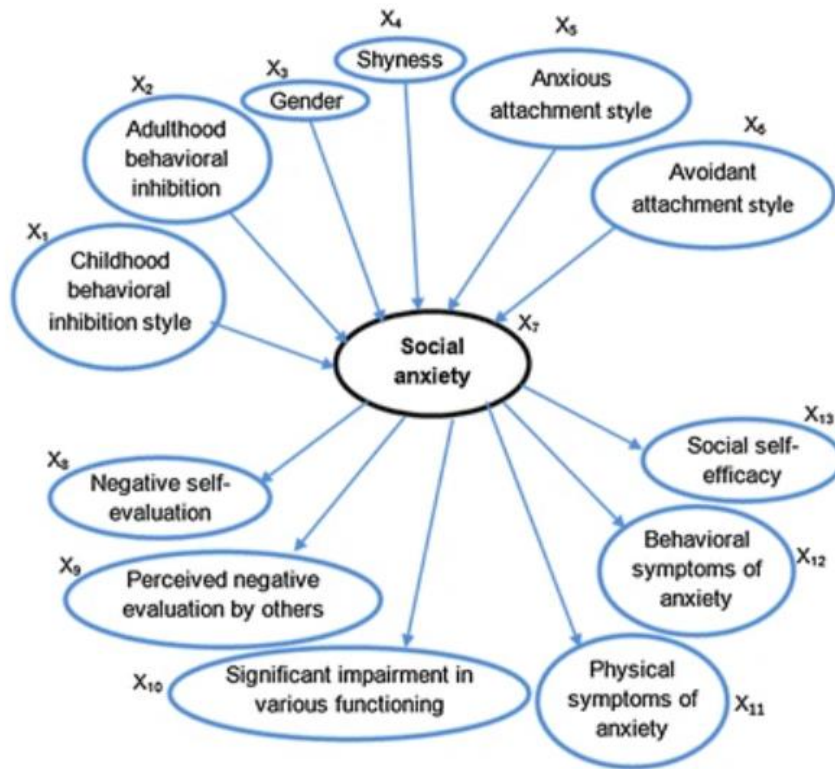


Fig 3: Bayesian Network for Social Anxiety [2]

Important Points:

- Performed on a small dataset of university students (438 participants)
- Result: AUC-ROC score of 0.89

[2] Bayesian network modeling for diagnosis of social anxiety using some cognitive-behavioral factors (Estabragh et al, 2013) | [Paper](#)

Reinforcement Learning: Modification and Results

Table 2: 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
Episodes - 10	0.59	0.58	0.58	0.59
Episodes - 7	0.62	0.66	0.73	0.60

Modification Tried:

- Reward: Increase in accuracy with least number of responses
- Learning Agent: Proximal Policy Optimisation Agent
- Varying Epoch number – 10 epochs with early stopping on reward stagnation in 2 steps

Insights from review papers: Reinforcement Learning

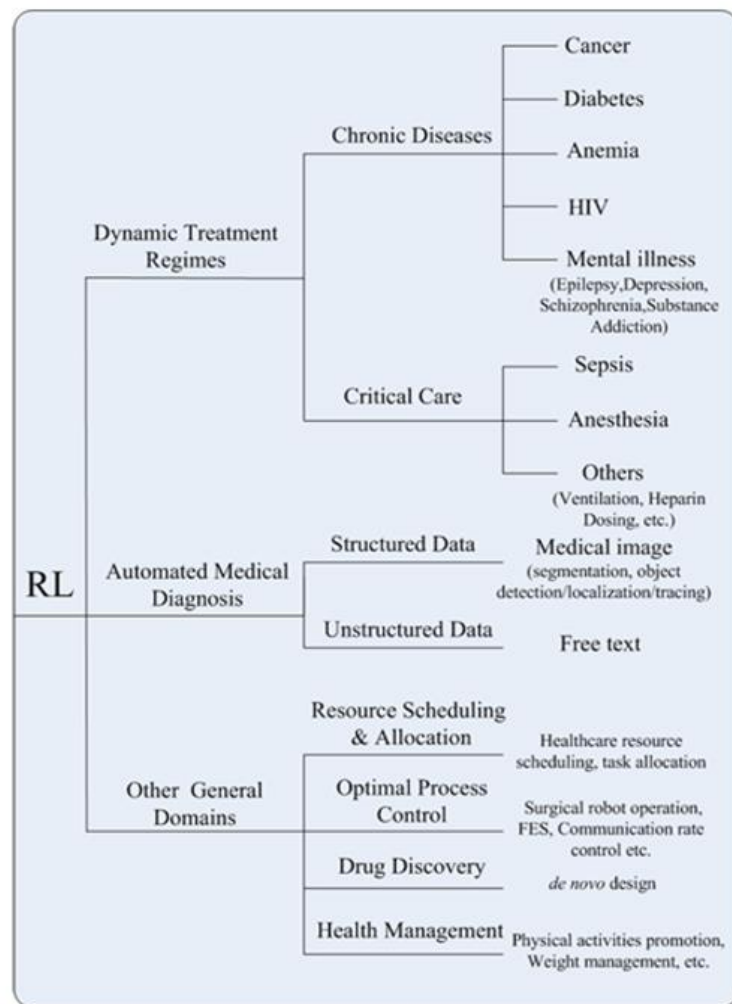


Fig. 2. The outline of application domains of RL in healthcare.

