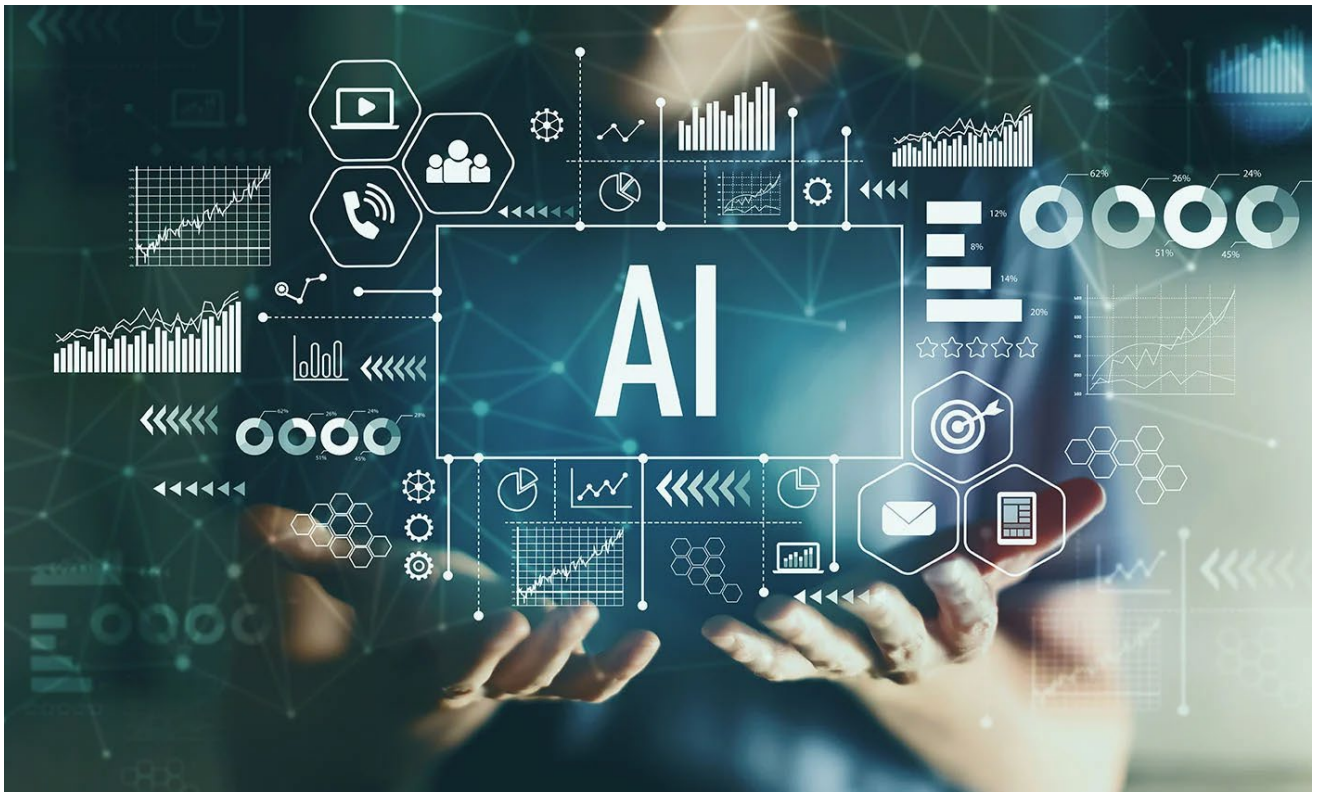
Editorial Overview

Introduction: Artificial Intelligence in Libraries

Ray Uzwyshyn, ruzwyshyn@txstate.edu
Texas State University Libraries



AI in Libraries and Education, Tierney, Courtesy Adobe Stock

Introduction

The world is changing, and technological paradigms of AI are quickly being adopted in the world of libraries and information management. With a newly approved 2022 IFLA Special Interest Group in AI, this issue introduces libraries and information professionals around the globe engaging with these new leading-edge AI IT paradigms. This issue of *Trends and Issues in Library Technology's* AI brings together authors, researchers, and practitioners. Articles range from general to high level introductions to algorithmic overviews, AI projects and AI histories. All articles focus through a lens of libraries and information management. The issue also overviews intersectional similarities among learning, libraries and education environments. There are new possibilities for educating next generations of information professionals into AI paradigms. Thematic AI topics range from the role of data and metadata for AI model training to machine learning. Larger roles are also being played by national libraries in opening possibilities through natural language processing, harnessing large datasets for AI and new collaboration possibilities with associated supercomputing centers.

