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How To Teach Integrated AI-Driven Technologies in Journalism (A guideline of journalism teaching based on a review of research and teaching experiences)

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ABSTRAK

This article explores various research projects and international teaching experiences that introduce AI within journalism education based on six international academic events addressing AI across three areas of communication: research, professional context, and university teaching. The insights, projects, and teaching initiatives obtained approach AI from two angles: a critical perspective that examines the social consequences of its use in the media context, and an applied perspective focusing on training journalism students in data collection and processing, automated content creation, and content verification. Despite the scarcity of research and teaching initiatives, this study provides methods to incorporate AI into journalism and communication curricula. This includes adopting a critical perspective that considers media practices while addressing the educational challenges posed by AI technology.

Penelitian ini mengeksplorasi berbagai proyek penelitian dan pengalaman pengajaran internasional yang memperkenalkan kecerdasan buatan dalam pembelajaran jurnalisme mengacu pada enam seminar internasional tentang kecerdasan buatan dalam tiga bidang ilmu komunikasi, yaitu: penelitian, paraktisi profesional, dan pengajaran di perguruan tinggi. Pendekatan pembelajaran jurnalis berbasis teknologi kecerdasan buatan melalui: perspektif kritis yang berfokus pada aktifitas jurnalis dalam konteks media, dan perspektif terapan yang berfokus pada pelatihan mahasiswa jurnalisme dalam pengumpulan dan pemrosesan data, pembuatan konten otomatis, dan verifikasi konten. Meskipun penelitian dan inisiatif pengajaran masih langka, penelitian ini memberikan metode untuk mengintegrasikan kecerdasan buatan ke dalam kurikulum tentang jurnalis dalam program ilmu komunikasi

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INTRODUCTION

AI has rapidly expanded since the mid-2000s in academia and industry (Crawford, 2021). It encompasses technologies enabling computers to perform tasks requiring human intelligence (Beckett, 2019). AI refers to systems that show intelligent behaviour, analysing their environment and acting autonomously, such as performing repetitive tasks, finding data patterns, or predicting climate change (European Commission, 2020). Subfields like machine learning and natural language processing (NLP) are continuously developing. Over time, what is considered AI may change (Gunkel, 2020).

Public institutions like the European Commission and universities are working to introduce AI in various areas, alongside company narratives and lobbying, especially in the UK, which can lead to ineffective political responses to ADM systems' human rights implications. AI, derived from technology and human input, can serve the common good, like Bernstein's algorithm detecting labour exploitation, or be used destructively (O'Neill, 2016).

Reports from Journalism AI at The London School of Economics highlight AI's growing significance in journalism, leading to "computational journalism" which automates information generation (Coddington, 2015). AI is expected to transform work structures, news flow, user relationships, and tasks related to content collection, production, and distribution. It will promote the use of augmented reality, drones, voice recognition, and wearables (Beckett, 2019), and modify epistemic standards due to technology's impact on responsibilities (Golder, Reich, and Miller, 2020).

Given the media's demand for AI training (Beckett, 2019) and the absence of AI in authors university (UMLB) communication degree curricula, authors have been decided to design an integrated AI-driven technologies into journalism training.

AI technologies significantly impact journalism, enabling algorithms to collect, analyze, classify data, and personalize news feeds (Coddington, 2015; Zamith, 2019; McAdams, 2019). Terms like computational, algorithmic, robot, or augmented journalism highlight this shift (Marconi, 2020). These changes require skills in arithmetic, precision, and basic statistics (McAdams, 2019). Unlike other fields, journalism focuses on creating, verifying, and communicating knowledge based on values like honesty, research, and fairness (Lewis, 2019).

Algorithmic journalism uses semi-automatic natural language generation (NLG) to create informative texts from public databases. These systems are cost-

effective, generate news in multiple languages, and reach broader audiences. For example, Narrativa produces eighteen thousand articles weekly about different soccer leagues for news portals like MSN and El Confidencial (Marconi, 2020).

