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LEVERHULME CENTRE FOR THE
FUTURE OF INTELLIGENCE

WHO MAKES AI?

THE GENDER OF AI
SCIENTISTS IN POPULAR
FILM

Dr Stephen Cave
Dr Kanta Dihal
Dr Eleanor Drage
Dr Kerry McInerney



CONTENTS

01. EXECUTIVE SUMMARY

02. ABOUT THIS REPORT

03. THE PROBLEM:

- WHERE ARE THE WOMEN?
- WHY DOES REPRESENTATION MATTER?

04. SCIENTISTS ON SCREEN: THE CULTURAL CONSTRUCTION OF THE AI ENGINEER

05. MAPPING WHO MAKES AI ON SCREEN

06 - 10. AI SCIENTISTS ON SCREEN AND GENDER STEREOTYPES AND CASE STUDIES

- CASE STUDY 1: IRON MAN
- CASE STUDY 2: EX MACHINA
- CASE STUDY 3: TRANSCENDENCE

11. CONCLUSION

12. ABOUT THE AUTHORS

13. REFERENCES

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The findings covered in this report are discussed in more detail in our article in *Public Understanding of Science* 'Who Makes AI? Gender and Portrayals of AI Scientists in Popular Film, 1920-2020' (DOI 10.1177/09636625231153985) and our chapter 'Shuri in the sea of dudes: The cultural construction of the AI engineer in popular film, 1920-2020' in the forthcoming book *Feminist AI: Critical Perspectives on Data, Algorithms and Intelligent Machines* (Oxford University Press, 2023).

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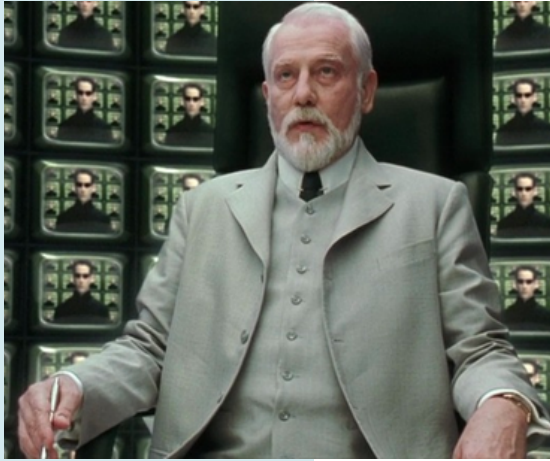
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Front Page Image Credits:

Shuri from Marvel's Avengers: Infinity War. Image credits: The Walt Disney Company

To see how gender shapes representation of AI scientists on screen, we analysed the 142 most influential films featuring AI from 1920 to 2020, of which 86 showed one or more AI researchers, totalling 116 individuals. We found that:

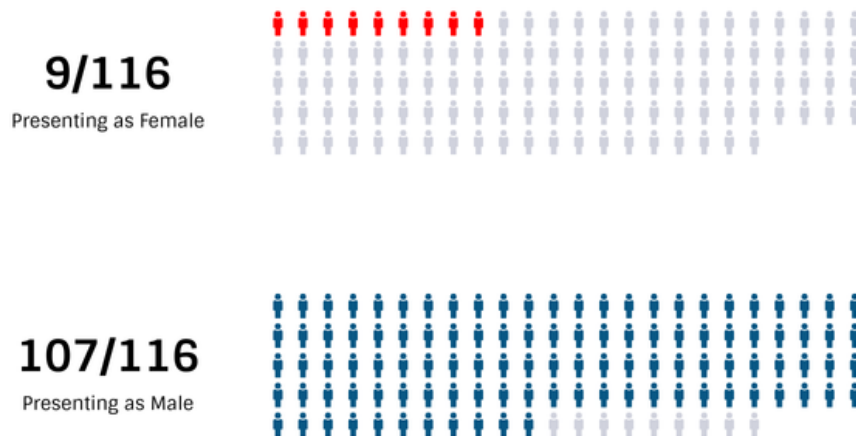
- Only 9 out of 116 (8%) AI professionals in influential films were female (8 scientists, 1 CEO).
- The first film to feature a female AI creator is from 1997.
- The proportion of AI scientists and engineers who are portrayed as men in mainstream films (92%) is even higher than the percentage of men in the AI workforce (78%).
- Only 1% of directors in our corpus presented as women at the time their films came out (2 films out of 142) and in both instances they worked with co-directors who presented as men. None of the 142 AI films were solely directed by a woman.
- Out of the 116 AI scientists, 38 (33%) were coded as geniuses. 37 out of the 38 geniuses shown in films were male. Due to the 'brilliance bias', this portrayal of AI scientists as geniuses may discourage women's career aspirations in the AI sector.
- AI scientists were frequently pictured as part of traditionally masculine institutions, such as large corporations or the military. A significant number of films (19, or 22%) feature male creators who aim to create artificial life.
- Gender inequality also shapes how women are represented on screen. Out of the eight female AI scientists, 50% (4) were presented as inferior to or subservient to a man.



