

## Metadata The Mit Press Essential Knowledge Series

Integrating the disparate disciplines of descriptive cataloging, subject cataloging, indexing, and classification, the book adopts a conceptual framework that views the process of organizing information as the use of a special language of description called a bibliographic language. Instant electronic access to digital information is the single most distinguishing attribute of the information age. The elaborate retrieval mechanisms that support such access are a product of technology. But technology is not enough. The effectiveness of a system for accessing information is a direct function of the intelligence put into organizing it. Just as the practical field of engineering has theoretical physics as its underlying base, the design of systems for organizing information rests on an intellectual foundation. The subject of this book is the systematized body of knowledge that constitutes this foundation. Integrating the disparate disciplines of descriptive cataloging, subject cataloging, indexing, and classification, the book adopts a conceptual framework that views the process of organizing information as the use of a special language of description called a bibliographic language. The book is divided into two parts. The first part is an analytic discussion of the intellectual foundation of information organization. The second part moves from generalities to particulars, presenting an overview of three bibliographic languages: work languages, document languages, and subject languages. It looks at these languages in terms of their vocabulary, semantics, and syntax. The book is written in an exceptionally clear style, at a level that makes it understandable to those outside the discipline of library and information science.

Cultural heritage professionals have high levels of training in metadata. However, the institutions in which they practice often depend on support staff, volunteers, and students in order to function. With limited time and funding for training in metadata creation for digital collections, there are often many questions about metadata without a reliable, direct source for answers. The Metadata Manual provides such a resource, answering basic metadata questions that may appear, and exploring metadata from a beginner's perspective. This title covers metadata basics, XML basics, Dublin Core, VRA Core, and CDWA schemes and provides exercise in the creation of metadata. Finally, the book gives an overview of metadata, including mapping and sharing. Outlines the most popular metadata schema written by practicing metadata librarians Focuses on what you "need to know Does not require coding experience to use and understand

The first comprehensive and detailed presentation of techniques for authenticating digital images.

Note about this ebook: This ebook exploits many advanced capabilities with images, hypertext, and interactivity and is optimized for EPUB3-compliant book readers, especially Apple's iBooks and browser plugins. These features may not work on all ebook readers. We organize things. We organize information, information about things, and information about information. Organizing is a fundamental issue in many professional fields, but these fields have only limited agreement in how they approach problems of organizing and in what they seek as their solutions. The Discipline of Organizing synthesizes insights from library science, information science, computer science, cognitive science, systems analysis, business, and other disciplines to create an Organizing System for understanding organizing. This framework is robust and forward-looking, enabling effective sharing of insights and design patterns between disciplines that weren't possible before. The Professional Edition includes new and revised content about the active resources of the "Internet of Things," and how the field of Information Architecture can be viewed as a subset of the discipline of organizing. You'll find: 600 tagged endnotes that connect to one or more of the contributing disciplines Nearly 60 new pictures and illustrations Links to cross-references and external citations Interactive study guides to test on key points The Professional Edition is ideal for practitioners and as a primary or supplemental text for graduate courses on information organization, content and knowledge management, and digital collections. FOR INSTRUCTORS: Supplemental materials (lecture notes, assignments, exams, etc.) are available at <http://disciplineoforganizing.org>. FOR STUDENTS: Make sure this is the edition you want to buy. There's a newer one and maybe your instructor has adopted that one instead.

A critical history of the modern tradition of documentation, tracing the representation of individuals and groups in the form of documents, information, and data.

A concise introduction to the basics of open access, describing what it is (and isn't) and showing that it is easy, fast, inexpensive, legal, and beneficial. The Internet lets us share perfect copies of our work with a worldwide audience at virtually no cost. We take advantage of this revolutionary opportunity when we make our work "open access": digital, online, free of charge, and free of most copyright and licensing restrictions. Open access is made possible by the Internet and copyright-holder consent, and many authors, musicians, filmmakers, and other creators who depend on royalties are understandably unwilling to give their consent. But for 350 years, scholars have written peer-reviewed journal articles for impact, not for money, and are free to consent to open access without losing revenue. In this concise introduction, Peter Suber tells us what open access is and isn't, how it benefits authors and readers of research, how we pay for it, how it avoids copyright problems, how it has moved from the periphery to the mainstream, and what its future may hold. Distilling a decade of Suber's influential writing and thinking about open access, this is the indispensable book on the subject for researchers, librarians, administrators, funders, publishers, and policy makers.

Everything we need to know about metadata, the usually invisible infrastructure for information with which we interact every day. When "metadata" became breaking news, appearing in stories about surveillance by the National Security Agency, many members of the public encountered this once-obscure term from information science for the first time. Should people be reassured that the NSA was "only" collecting metadata about phone calls—information about the caller, the recipient, the time, the duration, the location—and not recordings of the conversations themselves? Or does phone call metadata reveal more than it seems? In this book, Jeffrey Pomerantz offers an accessible and concise introduction to metadata. In the era of ubiquitous computing, metadata has become infrastructural, like the electrical grid or the highway system. We interact with it or generate it every day. It is not, Pomerantz tell us, just "data about data." It is a means by which the complexity of an object is represented in a simpler form. For example, the title, the author, and the cover art are metadata about a book. When metadata does its job well, it fades into the background; everyone (except perhaps the NSA) takes it for granted. Pomerantz explains what metadata is, and why it exists. He distinguishes among different types of metadata—descriptive, administrative, structural, preservation, and use—and examines different users and uses of each type. He discusses the technologies that make modern metadata possible, and he speculates about metadata's future. By the end of the book, readers will see metadata everywhere. Because, Pomerantz warns us, it's metadata's world, and we are just living in it.