Conversion to BIBFRAME triples is also contextualized and detailed. National library perspectives can act as a gateway towards helping semantic web-linking and future AI harnessing possibilities. Complex AI -related projects surrounding online audio-visual archives are also overviewed. These explore the potential of AI, speech recognition and natural language processing. Global linguistic online archives can now improve search and retrieval mechanisms to create higher information quality audio-visual archives.

Important, but often overlooked topics of AI, information professionals and ethics are also examined from perspectives of AI ethics scenarios. Scenarios may be both teaching tools for information professionals but also developmental contexts for system designers. AI ethics scenarios help organizations think more widely about social implications of the currently occurring AI revolution.

All of these articles together create a vibrant picture of AI's future possibilities and challenges for libraries and

information centers. From these perspectives, our special issue's authors need to be lauded. They have written insightful historic overviews, but also taken up the pragmatic new challenge of AI. This ranges from the algorithmic and programmatic to larger project management challenges and current new ethical questions arising from AI technologies' sea change in technological paradigms affecting information professions.

Articles, Authors, and Global AI Perspectives

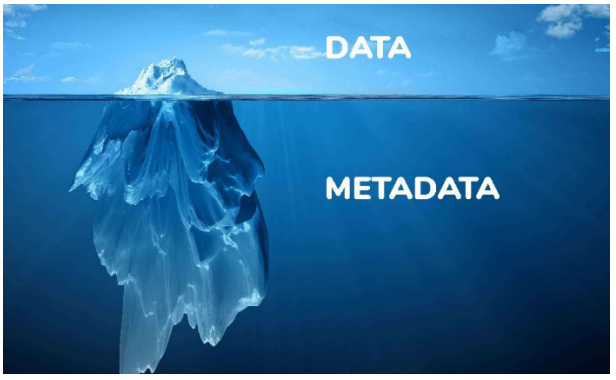
Juja Chakarova begins this special issue of TILT with a broad historical overview of AI beginning with Aristotle's logic and then refocusing Arnold Toynbee's original definition of 'Industrial Revolution'. Toynbee first employed the term 'Industrial Revolution' in the 19th Century and Chakarova frames Toynbee's characterization within historical phases of industrial revolutions (IR, 1-4) She traces these through the last two centuries to our present era and AI.

Chakarova's overview then sets the stage for the twentieth century AI luminaries from Alan Turing to John McCarthy and Douglas Hofstadter. Current AI definitions, subfields, ethical considerations, and futures for libraries are also explored. Chakarova speculates that the fourth Industrial Revolution will combine physical, digital, and biological worlds enabling quantum computing, robotics, cyber physical systems and artificial intelligence. According to Chakarova, we have somewhat unwittingly already entered this fourth IR AI phase.

Following Chakarova, Lynn Kleinveldt continues focusing this historical optic on AI within present necessary parameters of teaching, learning and libraries. Kleinveldt advocates that library must now add 'Algorithmic (AI) Literacy' to more well-known library literacy areas of 'information' and 'digital literacies'. This will empower 'Generation AI' with these new and necessary interdisciplinary competencies.

In her article, Kleinveldt offers a compelling list of rationales for the necessity of AI literacy in larger digital and information literacy curricula in academic libraries, higher education and learning environments. Kleinveldt argues for the library as a natural third place for a previously lost interdisciplinarity in traditional compartmentalized curricula. 'Algorithmic' Literacy should be organically added to the 'information' and 'digital' literacies already taken up by libraries to fill other gaps. Kleinveldt eloquently forwards imperatives of adding algorithmic AI literacy both to Gen AI library schools (i.e., 'i-Schools') and Information Science curriculums. Higher educational institutions need to be taking up these new cyber-physical (robotics), network and artificial intelligence paradigms through academic library interdisciplinary third space curricular perspectives.

The next two articles shift angles and move us to pragmatically realized projects. They approach libraries and AI from fundamentally important but different angles of data and metadata.



Data, Metadata and AI Ecosystems

Providing data and metadata in suitable formats is a primary need for AI. This ranges from the training samples needed for 'Machine Learning and Deep Learning' to large scale 'Natural Language Processing'.

In their article on 'Digital Transformation, Data Reuse and Heritage Collections at the National Library of Spain', Elena Sánchez Nogales, Alicia Pastrana García and José Carlos Cerdán Medina provide excellent overviews of the National Library of Spain's' (BNE) work in these areas. Nogales, Garcia, and Medina focus on novel forms of institutional cooperation and the new BNElab's work to promote the use and reuse of the national library's (BNE's) resources. This ranges from data, metadata and digital resources hosting to open licenses for Spanish public sector data. These are all needed for areas such as machine learning and artificial intelligence.

