

Contents

	<i>Prefaceix</i>
	Acknowledgmentsxiii
	About the Authors xv
	Introduction
	1.1 What We Talk about When We Talk about Things: Terminology 2
	1.2 Achieving System Qualities
	1.3 Life-Cycle Processes
	1.4 Software Architecture 10
	1.5 AI Model Quality
	1.6 Dealing with Uncertainty
	1.7 Summary
	1.8 Discussion Questions
	1.9 For Further Reading
Chapter 1	Software Engineering Background
	2.1 Distributed Computing
	2.2 DevOps Background
	2.3 MLOps Background
	2.4 Summary
	2.5 Discussion Questions
	2.6 For Further Reading 45
Chapter 2	AI Background
	3.1 Terminology
	3.2 Selecting a Model
	3.3 Preparing the Model for Training 65
	3.4 Summary
	3.5 Discussion Questions
	3.6 For Further Reading





vi

Contents

Chapter 3	Foundation Models71
	4.1 Foundation Models
	4.2 Transformer Architecture
	4.3 Alternatives in FM Architectures
	4.4 Customizing FMs
	4.5 Designing a System Using FMs
	4.6 Maturity of FMs and Organizations
	4.7 Challenges of FMs
	4.8 Summary
	4.9 Discussion Questions
	4.10 For Further Reading
Chambau 1	AIModal Life Code
Chapter 4	AI Model Life Cycle
	5.1 Developing the Model 97 5.2 Building the Model 108
	5.3 Testing the Model
	5.4 Release
	5.5 Summary
	5.6 Discussion Questions
	5.7 For Further Reading
	o., Toll atticl Reduing
Chapter 5	System Life Cycle
	6.1 Design
	6.2 Developing Non-AI Modules
	6.3 Build
	6.4 Test
	6.5 Release and Deploy
	6.6 Operate, Monitor, and Analyze
	6.7 Summary
	6.8 Discussion Questions
	6.9 For Further Reading
Chapter 6	Reliability
Chapter 0	7.1 Fundamental Concepts
	7.2 Preventing Faults
	7.3 Detecting Faults
	7.4 Recovering from Faults

(







	7.5 Summary
	7.6 Discussion Questions
	7.7 For Further Reading
Chapter 7	Performance
	8.1 Efficiency
	8.2 Accuracy
	8.3 Summary
	8.4 Discussion Questions
	8.5 For Further Reading
Chapter 8	Security
•	9.1 Fundamental Concepts
	9.2 Approaches to Mitigating Security Concerns
	9.3 Summary
	9.4 Discussion Questions
	9.5 For Further Reading
	70 To Talue Tealing
Chapter 9	Privacy and Fairness
	10.1 Privacy in AI Systems
	10.2 Fairness in AI Systems
	10.3 Achieving Privacy
	10.4 Achieving Fairness
	10.5 Summary
	10.6 Discussion Questions
	10.7 For Further Reading
Chapter 10	Observability
Chapter 10	11.1 Fundamental Concepts. 203
	11.2 Evolving from Monitorability to Observability
	11.3 Approaches for Enhancing Observability
	11.4 Summary
	11.6 For Further Reading
Chapter 11	The Fraunhofer Case Study: Using a Pretrained Language
	Model for Tendering213
	12.1 The Problem Context
	12.2 Case Study Description and Setup

(





(

viii Contents

	12.3 Summary	232
	12.4 Takeaways	233
	12.5 Discussion Questions	233
	12.6 For Further Reading	233
Chapter 12	The ARM Hub Case Study: Chatbots for Small and Medium-Size	Aus-
_	tralian Enterprises	235
	13.1 Introduction	235
	13.2 Our Approach	236
	13.3 LLMs in SME Manufacturing	238
	13.4 A RAG-Based Chatbot for SME Manufacturing	238
	13.5 Architecture of the ARM Hub Chatbot	239
	13.6 MLOps in ARM Hub.	244
	13.7 Ongoing Work	251
	13.8 Summary	252
	13.9 Takeaways	253
	13.10 Discussion Questions	254
	13.11 For Further Reading	254
Chapter 13	The Banking Case Study: Predicting Customer Churn in Banks	255
Chapter 13	The Banking Case Study: Predicting Customer Churn in Banks 14.1 Customer Churn Prediction	
Chapter 13		256
Chapter 13	14.1 Customer Churn Prediction	256 265
Chapter 13	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector	256265265
Chapter 13	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary	256265265266
Chapter 13	14.1 Customer Churn Prediction.14.2 Key Challenges in the Banking Sector14.3 Summary14.4 Takeaways	256265265266266
Chapter 13 Chapter 14	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary 14.4 Takeaways 14.5 Discussion Questions	256 265 265 266 266 267
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary 14.4 Takeaways 14.5 Discussion Questions 14.6 For Further Reading	256 265 265 266 266 267 269
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector. 14.3 Summary. 14.4 Takeaways. 14.5 Discussion Questions. 14.6 For Further Reading. The Future of AI Engineering.	256 265 265 266 266 267 269 270
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary 14.4 Takeaways 14.5 Discussion Questions 14.6 For Further Reading The Future of AI Engineering. 15.1 The Shift to DevOps 2.0	256 265 265 266 266 267 269 270 271
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary 14.4 Takeaways 14.5 Discussion Questions 14.6 For Further Reading The Future of AI Engineering. 15.1 The Shift to DevOps 2.0 15.2 AI's Implications for the Future	256 265 265 266 266 267 269 270 271 276
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary 14.4 Takeaways 14.5 Discussion Questions 14.6 For Further Reading The Future of AI Engineering. 15.1 The Shift to DevOps 2.0 15.2 AI's Implications for the Future 15.3 AIWare or AI-as-Software	256 265 266 266 267 269 270 271 276 279
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector. 14.3 Summary. 14.4 Takeaways. 14.5 Discussion Questions. 14.6 For Further Reading. The Future of AI Engineering. 15.1 The Shift to DevOps 2.0. 15.2 AI's Implications for the Future. 15.3 AIWare or AI-as-Software. 15.4 Trust in AI and the Role of Human Engineers.	256 265 265 266 266 267 270 271 276 279 280
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary 14.4 Takeaways 14.5 Discussion Questions 14.6 For Further Reading The Future of AI Engineering. 15.1 The Shift to DevOps 2.0 15.2 AI's Implications for the Future 15.3 AIWare or AI-as-Software 15.4 Trust in AI and the Role of Human Engineers. 15.5 Summary	256 265 265 266 266 267 270 271 276 279 280 281
•	14.1 Customer Churn Prediction. 14.2 Key Challenges in the Banking Sector 14.3 Summary 14.4 Takeaways 14.5 Discussion Questions 14.6 For Further Reading The Future of AI Engineering. 15.1 The Shift to DevOps 2.0 15.2 AI's Implications for the Future 15.3 AIWare or AI-as-Software 15.4 Trust in AI and the Role of Human Engineers. 15.5 Summary 15.6 Discussion Questions	256 265 265 266 266 267 270 271 276 279 280 281 281