An investigation into how specific Web technologies can change the dynamics of organizing and participating in political and social protest.

Discover Digital Libraries: Theory and Practice is a book that integrates both research and practice concerning digital library development, use, preservation, and evaluation. The combination of current research and practical guidelines is a unique strength of this book. The authors bring in-depth expertise on different digital library issues and synthesize theoretical and practical perspectives relevant to researchers, practitioners, and students. The book presents a comprehensive overview of the different approaches and tools for digital library development, including discussions of the social and legal issues associated with digital libraries. Readers will find current research and the best practices of digital libraries, providing both US and international perspectives on the development of digital libraries and their components, including collection, digitization, metadata, interface design, sustainability, preservation, retrieval, and evaluation of digital libraries. Offers an overview of digital libraries and the conceptual and

practical understanding of digital libraries Presents the lifecycle of digital library design, use, preservation and evaluation, including collection development, digitization of static and multimedia resources, metadata, digital library development and interface design, digital information searching, digital preservation, and digital library evaluation Synthesizes current research and the best practices of digital libraries, providing both US and international perspectives on the development of digital libraries Introduces new developments in the area of digital libraries, such as large-scale digital libraries, social media applications in digital libraries, multilingual digital libraries, digital curation, linked data, rapid capture, guidelines for the digitization of multimedia resources Highlights the impact, challenges, suggestions for overcoming these challenges, and trends of present and future development of digital libraries Offers a comprehensive bibliography for each chapter

In this new, authoritative textbook, internationally recognized metadata experts Zeng and Qin have created a comprehensive primer for advanced undergraduate, graduate, or continuing education courses in information organization, information technology, cataloging, digital libraries, electronic archives, and, of course, metadata. Instructors seeking a text that covers the theory as well as the how-to's of application design, implementation, and evaluation will find it here. An outcome-based approach lets learners with different orientations adapt their new knowledge and skills to any domain. Examples and practice problems focus on tasks typical to all metadata application projects. Other useful features include sample problems with solutions, quizzes, hands-on tutorials, and a recommended reading list at the end of each chapter. A companion digital library on CD-ROM for instructors includes quizzes, answer keys, and additional exercises. An ideal classroom tool, this book works equally well for self-guided study. Individual modules can stand alone, for reference on an as-needed basis, when transitioning from traditional cataloging to compilations of metadata for locally created resources and websites, for example. Or you can study metadata systematically, module by module. Regardless of your approach, this book is the ideal guide to metadata for both students and working information professionals.

A philosopher considers whether the scientific and philosophical arguments against free will are reason enough to give up our belief in it. In our daily life, it really seems as though we have free will, that what we do from moment to moment is determined by conscious decisions that we freely make. You get up from the couch, you go for a walk, you eat chocolate ice cream. It seems that we're in control of actions like these; if we are, then we have free will. But in recent years, some have argued that free will is an illusion. The neuroscientist (and best-selling author) Sam Harris and the late Harvard psychologist Daniel Wegner, for example, claim that certain scientific findings disprove free will. In this engaging and accessible volume in the Essential Knowledge series, the philosopher Mark Balaguer examines the various arguments and experiments that have been cited to support the claim that human beings don't have free will. He finds them to be overstated and misguided. Balaguer discusses determinism, the view that every physical event is predetermined, or completely caused by prior events. He describes several philosophical and scientific arguments against free will, including one based on Benjamin Libet's famous neuroscientific experiments, which allegedly show that our conscious decisions are caused by neural events that occur before we choose. He considers various religious and philosophical views, including the philosophical pro-free-will view known as compatibilism. Balaguer concludes that the anti-free-will arguments put forward by philosophers, psychologists, and neuroscientists simply don't work. They don't provide any good reason to doubt the existence of free will. But, he cautions, this doesn't necessarily mean that we have free will. The question of whether we have free will remains an open one; we simply don't know enough about the brain to answer it definitively.

An introduction to annotation as a genre--a synthesis of reading, thinking, writing, and communication--and its significance in scholarship and everyday life. Annotation--the addition of a note to a text--is an everyday and social activity that provides information, shares commentary, sparks conversation, expresses power, and aids learning. It helps mediate the relationship between reading and writing. This volume in the MIT Press Essential Knowledge series offers an introduction to annotation and its literary, scholarly, civic, and everyday significance across historical and contemporary contexts. It approaches annotation as a genre--a synthesis of reading, thinking, writing, and communication--and offer examples of annotation that range from medieval rubrication and early book culture to data labeling and online reviews.

