|  |  |  |
| --- | --- | --- |
| **Challenges** | **Contributions** |  **Future research directions and remedies**  |
| Complexity | [69] | * How to solve the complexity issue in IoT?
* The complex network-based approaches are soultions.
 |
| Connectivity  | [71] | * How to connect a large number of objects in IoT-based technologies?
* The usage of social relations and exploring AI and machine learning.
 |
| IoT and SIoT standards  | [72] | * There is a lack of IoT and SIoT standards.
* The development of new standards combining complex networks is a good research direction.
 |
| Complex data  | [73] | * How to handle diverse data types in IoT?
* The use of AI and Machine learning is helpful to overcome this issue.
 |
| Noisy data | [75] | * How to clean noisy big data?
* Develop more advanced AI-based methods.
 |
| Self-organized structures | [78] | * How to handle self-organization and autonomous IoT infrastructure?
* Develop novel methods using learning systems and automated reasoning.
 |
| Trust, security, and privacy | [80] | * What entities are available in the IoT-based technologies?
* How is the trust management process more efficient and accurate?
* Are any efficient trust models available in the IoT?
* What models and tools are available for security and privacy?
 |
| Energy Management | [83] | * What are possible solutions for efficient energy management in IoT-based technologies?
 |