AI enables story discovery, presentation, monetization, classification, topic detection, video analysis, content personalization, data analysis, trend identification, format automation, reader insights, and optimized content distribution (Cohen et al., 2011; Marconi, 2020; Neuman, 2021). Small journalistic companies, facing AI adoption challenges (Goleatz, Bear, and Katzenbach, 2018), are keen on AI to enhance efficiency, content relevance, and develop content generation, labeling, recommendation, and personalization tools (Beckett, 2019).

Algorithms mediate media consumption, interactions, and social relations, changing journalism on three levels. Firstly, algorithmic journalism sees the audience as automated and quantifiable through big data (Anderson, 2013), though it's unclear how people are grouped (Gandi, 2021). Secondly, AI automates source selection, content review, writing, and distribution, making journalists' roles more indirect, acting as "gatekeepers" (Köor, 2015; Walles, 2018 in Zamith, 2019). Lastly, algorithms perform tasks like subtitling videos and classifying photos, activities now automated by facial recognition, replacing media workers (López de Quintana, 2021).

Media adoption of AI faces challenges like financial constraints, knowledge gaps, cultural resistance, job loss fears, habit change resistance, hostility to new tech, and lack of strategic management knowledge. Literacy and training are key, focusing on six areas: 1. Understanding AI in journalism; 2. Coding and model generation skills; 3. Advanced AI skills for innovation; 4. AI management uses; 5. Ethics to reduce bias and improve reliability; 6. General AI knowledge for better societal understanding (Beckett, 2019). Current literature offers perspectives on AI in journalism but lacks comprehensive research and teaching initiatives. This work aims to fill that gap.

This work aims to identify ways to introduce AI in communication studies, particularly journalism training. Building on previous works that highlight innovative teaching experiences (García Galera et al., 2021; Marinho & Sánchez García, 2021; Martínez Nicolás, 2016; Solkin, 2020), we identified teaching methods that incorporate AI in journalism education. We also agree with Nahon (2021) on the importance of academic research in shaping AI education in universities.

METHODOLOGY

Fieldwork from March to October 2021 involved a systematic and integrative literature review (Torraco, 2005), also called a meta-narrative (Xiau, Watson, 2019). This review identifies, synthesizes, and generates frameworks from the literature. We searched WOS, SCOPUS, ERIC databases, and Google Scholar for academic papers on AI in journalism education using search terms like “artificial intelligence and journalism education,” “automated journalism and education,” “data journalism and education,” “journalism and education,” and “robot journalism and education.”

Given the lack of academic papers on AI in journalism education, and agreeing with Nahon (2021) on the importance of research in this area, we searched for projects on AI and communication. To gain more perspectives, we attended six academic events in 2021 discussing AI in communication sectors: (1) IPRA's webinar on AI in PR; (2) "Histories of AI" by Digital Labour Research Lab and University of Cambridge; (3) SEDIC's XXII Seminar on AI and information professionals; (4) Oscar H. Gandi's conference on algorithmic manipulation by Oregon Humanities Centre; (5) ECREA's conference on digital native communicators training; (6) Congress on AI and the future of journalism by the Portuguese EU presidency.

RESULT

In response to increasing online educational initiatives by universities introducing AI, we found teaching experiences integrating this technology in journalism education and research projects on AI and communication. Our review proposes a typology differentiating critical and applied perspectives. Critical initiatives address AI's social consequences, while applied initiatives focus on training students in data processing, content automation, and content verification for journalistic activities.

Teaching experiences

Gordon and Lule (2019) from Lehigh University teach the Media & Society course, which is designed to introduce journalism students to the crucial role that artificial intelligence (AI) plays in modern media. This course underscores the importance of understanding AI just as thoroughly as students study traditional television and digital media. The instructors provide tangible examples of AI-powered platforms like Google, Amazon, and Netflix, alongside voice assistants such as Pandora and music services like Spotify.

In their structured curriculum, Gordon and Lule offer a comprehensive working definition of AI, explaining it as the simulation of human intelligence by machines. They also delve into the

historical timeline of AI's development, tracing its evolution from its early conceptual stages to its current state. This historical perspective helps students appreciate the rapid advancements and the transformative impact of AI on the media industry.

Further, the course provides an overview of the different types of AI, including machine learning, natural language processing, and neural networks. This foundational knowledge equips students with an understanding of how these technologies operate and how they are applied in various media contexts.