A new way of thinking about data science and data ethics that is informed by the ideas of intersectional feminism. Today, data science is a form of power. It has been used to expose injustice, improve health outcomes, and topple governments. But it has also been used to discriminate, police, and surveil. This potential for good, on the one hand, and harm, on the other, makes it essential to ask: Data science by whom? Data science for whom? Data science with whose interests in mind? The narratives around big data and data science are overwhelmingly white, male, and techno-heroic. In *Data Feminism*, Catherine D'Ignazio and Lauren Klein present a new way of thinking about data science and data ethics—one that is informed by intersectional feminist thought. Illustrating data feminism in action, D'Ignazio and Klein show how challenges to the male/female binary can help challenge other hierarchical (and empirically wrong) classification systems. They explain how, for example, an understanding of emotion can expand our ideas about effective data visualization, and how the concept of invisible labor can expose the significant human efforts required by our automated systems. And they show why the data never, ever “speak for themselves.” *Data Feminism* offers strategies for data scientists seeking to learn how feminism can help them work toward justice, and for feminists who want to focus their efforts on the growing field of data science. But *Data Feminism* is about much more than gender. It is about power, about who has it and who doesn't, and about how those differentials of power can be challenged and changed.

What is metadata and what do I need to know about it? These are two key questions for the information professional operating in the digital age as more and more information resources are available in electronic format. This is a thought-provoking introduction to metadata written by one of its leading advocates. It assesses the current theory and practice of metadata and examines key developments - including global initiatives and multilingual issues - in terms of both policy and technology. Subjects discussed include: What is metadata? definitions and concepts Retrieval environments: web; library catalogues; documents and records management; GIS; e-Learning Using metadata to enhance retrieval: pointing to content; subject retrieval; language control and indexing Information management issues: interoperability; information security; authority control; authentication and legal admissibility of evidence; records management and document lifecyc? preservation issues Application of metadata to information management: document and records management; content management systems for the internet Managing metadata: how to develop a schema Standards development: Dublin Core; UK Government metadata standards (eGIF); IFLA FRBR Model for cataloguing resources Looking forward: the semantic web; the Web Ontology Working Group. Readership: This book will be essential reading for network-oriented librarians and information workers in all sectors and for LIS students. In addition, it will provide useful background reading for computer staff supporting information services. Publishers, policy makers and practitioners in other curatorial traditions such as museums work or archiving will also find much of relevance.

How a flexible and creative approach to intellectual property can help an organization accomplish goals ranging from building market share to expanding an industry. Most managers leave intellectual property issues to the legal department, unaware that an organization's intellectual property can help accomplish a range of management goals, from accessing new markets to improving existing products to generating new revenue streams. In this book, intellectual property expert and Harvard Law School professor John Palfrey offers a short briefing on intellectual property strategy for corporate managers and nonprofit administrators. Palfrey argues for strategies that go beyond the traditional highly restrictive “sword and shield” approach, suggesting that flexibility and creativity are essential to a profitable long-term intellectual property strategy—especially in an era of changing attitudes about media. Intellectual property, writes Palfrey, should be considered a key strategic asset class. Almost every organization has an intellectual property portfolio of some value and therefore the need for an intellectual property strategy. A brand, for example, is an important form of intellectual property, as is any information managed

and produced by an organization. Palfrey identifies the essential areas of intellectual property—patent, copyright, trademark, and trade secret—and describes strategic approaches to each in a variety of organizational contexts, based on four basic steps. The most innovative organizations employ multiple intellectual property approaches, depending on the situation, asking hard, context-specific questions. By doing so, they achieve both short- and long-term benefits while positioning themselves for success in the global information economy.

An account of the emergence of the mind: how the brain acquired self-awareness, functional autonomy, the ability to think, and the power of speech. How did the human mind emerge from the collection of neurons that makes up the brain? How did the brain acquire self-awareness, functional autonomy, language, and the ability to think, to understand itself and the world? In this volume in the Essential Knowledge series, Zoltan Torey offers an accessible and concise description of the evolutionary breakthrough that created the human mind. Drawing on insights from evolutionary biology, neuroscience, and linguistics, Torey reconstructs the sequence of events by which *Homo erectus* became *Homo sapiens*. He describes the augmented functioning that underpins the emergent mind—a new (“off-line”) internal response system with which the brain accesses itself and then forms a selection mechanism for mentally generated behavior options. This functional breakthrough, Torey argues, explains how the animal brain’s “awareness” became self-accessible and reflective—that is, how the human brain acquired a conscious mind. Consciousness, unlike animal awareness, is not a unitary phenomenon but a composite process. Torey’s account shows how protolanguage evolved into language, how a brain subsystem for the emergent mind was built, and why these developments are opaque to introspection. We experience the brain’s functional autonomy, he argues, as free will. Torey proposes that once life began, consciousness had to emerge—because consciousness is the informational source of the brain’s behavioral response. Consciousness, he argues, is not a newly acquired “quality,” “cosmic principle,” “circuitry arrangement,” or “epiphenomenon,” as others have argued, but an indispensable working component of the living system’s manner of functioning.

