AI & the Future Workforce of Museums

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Introduction

Artificial Intelligence (AI), one of the top ten IT & Technology Buzzwords in 2019, has become ubiquitous in today's world with a more crystallized concept.[1] Its image, to the public, is no longer only the self-driving car, robot, or other somewhat futuristic application. Instead it is often portrayed as an essential work partner, from the Gmail Smart Compose to 24/7 security monitors. With perceived human-like characteristics such as the ability to undertake multiple tasks computationally based on its increasing scale of data, AI is powering efficiency and is likely to outperform humans at various workplace in the near future.

Yet there is reason for caution in the age of AI. As was predicted at the turn of the century, AI has, and will continue to disrupt many traditional careers.[2] According to a report by th global consultancy firm McKinsey & Company, by the year 2030 automation and AI could force around 33 percent of the US's projected 166 million workforce to change jobs.[3] AI applications are becoming increasingly common in life, the public sector, and museums. Therefore, the future workforce and job marketplace for art museums professionals will be impacted by AI, although perhaps not as one may expect.

The threat AI brings to the workforce in art museums

AI has the potential to impact almost every current job in art museums. Some jobs will likely be reduced in the necessity or eliminated by future AI. The jobs which are at greater risk of replacement by automation and computerization are those that involve primarily simple or sequential tasks. Many current AI algorithms are capable of learning simple tasks as fast as humans can. Numerous daily museum tasks fit this category, therefore we can expect that in the near future AI working at the museum will do many tasks that are currently done by humans.[4]

Museum ticket sales staff hold the position which is most likely to be considered under a red card warning for AI replacement. Its related position – Sales Representatives – is projected to have an 85% possibility of being job replacement according to Will Robots Take My Job?.[5] Ticket sales, a service many museums already offer online, may

[1] "10 IT & Technology Buzzwords For 2019 You Won't Be Able To Avoid." *Datapine*. November 23, 2018. Accessed May 07, 2019. https://www.datapine.com/blog/technology-buzzwords/.

[2] Wiggers, Kyle. "Forrester: 10% of U.S. Jobs Will Be Lost to Automation in 2019." *VentureBeat.* November 09, 2018. Accessed May 07, 2019. https://venturebeat.com/2018/11/06/forrester-10-of-u-s-jobs-will-be-lost-to-automation-in-2019/.

[3] "JOBS LOST, JOBS GAINED: WORKFORCE TRANSITIONS IN A TIME OF ..." Accessed March 19, 2019. https://www.mckinsey.com/~/media/McKinsey/Featured Insights/Future of Organizations/What the future of work will mean for jobs skills and wages/MGI-Jobs-Lost-Jobs-Gained-Report-December-6-2017.ashx.

[4] Knight, Will. "Machine Learning Inspired by Human Learning." *MIT Technology Review*. December 16, 2015. Accessed May 07, 2019. https://www.technologyreview.com/s/544376/this-ai-algorithm-learns-simple-tasks-as-fast-as-we-do/.

[5] Will "Sales Representatives, Wholesale and Manufacturing, Except Technical" Be Replaced by AI & Robots? Accessed May 07, 2019. https://willrobotstakemyjob.com/41-4012-sales-representatives-wholesale-and-manufacturing-except-technical.

be conducted on-site by AI in the art museum because ticketing is a predictable routine activity. Thus, placing self-service ticket machines instead of the human labor force in the museum place will likely become a more common way of enhancing the ticket-sales efficiency by lowering labor costs. As AI and machine learning systems become more sophisticated they may be able to engage in personalized questions and answer informative exchanges with guests at the point of sale, somewhat akin to an enhanced chatbot. While some guests may enjoy this type of interaction, others may find it less appealing and, depending on the needs and audience of an institution, therefore AI may be unable to meet the conversational needs of all visitors.

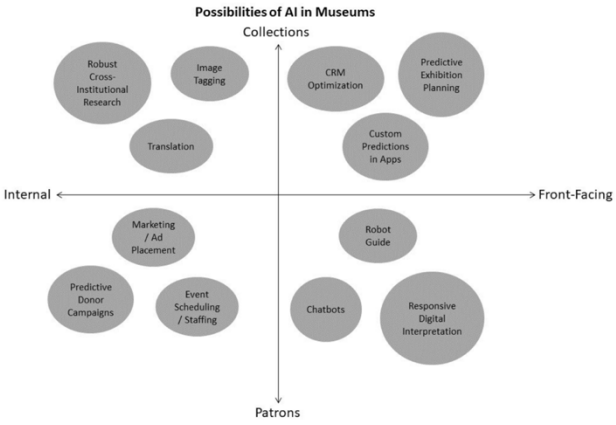

Figure 1: Museum and AI: Could Robots be Your Co-workers? Source: American Alliance of Museums