Moreover, Gordon and Lule address the ethical challenges posed by AI, such as concerns about privacy, bias, and the potential for misuse. By highlighting these issues, the instructors aim to foster a critical mindset in students, encouraging them to think deeply about the implications of AI on society and the media landscape.

The overarching goal of the course is to spark curiosity and enthusiasm among students about AI. By presenting AI in a relatable and accessible manner, Gordon and Lule hope to inspire future journalists to explore and innovate with AI technologies, ultimately preparing them to navigate and contribute to the evolving media environment (Friedman, 2019).

Dupagne (2019) advocates for integrating AI studies into journalism departments through a comprehensive course that examines the strengths, weaknesses, ethical considerations, and practical applications of AI in communication. The primary objective of this course is to familiarize students with the intricate relationship between AI and the media, with a particular focus on its impact on journalism.

To achieve this, Dupagne suggests incorporating a diverse range of educational resources, including notable works by Broussard and Diakopoulos. Additionally, the course would benefit from Gerrish's "How Smart Machines Think" (2018), which provides valuable case studies, such as the functioning of Netflix's recommendation system. These resources would not only offer theoretical insights but also practical examples that resonate with students, helping them understand the real-world implications of AI in the media landscape.

Through this course, students would gain a nuanced understanding of how AI technologies are reshaping journalistic practices, from content creation and distribution to audience engagement and ethical dilemmas. The curriculum aims to equip future journalists with the knowledge and skills needed to navigate and leverage AI advancements effectively, preparing them to contribute meaningfully to the evolving field of journalism.

In a course titled "Algorithmic Culture," taught by Sandvigm (2016), students are encouraged to critically examine the intersection of algorithms and culture. This course is rooted in a critical perspective, aiming to provide students with a comprehensive understanding of both domains. The primary learning method involves posing thought-provoking questions about how algorithms influence and shape cultural practices. This approach is designed to help students develop an informed and nuanced stance on the intellectual debates surrounding the emergence and application of AI technologies.

Throughout the course, students explore the historical and theoretical foundations of algorithmic culture, delving into key concepts and frameworks that inform current discussions. They engage with a variety of scholarly texts and case studies that highlight the multifaceted impact of algorithms on cultural production, consumption, and interpretation. By examining these materials, students are encouraged to critically analyze the ethical, social, and political implications of AI technologies in contemporary society.

An essential component of the course involves establishing connections between future developments in algorithmic culture and existing intellectual frameworks. Students are tasked with identifying how emerging AI technologies might influence cultural practices and examining the potential consequences of these changes. This reflective exercise enables students to envision the trajectory of algorithmic culture and consider its broader impact on society.

To solidify their understanding and foster critical thinking, students are required to write a research article as part of their coursework. This assignment prompts them to investigate specific aspects of AI technologies, such as their role in media production, user interactions, or societal perceptions. Through this research, students are expected to articulate their insights on the complexities and challenges posed by the integration of AI in cultural contexts.

Overall, Sandvigm's course on "Algorithmic Culture" provides students with a robust framework to critically engage with the evolving landscape of AI and its cultural ramifications. By fostering an environment of inquiry and analysis, the course equips students with the intellectual tools necessary to navigate and contribute to the ongoing debates about the role of algorithms in shaping our cultural reality.

Westlund and Lewis (2017) present a compelling argument that the introduction and utilization of AI mark a significant shift for journalism educators. In addition to

traditional methods of accessing and processing information, students must now learn to navigate and employ automated processes performed by "actants" or AI algorithms. This technological shift redefines the way information is generated and produced, particularly through the automation of text generation based on quantifiable data, such as sports results.

According to Westlund and Lewis, the role of AI in journalism aligns with an applied perspective. They highlight that the diminishing need for human intervention in editing tasks is due to the capabilities of technological actants to adapt headlines, filters, and videos for various platforms. This evolution necessitates that future journalists become proficient in using Content Management Systems (CMS) across different platforms to publish their content effectively.