Taking “Gangnam Style” seriously: what Internet memes can tell us about digital culture. In December 2012, the exuberant video “Gangnam Style” became the first YouTube clip to be viewed more than one billion times. Thousands of its viewers responded by creating and posting their own variations of the video—“Mitt Romney Style,” “NASA Johnson Style,” “Egyptian Style,” and many others. “Gangnam Style” (and its attendant parodies, imitations, and derivations) is one of the most famous examples of an Internet meme: a piece of digital content that spreads quickly around the web in various iterations and becomes a shared cultural experience. In this book, Limor Shifman investigates Internet memes and what they tell us about digital culture. Shifman discusses a series of well-known Internet memes—including “Leave Britney Alone,” the pepper-spraying cop, LOLCats, Scumbag Steve, and Occupy Wall Street’s “We Are the 99 Percent.” She offers a novel definition of Internet memes: digital content units with common characteristics, created with awareness of each other, and circulated, imitated, and transformed via the Internet by many users. She differentiates memes from virals; analyzes what makes memes and virals successful; describes popular meme genres; discusses memes as new modes of political participation in democratic and nondemocratic regimes; and examines memes as agents of globalization. Memes, Shifman argues, encapsulate some of the most fundamental aspects of the Internet in general and of the participatory Web 2.0 culture in particular. Internet memes may be entertaining, but in this book Limor Shifman makes a compelling argument for taking them seriously.

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A visionary report on the revitalization of the liberal arts tradition in the electronically inflected, design-driven, multimedia language of the twenty-first century. *Digital Humanities* is a compact, game-changing report on the state of contemporary knowledge production. Answering the question “What is digital humanities?,” it provides an in-depth examination of an emerging field. This collaboratively authored and visually compelling volume explores methodologies and techniques unfamiliar to traditional modes of humanistic inquiry—including geospatial analysis, data mining, corpus linguistics, visualization, and simulation—to show their relevance for contemporary culture. Written by five leading practitioner-theorists whose varied backgrounds embody the intellectual and creative diversity of the field, *Digital Humanities* is a vision statement for the future, an invitation to engage, and a critical tool for understanding the shape of new scholarship.

This highly practical handbook teaches you how to unlock the value of your existing metadata through cleaning, reconciliation, enrichment and linking and how to streamline the process of new metadata creation. Libraries, archives and museums are facing up to the challenge of providing access to fast growing collections whilst managing cuts to budgets. Key to this is the creation, linking and publishing of good quality metadata as Linked Data that will allow their collections to be discovered, accessed and disseminated in a sustainable manner. This highly practical handbook teaches you how to unlock the value of your existing metadata through cleaning, reconciliation, enrichment and linking and how to streamline the process of new metadata creation. Metadata experts Seth van Hooland and Ruben Verborgh introduce the key concepts of metadata standards and Linked Data and how they can be practically applied to existing metadata, giving readers the tools and understanding to achieve maximum results with limited resources. Readers will learn how to critically assess and use (semi-)automated methods of managing metadata through hands-on exercises within the book and on the accompanying website. Each chapter is built around a case study from institutions around the world, demonstrating how freely available tools are being successfully used in different metadata contexts. This handbook delivers the necessary conceptual and practical understanding to empower practitioners to make the right decisions when making their organisations resources accessible on the Web. Key topics include: - The value of metadata Metadata creation – architecture, data models and standards - Metadata cleaning - Metadata reconciliation - Metadata enrichment through Linked Data and named-entity recognition - Importing and exporting metadata - Ensuring a sustainable publishing model. Readership: This will be an invaluable guide for metadata practitioners and researchers within all cultural heritage contexts, from library cataloguers and archivists to museum curatorial staff. It will also be of interest to students and academics within information science and digital humanities fields. IT managers with responsibility for information systems, as well as strategy heads and budget holders, at cultural heritage organisations, will find this a valuable decision-making aid.

A concise history of GPS, from its military origins to its commercial applications and ubiquity in everyday life. GPS is ubiquitous in everyday life. GPS mapping is standard equipment in many new cars and geolocation services are embedded in smart phones. GPS makes Uber and Lyft possible; driverless cars won’t be able to drive without it. In this volume in the MIT Press Essential Knowledge series, Paul Ceruzzi offers a concise history of GPS, explaining how a once-obscure space technology became an invisible piece of our infrastructure, as essential to modern life as electric power or clean water. GPS relays precise time and positioning information from orbiting satellites to receivers on the ground, at sea, and in the air. It operates worldwide, and its basic signals are free, although private companies can commodify the data provided. Ceruzzi recounts the origins of GPS and its predecessor technologies, including early aircraft navigation systems and satellites. He describes the invention of GPS as a space technology in the post-Apollo, pre-Space Shuttle years and its first military and commercial uses. Ceruzzi explains how the convergence of three major technological developments—the microprocessor, the Internet, and cellular telephony—enabled the development and application of GPS technology. Recognizing the importance of satellite positioning systems in a shifting geopolitical landscape—and perhaps doubting U.S. assurances of perpetual GPS availability—other countries are now building or have already developed their own systems, and Ceruzzi reports on these efforts in the European Union, Russia, India, China, and Japan.

