

Artificial intelligence

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Introduction

This section describes some research studies into career interventions designed to increase exposure to either the workplace or professionals within it, which offer learning opportunities or the chances for using evidence and ideas in approaches

In doing so, in the Practices and Outcomes section, we have noted the potential contribution that the study could make to practice, by identifying the type of challenge it addresses.

As well as publications showing implementations for this type of career intervention, we have included several resources from other media, including talks, interviews and case studies. These may not be “academically” rigorous, but can provoke reflection and understanding of further approaches. These are included in the “Further illustrations and perspectives” section.

Finally, from either discussions we have had with the CDI, or through research agendas suggested in careers or related fields, we include a section on some potential future “Research questions”.

Practices and outcomes

Selected publications that describe practices and outcomes for different challenges are listed below, with links in the title column. We have mostly included open access sources, but where the sources requires payment, it is noted next to the link by “(Paid)”.

Title	Themes	Brief description
Kretzschmar, K., et al (2019). Can Your Phone Be Your Therapist? Young People’s Ethical Perspectives on the Use of Fully Automated Conversational Agents (Chatbots) in Mental Health Support. <i>Biomedical Informatics Insights</i> , 11. (Link)(Paid)	Using mobile apps and considering ethical issues	In this article, an application of AI is explored from outside of careers, in the area of a mobile app. The paper takes a young person’s perspective and reviews the strengths and limitations of using chatbots in mental health support. The authors also outline what are the minimum ethical standards for these platforms, including issues surrounding privacy and confidentiality, efficacy, and safety, and review three existing platforms (Woebot, Joy, and Wysa)
Mehraj, T., & Baba, A. M. (2019). Scrutinizing artificial intelligence based career guidance and counselling systems: an appraisal. <i>International journal of interdisciplinary research and innovations</i> , 7(1), 402-411. (Link)	Scrutinising AI systems	The paper reviews the numerous Artificial Intelligence (AI) based schemes that had already been published in career guidance by 2019. The different technological approaches are described and their implications, such as case based reasoning systems, or expert systems. Some of the technical drawbacks are outlined with some of the approaches, given the ambitions of such systems e.g. the lack of adaptiveness in some configurations. At the time, the systems reviewed showed generic capability but had weaknesses, leading to recommended research.
Terblanche, N., & Cilliers, D. (2020). Factors that influence users’ adoption of being coached by an artificial intelligence coach. <i>Philosophy of Coaching: An International Journal</i> , 5(1), 61-70. (Link)	Understanding acceptance of AI-based coaching and counselling	The paper reviews one of the first ever studies on the use of AI in organisational coaching. (Although not career coaching, the factors that were evaluated could prove instructive). Authors used the Unified Theory of Acceptance and Use of Technology (UTAUT) as a theoretical framework to use an AI coach for goal attainment (called Vicci). n=226 users had a coaching conversation with Vicci. The analysis of the results showed that

