

## ***Ai Robots And Swarms Issues Questions And Cna***

Systems designers have learned that many agents co-operating within the system can solve very complex problems with a minimal design effort. In general, multi-agent systems that use swarm intelligence are said to be swarm intelligent systems. Today, these are mostly used as search engines and optimization tools. This volume reviews innovative methodologies of swarm intelligence, outlines the foundations of engineering swarm intelligent systems and applications, and relates experiences using

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the particle swarm optimisation.

The book's contributing authors are among the top researchers in swarm intelligence. The book is intended to provide an overview of the subject to novices, and to offer researchers an update on interesting recent developments.

Introductory chapters deal with the biological foundations, optimization, swarm robotics, and applications in new-generation telecommunication networks, while the second part contains chapters on more specific topics of swarm intelligence research.

A comprehensive survey of artificial intelligence algorithms and programming organization for robot

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systems, combining theoretical rigor and practical applications. This textbook offers a comprehensive survey of artificial intelligence (AI) algorithms and programming organization for robot systems. Readers who master the topics covered will be able to design and evaluate an artificially intelligent robot for applications involving sensing, acting, planning, and learning. A background in AI is not required; the book introduces key AI topics from all AI subdisciplines throughout the book and explains how they contribute to autonomous capabilities. This second edition is a major expansion and reorganization of the first edition, reflecting the dramatic advances made in

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AI over the past fifteen years. An introductory overview provides a framework for thinking about AI for robotics, distinguishing between the fundamentally different design paradigms of automation and autonomy. The book then discusses the reactive functionality of sensing and acting in AI robotics; introduces the deliberative functions most often associated with intelligence and the capability of autonomous initiative; surveys multi-robot systems and (in a new chapter) human-robot interaction; and offers a “metaview” of how to design and evaluate autonomous systems and the ethical considerations in doing so. New material covers locomotion, simultaneous localization and

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mapping, human-robot interaction, machine learning, and ethics. Each chapter includes exercises, and many chapters provide case studies. Endnotes point to additional reading, highlight advanced topics, and offer robot trivia. This volume offers an innovative and counter-intuitive study of how and why artificial intelligence-infused weapon systems will affect the strategic stability between nuclear-armed states. Johnson demystifies the hype surrounding artificial intelligence (AI) in the context of nuclear weapons and, more broadly, future warfare. The book highlights the potential, multifaceted intersections of this and other disruptive technology – robotics and

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autonomy, cyber, drone swarming, big data analytics, and quantum communications – with nuclear stability.

Anticipating and preparing for the consequences of the AI-empowered weapon systems are fast becoming a critical task for national security and statecraft. Johnson considers the impact of these trends on deterrence, military escalation, and strategic stability between nuclear-armed states – especially China and the United States. The book draws on a wealth of political and cognitive science, strategic studies, and technical analysis to shed light on the coalescence of developments in AI and other disruptive emerging technologies. Artificial intelligence

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and the future of warfare sketches a clear picture of the potential impact of AI on the digitized battlefield and broadens our understanding of critical questions for international affairs. AI will profoundly change how wars are fought, and how decision-makers think about nuclear deterrence, escalation management, and strategic stability – but not for the reasons you might think.

28th Canadian Conference on Artificial Intelligence,  
Canadian AI 2015, Halifax, Nova Scotia, Canada, June  
2-5, 2015, Proceedings

Living with Robots

Changing Dynamics of National Security

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Attack and Defence

Cambrian Intelligence

Ten Visions for Our Future

Introduction to AI Robotics, second edition

This open access book examines recent advances in how artificial intelligence (AI) and robotics have elicited widespread debate over their benefits and drawbacks for humanity. The emergent technologies have for instance implications within medicine and health care, employment, transport, manufacturing, agriculture, and



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armed conflict. While there has been considerable attention devoted to robotics/AI applications in each of these domains, a fuller picture of their connections and the possible consequences for our shared humanity seems needed. This volume covers multidisciplinary research, examines current research frontiers in AI/robotics and likely impacts on societal well-being, human – robot relationships, as well as the opportunities and risks for sustainable development and peace. The attendant ethical and religious dimensions

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of these technologies are addressed and implications for regulatory policies on the use and future development of AI/robotics technologies are elaborated. Artificial Intelligence and Global Security: Future Trends, Threats and Considerations brings a much-needed perspective on the impact of the integration of Artificial Intelligence (AI) technologies in military affairs. Experts forecast that AI will shape future military operations in ways that will revolutionize warfare.