The book as object, as content, as idea, as interface. What is the book in a digital age? Is it a physical object containing pages encased in covers? Is it a portable device that gives us access to entire

libraries? The codex, the book as bound paper sheets, emerged around 150 CE. It was preceded by clay tablets and papyrus scrolls. Are those books? In this volume in the MIT Press Essential Knowledge series, Amaranth Borsuk considers the history of the book, the future of the book, and the idea of the book. Tracing the interrelationship of form and content in the book's development, she bridges book history, book arts, and electronic literature to expand our definition of an object we thought we knew intimately. Contrary to the many reports of its death (which has been blamed at various times on newspapers, television, and e-readers), the book is alive. Despite nostalgic paeans to the codex and its printed pages, Borsuk reminds us, the term "book" commonly refers to both medium and content. And the medium has proved to be malleable. Rather than pinning our notion of the book to a single form, Borsuk argues, we should remember its long history of transformation. Considering the book as object, content, idea, and interface, she shows that the physical form of the book has always been the site of experimentation and play. Rather than creating a false dichotomy between print and digital media, we should appreciate their continuities.

An introduction to the mind–body problem, covering all the proposed solutions and offering a powerful new one. Philosophers from Descartes to Kripke have struggled with the glittering prize of modern and contemporary philosophy: the mind-body problem. The brain is physical. If the mind is physical, we cannot see how. If we cannot see how the mind is physical, we cannot see how it can interact with the body. And if the mind is not physical, it cannot interact with the body. Or so it seems. In this book the philosopher Jonathan Westphal examines the mind-body problem in detail, laying out the reasoning behind the solutions that have been offered in the past and presenting his own proposal. The sharp focus on the mind-body problem, a problem that is not about the self, or consciousness, or the soul, or anything other than the mind and the body, helps clarify both problem and solutions. Westphal outlines the history of the mind-body problem, beginning with Descartes. He describes mind-body dualism, which claims that the mind and the body are two different and separate things, nonphysical and physical, and he also examines physicalist theories of mind; antimaterialism, which proposes limits to physicalism and introduces the idea of qualia; and scientific theories of consciousness. Finally, Westphal examines the largely forgotten neutral monist theories of mind and body, held by Ernst Mach, William James, and Bertrand Russell, which attempt neither to extract mind from matter nor to dissolve matter into mind. Westphal proposes his own version of neutral monism. This version is unique among neutral monist theories in offering an account of mind-body interaction.

What happens when people turn their everyday experience into data: an introduction to the essential ideas and key challenges of self-tracking. People keep track. In the eighteenth century, Benjamin Franklin kept charts of time spent and virtues lived up to. Today, people use technology to self-track: hours slept, steps taken, calories consumed, medications administered. Ninety million wearable sensors were shipped in 2014 to help us gather data about our lives. This book examines how people record, analyze, and reflect on this data, looking at the tools they use and the communities they become part of. Gina Neff and Dawn Nafus describe what happens when people turn their everyday experience—in particular, health and wellness-related experience—into data, and offer an introduction to the essential ideas and key challenges of using these technologies. They consider self-tracking as a social and cultural phenomenon, describing not only the use of data as a kind of mirror of the self but also how this enables people to connect to, and learn from, others. Neff and Nafus consider what's at stake: who wants our data and why; the practices of serious self-tracking enthusiasts; the design of commercial self-tracking technology; and how self-tracking can fill gaps in the healthcare system. Today, no one can lead an entirely untracked life. Neff and Nafus show us how to use data in a way that empowers and educates. Why cloud computing represents a paradigm shift for business, and how business users can best take advantage of cloud services. Most of the information available on cloud computing is either highly technical, with details that are irrelevant to non-technologists, or pure marketing hype, in which the cloud is simply a selling point. This book, however, explains the cloud from the user's viewpoint—the business user's in particular. Nayan Ruparelia explains what the cloud is, when to use it (and when not to), how to select a cloud service, how to integrate it with other technologies, and what the best practices are for using cloud computing. Cutting through the hype, Ruparelia cites the simple and basic definition of cloud computing from the National Institute of Science and Technology: a model enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources. Thus with cloud computing, businesses can harness information technology resources usually available only to large enterprises. And this, Ruparelia demonstrates, represents a paradigm shift for business. It will ease funding for startups, alter business plans, and allow big businesses greater agility. Ruparelia discusses the key issues for any organization considering cloud computing: service level agreements, business service delivery and consumption, finance, legal jurisdiction, security, and social responsibility. He introduces novel concepts made possible by cloud computing: cloud cells, or specialist clouds for specific uses; the personal cloud; the cloud of things; and cloud service exchanges. He examines use case patterns in terms of infrastructure and platform, software information, and business process; and he explains how to transition to a cloud service. Current and future users will find this book an indispensable guide to the cloud.