The researchers emphasize the importance of equipping journalism students with the skills to harness AI technology. They argue that understanding and utilizing AI tools is crucial for the modern journalist, who must adapt to the rapidly changing media landscape. By mastering these automated processes, journalists can enhance their efficiency, accuracy, and overall effectiveness in content creation and distribution.

In essence, Westlund and Lewis (2017) advocate for a paradigm shift in journalism education, where the integration of AI technology becomes a fundamental component. Their perspective underscores the need for educational curricula to evolve, ensuring that journalism students are well-prepared to navigate and thrive in an industry increasingly shaped by AI advancements. This applied approach not only equips students with practical skills but also prepares them to contribute innovatively to the future of journalism.

Building on their insights, teachers suggest that journalism educators should aim to achieve four primary objectives to adapt to the changing landscape brought about by AI and digital transformation. Firstly, Understanding Online Information Dissemination: Educators should ensure that students comprehend the mechanisms of online information dissemination. This includes mastering search engine optimization (SEO) to enhance the visibility of content on search engines and social media optimization (SMO) to effectively utilize social media platforms for distributing news. By understanding these digital tools, students can better navigate and utilize the online environment to reach wider audiences. Secondly, Reevaluating Journalistic Ideals and Norms: It is crucial for educators to reassess and potentially redefine the journalistic ideals and norms they impart. This involves questioning traditional attitudes such as

professional control, which may hinder innovation within the profession. By fostering a mindset that embraces change and innovation, educators can prepare students to be more adaptable and open to new methods and technologies in journalism. Thirdly, Collaborating with Technological Actors: The focus of journalism education should shift from viewing journalists solely as individuals who edit and process news to a collaborative approach where students work alongside technological actors. This means integrating AI tools and technologies in the news production process, allowing students to create content that is tailored for a variety of platforms. By collaborating with these technological entities, students can produce more versatile and platform-specific news content. Lastly, Emphasizing Information Distribution: In the digital age, the distribution of information has evolved significantly. News companies are no longer confined to proprietary and analog platforms but have expanded to encompass a wide spectrum of digital destinations. Educators should emphasize the importance of understanding this transformation and teach students how to effectively distribute content across multiple digital channels. This involves leveraging various digital platforms to ensure that news reaches diverse and widespread audiences.

By focusing on these four objectives, journalism educators can equip students with the skills and knowledge necessary to thrive in an industry that is increasingly influenced by AI and digital technologies. This approach not only prepares students to embrace and utilize new tools but also encourages a more innovative and adaptive mindset that is essential for the future of journalism.

Collection and processing of data

The concept of AI is inherently tied to algorithms, which in turn depend on databases. Algorithms are essentially lifeless and meaningless until they are connected to databases where they can perform their functions (Guillespie, 2014). With the rise of "big data," journalists must proficiently use statistics, as news generation now heavily relies on numerical calculations (Nguyen and Lugo Ocando, 2016).

In data journalism, mastering four core skills is essential for producing insightful and impactful stories. Journalists need to adeptly search for and find relevant documents and data, understanding various data sources and using advanced search techniques. They must understand data structures and perform data cleaning, ensuring accuracy and consistency by recognizing different data formats and using data cleaning tools and techniques.

Data analysis is crucial, requiring proficiency in spreadsheets, databases, mapping software, and visualization tools to interpret and present data effectively. Lastly, learning advanced statistical methods, such as regression analysis and hypothesis testing, enables journalists to draw meaningful insights from data, ensuring their findings are robust and based on sound statistical principles.

Therefore, teaching data journalism involves guiding students through the process of identifying and obtaining relevant data. Educators must instruct students on how to select, clean, and prepare data for analysis. Additionally, students should learn to create visual stories that integrate graphics and data to convey information in an engaging and accessible manner.

By mastering these competencies, future journalists will be well-equipped to produce well-researched, insightful, and visually appealing stories that resonate with their audiences. This comprehensive approach to data journalism education ensures that students are prepared to navigate and leverage the growing importance of data in the media landscape (Berret & Phillips, 2019; Sercan, 2021).