Another endangered position at the art museum might be collections cataloguer, whose day-to-day tasks are similar than librarians, receiving a chance of 65% to be replaced by robots.[6] Elements of cataloguers' work are routine and repetitive: add artworks to the museum database; put bar-code labels on the works; digitize the documents in the collection; check, correct and update the database.[7] Therefore it is likely that AI will take over many tasked currently carried out by cataloguers in just a matter of time.

From a social equity perspective, the members of the labor force whose jobs are most at risk for replacement by AI tend to be are people with limited educational background or insufficient qualifications to undertake high skilled, non-routine work.[8] The job description of the Retail Associate position at the Broad notes that the museum job postings accept , and therefore may hire, candidates who possess only a high school diploma.[9] Museums have created the diverse levels of positions for people with different background to gain the opportunities for the simple-task work at museums. However, because the coming AI revolution might automate millions of daily tasks to make them faster and better, and in light of the constant struggle to operations funding, art

[6] "Will "Librarians" Be Replaced by AI & Robots?" Accessed May 07, 2019. https://willrobotstakemyjob.com/25-4021-librarians.

[7] "Collections Cataloguer: Art Museum, Princeton University." *Association of Academic Museums and Galleries*. Accessed May 07, 2019. https://www.aamg-us.org/wp/collections-cataloguer-art-museum-princeton-university/.

[8] Whitehouse, Mark, and Mira Mira Rojanasakul. "Find Out If Your Job Will Be Automated." *Bloomberg.com.* Accessed May 07, 2019. https://www.bloomberg.com/graphics/2017-job-risk/.

[9] "Retail Associate." *Job Opportunity | The Broad.* Accessed May 07, 2019. https://www.thebroad.org/employment/retail-associate-0.

museums are likely to be increasingly incentivized to automate these once accessible routine jobs. Fewer opportunities for lower-educated people and a smaller plurality of the employment might become the issue caused by AI for the museum workforce. Inequality will therefore increase in the future museum job market.

the current staff for their future job stability.

The benefit AI brings to the workforce in art museums

Although AI may create job insecurity in certain areas of museum employment, AI-powered systems are not designed to eliminate every job that they can but to create a systematic working environment

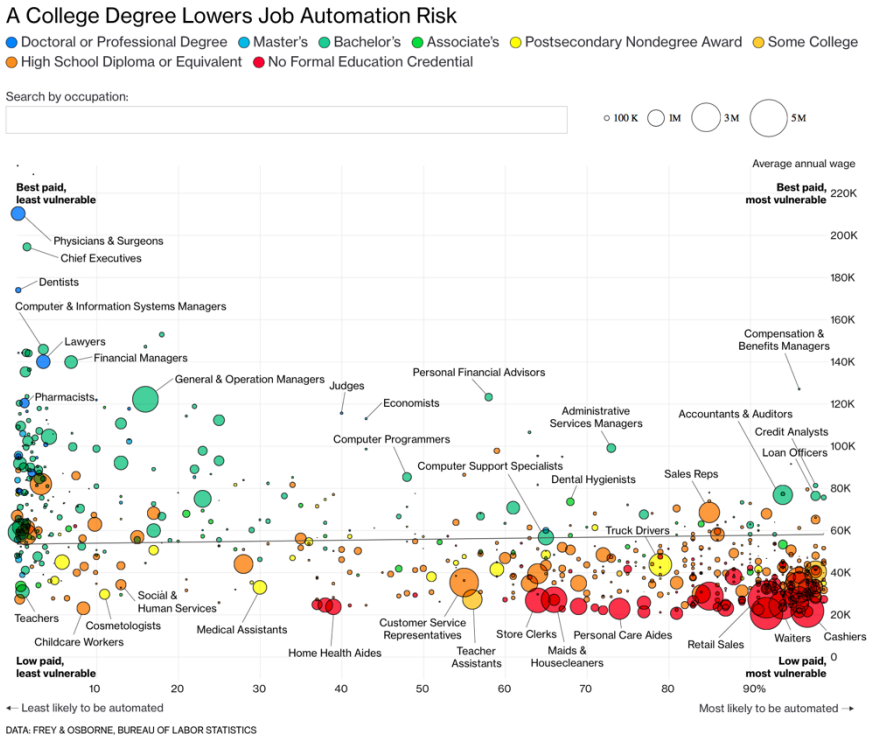

Figure 2: Job Automation Risk Chart. Source: Bloomberg.com.