An accessible introduction to the artificial intelligence technology that enables computer vision, speech recognition, machine translation, and driverless cars. Deep learning is an artificial intelligence technology that enables computer vision, speech recognition in mobile phones, machine translation, AI games, driverless cars, and other applications. When we use consumer products from Google, Microsoft, Facebook, Apple, or Baidu, we are often interacting with a deep learning system. In this volume in the MIT Press Essential Knowledge series, computer scientist John Kelleher offers an accessible and concise but comprehensive introduction to the fundamental technology at the heart of the artificial intelligence revolution. Kelleher explains that deep learning enables data-driven decisions by identifying and extracting patterns from large datasets; its ability to learn from complex data makes deep learning ideally suited to take advantage of the rapid growth in big data and computational power. Kelleher also explains some of the basic concepts in deep learning, presents a history of advances in the field, and discusses the current state of the art. He describes the most important deep learning architectures, including autoencoders, recurrent neural networks, and long short-term networks, as well as such recent developments as Generative Adversarial Networks and capsule networks. He also provides a comprehensive (and comprehensible) introduction to the two fundamental algorithms in deep learning: gradient descent and backpropagation. Finally, Kelleher considers the future of deep learning—major trends, possible developments, and significant challenges.

An introduction to paradoxes showing that they are more than mere puzzles but can prompt new ways of thinking. Thinkers have been fascinated by paradox since long before Aristotle grappled with Zeno's. In this volume in The MIT Press Essential Knowledge series, Margaret Cuonzo explores paradoxes and the strategies used to solve them. She finds that paradoxes are more than mere puzzles but can prompt new ways of thinking. A paradox can be defined as a set of mutually inconsistent claims, each of which seems true. Paradoxes emerge not just in salons and ivory towers but in everyday life. (An Internet search for "paradox" brings forth a picture of an ashtray with a "no smoking" symbol inscribed on it.) Proposing solutions, Cuonzo writes, is a natural response to paradoxes. She invites us to rethink paradoxes by focusing on strategies for solving them, arguing that there is much to be learned from this, regardless of whether any of the more powerful paradoxes is even capable of solution. Cuonzo offers a catalog of paradox-solving strategies—including the Preemptive-Strike (questioning the paradox itself), the Odd-Guy-Out (calling one of the assumptions into question), and the You-Can't-Get-There-from-Here (denying the validity of the reasoning). She argues that certain types of solutions work better in some contexts than others, and that as paradoxicality increases, the success of certain strategies grows more unlikely. Cuonzo shows that the processes of paradox generation and solution proposal are interesting and important ones. Discovering a paradox leads to advances in knowledge: new science often

stems from attempts to solve paradoxes, and the concepts used in the new sciences lead to new paradoxes. As Niels Bohr wrote, “How wonderful that we have met with a paradox. Now we have some hope of making progress.”

A short, informal account of our ever-increasing dependence on a complex multiplicity of messages, records, documents, and data. We live in an information society, or so we are often told. But what does that mean? This volume in the MIT Press Essential Knowledge series offers a concise, informal account of the ways in which information and society are related and of our ever-increasing dependence on a complex multiplicity of messages, records, documents, and data. Using information in its everyday, nonspecialized sense, Michael Buckland explores the influence of information on what we know, the role of communication and recorded information in our daily lives, and the difficulty (or ease) of finding information. He shows that all this involves human perception, social behavior, changing technologies, and issues of trust. Buckland argues that every society is an “information society”; a “non-information society” would be a contradiction in terms. But the shift from oral and gestural communication to documents, and the wider use of documents facilitated by new technologies, have made our society particularly information intensive. Buckland describes the rising flood of data, documents, and records, outlines the dramatic long-term growth of documents, and traces the rise of techniques to cope with them. He examines the physical manifestation of information as documents, the emergence of data sets, and how documents and data are discovered and used. He explores what individuals and societies do with information; offers a basic summary of how collected documents are arranged and described; considers the nature of naming; explains the uses of metadata; and evaluates selection methods, considering relevance, recall, and precision.

The first textbook to present a comprehensive and detailed economic analysis of electricity markets, analyzing the tensions between microeconomics and political economy. The power industry is essential in our fight against climate change. This book is the first to examine in detail the microeconomics underlying power markets, stemming from peak-load pricing, by which prices are low when the installed generation capacity exceeds demand but can rise a hundred times higher when demand is equal to installed capacity. The outcome of peak-load pricing is often difficult to accept politically, and the book explores the tensions between microeconomics and political economy. Understanding peak-load pricing and its implications is essential for designing robust policies and making sound investment decisions. Thomas-Olivier Léautier presents the model in its simplest form, and introduces additional features as different issues are presented. The book covers all segments of electricity markets: electricity generation, under perfect and imperfect competition; retail competition and demand response; transmission pricing, transmission congestion management, and transmission constraints; and the current policy issues arising from the entry of renewables into the market and capacity mechanisms. Combining anecdotes and analysis of real situations with rigorous analytical modeling, each chapter analyzes one specific issue, first presenting findings in nontechnical terms accessible to policy practitioners and graduate students in management or public policy and then presenting a more mathematical analytical exposition for students and researchers specializing in the economics of electricity markets and for those who want to understand and apply the underlying models.