The Architect from the Matrix franchise. Image Credits:

Gender of AI Professionals in Popular Film

1920-2020



Gender inequality in the AI industry is systemic and pervasive. One crucial aspect relates to cultural stereotypes of who is suited to a career in AI. Mainstream films are an enormously influential source and amplifier of these cultural stereotypes.

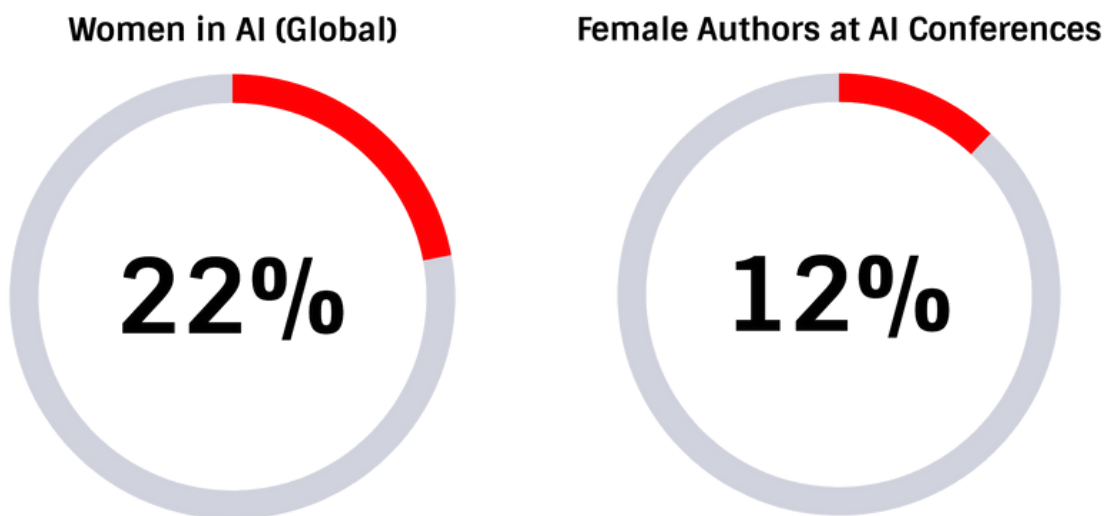
Previous research has established that (a) cultural stereotypes and representations of scientists and engineers influence the ability of women to access and flourish in STEM fields, (b) such representations in popular media are overwhelmingly male, and (c) films directed by men are less likely to feature female protagonists. However, until now there has been no large-scale study of how AI scientists have been represented on screen.

This report provides a comprehensive assessment of the state of gender representation in AI films. This includes both who is in front of the camera i.e. the gender of the AI scientists and engineers on screen, and who is behind the camera, i.e. who is in charge of directing prominent and popular films about AI. It is based on a study conducted from 2020-2021 by a team of four researchers at the Leverhulme Centre for the Future of Intelligence at the University of Cambridge. More details about the methodology and results can be found in our article in the journal *Public Understanding of Science* (DOI 10.1177/09636625231153985).