		performance expectancy, social influences and attitude all played a role in the acceptance of the intervention.
Akkök, F., Hughes, D., & CareersNet, U. K. (2021). Career chat: the art of AI and the human interface in career development. The European Centre for the Development of Vocational Training (Cedefop), 91. (Link)	Crafting career conversations between humans and AI	The chapter reviews new forms of digital career guidance support and particularly focuses on AI. The benefits and risks of AI are discussed from a literature review. The second part of the paper discusses 'career chat' conversations that harness big data, artificial intelligence (AI), machine learning, labour market intelligence (LMI) and chatbots.
Westman, S., Kauttonen, J., Klemetti, A., Korhonen, N., Manninen, M., Mononen, A., ... & Paananen, H. (2021). Artificial Intelligence for Career Guidance--Current Requirements and Prospects for the Future. IAFOR Journal of Education, 9(4), 43-62. (Link)	Defining use cases for AI in Higher education	This paper reports on development on using artificial intelligence to support and further career guidance in higher education institutions. Results from focus groups, scenario work and practical trials are presented, mapping requirements and possibilities for using artificial intelligence in career guidance from the viewpoints of students, guidance staff and institutions.
Grosso, C., Sazen, N., & Boselli, R. (2022, September). AI-implemented toolkit to assist users with career" configuration" the case of create your own future. In Proceedings of the 26th ACM International Systems and Software Product Line Conference-Volume B (pp. 158-165). (Link)	Developing an AI toolkit to provide support for career planning	This conference paper presents a slightly different emphasis to other papers, that often represent information provision and/or decision-support tools, by offering support for users to develop a career pathway. The tool is called Create Your Own Future (CYOF), produced by a company called Saffron Interactive. It supports individuals in finding careers that are congruent with their "vocational personality" and selects a tailored roadmap to progress in their career or a pathway to a new one. The European migration crisis, and the need for career adaptability, is proposed as a motivation for looking more at digital and automated solutions that address "pathways".
Song, Q. C., Shin, H. J., Tang, C., Hanna, A., & Behrend, T.	Using machine learning to augment	Based on a review that found interests are important predictors of career choices, the authors developed and

<p>(2024). Investigating machine learning's capacity to enhance the prediction of career choices. <i>Personnel Psychology</i>, 77(2), 295-319. (Link)</p>	<p>career choices based on interests</p>	<p>tested a machine learning algorithm to link vocational interests and occupations in the population. A large-scale study of n=81,267 was used to test the model with employed and unemployed members of the population and found a superior occupational fit than the existing method. The implications are suggested as being that machine learning can improve career choices based on occupational interests.</p>
<p>Ceric (2023.) Five tools for career exploration (Link)</p>	<p>Exploring capabilities of AI tools for career exploration</p>	<p>This review from Ceric, a Canadian charitable organisation dedicated to advancing careers education and research.</p>
<p>Chen, IC., Bradford, L., Schneider, B. (2023). Learning Career Knowledge: Can AI Simulation and Machine Learning Improve Career Plans and Educational Expectations?. In: Niemi, H., Pea, R.D., Lu, Y. (eds) <i>AI in Learning: Designing the Future</i>. Springer, Cham. (Link)</p>	<p>Applying AI to raise career awareness of disadvantaged pupils.</p>	<p>This particular experiment shows an AI used within a game for students whereby they are encouraged to seek alignment between career choices, educational choices and salary expectations. It is also a more general example of using AI in education while gaming career educating. The author argues that the results show AI as capable of reducing educational inequities by improving the decision making capabilities of disadvantaged groups.</p>
<p>Devanshu, D., Sandhu, G. G., Mittal, H., Prajapati, K., & Kumar, S. (2023). Artificial Intelligence Based Career Development Web Counseling: A Review. <i>Kilby</i>, 100, 7th. (Link)(Paid)</p>	<p>Reviewing research and development in online AI career tools</p>	<p>.This article critically examines twenty articles related to online web application career guidance following elementary and high school graduation, drawn from reputable sources such as the IEEE, IRJET, and other respected journals. The analysis aims to identify trends, challenges, and opportunities linked to online career services. This article evaluates the effectiveness of online career counselling and the use of online career counselling services to provide counselling and support to students. The study reveals that online career counselling is gaining popularity as an effective means of providing career guidance to students</p>