A historical and ethnographic study of the conflict between global transportation and rural development as the two intersect at the Panama Canal. In this innovative book, Ashley Carse traces the water that flows into and out from the Panama Canal to explain how global shipping is entangled with Panama's cultural and physical landscapes. By following container ships as they travel downstream along maritime routes and tracing rivers upstream across the populated watershed that feeds the canal, he explores the politics of environmental management around a waterway that links faraway ports and markets to nearby farms, forests, cities, and rural communities. Carse draws on a wide range of ethnographic and archival material to show the social and ecological implications of transportation across Panama. The Canal moves ships over an aquatic staircase of locks that demand an enormous amount of fresh water from the surrounding region. Each passing ship drains 52 million gallons out to sea—a volume comparable to the daily water use of half a million Panamanians. Infrastructures like the Panama Canal, Carse argues, do not simply conquer nature; they rework ecologies in ways that serve specific political and economic priorities. Interweaving histories that range from the depopulation of the U.S. Canal Zone a century ago to road construction conflicts and water hyacinth invasions in canal waters, the book illuminates the human and nonhuman actors that have come together at the margins of the famous trade route. 2014 marks the 100th anniversary of the Panama Canal. *Beyond the Big Ditch* calls us to consider how infrastructures are materially embedded in place, producing environments with winners and losers.

A concise introduction to the emerging field of data science, explaining its evolution, relation to machine learning, current uses, data infrastructure issues, and ethical challenges. The goal of data science is to improve decision making through the analysis of data. Today data science determines the ads we see online, the books and movies that are recommended to us online, which emails are filtered into our spam folders, and even how much we pay for health insurance. This volume in the MIT Press Essential Knowledge series offers a concise introduction to the emerging field of data science, explaining its evolution, current uses, data infrastructure issues, and ethical challenges. It has never been easier for organizations to gather, store, and process data. Use of data science is driven by the rise of big data and social media, the development of high-performance computing, and the emergence of such powerful methods for data analysis and modeling as deep learning. Data science encompasses a set of principles, problem definitions, algorithms, and processes for extracting non-obvious and useful patterns from large datasets. It is closely related to the fields of data mining and machine learning, but broader in scope. This book offers a brief history of the field, introduces fundamental data concepts, and describes the stages in a data science project. It considers data infrastructure and the challenges posed by integrating data from multiple sources, introduces the basics of machine learning, and discusses how to link machine learning expertise with real-world problems. The book also reviews ethical and legal issues, developments in data regulation, and computational approaches to preserving privacy. Finally, it considers the future impact of data science and offers principles for success in data science projects.

The goal of machine learning is to program computers to use example data or past experience to solve a given problem. Many successful applications of machine learning exist already, including systems that analyze past sales data to predict customer behavior, optimize robot behavior so that a task can be completed using minimum resources, and extract knowledge from bioinformatics data. *Introduction to Machine Learning* is a comprehensive textbook on the subject, covering a broad array of topics not usually included in introductory machine learning texts. Subjects include supervised learning; Bayesian decision theory; parametric, semi-parametric, and nonparametric methods; multivariate analysis; hidden Markov models; reinforcement learning; kernel machines; graphical models; Bayesian estimation; and statistical testing. Machine learning is rapidly becoming a skill that computer science students must master before graduation. The third edition of *Introduction to Machine Learning* reflects this shift, with added support for beginners, including selected solutions for exercises and additional example data sets (with code available online). Other substantial changes include discussions of outlier detection; ranking algorithms for perceptrons and support vector machines; matrix decomposition and spectral methods; distance estimation; new kernel algorithms; deep learning in multilayered perceptrons; and the nonparametric approach to Bayesian methods. All learning algorithms are explained so that students can easily move from the equations in the book to a computer program. The book can be used by both advanced undergraduates and graduate students. It will also be of interest to professionals who are concerned with the application of machine learning methods.

An accessible guide to the ideas and technologies underlying such applications as GPS, Google Maps, Pokémon Go, ride-sharing, driverless cars, and drone surveillance. Billions of people around the globe use various applications of spatial computing daily—by using a ride-sharing app, GPS, the e911 system, social media check-ins, even Pokémon Go. Scientists and researchers use spatial computing to track diseases, map the bottom of the oceans, chart the behavior of endangered species, and create election maps in real time. Drones and driverless

cars use a variety of spatial computing technologies. Spatial computing works by understanding the physical world, knowing and communicating our relation to places in that world, and navigating through those places. It has changed our lives and infrastructures profoundly, marking a significant shift in how we make our way in the world. This volume in the MIT Essential Knowledge series explains the technologies and ideas behind spatial computing. The book offers accessible descriptions of GPS and location-based services, including the use of Wi-Fi, Bluetooth, and RFID for position determination out of satellite range; remote sensing, which uses satellite and aerial platforms to monitor such varied phenomena as global food production, the effects of climate change, and subsurface natural resources on other planets; geographic information systems (GIS), which store, analyze, and visualize spatial data; spatial databases, which store multiple forms of spatial data; and spatial statistics and spatial data science, used to analyze location-related data.