As AI replaces jobs based on routine tasks it may initiate a sequence of events that impacts the availability and attainability of jobs less subject to replacement by automation. Once a job is replaced by AI, it will likely lead a staffing transformation: those refugees in the AI job revolution will likely rush to apply for the current surviving simple positions which additional diplomas or qualifications are not required. Those jobs which have not yet been replaced by AI will become much competitive and increase the anxiety to

to improve the quality and consistency of work. Very few jobs in art museums are comprised solely of task which AI can fully replicate, hence most jobs are likely to benefit from AI advances rather than come to the dead end.

Museum jobs, such as curators, fundraisers, event planners and graphic designers currently appear unlikely to be eliminated by AI. These jobs require highly trained professionals and involve the completion of multiple complex tasks. While some of the tasks could be augmented or automated by the technology, the majority depend on humans' knowledge, cognitive and emotional intelligence, and communication skills, which AI is not currently able to replicate. Therefore, most museum staff do not need to be concerned about unemployment in the age of AI, but instead could regard AI as a powerful teammate to support them to deal with the tasks faster and better.

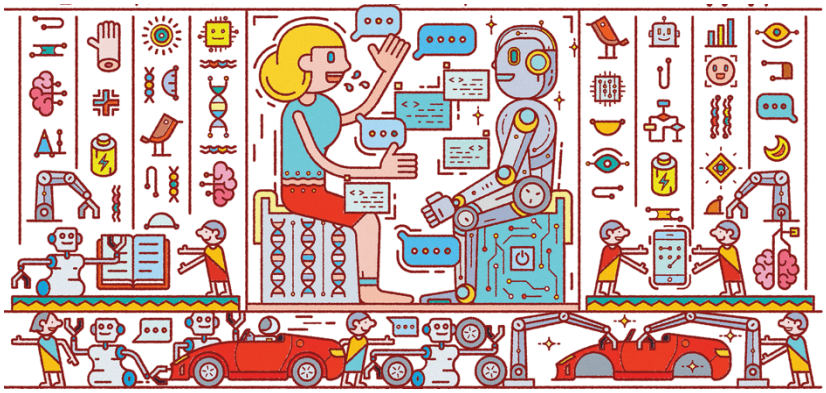

Figure 3: How Humans and AI Are Working Together in 1,500 Companies. Source: Harvard Business Review.

Philadelphia's Barnes Foundation art gallery uses AI and machine learning technology in the collection department to auto-pair digital works, interpret the artistic styles, and recognize the patterns and objects.[10] The technology categorizes each art piece automatically, an automation which assists the collections staff's ability to place millions of objects in the collection, and enhances the museum collection database. With the ability to do much of the groundwork, AI will also work as a search filter to aid curators in selecting related works from the museum database. Smithsonian's National Museum of Natural History and the Smithsonian Office have collaborated with NVIDIA on a project using AI to digitize the botany specimens, which will likely to assist curators to learn from the mass collection data and allow them to focus their time on more sophisticated curatorial works with the extracted information by AI.[11]

Some fear that AI-powered robots or chatbots will displace traditional tour guides. Museums are indeed experimenting with AI docents to assist human docents and curators by delivering digital tour guides in the art museums. For example, Smithsonian Institute deployed eight robots, Pepper, in three art museums in Washington D.C.,

[10] Anstey, Tom. "Barnes Foundation Uses Intelligent Machines to Offer New Ways of Interpreting Art Collections | Attractionsmanagement.com News." *Attractions Management*. Accessed May 07, 2019. http://www.attractionsmanagement.com/index.cfm?pagetype=news&codeID=338394.

[11] "Using Digitized Botany Specimens, AI Excels in Simple Curatorial Tasks." *Smithsonian Insider*. January 18, 2018. Accessed April 17, 2019. https://insider.si.edu/2017/12/using-digitized-botany-specimens-ai-excels-simple-curatorial-tasks/.

encouraging visitors to focus on the exhibits and interact with the artworks as well as other visitors.[12] The Dot Kiosk, a chatbot tour guide at the Akron Art Museum provides the visitors with a new visitor experience and connects them with art and technology.[13] While engaging more visitors and taking the responsibility for some simple tasks, these robots also collect data from the daily operation, which could help the future exhibition planning and visitor experience design. The AI docents are exciting, yet the emergence of the digital tour guides is unlikely to fully replace docents and curators in the art museums since currently AI cannot replicate the human ingenuity and deliver the heart-to-heart talks with the visitors.

