Contents

1	Inti	roduction to Recommendation Systems	1
	1.1	Evolution of Recommendation Systems	2
		1.1.1 Basic Recommendation Systems	2
		1.1.2 Deep-learning-based Recommendation Systems .	7
		1.1.3 Challenges	11
	1.2	Applications of Recommendation Systems	17
	1.3	Advanced Recommendation Systems	20
		1.3.1 Handling Context	21
		1.3.2 Dynamic Environments	24
		1.3.3 Explainable Recommendation Techniques	27
		1.3.4 Handling Cold-Start Problems	29
		1.3.5 Privacy-Preserving Recommendation Techniques	31
		1.3.6 Ethical Considerations	33
		1.3.7 Hybrid Recommendation Techniques	36
	1.4	Summary	39
2	Tra	ditional Recommendation Systems	41
		Collaborative Filtering	42
		Content-based Recommendation Systems	43
	2.3	Knowledge-based Recommendation Systems	44
		Ensemble Recommendation Systems	44
3	Dec	ep Learning for Recommendation Systems	45
		Deep Neural Netowrk Foundations	46
		Deep Audio Networks	46
		Deep Vision Networks	46
		Deep LLMs	46
		•	

vi Contents

	3.5	Advanced Components	47
		3.5.1 Deep Embeddings	47
		3.5.2 Attentions	47
		3.5.3 Transformers	47
4	Dee	ep-Learning-Based Recommendation Systems	49
	4.1	CNN-based Recommendation Models	50
	4.2	RNN-based Recommendation Models	50
	4.3	Deep RL-based Recommendation Models	50
		Deep LLM-based Recommendation Models	50
	4.5	Examples of Deep Recommendation Systems	50
		4.5.1 Neural Collaborative Filtering	50
	4.6	Deep Recommendation Modules	51
		4.6.1 Deep Feature Processing Modules	51
		4.6.2 Deep Retrieval Modules	51
		4.6.3 Deep Ranking Modules	51
		4.6.4 Hybrid Schemes	51
5	Adv	vanced Recommendation Systems	53
		Contextual Recommendation Systems	53
		Dynamic Recommendation Systems	55
		Recommendation Systems for Cold-Start	55
		Explainable Recommendation Systems	55
		Privacy-Preserving Recommendations	55
	5.6	Recommendation System with Ethical Considerations .	55
	5.7	Hybrid Recommendation Systems	55
6	Rea	al-Wolrd Recommendation Systems	57
	6.1	Real-world Applications - An Introduction	57
		6.1.1 Advertisement	57
		6.1.2 E-commerce and Retail	57
		6.1.3 E-commerce and Retail	62
		6.1.4 Content Streaming and Media	62
		6.1.5 Social Media	62
		6.1.6 Education and Learning	62
		6.1.7 Travel and Hospitality	62
		6.1.8 Gaming	62
	6.2	Content-based Recommendation Systems	62
		6.2.1 Image Recommendation Systems	62

vii

	6.2.3 Product Recommendation Systems	52 52 52 52 52 52		
	•	52		
	6.4.3 Google Content Recommendation System 6	52		
	6.4.4 Amazon Product Recommendation System 6	52		
	\mathcal{E}^{-1}	52		
	6.4.6 Linkedin Job Recommendation System 6	52		
7	System Performance Evaluations 6	53		
′	- ,	54		
		54		
		54		
		54		
		54		
8	Advanced Topics	55		
		56		
		66		
		56		
		66		
	8.5 Fair Recommendation	56		
	8.6 Privacy Preservation	56		
	8.7 Personalization 6	56		
	8.8 Researches Ongoing	66		
A	Appendix	57		
11		57		
Glo	Glossary			
Index				