<p>Goyal, R., Chaudhary, N. and Singh, M. (2023). "Machine Learning based Intelligent Career Counselling Chatbot (ICCC)," 2023 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, 2023, pp. 1-8 (Link)</p>	<p>Understanding how AI chatbots are configured</p>	<p>A number of chatbots have been developed for careers, often from computer scientists and software engineers, and presented in journals or at conferences. This is one such example, where an AI chat bot is applied for helping students with choices in pursuing further courses in IT and technical subjects. The paper explains the components and functions of such a system.</p>
<p>José-García, A., Sneyd, A., Melro, A., Ollagnier, A., Tarling, G., Zhang, H., ... & Arthur, R. (2023). C3-IoC: A career guidance system for assessing student skills using machine learning and network visualisation. International Journal of Artificial Intelligence in Education, 33(4), 1092-1119. (Link)</p>	<p>Using AI to evaluate specific skills and propose career paths within a technical field</p>	<p>In this paper, the authors briefly review the growth of AI in education and careers and introduce an AI-based solution named C3-IoC (https://c3-ioc.co.uk), for helping students to explore career paths in IT according to their level of education, skills and prior experience. It provides a visualisation of the job-role network, showing students communities of related jobs.</p>
<p>Muhammad, R. (2023). Barriers and effectiveness to counselling careers with Artificial Intelligence: A systematic literature review. Ricerche di Pedagogia e Didattica. Journal of Theories and Research in Education, 18(3), 143-164. (Link)</p>	<p>Reviewing barriers and effectiveness for AI in career counselling</p>	<p>This report reviews empirical data on career counselling with AI in two areas: barriers and effectiveness. After applying a criteria to past research, ten studies were selected for analysis. The research includes reference to studies that show strong results for making forms of recommendations, eliciting positive responses from users (e.g. in one study, 92% of student users gave positive feedback). However it also involves various drawbacks.</p>
<p>Sorensen, S. (2023). The AI-Enhanced Coaching Triad. BPS Coaching Psychology Division, Annual Research and</p>	<p>Introducing AI into coaching sessions</p>	<p>In this conference publication, an accredited coach describes the integration of AI technology into the coaching process, focusing on the way conversations are created between the coach, coachee, and an AI coaching</p>

Practitioners Conference, London (Link)		companion. The coach proposes that AI is useful for producing immediate insights that supplement the practice. This presentation examines the opportunities, risks, and ethical issues associated with this AI-enhanced coaching approach
Bridgeman, J., & Giraldez-Hayes, A. (2024). Using artificial intelligence-enhanced video feedback for reflective practice in coach development: benefits and potential drawbacks. <i>Coaching: An International Journal of Theory, Research and Practice</i> , 17(1), 32-49. (Link)	Using AI to provide augmented feedback to coaches and counsellors from videos of client interactions	One of the applications mentioned for AI within coaching and counselling is the opportunity to provide feedback to the practitioner. One way to do this would be to use AI to 'watch' and 'analyse' videos of client interactions. In this paper, such a practice is explored. In this study, n=15 coaches were interviewed who had deployed it. Benefits were reported in terms of the insights it offered, leading to greater self-awareness. Drawbacks included the nervousness around using new technology and on seeing one's own performance. Future research is suggested.
Dascalu, M. I., Brîndușescu, V. A., Stanica, I. C., Uta, B. I., Bratosin, I. A., Mitrea, D. A., & Brezoaie, R. E. (2024). CHATBOTS FOR CAREER GUIDANCE: THE CASE OF CAREPROFSYS CONVERSATIONAL AGENT. In <i>INTED2024 Proceedings</i> (pp. 6194-6204). IATED. (Link)	Use of AI chatbots for finding professions	This paper reports on an AI chatbot that is used to find out information about professions in the European classification of professions. Note is made of how it offers differentiated support to two types of users: The first type targets aspiring learners, e.g. high school students or students who want to practice a job related to their field of study. The chatbot provides details about universities found in different cities across the country and admission requirements, helping users make informed choices about their educational path. The second type of users is those who want to make a career change. Technical features of the tool are described and an initial evaluation with n=27 secondary students.
Gedrimiene, E., Celik, I., Kaasila, A., Mäkitalo, K., & Muukkonen, H. (2024). Artificial intelligence (AI)-enhanced	Evaluating AI career decision support tools	This research investigated advantages and challenges of AI-enhanced tool for supporting career decisions from the user perspective. Participants in Finland (n = 106) interacted with the AI-enhanced tool and responded to open-ended questionnaire questions.