THE PROBLEM: WHERE ARE THE WOMEN?

Women are grossly underrepresented in the field of AI:

- Globally, only 22% of AI professionals are female (Howard and Isbell, 2020), as opposed to 39% across all STEM fields (Hammond et al., 2020).
- Women comprise only 12% of authors at leading AI conferences, while the AI Index 2018 reported that men comprise more than 80% of AI professors (Shoham et al., 2018; Simonite, 2018).
- Women are often confined to lower-paid, lower-status roles such as software quality assurance, rather than prestigious sub-fields such as machine learning (Young et al., 2021: 23–25).
- Women's participation in the AI workforce in the United Kingdom is decreasing (M West et al., 2019).



WHY DOES REPRESENTATION MATTER?

On the one hand, the relative exclusion of women from the AI development and deployment pipeline devalues women's expertise and is compounding the gender pay gap. On the other hand, as journalist and author of *Invisible Women* Caroline Criado Perez shows, the marginalisation of women in the field may contribute to the industry's creation of AI products that do not work for women or actively discriminate against women (Criado Perez 2019).

SCIENTISTS ON SCREEN: THE CULTURAL CONSTRUCTION OF THE AI ENGINEER

Gendered perceptions and stereotypes of who 'counts' as an AI scientists affect women and girls' career aspirations:

- The lack of female role models affects female students' uptake of STEM subjects (PwC UK, 2017).
- Women in Tech UK found that 18% of the 1000 women surveyed cited "perceptions" as the most important reason why women are put off working in the technology sector (Women in Tech, 2019: 4).

Film plays a central role in creating and enforcing these stereotypes:

- The #ScullyEffect study by the Geena Davis Institute on Gender and Media found that "nearly two-thirds (63%) of women that work in STEM say [*The X Files's* scientist protagonist] Dana Scully served as their role model" (21st Century Fox et al., 2018: 5).
- However, Professor Jocelyn Steinke (University of Connecticut) found that overall "images of STEM professionals in popular media have for many years both created and perpetuated a cultural stereotype that depicts women as less likely than men to be present in STEM fields as well as less likely to be talented, successful, and valued in STEM fields" (Steinke, 2017: 2).
- The Geena Davis Institute found that only 8.6% of characters in computer science and an astonishing 2.4% of characters in engineering were women (Geena Davis Institute on Gender in Media, 2018).



Quintessa from Transformers: The Last Knight (2017). Image Credits: Paramount

Dana Scully from The X Files (1993-2018). Image credits: 20th Century Studios (The Walt Disney Company).



MAPPING WHO MAKES AI ON SCREEN

Shuri from Marvel's
Avengers: Infinity War.
Image credits: The Walt
Disney Company



We created a corpus of 1413 popular and/or influential films based on revenue earned or prizes won. Of the 1413 films in our corpus, we identified 142 as featuring AI. Of these, 86 films clearly showed or referred to one or more AI engineers or scientists. The total number of AI engineers or scientists shown was 116. Of these 116 AI engineers or scientists, 88 were men; 10 were male robots, aliens, animals or AIs; and 9 were corporations led by men, giving a total of 107 male figures, or 92% of the total. On the other hand, 7 were human women and 2 were female non-humans, giving a total of 9 female figures. This means that **only 8% of AI scientists on screen were female.**

Regarding the female AI scientists and engineers: the female alien is Quintessa in *Transformers: The Last Knight* (2017), while *The Emoji Movie* (2017) shows an AI-producing corporation led by Smiler, a female emoji. The other seven, all human, are Shuri in *Avengers: Infinity War* (2018), Evelyn Caster in *Transcendence* (2014), Ava in *The Machine* (2013), Dr Brenda Bradford in *Inspector Gadget* (1999), Dr Susan Calvin in *I, Robot* (2004), Dr Dahlin in *Ghost in the Shell* (2017), and the earliest film in our corpus to feature a female AI creator is from 1997: Frau Farbissina in *Austin Powers: International Man of Mystery*.