Data journalism is notably absent in Spanish universities (López López, 2019) and limited in the US (Berret & Phillips, 2019) and Australia (Davies and Cullen, 2016). Among the 113 accredited programs in the AEJMC, only eleven offer courses in emerging areas like drones and virtual reality. Most programs focus on teaching spreadsheet use, statistical concepts, and data visualization using tools like Tableau and Google Fusion (Berret & Phillips, 2019). Students learn to use a range of tools, including: Spreadsheets like Excell; data visualization tools: Tableau, Piktochart, Infogram, Datawrapper, Easel.ly, Gephi, Silobreaker, Venngage, Visually; Text mining programs: Leximancer, Text mining software, TerMine; data cleaning tools: Open Refine, Google Refine, Data cleaning; qualitative data analysis programs: Nvivo; map adaptation tools: Google MyMaps, Mapbox, Mapstory; trend identification tools: Google Trends; data scraping programs: Kimono, OutWitHub Pro; timeline and story mapping tools: KnightLab; news aggregators and trend maps: Twitter aggregator (Davis and Cullen, 2016).

Some educational programs cover geospatial analytics, combining data sets like education level and election results using tools like QGIS, ArcGIS, or Carto. For visual analysis, they use Tableau or Power BI (Lewis, 2019). Sercan (2021) suggests managing data with Excel, Google Fusion Tables, Tabule, and Wordle, and

creating visualizations with Google Charts, Piktochart, Tableau Public, Gephi, Timeline, Infogram, and Adobe Illustrator.

At Auckland University of Technology and New Zealand University, educators designed a comprehensive research project to help students acquire essential data management skills by investigating the impact of lotteries on impoverished communities in New Zealand. The project aimed to equip students with practical experience in data access, cleaning, and analysis.

To prepare for the project, students first received rigorous training in key areas such as Excel, data analysis, and data visualization. These foundational classes provided them with the necessary skills to handle complex data sets and draw meaningful insights from them.

Once the groundwork was laid, students embarked on the research project, applying their newly acquired skills in a real-world context. They used spreadsheets to organize and manipulate data, ensuring accuracy and consistency. Additionally, they employed web-based trend visualization tools such as Google Fusion Tables and Datawrapper to create informative and visually appealing representations of their findings.

Throughout the project, students not only honed their technical skills but also developed a deeper understanding of the socio-economic issues surrounding games of chance and their effects on vulnerable communities. This hands-on experience was invaluable in helping them bridge the gap between theoretical knowledge and practical application, preparing them to tackle complex data-driven challenges in their future careers.

Hewett (2016) emphasized the importance of continuous self-assessment for students in their journey to become proficient data journalists. To achieve this, students were required to maintain blogs and contribute to a collaborative website, documenting their progress and evolution in the field of data journalism. This ongoing self-reflection allowed students to articulate how data analysis had been instrumental in crafting their reports and to demonstrate their ability to critically analyze data journalism pieces.

The training module designed by Hewett aimed to equip students with a comprehensive understanding of data journalism. The curriculum was structured around several key objectives. Firstly, students were taught how to find compelling stories within datasets. This involved not only locating relevant data but also recognizing the potential narratives that could be derived from it.

Secondly, the module focused on helping students understand the structure and context of data. This included learning

how to interpret various data formats and grasping the contextual factors that could influence the data's meaning and implications. By developing this understanding, students could approach data with a more informed perspective.

Thirdly, data cleaning and analysis were critical components of the training. Students learned techniques for cleaning data to ensure its accuracy and reliability. They were also trained in various analytical methods, enabling them to process and draw meaningful insights from the data. This analytical proficiency was crucial for transforming raw data into coherent and informative stories.

Finally, the module emphasized the importance of generating stories from data. Students were encouraged to use their analytical findings to craft well-structured and engaging narratives. This process involved not only writing but also incorporating visual elements such as charts, graphs, and infographics to enhance the storytelling.

By the end of the training module, students had developed a robust skill set that allowed them to navigate the complexities of data journalism. They were equipped to find and interpret data, clean and analyze it, and generate compelling stories that resonated with their audiences. Through continuous self-assessment and practical application, students could reflect on their growth and identify areas for further improvement, ensuring a comprehensive and dynamic learning experience.