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providing the administrative support to the workshop.

Until the mid-1980s, AI researchers assumed that an intelligent system doing high-level reasoning was necessary for the coupling of perception and action. In this traditional model, cognition mediates between perception and plans of action. Realizing that this core AI, as it was known, was illusory, Rodney A. Brooks turned the field of AI on its head by introducing the behavior-based approach to robotics. The cornerstone of behavior-

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based robotics is the realization that the coupling of perception and action gives rise to all the power of intelligence and that cognition is only in the eye of an observer. Behavior-based robotics has been the basis of successful applications in entertainment, service industries, agriculture, mining, and the home. It has given rise to both autonomous mobile robots and more recent humanoid robots such as Brooks' Cog. This book represents Brooks' initial formulation of and contributions to the development of the

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behavior-based approach to robotics. It presents all of the key philosophical and technical ideas that put this "bottom-up" approach at the forefront of current research in not only AI but all of cognitive science.

Advances in Artificial Intelligence  
12th International Conference, ANTS 2020,  
Barcelona, Spain, October 26–28, 2020,  
Proceedings

The Next Generation of Competences  
Proliferation of Weapons- and Dual-Use  
Technologies

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Introduction and Applications

A Critical Introduction

Swarm Intelligence

**Should a self-driving car prioritize the lives of the passengers over the lives of pedestrians? Should we as a society develop autonomous weapon systems that are capable of identifying and attacking a target without human intervention? What happens when AIs become smarter and more capable than us? Could they have greater than human**

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moral status? Can we prevent superintelligent AIs from harming us or causing our extinction? At a critical time in this fast-moving debate, thirty leading academics and researchers at the forefront of AI technology development come together to explore these existential questions, including Aaron James (UC Irvine), Allan Dafoe (Oxford), Andrea Loreggia (Padova), Andrew Critch (UC Berkeley), Azim Shariff (Univ. .

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The contemporary geopolitical affairs anywhere around the globe, directly influence the national security of a state. Growing conventional, as well as non-conventional threats, are influencing the policies of the nation, both at the national and international levels. The book throws light on how the different dimensions of national security are constantly changing in this globalized and modernized world. This book focuses on how the 21st



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century is witnessing the new unconventional menaces like Cyber terrorism, Proxy wars, Elite capture, etc. the book also discusses how new threats for Indian interests have emerged in and across physical borders and how these threats are going to be countered.

The military is on the cusp of a major technological revolution, in which warfare is conducted by unmanned and increasingly autonomous weapon systems.

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However, unlike the last "sea change," during the Cold War, when advanced technologies were developed primarily by the Department of Defense (DoD), the key technology enablers today are being developed mostly in the commercial world. This study looks at the state-of-the-art of AI, machine-learning, and robot technologies, and their potential future military implications for autonomous (and semi-autonomous) weapon systems. While no one can predict how

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AI will evolve or predict its impact on the development of military autonomous systems, it is possible to anticipate many of the conceptual, technical, and operational challenges that DoD will face as it increasingly turns to AI-based technologies. This study examines key issues, identifies analysis gaps, and provides a roadmap of opportunities and challenges. It concludes with a list of recommended future studies. This comprehensive presentation of the

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core concepts and historical landmarks in robotics and artificial intelligence is a must-read for those who want to understand the important changes happening now in our everyday lives, in the workplace, and in our minds and bodies. What is deep in "deep learning"? Can artificial intelligence really think? What will robots really look like in the near future? Is there a new class divide between those who understand technology and those who

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fear it? A clear and exhaustive introduction for non-specialists, 30-Second AI & Robotics will help the reader to navigate the world of ubiquitous computers, smart cities, and collaborative robots. At last, an optimistic and friendly book about our human possibilities in the time of automata.