<p>learning analytics (LA) for supporting career decisions: Advantages and challenges from user perspective. Education and Information Technologies, 29(1), 297-322. (Link)</p>		<p>Two models were used to measure different facets of the user experience, a) the Technology Acceptance Model and b) the Career decision making model. Users perceived five benefits of the tool: 1) provision of career information, 2) research and analysis of the information, 3) diversification of ideas on possible career paths, 4) providing direction and decision support, and 5) self-reflection. However users also found difficulties with the tool.</p>
<p>Herath, G.A.C.A., Kumara, B.T., Ishanka, U.A.P., & Rathnayaka, R.M.K.T. (2024). Computer-Assisted Career Guidance Tools for Students' Career Path Planning: A Review on Enabling Technologies and Applications. J. Inf. Technol. Educ. Res., 23, 6. (Link)</p>	<p>Reviewing the variety of digital tools and use cases that have been developed to date, as context to AI</p>	<p>A systematic literature review was conducted between 2011 through to 2023, producing n=46 applicable studies for investigating how digital technologies supported student career planning. AI is described as an enabling technology. The key findings of this study revealed experimentation with a wide range of enabling technologies and techniques in the implementation of CACG tools for students' career path planning. Within these tools, a distinct set of parameters associated with students has been considered as input for offering personalized career decision support. Further, it was found that the use of CACG tools in career guidance differs across distinct educational stages. Recommendations are made to career practitioners and researchers.</p>
<p>Monreal, J. B., & Palaoag, T. (2024). Use of Artificial Intelligence in Career Guidance: Perspectives of Secondary Guidance Counselor. Nanotechnology Perceptions, 436-449. (Link)</p>	<p>Understanding the valued features of AI amongst students</p>	<p>This study explores the use of Artificial Intelligence (AI) in career guidance within public secondary schools in Legazpi City, Philippines. Student feedback was positive. Respondents highlighted several benefits of AI, including increased efficiency in their work, the ability to guide students more effectively, opportunities for further research, and enabling students to make informed decisions about their academic paths.</p>

Further illustrations and perspectives

Title	Themes	Brief description
<p>Chamorro-Premuzic, T., Polli, F., & Dattner, B. (2019). Building Ethical AI for Talent Management. Harvard Business Review. (Link)(Paid)</p>	<p>Using AI to create more ethical, fair practices in labour markets</p>	<p>The paper provides the context of AI being deployed widely across the labour market, with the opportunity to create more ethical and fair practices in recruitment. The implications of AI lead to all sorts of organisations needing to pursue several steps, such as obtaining consent for data-use within AI systems, and using third parties to audit systems and maintain accountability</p>
<p>Graßmann, C., & Schermuly, C. C. (2021). Coaching with artificial intelligence: Concepts and capabilities. Human Resource Development Review, 20(1), 106-126. (Link)</p>	<p>Considering the possibilities and issues related to using AI in coaching</p>	<p>Although covering generic coaching, this paper discusses salient considerations for various forms of coaching practice that deploy AI. The authors challenge the assumption that AI coaching is feasible by challenging its capability to lead through a systematic coaching process and to establish a working alliance. The greatest difficulties are found in clients' problem identification and in delivering individual feedback.. However, AI generally appears capable of guiding clients through many other areas. The framework provided by the authors also provides a useful way to evaluate AI coaching tools in a systematic way.</p>
<p>Beretta, E., Brinberg, D., Dianova, V., Miniero, G., & Sponchioni, C. (2023). The Post-COVID-19 Job Market: AI in Recruitment and Career Guidance Services. California Management Review (Link)</p>	<p>Reviewing trends and the benefits of AI in a changing labour market</p>	<p>This discussion paper recognises the impact that COVID had on the society, the economy and knock-on effects to both recruitment and career guidance. AI is proposed as a beneficial tool and with significant promise, if it can be scaled, to increase the efficiency, equity, and personalization of both recruitment and career guidance.</p>
<p>Brione, P. et al (2023), Potential impact of artificial intelligence on the labour market. House of</p>	<p>Understanding potential impacts on future labour markets</p>	<p>This paper reviews definitions and some of the key issues with AI (e.g discrimination), and then reviews a series of third party studies that have examined future impacts. These includes ones by PWC/BEIS, the Business, Energy and Industrial Strategy Committee, Office for National Statistics</p>