Kashyap and Bhaskaran (2020) propose a comprehensive approach to integrating data teaching into journalism education by outlining three key actions designed to equip students with essential skills: using public databases for research projects to help students understand societal issues and apply data analysis in a meaningful context; engaging in community-based projects to emphasize the importance of relevant data and audience understanding, thereby exposing students to the complexities and ethical considerations of data collection; and teaching coding and database management skills using programming languages like R, Python, or JavaScript, along with tools such as Ruby on Rails or MySQL, to enhance data literacy and enable students to handle large datasets and perform complex analyses.

By following these three lines of action, Kashyap and Bhaskaran's approach aims to create a robust framework for data journalism education. This framework not only equips students with technical skills but also instills in them an understanding of the ethical and social implications of their work. Through practical projects and real-world applications, students learn to

appreciate the power of data in storytelling and the positive impact it can have on their communities. This holistic approach ensures that future journalists are well-prepared to navigate the evolving landscape of data-driven journalism.

Automated creation

In a workshop at "The Tow Center for Digital Journalism" at Columbia Journalism School, students learned to create text with videos using two AI tools: Automated Insights and Wibbitz. Automated Insights transforms data into narratives through natural language generation (NLG), creating dynamic templates to convert structured data into articles. Wibbitz uses image recognition to create videos. Representatives from both tools provided an overview, answered questions, and offered suggestions for improving automatically generated content. Although students were interested in these tools and quickly learned to use them, some expressed concerns about their cost.

Jones (2018) aimed to teach final-year journalism students about bot creation using the free Flow XO platform, highlighting the benefits of incorporating accessible tech tools into university teaching (Gómez-Diago, 2014). The goal was to familiarize students with the technology, enhancing their skill set for future employment. Jones prepared a guide detailing the steps to configure accounts and add commands. Students focused on the "small talk" option, which helps develop responses to various user queries.

Liao, Wang, and Wu (2019) noted that, due to the inability to train students in the complex mathematics needed to design machine learning algorithms, they focused instead on practical API (Application Programming Interface) skills for cloud computing. They developed an elective course titled “API, ML, and AI,” where students were taught the basics of AI taxonomy and machine learning concepts. Additionally, students learned to use various tools such as Tableau Public, GitHub, Python Anywhere, Jupyter Online, Digital Ocean, AWS, and GitHub Student.

In Körner's (2019) course, students worked in teams to create a Twitterbot, gaining their first programming experiences and experimenting with different coding programs to understand the possibilities and limitations of Twitterbots. They also explored concepts such as big data, algorithms, artificial intelligence, algorithmic authority, bias, responsibility, transparency, and literacy. Each student wrote an individual essay on AI's impact on the media.

After the course, students expressed a strong interest in learning to program. Guilmor (2016) believes all journalists should take at least one JavaScript course to

communicate with programmers and understand basic coding principles. Similarly, Körner (2019) advocates for including computational skills in the journalism curriculum to prepare students for the current media landscape.

Royal (2017) highlights that programming skills enable students to better understand media platforms and create more meaningful stories using data and visualizations. By using code to retrieve data, insert it into a spreadsheet, and create visualizations, students can share powerful visual stories. Royal (2017) also suggests using programming interfaces (APIs) from services like Twitter, Facebook, and Spotify to retrieve data for journalism purposes.

Gunkel (2020) emphasizes the importance of human-centered algorithm-based communication in his teaching. He introduces students to AI through videos and texts that cover fundamental concepts of the technology. By engaging in practical exercises, students develop basic computer skills, learn about algorithms, and understand how they function. Students are taught to write simple algorithms in JavaScript and build basic translation algorithms. Gunkel also instructs them on programming a chatbot to grasp the basics of natural language processing (NLP). Furthermore, he guides them in creating a natural language generation (NLG) template to produce song lyrics. This comprehensive approach equips students with essential skills and knowledge to navigate the world of AI and algorithms.

From both an applied and critical perspective, Diakopoulos (2013) suggests analyzing algorithms using the reverse engineering model (Gehl, 2014). This model involves rigorously identifying a system's specifications through knowledge, observation, and deduction. Diakopoulos emphasizes the importance of extensive testing to effectively integrate AI teaching in journalism studies. He also highlights the necessity of educating students on "algorithmic responsibility," which includes understanding: the criteria algorithms use for prioritizing, classifying, and emphasizing information. the data that serves as inputs to the algorithms. the error rates of the algorithms. the training data for the algorithms and potential biases. And the definitions or thresholds set by the algorithms.