11th International Conference, ANTS  
2018, Rome, Italy, October 29–31, 2018,  
Proceedings

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**Swarm Intelligent Systems  
Reconsidering American Civil-Military  
Relations**

**What Every Anxious Human Needs to Know  
Multi-Robot Systems. From Swarms to  
Intelligent Automata, Volume III  
The USA, China, and strategic stability  
Swarm Robotics**

**How will artificial intelligence change our world within twenty  
years? A WALL STREET JOURNAL, WASHINGTON POST,  
AND FINANCIAL TIMES BEST BOOK OF THE YEAR •  
“This inspired collaboration between a pioneering technologist**

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**and a visionary writer of science fiction offers bold and urgent insights.”—Yann LeCun, winner of the Turing Award; chief AI scientist, Facebook “Amazingly entertaining . . . Lee and Chen take us on an immersive trip through the future. . . . Eye-opening.”—Mark Cuban AI will be the defining development of the twenty-first century. Within two decades, aspects of daily human life will be unrecognizable. AI will generate unprecedented wealth, revolutionize medicine and education through human-machine symbiosis, and create brand-new forms of communication and entertainment. In liberating us from routine work, however, AI will also challenge the organizing principles of our economic and social order. Meanwhile, AI will bring new risks in the form of autonomous weapons and smart technology that inherits human bias. AI is**

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**at a tipping point, and people need to wake up—both to AI’s radiant pathways and its existential perils for life as we know it. In this provocative, utterly original work, Kai-Fu Lee, the former president of Google China and bestselling author of AI Superpowers, teams up with celebrated novelist Chen Qiufan to imagine our world in 2041 and how it will be shaped by AI. In ten gripping short stories, they introduce readers to an array of eye-opening 2041 settings, such as:**

- **In San Francisco, the “job reallocation” industry emerges as deep learning AI causes widespread job displacement**
- **In Tokyo, a music fan is swept up in an immersive form of celebrity worship based on virtual reality and mixed reality**
- **In Mumbai, a teenage girl rebels when AI’s crunching of big data gets in the way of romance**
- **In Seoul, virtual companions with perfected natural language**



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**processing (NLP) skills offer orphaned twins new ways to connect • In Munich, a rogue scientist draws on quantum computing, computer vision and other AI technologies in a revenge plot that imperils the world By gazing toward a not-so-distant horizon, AI 2041 offers urgent insights into our collective future—while reminding readers that, ultimately, humankind remains the author of its destiny.**

**Bousquet's landmark book examines the impact of key technologies and scientific ideas on the theory and practice of warfare and the handling of the perennial tension between order and chaos on the battlefield. Spanning the entire modern era, from the Scientific Revolution to the present, it offers a systematic account of modern warfare as the constitution of increasingly complex assemblages of bodies and machines**

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**whose integration rests upon a military assimilation of scientific thought. Reflecting the pervasive influence of scientific conceptual frameworks upon warfare, modern armies have been successively organised by reference to the paradigmatic technologies of the clock, engine, computer, and network. Conversely, major scientific developments and technological breakthroughs have become intertwined with the experience of war, especially since the Second World War's unprecedented mobilisation of scientific rationality and technical expertise. This increasingly tight symbiosis between science, technology, and war is at the heart of both the tremendous powers and enduring pathologies displayed by the contemporary military machine. In this new and revised edition, Bousquet extends the analysis to encompass the latest developments in the scientific**

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**way of warfare in the midst of renewed great power competition and a wave of technological innovation in artificial intelligence and robotics.**

**The authors of this report examine military applications of artificial intelligence (AI); compare development efforts in the United States, China, and Russia; and consider the ethical implications of employing military AI in war and peace.**

**AI is poised to disrupt our work and our lives. We can harness these technologies rather than fall captive to them—but only through wise regulation. Too many CEOs tell a simple story about the future of work: if a machine can do what you do, your job will be automated. They envision everyone from doctors to soldiers rendered superfluous by ever-more-powerful AI. They offer stark alternatives: make robots or be replaced by them.**

