

Contents

Certificate	ii
Declaration by the Candidate	iii
Copyright Transfer Certificate	iv
Acknowledgements	v
List of Tables	xiv
List of Figures	xvii
Preface	xx
1 Introduction	1
1.1 Recommender Systems	1
1.1.1 Academic Recommender Systems	3
1.2 Classification of Academic Recommendation Algorithms	5
1.2.1 Content-based Filtering (CBF)	6
1.2.2 Collaborative Filtering (CF)	6
1.2.3 Hybrid Recommendation	8
1.2.4 Social Filtering (SF)	9
1.3 Limitations of Academic Recommender Systems	9
1.3.1 Problems with CBF Approaches	10
1.3.2 Problems of CF Approaches	10
1.3.3 Problems with SF Approaches	11
1.4 Motivation	11

1.4.1	Journal Recommendation	12
1.4.2	Collaborator Recommendation	15
1.5	Research Goals	17
1.6	Contributions	18
1.6.1	DISCOVER: A Journal Recommendation System	18
1.6.2	CNAVER: A Journal Recommendation system	20
1.6.3	DeepRec: A Journal Recommendation System	21
1.6.4	DRACoR: A Collaborator Recommendation System	22
1.7	Structure of the Thesis	24
2	Background	25
2.1	Literature Review in Journal Recommendation	25
2.1.1	Collaborative Filtering-based Recommendation (CF)	25
2.1.2	Content-based Recommendation (CBF)	26
2.1.3	Hybrid Recommendation	27
2.1.4	Social Filtering-based Recommendation (SF)	27
2.1.5	Deep Learning-based Recommendation	28
2.2	Literature Review in Collaborator Recommendation	29
2.2.1	Content-based Filtering Method (CBF)	29
2.2.2	Hybrid Method	30
2.2.3	Social Filtering-based Method (SF)	30
2.3	Literature Review in Other Academic Recommendation	32
2.3.1	Reviewer Recommendation	32
2.3.2	Citation Recommendation	33
2.4	Preliminaries	34
2.4.1	Centrality Measures (Social Network Analysis)	34
2.4.2	Information Retrieval Methods	36
2.4.3	Deep Learning Methods	39
2.5	Evaluation Strategy	43
2.6	Evaluation Metrics	44
2.7	Datasets	47
2.7.1	MAG (Microsoft Academic Graph)	47

2.7.2	DBLP-citation-network V10	48
2.7.3	Hep-th (Theoretical High Energy Particle Physics)	48
2.8	Baseline Methods	49
2.8.1	Baseline Methods for Journal Recommendation	49
2.8.2	Baseline Methods for Collaborator Recommendation	50
3	DISCOVER: A Sequential Approach-based Academic Venue Recommender System	52
3.1	Introduction	52
3.2	Problem Description	53
3.3	The Functional Architecture of DISCOVER	53
3.3.1	Framework of DISCOVER	54
3.3.2	A. Data Preprocessing	55
3.3.3	B. Content Analysis (Keyword-based Search Strategy)	57
3.3.4	C. Social Network Analysis	58
3.3.5	B. Content Analysis	62
3.3.6	D. Citation Analysis	63
3.3.7	E. Main Path Analysis	68
3.3.8	F. Result Fusion	72
3.4	Experiments	75
3.4.1	Dataset Used	75
3.4.2	Evaluation Strategy	75
3.4.3	Evaluation Metrics	75
3.4.4	Experimental Setting	75
3.4.5	Parameter Tuning and Optimization	78
3.4.6	Baseline Methods	79
3.5	Results and Discussions	79
3.5.1	Offline or Coarse-level Evaluation	80
3.5.2	Online or Finer-level Evaluation	83
3.5.3	Evaluation of Diversity	92
3.5.4	Evaluation of Stability	92
3.5.5	Ablation Study and Analysis	92

3.5.6	Study of the Proposed Approach	94
3.5.7	Some Insights	98
3.6	Conclusions	99
4	CNAVER: A Fusion-based Scholarly Venue Recommender System	100
4.1	Introduction	100
4.2	Problem Description	102
4.3	Architecture of CNAVER	104
4.3.1	Framework of CNAVER	105
4.4	Data Preprocessing and Centrality Calculation (Layer-1)	107
4.5	Contextual Similarity Calculation (Layer-2)	108
4.6	Peer-peer Network Model (Layer 3)	109
4.6.1	The Architecture of PPPN Model	109
4.6.2	The Architecture of VVPN Model	115
4.7	Fusion Model: CNAVER (Layer-4)	122
4.7.1	Top Venues Recommendation (PPPN Model)	122
4.7.2	Top Venues Recommendation (VVPN Model)	122
4.7.3	Final Venues Recommendation (Fusion Model)	123
4.8	Experiments	125
4.8.1	Dataset	125
4.8.2	Evaluation Strategy	125
4.8.3	Evaluation Metrics	125
4.8.4	Experimental Setting	125
4.8.5	Parameter Tuning and Optimization	128
4.8.6	Baseline Methods	132
4.9	Results and Discussion	132
4.9.1	Offline Evaluation of PPPN Model	133
4.9.2	Online Evaluation of PPPN Model	133
4.9.3	Offline Evaluation of VVPN Model	136
4.9.4	Online Evaluation of VVPN Model	137
4.9.5	Offline Evaluation of Fusion Model: CNAVER	138
4.9.6	Online Evaluation of Fusion Model: CNAVER	140