The job requirement in AI future

Facing the highly-automated labor market in art museums, it is likely that arts managers will gradually create a vision for workforce transformation. The change will likely be tracked between the words on job descriptions since the requirements and qualifications to each job will keep aligned with the emerging trend in the human workforce. AI is the controller behind the scene. It is transferring the current job marketplace and redefining the staff requirement for art museums.

According to the 2018 Global Human Capital Trends report by Deloitte, computer science, coding or blockchain expertise will not be the technical skills that the future staff must obtain to survive in the huge competitive job market, instead, recruiters will look for people who excel in the soft skills that

Figure 4: Artificial Intelligence Like a Robot, Enhances Museum Experience. Source: The New York Times.

[12] "Smithsonian Launches Pilot Program of "Pepper" Robots." *Smithsonian Institution.* January 01, 1970. Accessed May 07, 2019. https://www.si.edu/newsdesk/releases/smithsonian-launches-pilot-program-pepper-robots.

[13] Litt, Steven. "Dot, the New Akron Art Museum Chatbot, Wants to Get You Talking about Art and Life." *Cleveland.com*. August 05, 2018. Accessed May 07, 2019. https://www.cleveland.com/arts/2018/08/dot_the_new_akron_art_museum_c.html.

represent humans advantages in the age of AI, including creativity, communication skills, critical thinking and complex problem solving.[14] It is artificial intelligence that makes emotional intelligence more crucial and helps humans realize their valuable inborn capabilities which AI cannot imitate. Inspiring the public with creativity and curiosity, art museums are essential to incorporate those soft skills into their job requirements to acquire the best human-machine balance in the museum workplace, thus hiring staff with high emotional intelligence and soft skills will become a huge benefit for the future work in art museums.

Besides reaching new staff with demonstrable soft skills, art managers in museums can also develop various training programs to nurture current staff's potential abilities and assist them in preparing for work efficiency and survival in the age of AI. One effective strategy involves creating a diverse workforce that balances the experience in emotional intelligence to encourage them to generate a collective and comprehensive mindset.[15] Additional investment in staff training is needed since it is a critical step for AI adoption. A report by Infosys in 2017 revealed that 84 percent of managers, globally, planned to train the staff about the benefit of AI, and 80 percent of them planned to retrain the staff who have been replaced with the technology or are planned to be replaced.[16] More optimistically, according to the 2017 University of Michigan study, a nine-month soft skill training increased the staff productivity by 12%.[17]

The potential job in AI future

There is absolutely no doubt that the advancement of AI technology will create novel jobs in the museum workplace. According to the Future of Jobs 2018 report, AI, by 2022, is expected to create 58 million new jobs in all industries.[18] Those unprecedented new jobs, which still needs more exploration, can be labeled as the trainer, explainer and sustainer.[19] In the museum workplace, trainer serves as the instructor, teaching AI how to simulate human-like conversation with the visitors; explainer's work is clarifying the benefit and threat the AI-related

[14] Team, Insights. "Is Your Company 'Soft' Enough?" *Forbes*. December 05, 2018. Accessed May 07, 2019. https://www.forbes.com/sites/insights-intelai/2018/11/29/is-your-company-soft-enough/#457ab05552e0.
[15] Thomas, Vegard. Kolbjørnsrud, Richard. Amico, Robert J.. "How Artificial Intelligence Will Redefine Management." *Harvard Business Review*. September 21, 2017. Accessed May 07, 2019. https://hbr.org/2016/11/how-artificial-intelligence-will-redefine-management.
[16] Infosys Limited. "Amplifying Human Potential – Towards Purposeful Artificial Intelligence." *Infosys*. Accessed May 07, 2019. https://www.infosys.com/aimaturity/.
[17] Guest, Greta. "Soft Skills Training Boosts Productivity." *University of Michigan News*. January 19, 2017. Accessed May 07, 2019. https://news.umich.edu/soft-skills-training-boosts-productivity/.
[18] Chowdhry, Amit. "Artificial Intelligence To Create 58 Million New Jobs By 2022, Says Report." *Forbes*. September 18, 2018. Accessed May 08, 2019. https://www.forbes.com/sites/amitchowdhry/2018/09/18/artificial-intelligence-to-create-58-million-new-jobs-by-2022-says-report/#2e7642bc4d4b.
[19] Wilson, H. James, Paul R. Daugherty, and Nicola Morini-Bianzino. "The Jobs That Artificial Intelligence Will Create." *MIT Sloan Management Review*. Accessed May 08, 2019. https://sloanreview.mit.edu/article/will-ai-create-as-many-jobs-as-it-eliminates/.

proposal will pose to the museum; sustainer is like a performance evaluator, examining if the current work status to ensure both human and AI staff are working on the right track. The following three potential jobs at art museums are well aligned with the idea of the AI-related job classification which was proposed by the MIT Sloan Management Review.