Diakopoulos' course, “Computational Journalism,” delves into the conceptualization and practical application of computational methods in journalism. Students explore how computational techniques are revolutionizing journalistic practices, including data collection, content curation, meaning, presentation, dissemination, and analysis. The course includes hands-on tasks that students apply

in journalistic contexts, focusing on news automation, data mining, visual analysis, platform utilization, and the exercise of both algorithmic and ethical responsibility.

Given the intricate nature of algorithms, Diakopoulos (2013) emphasizes the critical role journalists play in ensuring information transparency. He argues that just as business journalists help the public understand financial data, journalists will be essential in framing, contextualizing, and explaining algorithmic information. They will participate in algorithmic accountability by conducting interviews and document reviews that delve into the motives and design intentions behind algorithms. This ensures that the public receives clear and comprehensible information on how algorithms function and their broader implications.

Content verification

One of AI's lines of action is news checking, an increasingly relevant activity in an environment in which the ease of publishing content has exponentially multiplied false content.

The European Commission's high-level expert group (HLEG), in its 2018 report on "fake news," emphasizes the critical need for journalists to have access to technological tools to tackle misinformation. Similarly, the European Union, in its 2018 document "Communication on the fight against online disinformation," highlights the importance of leveraging AI to combat disinformation effectively.

While AI tools are employed to detect fake news, the creation of most "deep-fakes" — videos that depict fake images, usually of someone's face — relies on AI. The algorithm searches for instances where two people have similar expressions and overlays one face onto the other. Marconi and Daldrup (2010) suggest three methods to identify fake videos: examining the source, finding previous versions of the video, and closely inspecting the video. Luttrell, Wallace, McCollough, and Lee (2020) advocate for using AI tools in educational settings to help students verify information. They argue that although Millennials and Generation Z are digital natives, they often lack awareness of the professional applications available to them and a critical understanding of how digital platforms operate.

Wardle and Derachsan (2017), as cited in Vukić (2020), argue that the term "fake news" fails to capture the complexity of certain types of information. They suggest referring to these as misinformation and bad information. To analyze the veracity of information, they emphasize the importance of focusing on three phases: Creation, Production, and Distribution, along with three key elements: Agent,

Message, and Interpreter. These components play crucial roles in the information production process and must be considered to ensure the accuracy and reliability of the content.

Orsoz (2017) proposes that AI-related content be integrated across all subjects in journalism studies. Specifically, the researcher recommends teaching students to use various information verification tools and to download and configure browser extensions for data verification. Additionally, Orsoz suggests that students should collaboratively reflect on the criteria these tools use for verification, fostering a deeper understanding of their application and effectiveness.

In an effort to introduce journalism students to the use of AI for content verification, Veglis, Maniou, and Panagiotou (2019) implemented an activity where students used the TruthNest app to examine the Twitter accounts of European Union political leaders for ten days. Each student was randomly assigned two political leaders. After completing the analysis, students discussed with their teacher the variables the tool used to determine content authenticity. These variables included publication frequency, weekly activity, hashtags used, users mentioned, users retweeted, tweet content, websites mentioned, network size, update frequency, important followers, suspicious followers, retweets received, and profiles with similar names.

CONCLUSION

AI challenges university journalism education on three levels: epistemological, theoretical and ethical, and pragmatic. Epistemologically, AI technologies act as sources and receivers of information, necessitating research on interactions between humans and machines. Theoretically and ethically, there is a need to contribute to the profession's redefinition. Pragmatically, the gap between media demands and journalism education must be bridged. Expanding the communication studies curriculum to include programming skills and critical engagement with technology from social sciences and humanities perspectives is essential. Placing humans at the centre of AI discourse and promoting unique human can shift journalists' roles to facilitators and connectors. To renew journalism, integrating AI in education, teaching data processing, automated content creation, content verification, and algorithmic responsibility is crucial. This ensures students are equipped to participate in designing virtual environments that shape societal relationships.

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