Nogales, Garcia, and Medina's article also focuses on the Spanish Web Archive as a training ground for AI-based Natural Language Processing models. The National Library of Spain has partnered with the Barcelona Supercomputing Center to train Spanish language models using a supercomputer. The most powerful supercomputer in Spain (*MareNostrum*) is utilized to clean massive WARC data sets. Nogales, Garcia, and Medina detail their fascinating project journey and its use of neural network technology based on Transformer (previously used for the English language natural language processing). Transformer is now trained and refocused towards Spanish datasets to create an AI model that can understand Spanish vocabulary, expression and writing rules on expert levels. The model called *MarIA* can also understand abstract concepts and infer word meaning from usage contexts. The project is a milestone in the application of artificial intelligence for the Spanish language and a great example of library/supercomputing centers collaboration and use and reuse of large datasets.

Equally foundational, Marcelo Lorca, of the National Congress of Chile, presents an important and detailed set of programmatic steps of the National Library of Chile's

transition from MARC records to BIBFRAME. Converting to BIBFRAME fundamentally improves bibliographic data by integrating it with and enabling it for other data resources on the semantic web. Specifically, BIBFRAME opens future AI possibilities for the data now recategorized within triples. The BIBFRAME format allows conversion of traditional library catalogue records towards compatible semantic web formats which can further be linked to each other and other web resources. Lorca details the National Chilean Library's path through these challenges and possibilities on deep programmatic levels. Both projects will be interesting to follow as other national libraries follow and/or remix and continue to develop these AI/Metadata and new data formatting-centered paths.

The potential of AI Natural Language Processing, data and Machine Learning is also explored further in Malliari's, Nitsos, Zapounidou and Doropoulos', 'OAVA, Open Audio-Visual Archives', an ambitious project to develop a new Greek audio-visual archive (OAVA), aggregator.
Through the project, the largely Greek universities group explores the potential of AI to create a better search and retrieval mechanism for Greek language and related audio-visual material. The application of deep learning AI Models are applied to large Greek audio-visual datasets. Algorithms are trained and developed to perform speech recognition from Greek and English audio-visual datasets. This AI centered project serves to develop a better search mechanism. This occurs through both previous aggregate audio-visual metadata and the audio-visual materials' newly speech-recognized linguistic Greek and English content. Similar to the National Library of Spain's natural language processing models and training for Spanish on WARC files (Web Archive Files), the Greek group utilizes AI NLP techniques on audio-visual Greek and Greek-related material. This use of AI Natural Language Processing potential creates better searchable content through speech recognition processing of audiovisual material. The deep programmatic complexity and algorithmic detail of the project speaks for itself. Like other keystones presented here, the project makes strong headway into less trodden pathways. The future modelling potential is for other linguistic-focused audio-visual aggregators from various other national libraries and country global language centers to follow and continue to develop these models.

Rounding out the spectrum of AI papers, Andrew Cox, from the University of Sheffield, UK, approaches the topic from a different but equally important angle. Cox reflects in his article on largely overlooked ethical valences of artificial intelligence and advocates towards the necessity and importance of thinking about ethics for information professionals and information management.

Cox begins considerations with an overview of various important ethical parameters to which artificial intelligence's newer realized branch of computer science heralds.

Ethics Scenarios for AI, Andrew Cox

Cox then advances notions of the utility of AI-related ethical scenarios for thinking through complex ethical implications of AI systems. He puts forward a set of ethics-based AI case studies which may be utilized as forms of model curricula for teaching new information professionals. These may also be used as a useful point of departure for organizations beginning to think seriously about implications of AI design and implementation. AI systems have necessary ethical considerations for libraries and in this work Cox provides further links to eight well developed AI ethics scenarios as springboards and example for further reflection and discussion.

Conclusions

Together, this 2022 issue's grouping is a stellar constellation of leading edge AI library articles illuminating where information management professionals are taking AI. The articles also give an excellent indication of future possibilities, challenges and areas necessary for further development.

We have come a far way from the ancient Library of Alexandria's *kata-logos* (list of words), but our AI programs still find ancient antecedent with the logic of Aristotle. Our organization and training of new AI Deep Learning-models is largely in the global Cloud now, but we are also a global village that may reap the benefits from this shared environment.

We must now work and network together to solve these future AI challenges for the betterment of our global community. It is our duty to continue to help move the ancient '*kata-logos*' forward and continue to transform archives of information and data into insight, knowledge and hopefully wisdom towards future generations and our collective good.

The future does await but we build in the present. The shadows of our collective past infrastructures remain. This issue's content hopefully provides an inspirational glimpse of the future in this global grouping of excellent articles which follow.