Representative Roles Created by AI

TRAINERS	
Customer-language tone and meaning trainer	Teaches AI systems to look beyond the literal meaning of a communication by, for example, detecting sarcasm.
Smart-machine interaction modeler	Models machine behavior after employee behavior so that, for example, an AI system can learn from an accountant's actions how to automatically match payments to invoices.
Worldview trainer	Trains AI systems to develop a global perspective so that various cultural perspectives are considered when determining, for example, whether an algorithm is "fair."
EXPLAINERS	
Context designer	Designs smart decisions based on business context, process task, and individual, professional, and cultural factors.
Transparency analyst	Classifies the different types of opacity (and corresponding effects on the business) of the AI algorithms used and maintains an inventory of that information.
AI usefulness strategist	Determines whether to deploy AI (versus traditional rules engines and scripts) for specific applications.
SUSTAINERS	
Automation ethicist	Evaluates the noneconomic impact of smart machines, both the upside and downside.
Automation economist	Evaluates the cost of poor machine performance.
Machine relations manager	"Promotes" algorithms that perform well to greater scale in the business and "demotes" algorithms with poor performance.

Figure 5: Representative Roles Created by AI. Source: MIT Sloan Management Review.

Chatbot designer

Professional chatbot designers, act as trainers, teaches AI systems to simulate the immersive conversation with the visitors to enhance the public engagement and interaction in the museum. The Carnegie Museum of Pittsburgh Innovation Studio has developed a successful chatbot – Andy CarnegieBot, which worked on the Facebook Messenger, encouraging visitors to digitalize the museum visiting experience.[20] It is never an easy task for the chatbot designers to develop a thoughtful but straightforward system, which is essential to simplify the interface and process, focus the right balance between the proactive and reactive conversations, build trust among designers, visitors and chatbot, also, personalize the conversation for every visitor is needed.[21] Chatbot designer might be an indispensable prospective

[20] Ticknor, Sam. "A Chatbot Adventure." *The Studio*. August 06, 2018. Accessed May 08, 2019. https://studio.carnegiemuseums.org/a-chatbot-adventure-c729812571ea.

[21] Babu, Ruben. "Designing an A.I. Chatbot- How Conversational Design Changed the Way I Think about Design." *UX Collective*. November 03, 2018. Accessed May 08, 2019. https://uxdesign.cc/designing-an-a-i-chatbot-how-conversational-design-changed-the-way-i-think-about-design-3eb93be83333.

position appearing on the museum career board in the near future.

Technology strategist
While AI possesses huge computing power and spectacular learning behavior which brings enormous numbers of benefit to the museum, it is still difficult for people to decide how to deploy it in the museum work or which tasks to apply it to. A technology strategist may be needed to help leverage AI in the museum workplace and generate an optimized plan for further decision makings.

Human-machine team manager
The current managers at art museums are well-trained to deal with the interpersonal relationship with the human labor. As the idea and method between managing humans and machines are different, their professional background might not be suitable and reliable to manage the teamwork which incorporates both human and AI. In the coming workforce revolution in art museums, almost every human staff in diverse departments will work in collaboration with AI, professional human-machine team manager position (sustainer) will be necessary to be designed conduct systematic performance evaluation, supervise the efficiency and quality of the work cooperation model between human and machine.

Conclusion

The emergence of AI redefines and reframes the current work at art museums. Its growing power fosters art managers to reconsider what is the right workforce relationship with AI and how to best leverage AI in the museum working environment. While some routine aspects of museum work may become automated, AI's overall impact in museums may be positive, and its potential is unprecedented. It is better for arts professionals to keep an eye on AI's rapidly evolving capabilities, consider how to integrate AI into their daily work as well as coordinate a healthy human-machine team model in order to assist them in accomplishing their tasks faster and better, and conveying the museum's mission to the community.

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