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**Another story is possible. In virtually every walk of life, robotic systems can make labor more valuable, not less. Frank Pasquale tells the story of nurses, teachers, designers, and others who partner with technologists, rather than meekly serving as data sources for their computerized replacements. This cooperation reveals the kind of technological advance that could bring us all better health care, education, and more, while maintaining meaningful work. These partnerships also show how law and regulation can promote prosperity for all, rather than a zero-sum race of humans against machines. How far should AI be entrusted to assume tasks once performed by humans? What is gained and lost when it does? What is the optimal mix of robotic and human interaction? New Laws of Robotics makes the case that policymakers must not allow corporations or engineers to**

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**answer these questions alone. The kind of automation we get—and who it benefits—will depend on myriad small decisions about how to develop AI. Pasquale proposes ways to democratize that decision making, rather than centralize it in unaccountable firms. Sober yet optimistic, *New Laws of Robotics* offers an inspiring vision of technological progress, in which human capacities and expertise are the irreplaceable center of an inclusive economy.**

**Artificial intelligence and the future of warfare**

**AI, Robots, and Swarms**

**Ethics of Artificial Intelligence**

**Security and Performance**

**30-Second AI and Robotics**

**Proceedings from the 2005 International Workshop on Multi-**

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## **Robot Systems**

This volume explores the intersection of robust intelligence (RI) and trust in autonomous systems across multiple contexts among autonomous hybrid systems, where hybrids are arbitrary combinations of humans, machines and robots. To better understand the relationships between artificial intelligence (AI) and RI in a way that promotes trust between autonomous systems and human users, this book explores the underlying theory, mathematics, computational models, and field applications. It uniquely unifies the fields of RI and trust and frames it in a broader context, namely the effective integration of human-autonomous systems. A description of the current state of the art in RI and trust introduces the

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research work in this area. With this foundation, the chapters further elaborate on key research areas and gaps that are at the heart of effective human-systems integration, including workload management, human computer interfaces, team integration and performance, advanced analytics, behavior modeling, training, and, lastly, test and evaluation. Written by international leading researchers from across the field of autonomous systems research, *Robust Intelligence and Trust in Autonomous Systems* dedicates itself to thoroughly examining the challenges and trends of systems that exhibit RI, the fundamental implications of RI in developing trusted relationships with present and future autonomous systems, and the effective human systems integration that must result for trust to be sustained. Contributing authors: David W. Aha,

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Jenny Burke, Joseph Coyne, M.L. Cummings, Munjal Desai, Michael Drinkwater, Jill L. Drury, Michael W. Floyd, Fei Gao, Vladimir Gontar, Ayanna M. Howard, Mo Jamshidi, W.F. Lawless, Kapil Madathil, Ranjeev Mittu, Arezou Moussavi, Gari Palmer, Paul Robinette, Behzad Sadrfaridpour, Hamed Saeidi, Kristin E. Schaefer, Anne Selwyn, Ciara Sibley, Donald A. Sofge, Erin Solovey, Aaron Steinfeld, Barney Tannahill, Gavin Taylor, Alan R. Wagner, Yue Wang, Holly A. Yanco, Dan Zwillinger.

The truth about robots: two experts look beyond the hype, offering a lively and accessible guide to what robots can (and can't) do. There's a lot of hype about robots; some of it is scary and some of it utopian. In this accessible book, two robotics experts reveal the truth about what robots can and



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can't do, how they work, and what we can reasonably expect their future capabilities to be. It will not only make you think differently about the capabilities of robots; it will make you think differently about the capabilities of humans. Ruth Aylett and Patricia Vargas discuss the history of our fascination with robots—from chatbots and prosthetics to autonomous cars and robot swarms. They show us the ways in which robots outperform humans and the ways they fall woefully short of our superior talents. They explain how robots see, feel, hear, think, and learn; describe how robots can cooperate; and consider robots as pets, butlers, and companions. Finally, they look at robots that raise ethical and social issues: killer robots, sexbots, and robots that might be gunning for your job. *Living with Robots* equips readers to look at robots

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concretely—as human-made artifacts rather than placeholders for our anxieties. Find out:

- Why robots can swim and fly but find it difficult to walk
- Which robot features are inspired by animals and insects
- Why we develop feelings for robots
- Which human abilities are hard for robots to emulate

This reference work examines how sophisticated cyber-attacks and innovative use of social media have changed conflict in the digital realm, while new military technologies such as drones and robotic weaponry continue to have an impact on modern warfare.