We also collected information on the directors' gender (where 'gender' referred to the directors' self-presentation at the time of the film's release). According to this metric, only 1% of directors in our corpus are women (2 films out of 142) and in both instances the women were co-directing with men. **Not a single influential AI film has been directed solely by a woman.**

AI SCIENTISTS ON SCREEN AND GENDER STEREOTYPES

We will now explore some of the traits of AI scientists on screen that lead to them being portrayed as men, or amplify the perceived masculinity of the AI scientist.

THE 'GENIUS'

Out of the 116 AI scientists, 38 (33%) were coded as geniuses. Furthermore, 14 (12%) of the AI engineers, scientists, or researchers were explicitly represented as child prodigies or as being intellectually precocious from a very young age.

But genius is not a neutral concept, and is shaped by gendered and racialised notions of intelligence that historically have been shaped by a white male elite (Cave 2020).

Numerous studies demonstrate that people across different age groups continue to associate brilliance and exceptional intellectual ability with men (Bian et al., 2018; Jaxon et al., 2019; Storage et al., 2020). This phenomenon, sometimes called the 'brilliance bias', suggests that men are more likely to be seen as geniuses than women. In the films we examined for this report, 37 out of the 38 geniuses shown in films were male.

The coding of AI scientists as geniuses risks entrenching the belief that women are less 'naturally' suited for a career in the field of AI. As Bian et al. have shown, fields that emphasise the importance of brilliance over other characteristics lower women's interest in these fields (Bian et al., 2018). Hence, the portrayal of AI scientists as geniuses may discourage women's career aspirations in the AI sector.



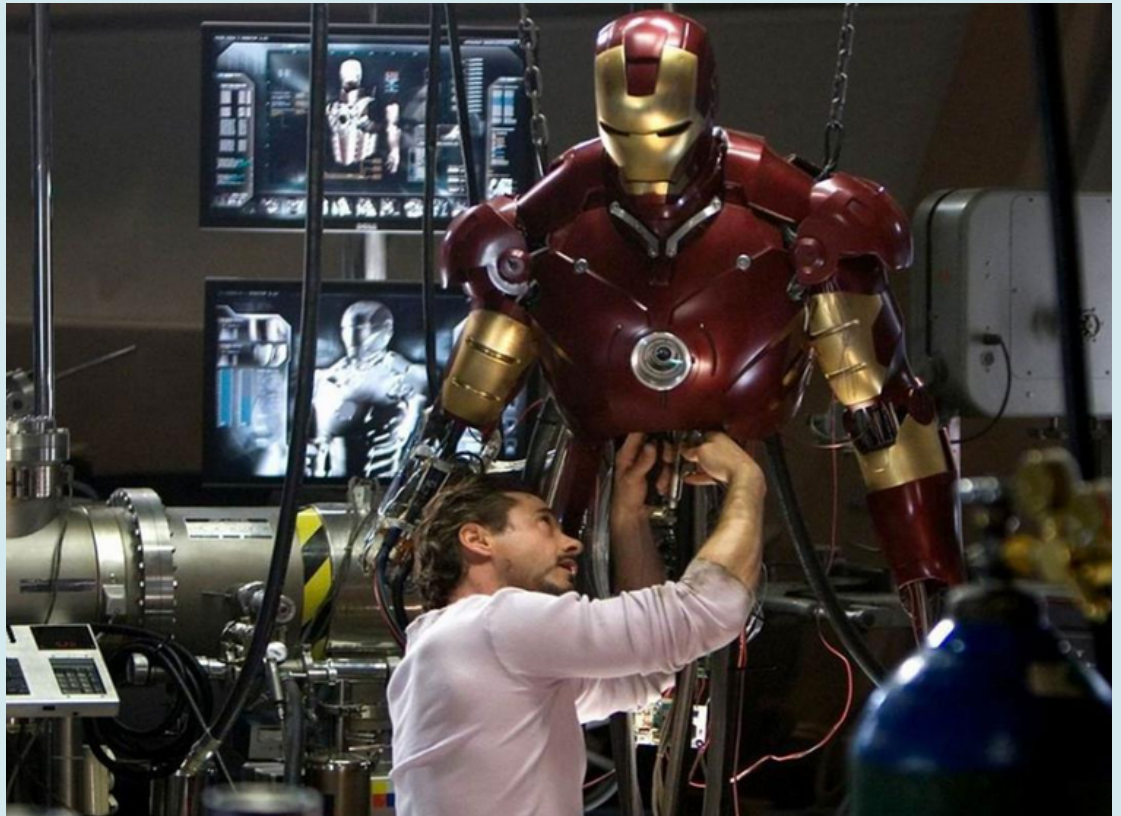
Rotwang from Metropolis (1927). US Public Domain