Doing Meta-Analysis with R: A Hands-On Guide serves as an accessible introduction on how meta-analyses can be conducted in R. Essential steps for meta-analysis are covered, including calculation and pooling of outcome measures, forest plots, heterogeneity diagnostics, subgroup analyses, meta-regression, methods to control for publication bias, risk of bias assessments and plotting tools. Advanced but highly relevant topics such as network meta-analysis, multi-three-level meta-analyses, Bayesian meta-analysis approaches and SEM meta-analysis are also covered. A companion R package, dmetar, is introduced at the beginning of the guide. It contains data sets and several helper functions for the meta and metafor package used in the guide. The programming and statistical background covered in the book are kept at a non-expert level, making the book widely accessible. Features • Contains two introductory chapters on how to set up an R environment and do basic imports/manipulations of meta-analysis data, including exercises • Describes statistical concepts clearly and concisely before applying them in R • Includes step-by-step guidance through the coding required to perform meta-analyses, and a companion R package for the book

The idea of technological singularity, and what it would mean if ordinary human intelligence were enhanced or overtaken by artificial intelligence. The idea that human history is approaching a “singularity”—that ordinary humans will someday be overtaken by artificially intelligent machines or cognitively enhanced biological intelligence, or both—has moved from the realm of science fiction to serious debate. Some singularity theorists predict that if the field of artificial intelligence (AI) continues to develop at its current dizzying rate, the singularity could come about in the middle of the present century. Murray Shanahan offers an introduction to the idea of the singularity and considers the ramifications of such a potentially seismic event. Shanahan's aim is not to make predictions but rather to investigate a range of scenarios. Whether we believe that singularity is near or far, likely or impossible, apocalypse or utopia, the very idea raises crucial philosophical and pragmatic questions, forcing us to think seriously about what we want as a species. Shanahan describes technological advances in AI, both biologically inspired and engineered from scratch. Once human-level AI—theoretically possible, but difficult to accomplish—has been achieved, he explains, the transition to superintelligent AI could be very rapid. Shanahan considers what the existence of superintelligent machines could mean for such matters as personhood, responsibility, rights, and identity. Some superhuman AI agents might be created to benefit humankind; some might go rogue. (Is Siri the template, or HAL?) The singularity presents both an existential threat to humanity and an existential opportunity for humanity to transcend its limitations. Shanahan makes it clear that we need to imagine both possibilities if we want to bring about the better outcome.

In addition to providing students with a solid foundation in library management, with its structured, practical knowledge this impressive volume will also benefit experienced managers.

The first book on the philosophy and aesthetics of digital preservation examines the challenge posed by new media to our long-term social memory. How will our increasingly digital civilization persist beyond our lifetimes? Audio and videotapes demagnetize; CDs delaminate; Internet art links to websites that no longer exist; Amiga software doesn't run on iMacs. In *Re-collection*, Richard Rinehart and Jon Ippolito argue that the vulnerability of new media art illustrates a larger crisis for social memory. They describe a variable media approach to rescuing new media, distributed across producers and consumers who can choose appropriate strategies for each endangered work. New media art poses novel preservation and conservation dilemmas. Given the ephemerality of their mediums, software art, installation art, and interactive games may be heading to obsolescence and oblivion. Rinehart and Ippolito, both museum professionals, examine the preservation of new media art from both practical and theoretical perspectives, offering concrete examples that range from Nam June Paik to *Danger Mouse*. They investigate three threats to twenty-first-century creativity: technology, because much new media art depends on rapidly changing software or hardware; institutions, which may rely on preservation methods developed for older mediums; and law, which complicates access with intellectual property constraints such as copyright and licensing. Technology, institutions, and law, however, can be enlisted as allies rather than enemies of ephemeral artifacts and their preservation. The variable media approach that Rinehart and Ippolito propose asks to what extent works to be preserved might be medium-independent, translatable into new mediums when their original formats are obsolete.

Complete with an updated bibliography pointing readers to essential books, articles, and web documents for deeper learning, in its new second edition this volume cements its relevance to current practitioners and students.

A concise and accessible guide to techniques for detecting doctored and fake images in photographs and digital media. Stalin, Mao, Hitler, Mussolini, and other dictators routinely doctored photographs so that the images aligned with their messages. They erased people who were there, added people who were not, and manipulated backgrounds. They knew if they changed the visual record, they could change history. Once, altering images required hours in the darkroom; today, it can be done with a keyboard and mouse. Because photographs are so easily faked, fake photos are everywhere—supermarket tabloids, fashion magazines, political ads, and social media. How can we tell if an image is real or false? In this volume in the MIT Press Essential Knowledge series, Hany Farid offers a concise and accessible guide to techniques for detecting doctored and fake images in photographs and digital media. Farid, an expert in photo forensics, has spent two decades developing techniques for authenticating digital images. These techniques model the entire image-creation process in order to find the digital disruption introduced by manipulation of the image. Each section of the book describes a different technique for analyzing an image, beginning with those requiring minimal technical expertise and advancing to those at intermediate and higher levels. There are techniques for, among other things, reverse image searches, metadata analysis, finding image imperfections introduced by JPEG compression, image cloning, tracing pixel patterns, and detecting images that are computer generated. In each section, Farid describes the techniques, explains when they should be applied, and offers examples of image analysis.

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