- Provides fascinating information about cyber weapons that effectively strike through cyberspace to weaken and even cripple its target
- Demonstrates how social media is employed in conflicts in innovative ways, including communication, propaganda, and

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psychological warfare • Explores potential technology avenues related to ensuring the continued military advantages of the United States • Identifies and describes nuclear, precision, and other technological capabilities that have historically been the preserve of superpowers but have been newly acquired by various states

Standard approaches to understanding swarms rely on inspiration from biology and are generally covered by the term “biomimetics”. This book focuses on a different, complementary inspiration, namely physics. The editors have introduced the term 'physicomimetics' to refer to physics-based swarm approaches, which offer two advantages. First, they capture the notion that “nature is lazy”, meaning that physics-based systems always perform the minimal amount

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of work necessary, which is an especially important advantage in swarm robotics. Second, physics is the most predictive science, and can reduce complex systems to simple concepts and equations that codify emergent behavior and help us to design and understand swarms. The editors consolidated over a decade of work on swarm intelligence and swarm robotics, organizing the book into 19 chapters as follows. Part I introduces the concept of swarms and offers the reader a physics tutorial; Part II deals with applications of physicomimetics, in order of increased complexity; Part III examines the hardware requirements of the presented algorithms and demonstrates real robot implementations; Part IV demonstrates how the theory can be used to design swarms from first principles and provides a novel algorithm

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that handles changing environments; finally, Part V shows that physicomimetics can be used for function optimization, moving the reader from issues of swarm robotics to swarm intelligence. The text is supported with a downloadable package containing simulation code and videos of working robots. This book is suitable for talented high school and undergraduate students, as well as researchers and graduate students in the areas of artificial intelligence and robotics.

Legality and Ethicality of Autonomous Weapons

Order and Chaos on the Battlefields of Modernity

Artificial Intelligence and Global Security

Future Trends, Threats and Considerations

Physics-Based Swarm Intelligence

Machine Learning for Cyber Agents

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### Artificial War

This book explores contemporary civil-military relations in the United States. Much of the canonical literature on civil-military relations was either written during or references the Cold War, while other major research focuses on the post-Cold War era, or the first decade of the twenty-first century. A great deal has changed since then. This book considers the implications for civil-military relations of many of these changes. Specifically, it focuses on factors such as breakdowns in democratic and civil-military norms and conventions; intensifying partisanship and deepening political divisions in American society; as well as new technology and the evolving character of armed conflict. Chapters are organized around the principal actors in civil-

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military relations, and the book includes sections on the military, civilian leadership, and the public. It explores the roles and obligations of each. The book also examines how changes in contemporary armed conflict influence civil-military relations. Chapters in this section examine the cyber domain, grey zone operations, asymmetric warfare and emerging technology. The book thus brings the study of civil-military relations into the contemporary era, in which new geopolitical realities and the changing character of armed conflict combine with domestic political tensions to test, if not potentially redefine, those relations. Social insects--ants, bees, termites, and wasps--can be viewed as powerful problem-solving systems with sophisticated collective intelligence. Composed of simple

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interacting agents, this intelligence lies in the networks of interactions among individuals and between individuals and the environment. A fascinating subject, social insects are also a powerful metaphor for artificial intelligence, and the problems they solve--finding food, dividing labor among nestmates, building nests, responding to external challenges--have important counterparts in engineering and computer science. This book provides a detailed look at models of social insect behavior and how to apply these models in the design of complex systems. The book shows how these models replace an emphasis on control, preprogramming, and centralization with designs featuring autonomy, emergence, and distributed functioning. These designs are proving immensely flexible and robust, able to



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adapt quickly to changing environments and to continue functioning even when individual elements fail. In particular, these designs are an exciting approach to the tremendous growth of complexity in software and information. Swarm Intelligence draws on up-to-date research from biology, neuroscience, artificial intelligence, robotics, operations research, and computer graphics, and each chapter is organized around a particular biological example, which is then used to develop an algorithm, a multiagent system, or a group of robots. The book will be an invaluable resource for a broad range of disciplines.