Commons Library. (Link)		
Department of Education (2023), The impact of AI on jobs and training (Link)	Understanding potential impacts on future jobs and training	The report looks more at the activity-level impact of AI on jobs and training, considering the human activities that AI can or would replace. This micro analysis is then extrapolated to industry level evaluations. Differences are seen in how AI is expected to affect different professions and people at different training levels.
Donald, W. E., & Straby, R. (2024). Supporting clients via narrative storytelling and artificial intelligence: a practitioner guide for career development professionals. Career Development International. (Link)	Using AI in conjunction with narrative counselling techniques	This paper provides a methodology of combining narrative counselling with the use of AI to support clients making career choices through a staged process. Ethical consideration and future discussions are also proposed.
Duan, J., & Wu, S. (2024). Beyond Traditional Pathways: Leveraging Generative AI for Dynamic Career Planning in Vocational Education. International Journal of New Developments in Education, 6(2). (Link)	The potential of AI to facilitate adaptive and personalised learning/ career plans for vocational and non traditional career paths	The paper discusses the potential for future AI in helping people to plan their careers, particularly noting the ability to create adaptive and personalised learning and career pathways for vocational students and those taking non traditional routes: This paper investigates the transformative impact of generative artificial intelligence (AI) on vocational education career planning, transitioning from traditional methodologies to personalized, dynamic strategies. By leveraging Natural Language Processing (NLP) and Machine Learning (ML), it delves into how generative AI can provide tailored career guidance, adaptive learning pathways, and labor market insights, underpinned by constructivist learning theory and career development models.
Passmore, J., & Tee, D. (2023). Can Chatbots like GPT-4 replace human coaches: Issues and	Discussion on the potential evolution of the role of coach as AI also evolves,	This paper discusses the extent that AI might displace the role of a coach, with the increasing integration into coaching. Benefits and limitations of AI coaching chatbots are discussed. The paper also explores the role of coaching psychology,

<p>dilemmas for the coaching profession, coaching clients and for organisations. The Coaching Psychologist, 19(1), 47-54. (Link)</p>	<p>and the extent of job displacement.</p>	<p>professional bodies and governments in the development and evolution of AI systems and coaching chatbots. It is concluded that there is an urgent need to protect clients and organisations from unregulated and unethical practices. Note: Passmore et al (2024) also write a book (“The Digital and AI Coaches' Handbook: The Complete Guide to the Use of Online, AI, and Technology in Coaching”) with contributions from many authors in this area</p>
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Future research questions

In discussing AI with career academic experts, the CDI found that key areas where more research would be valuable involved:

- Understanding AI adoption and use amongst students at school
- Testing the veracity and value of AI-generated information
- Developing models for blended AI-human careers guidance provision

Further to these areas, a discussion paper by [Westman et al \(2021\)](#) into AI in career guidance suggested that future research topics would include:

- Agency in guidance interaction
- Developing a data ecosystem for career guidance
- Identifying and navigating ethical issues.

In adjacent areas to career guidance, notably education, research agendas have been proposed which potentially have questions that are also relevant to CEIAG. For instance:

- Multidisciplinary topics in AI ([Dwivedi, Yogesh K, 2021](#))
- AI in tertiary education ([Lodge et al, 2023](#))
- Chatbots ([Folstad et al, 2023](#))
- AI-human communication ([Guzzman et al, 2020](#))