1. Record Nr. UNINA9911047668403321

Autore	Zhou Yong
Titolo	Federated Edge Learning : Algorithms, Architectures and Trustworthiness / / by Yong Zhou, Wenzhi Fang, Yuanming Shi, Khaled B. Letaief
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2026
ISBN	3-031-96649-X
Edizione	[1st ed. 2026.]
Descrizione fisica	1 online resource (283 pages)
Collana	Wireless Networks, , 2366-1445
Altri autori (Persone)	FangWenzhi ShiYuanming LetaiefKhaled B (HKUST.)
Disciplina	004.6
Soggetti	Computer networks Wireless communication systems Mobile communication systems Telecommunication Computer Communication Networks Wireless and Mobile Communication Communications Engineering, Networks
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Part 1: Introduction and Overview -- 1. Introduction and overview -- 1.1. Overview of federated edge learning (FEEL) -- 1.2. Learning models and algorithms of FEEL -- 1.3. Motivation and challenges of FEEL -- 1.4. Organization -- Part 2: Algorithms -- 2. First-order optimization for FEEL -- 2.1. Background and motivation -- 2.2. Federated first-order optimization model and algorithm -- 2.3. Sparse and low-rank optimization for FEEL -- 2.4. Simulations and discussions -- 2.5. Summary -- 3. Second-order optimization for FEEL -- 3.1. Background and motivation -- 3.2. Federated second-order optimization model and algorithm -- 3.3. Convergence analysis -- 3.4. System optimization -- 3.5. Simulations and discussions -- 3.6. Summary -- 4. Zeroth-order optimization for FEEL -- 4.1. Background and motivation -- 4.2. Federated zeroth-order optimization model and algorithm -- 4.3. Convergence analysis -- 4.4. Over-the-air federated zeroth-order

optimization -- 4.5. Simulations and discussions -- 4.6. Summary -- Part 3: Architectures -- 5. Reconfigurable intelligent surface assisted FEEL -- 5.1. Background and motivation -- 5.2. Communication and learning models -- 5.3. Convergence analysis and problem formulation -- 5.4. Alternating optimization algorithm design -- 5.5. GNN-based learning algorithm design -- 5.6. Simulations and discussions -- 5.7. Summary -- 6. Unmanned aerial vehicle assisted FEEL -- 6.1. Background and motivation -- 6.2. Communication and learning models -- 6.3. Convergence analysis and problem formulation -- 6.4. Joint device scheduling, time allocation, and trajectory design -- 6.5. Simulations and discussions -- 6.6. Summary -- 7. FEEL over multi-cellwireless networks -- 7.1. Background and motivation -- 7.2. Communication and learning models -- 7.3. Convergence analysis and problem formulation -- 7.4. Cooperative optimization for multi-cell FEEL -- 7.5. Simulations and discussions -- 7.6. Summary -- Part 4: Trustworthiness -- 8. Differentially-private FEEL -- 8.1. Background and motivation -- 8.2. System model -- 8.3. Performance analysis and privacy preserving mechanism -- 8.4. Two-step alternating low-rank optimization -- 8.5. Simulations and discussions -- 8.6. Summary -- 9. Trustworthy FEEL via blockchain -- 9.1. Background and motivation -- 9.2. System model -- 9.3. Latency analysis and problem formulation -- 9.4. TD3 based resource allocation -- 9.5. Simulations and discussions -- 9.6. Summary -- Part 5: Conclusions and Future Directions -- 10. Conclusions and future directions -- 10.1. Conclusions -- 10.2. Future directions.

Sommario/riassunto

This book presents various effective schemes from the perspectives of algorithms, architectures, privacy, and security to enable scalable and trustworthy Federated Edge Learning (FEEL). From the algorithmic perspective, the authors elaborate various federated optimization algorithms, including zeroth-order, first-order, and second-order methods. There is a specific emphasis on presenting provable convergence analysis to illustrate the impact of learning and wireless communication parameters. The convergence rate, computation complexity and communication overhead of the federated zeroth/first/second-order algorithms over wireless networks are elaborated. From the networking architecture perspective, the authors illustrate how the critical challenges of FEEL can be addressed by exploiting different architectures and designing effective communication schemes. Specifically, the communication straggler issue of FEEL can be mitigated by utilizing reconfigurable intelligent surface and unmanned aerial vehicle to reconfigure the propagation environment, while over-the-air computation is utilized to support ultra-fast model aggregation for FEEL by exploiting the waveform superposition property. Additionally, the multi-cell architecture presents a feasible solution for collaborative FEEL training among multiple cells. Finally, the authors discuss the challenges of FEEL from the privacy and security perspective, followed by presenting effective communication schemes that can achieve differentially private model aggregation and Byzantine-resilient model aggregation to achieve trustworthy FEEL. This book is designed for researchers and professionals whose focus is wireless communications. Advanced-level students majoring in computer science and electrical engineering will also find this book useful as a reference.