AI, Robots, and Swarms Issues, Questions, and Recommended Studies

"The book I had been waiting for. I can't recommend it

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highly enough." —Bill Gates The era of autonomous weapons has arrived. Today around the globe, at least thirty nations have weapons that can search for and destroy enemy targets all on their own. Paul Scharre, a leading expert in next-generation warfare, describes these and other high tech weapons systems—from Israel's Harpy drone to the American submarine-hunting robot ship Sea Hunter—and examines the legal and ethical issues surrounding their use. "A smart primer to what's to come in warfare" (Bruce Schneier), Army of None engages military history, global policy, and cutting-edge science to explore the implications of giving weapons the freedom to make life and death decisions. A former soldier himself, Scharre argues that we must embrace technology where it

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can make war more precise and humane, but when the choice is life or death, there is no replacement for the human heart.

Digital War

Military Applications of Artificial Intelligence: Ethical Concerns in an Uncertain World

The Military, Society, Politics, and Modern War

Killer Robots

Strategic Stability: Contending Interpretations (Enlarged Edition)

From Natural to Artificial Systems

Multiagent-based Simulation of Combat

Digital War offers a comprehensive overview

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of the impact of digital technologies upon the military, the media, the global public and the concept of 'warfare' itself. This introductory textbook explores the range of uses of digital technology in contemporary warfare and conflict. The book begins with the 1991 Gulf War, which showcased post-Vietnam technological developments and established a new model of close military and media management. It explores how this model was reapplied in Kosovo (1999), Afghanistan (2001) and Iraq (2003), and how, with the

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Web 2.0 revolution, this informational control broke down. New digital technologies allowed anyone to be an informational producer leading to the emergence of a new mode of 'participative war', as seen in Gaza, Iraq and Syria. The book examines major political events of recent times, such as 9/11 and the War on Terror and its aftermath. It also considers how technological developments such as unmanned drones and cyberwar have impacted upon global conflict and explores emerging technologies such as soldier-

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systems, exo-skeletons, robotics and artificial intelligence and their possible future impact. This book will be of much interest to students of war and media, security studies, political communication, new media, diplomacy and IR in general.

"This 50-page report outlines concerns about these fully autonomous weapons, which would inherently lack human qualities that provide legal and non-legal checks on the killing of civilians. In addition, the obstacles to holding anyone accountable for harm caused by the

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weapons would weaken the law's power to deter future violations"--Publisher's website. This book constitutes the refereed proceedings of the 28th Canadian Conference on Artificial Intelligence, Canadian AI 2015, held in Halifax, Nova Scotia, Canada, in June 2015. The 15 regular papers and 12 short papers presented together with 8 papers from the Graduate Student Symposium were carefully reviewed and selected from 81 submissions. The papers are organized in topical sections such as agents, uncertainty

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and games; AI applications; NLP, text and social media mining; data mining and machine learning.

This book explores and analyzes the rapid pace of technological evolution in diplomatic, information, military, and economic sectors, which has contributed to a dynamic international policy environment. Global political stability is greatly influenced by innovations originating from numerous sources, including university labs, the technology sector, and military research.



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Collectively, these innovations guide the movement of people, ideas, and technology that in turn affect the international balance of power. The objective of this volume is to develop new insights into how the proliferation of innovative ideas, low-cost weapons, and dual-use technologies impact the changing global security landscape. Innovative and dual-use technologies can be used for beneficial purposes or defensive purposes. Alternatively they may be appropriated or employed for nefarious

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purposes by hostile military powers and non-state actors alike. Such actions can threaten global security and stability. As the complexity of technological innovations continues to increase, existing control mechanisms such as international regulations and security arrangements may be insufficient to stem the tide of proliferation over time. As such, this works seeks to assess and present policy solutions to curtail the threat to global stability posed by the proliferation of weapons and dual-use technology.