Important Points:

- Highlight the importance of choosing the right reward function – Qualitative
- Reference an interesting paper: Small Sample Learning in Big Data Era, (Shu et al, 2018) | [Paper](#)

[3] Reinforcement Learning in Healthcare: A Survey (Yu et al, 2020) | [Paper](#)

Insights from review papers: Reinforcement Learning

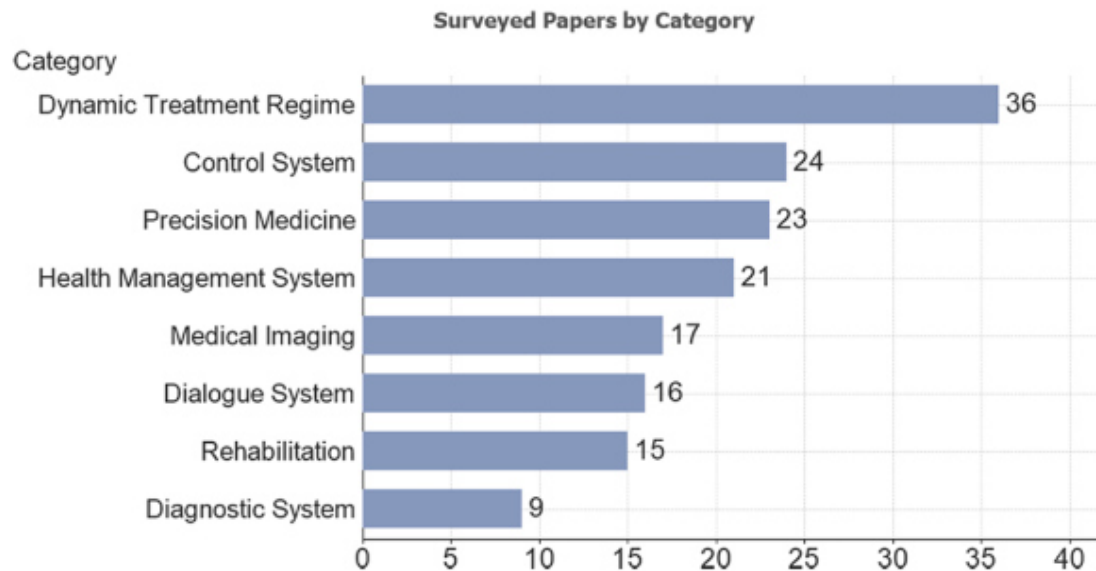
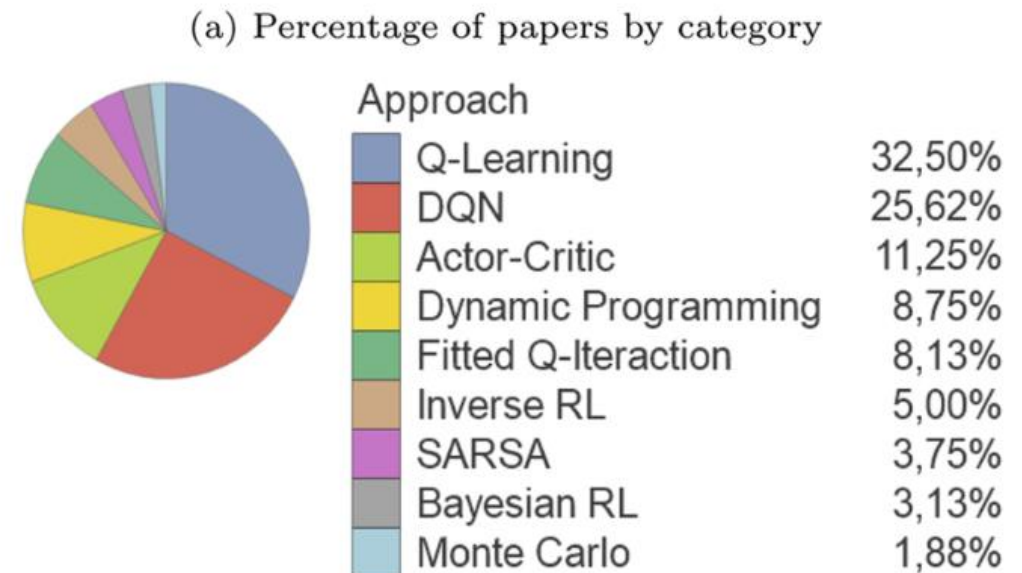


Fig. 3. Number of papers surveyed by category.



[4] Reinforcement learning for intelligent healthcare applications: A survey (Coronato et al, 2020) | [Paper](#)

Tentative Plan

Plan for next week

1. Read literature on reward selection, small data
2. Improve the RL method with ideas
3. Implement ideas learnt for small datasets and measure impact

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