4.9.7	Evaluation of Diversity	142
4.9.8	Evaluation of Stability	142
4.9.9	Study of the Proposed Approach	143
4.9.10	Discussion on DISCOVER as Baseline	146
4.9.11	Some Insights	146
4.10	Conclusions	147
5	DeepRec: A Deep Learning-based Journal Recommender System	149
5.1	Introduction	149
5.2	Problem Descriptions	150
5.3	Functional Architecture of DeepRec	150
5.3.1	Data Preprocessing (Block-1)	152
5.3.2	Computational Learning (Block-2)	153
5.3.3	Ensemble Learning (Block-3)	161
5.4	Experiments	161
5.4.1	Dataset Description	161
5.4.2	Evaluation Strategy	162
5.4.3	Evaluation Metrics	162
5.4.4	Experimental Setting	162
5.4.5	Parameter Tuning and Optimization	166
5.4.6	Baseline Methods	168
5.5	Results and Discussion	168
5.5.1	Offline Evaluation of CNN Model	169
5.5.2	Online Evaluation of CNN Model	169
5.5.3	Offline Evaluation of LSTM Model	171
5.5.4	Online Evaluation of LSTM Model	173
5.5.5	Offline Evaluation of Ensembled Model: DeepRec	175
5.5.6	Online Evaluation of Ensembled Model: DeepRec	177
5.5.7	Study of Proposed Approach	180
5.5.8	Discussion on MAG as Evaluation Dataset	183
5.5.9	Some Insights	184
5.6	Conclusions	185

6 DRACoR: A Multi-level Fusion Based Collaborator Recommender System

tem	186
6.1 Introduction	186
6.2 Problem Statement and Other Definitions	187
6.3 The Functional Architecture of DRACoR	190
6.4 Data Preprocessing Layer (Layer-1)	192
6.5 Feature Representation Layer (Layer-2)	193
6.5.1 Topic Distribution of Research Interest	193
6.5.2 Researcher’s Interest Variation with Time	194
6.5.3 Author2Vec Edge Weighting	196
6.6 The Architecture of MRCR Model (Layer-3)	196
6.6.1 Generation of Author-Author Graph (AAG)	197
6.6.2 Meta-path Features (MPF)	198
6.6.3 Scholarly Influence-aware Features (SIF)	203
6.6.4 Recommendation of MRCR Model	205
6.7 The Architecture of DBCR Model (Layer-3)	205
6.7.1 Basics of RNNs and LSTMs	206
6.7.2 Label Selection	206
6.7.3 Proposed Architecture	207
6.8 Fusion Model: DRACoR (Layer-4)	212
6.9 Experiments	213
6.9.1 Data Collection	213
6.9.2 Evaluation Metrics	213
6.9.3 Baseline Methods	214
6.9.4 Experimental Setting	214
6.9.5 Parameter Tuning and Optimization	216
6.9.6 Parameter Tuning of DBCR Model	223
6.10 Results and Discussions	224
6.10.1 Results Analysis of MRCR Model	225
6.10.2 Results Analysis of DBCR Model	227
6.10.3 Results Analysis of DRACoR Model	228
6.10.4 Study of the Proposed Approach	231

6.10.5	Some Insights	233
6.11	Conclusions	234
7	Discussions	235
7.1	Summary and Contributions	235
7.1.1	RQ1: How to Handle Cold-start Issues in Journal Recommendation?	235
7.1.2	RQ2: How to Address Data Sparsity, and Diversity Issues in Journal Recommendation?	237
7.1.3	RQ3: How to Improve Relevance and Stability in Journal Recommendation?	238
7.1.4	RQ4: How the Overall Quality (Popularity) of Recommendation is Enhanced in Journal Recommender System?	240
7.1.5	RQ5: How is to Improve Overall Relevance and also to Handle Cold-start Issues in Collaborator Recommendation?	242
8	Conclusions and Future Work	244
8.1	Summary	244
8.2	Possible Research Directions	246
8.2.1	Journal Recommendation	246
8.2.2	Collaborator Recommendation	247
8.2.3	Other Academic Recommendation	247
8.2.4	Scalability of Academic Recommendation	247
8.2.5	Cross-domain Academic Recommendation	248
8.2.6	Explainability Based Academic Recommendation	248
A	List of Publications	271
A.1	Journal Papers	271
A.2	Conference Papers	272
B	Venue Recommendation in DeepRec (Examples)	273
B.1	DeepRec Recommendations	274