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Drones in Smart-Cities

Platforms and Artificial Intelligence

Robotics, AI, and Humanity

The Early History of the New AI

Mobile, Social, and Sentient Robots

From AI to Robotics

Losing Humanity

Drones in Smart-Cities: Security and Performance is the first book dedicated to drones in smart cities, helping address the many research challenges in bringing UAVs into practice. The book incorporates insights from the latest research in Internet of Things, big data, and cloud

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computing, 5G, and other communication technologies. It examines the design and implementation of UAV, focusing on data delivery, performability, and security. Intended for researchers, engineers, and practitioners, Drones in Smart-Cities: Security and Performance combines the technical aspects with academic theory to help implement the smart city vision around the globe. Addresses UAV and IoT for smart cities applications Examines topics as UAV safety, challenges, localization methods. QoS, simulation tools, and more Collect the relevant knowledge in one resource, saving research time and effort Military robots and other, potentially autonomous robotic systems such as unmanned combat air vehicles (UCAVs)

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and unmanned ground vehicles (UGVs) could soon be introduced to the battlefield. Look further into the future and we may see autonomous micro- and nanorobots armed and deployed in swarms of thousands or even millions. This growing automation of warfare may come to represent a major discontinuity in the history of warfare: humans will first be removed from the battlefield and may one day even be largely excluded from the decision cycle in future high-tech and high-speed robotic warfare. Although the current technological issues will no doubt be overcome, the greatest obstacles to automated weapons on the battlefield are likely to be legal and ethical concerns. Armin Krishnan explores the technological, legal

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and ethical issues connected to combat robotics, examining both the opportunities and limitations of autonomous weapons. He also proposes solutions to the future regulation of military robotics through international law.

The cyber world has been both enhanced and endangered by AI. On the one hand, the performance of many existing security services has been improved, and new tools created. On the other, it entails new cyber threats both through evolved attacking capacities and through its own imperfections and vulnerabilities. Moreover, quantum computers are further pushing the boundaries of what is possible, by making machine learning cyber agents faster

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and smarter. With the abundance of often-confusing information and lack of trust in the diverse applications of AI-based technologies, it is essential to have a book that can explain, from a cyber security standpoint, why and at what stage the emerging, powerful technology of machine learning can and should be mistrusted, and how to benefit from it while avoiding potentially disastrous consequences. In addition, this book sheds light on another highly sensitive area - - the application of machine learning for offensive purposes, an aspect that is widely misunderstood, under-represented in the academic literature and requires immediate expert attention. Collectively working robot teams can solve a problem

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more efficiently than a single robot, while also providing robustness and flexibility to the group. Swarm robotics model is a key component of a cooperative algorithm that controls the behaviors and interactions of all individuals.

The robots in the swarm should have some basic functions, such as sensing, communicating, and monitoring, and satisfy the following properties.

The Scientific Way of Warfare

Conflict in the 21st Century: The Impact of Cyber Warfare, Social Media, and Technology

An Artificial Intelligence Approach to Unmanned X Vehicles

AI 2041



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Designing Self-Organization in the Physical Realm

Issues, Questions, and Recommended Studies

The Case for Killer Robots: Why America's Military Needs to Continue Development of Lethal AI

*Artificial intelligence expert Robert J. Marks investigates the potential military use of lethal AI and examines the practical and ethical challenges. Marks provocatively argues that the development of lethal AI is not only appropriate in today's society-it is unavoidable if America wants to survive and thrive into the future.*

*This book draws inspiration from natural shepherding, whereby a farmer utilizes sheepdogs to herd sheep, to inspire a scalable and inherently human friendly approach*

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*to swarm control. The book discusses advanced artificial intelligence (AI) approaches needed to design smart robotic shepherding agents capable of controlling biological swarms or robotic swarms of unmanned vehicles. These smart shepherding agents are described with the techniques applicable to the control of Unmanned X Vehicles (UxVs) including air (unmanned aerial vehicles or UAVs), ground (unmanned ground vehicles or UGVs), underwater (unmanned underwater vehicles or UUVs), and on the surface of water (unmanned surface vehicles or USVs). This book proposes how smart shepherds could be designed and used to guide a swarm of UxVs to achieve a goal while ameliorating typical communication bandwidth issues that arise in the control of multi agent systems. The book covers*

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*a wide range of topics ranging from the design of deep reinforcement learning models for shepherding a swarm, transparency in swarm guidance, and ontology-guided learning, to the design of smart swarm guidance methods for shepherding with UGVs and UAVs. The book extends the discussion to human-swarm teaming by looking into the real-time analysis of human data during human-swarm interaction, the concept of trust for human-swarm teaming, and the design of activity recognition systems for shepherding. Presents a comprehensive look at human-swarm teaming; Tackles artificial intelligence techniques for swarm guidance; Provides artificial intelligence techniques for real-time human performance analysis. This book constitutes the proceedings of the 12th*

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*International Conference on Swarm Intelligence, ANTS 2020, held online -due to COVID-19- in Barcelona Spain, in October 2020. The 20 full papers presented , together with 8 short papers and 5 extended abstracts were carefully reviewed and selected from 50 submissions. ANTS 2020 contributions are dealing with any aspect of swarm intelligence.*

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*Sentient Robots is a journey into the world of agent-based robotics and it covers a number of interesting topics, both in the theory and practice of the discipline. The book traces the earliest ideas for autonomous machines to the mythical lore of ancient Greece and ends the last chapter with a debate on a prophecy set in the apparent future, where human beings and robots/technology may merge to create superior beings – the era of transhumanism. Throughout the text, the work of leading researchers is presented*

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*in depth, which helps to paint the socio-economic picture of how robots are transforming our world and will continue to do so. This work is presented along with the influences and ideas from futurists, such as Asimov, Moravec, Lem, Vinge, and of course Kurzweil. The book furthers the discussion with concepts of Artificial Intelligence and how it manifests in robotic agents. Discussions across various topics are presented in the book, including control paradigm, navigation, software, multi-robot systems,*

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*swarm robotics, robots in social roles, and artificial consciousness in robots. These discussions help to provide an overall picture of current day agent-based robotics and its prospects for the future. Examples of software and implementation in hardware are covered in Chapter 5 to encourage the imagination and creativity of budding robot enthusiasts. The book addresses several broad themes, such as AI in theory versus applied AI for robots, concepts of anthropomorphism, embodiment and situatedness, extending*



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*theory of psychology and animal behavior to robots, and the proposal that in the future, AI may be the new definition of science. Behavior-based robotics is covered in Chapter 2 and retells the debate between deliberative and reactive approaches. The text reiterates that the effort of modern day robotics is to replicate human-like intelligence and behavior, and the tools that a roboticist has at his or her disposal are open source software, which is often powered by crowd-sourcing. Open source meta-projects, such*

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*as Robot Operating System (ROS), etc. are briefly discussed in Chapter 5. The ideas and themes presented in the book are supplemented with cartoons, images, schematics and a number of special sections to make the material engaging for the reader. Designed for robot enthusiasts – researchers, students, or the hobbyist, this comprehensive book will entertain and inspire anyone interested in the exciting world of robots.*

*Military conflicts, particularly land combat, possess the characteristics of*

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*complex adaptive systems: combat forces are composed of a large number of nonlinearly interacting parts and are organized in a dynamic command-and-control network; local action, which often appears disordered, self-organizes into long-range order; military conflicts, by their nature, proceed far from equilibrium; military forces adapt to a changing combat environment; and there is no master voice that dictates the actions of every soldier (i*  
*This book constitutes the proceedings of*

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*the 11th International Conference on Swarm Intelligence, ANTS 2018, held in Rome, Italy, in October 2018. The 24 full papers and 12 short papers presented in this volume were carefully reviewed and selected from 69 submissions. They are devoted to the field of swarm intelligence as a whole, without any bias towards specific research directions.*

*Artificial intelligence (AI) and platforms are closely related. Most investments in AI, especially in critical technologies, are provided by large platforms. This book*

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*describes how platforms invest in AI and how AI will impact the next generation of competences, following a twofold approach to do so: on the one hand, the book seeks to understand how platforms for investment in intangibles and AI are organized, but on the other hand, it provides a framework to describe how AI will change jobs and competences in the future. Moreover, the book addresses five main themes: 1. platforms, platformization, and the foundations of their business models; 2. artificial intelligence, technological*

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*tendencies, and the policy agenda; 3. artificial intelligence, productivity, and the next generation of competences; 4. artificial intelligence, productivity, and the digital divide; 5. artificial intelligence, ethics, and the post-truth society. The book's content is mostly based on papers presented at the last two installments of the World Conference on Intellectual Capital for Communities. It brings together the views of leading scholars and experts on how artificial intelligence and platformization will*

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***impact competences in the near future.***

***The Case Against Killer Robots***

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