CASE STUDY: IRON MAN

TONY STARK AS THE STEREOTYPICAL MALE GENIUS

In the popular Avengers franchise Tony Stark is uncompromisingly portrayed as a genius whose intellect far outstrips that of everyone around him. In *Iron Man* (2008), Stark is introduced to the audience as a “visionary” and a “genius” who “from an early age...quickly stole the spotlight with his brilliant and unique mind”. Stark designed his first circuit board at four years old, his first engine at six years old, and graduated from MIT summa cum laude at 17. He has also mastered an unrealistically large number of scientific fields. Stark synthesises an element, which would require expert-level knowledge of the field of chemistry, and solves the problem of time travel in one night.

This unrealistic portrayal of Stark as a lone ‘genius’ further entrenches the cultural construction of the AI engineer as a male visionary.



Iron Man. Image credits: Unsplash

Tony Stark from the Iron Man Franchise. Image Credits: The Walt Disney Company.



AI scientists were frequently portrayed as part of hypermasculine milieus, such as corporations and the military.

- In 32 films (37% of our corpus), the AI was a product of a corporation, and in 10 of these instances no individual scientist was identified as being in charge of the AI.
- Of all the corporations, the only one that was not led by a man was led by a feminine emoji (voiced by a woman), in *The Emoji Movie*.
- Stereotypes of corporate leaders overlap with stereotypical male attributes, such as ambition and dominance (Koenig et al., 2011).
- 10 films contained AI produced by military organisations; the military is strongly associated with stereotypical male attributes (Goldstein, 2003)

Nathan from Ex Machina, 2014.

Image credits: A24

CASE STUDY: EX MACHINA

In Alex Garland's acclaimed AI film *Ex Machina* (2014), the AI scientist Nathan Bateman is the visionary CEO and driving force behind the fictional search engine firm Blue Book, and the employer of the film's main protagonist, Caleb. Nathan's genius has brought him corporate success and immense wealth – enough to fund a secluded and luxurious base in which he works privately on his AI development projects. Nathan's wealth and extraordinary genius renders him outside of the constraints of societal norms. His remote home, accessible only by helicopter, ensures isolation from all human contact, which also allows him to subject both his AIs and Caleb to violent and illegal behaviour. This includes Blue Book's unethical and illegal data scraping practices, which provide the data that Nathan uses to program his AIs. It also includes his creation and violation of female robots who are forced to function as Nathan's sex robots.

THE GOD COMPLEX, OR 'WOMB ENVY'

The Machine, 2013. Image credits: Red & Black Films



19, or 22%, of the male AI engineers in some way fulfil their desires by creating a human-like AI.

- There are 9 instances in film of male creators replacing lost loved ones; 5 of male creators creating ideal lovers, and a further 6 of male creators who use AI to create copies or artificially intelligent versions of themselves.
- This suggests that the association of AI and masculinity might be further exacerbated by this association of the creation of artificial intelligence or life in the laboratory with maleness, in contrast to the female creation of natural intelligence/life. This phenomenon is known as 'womb envy' (Lighthill 1973).

GENDER INEQUALITY

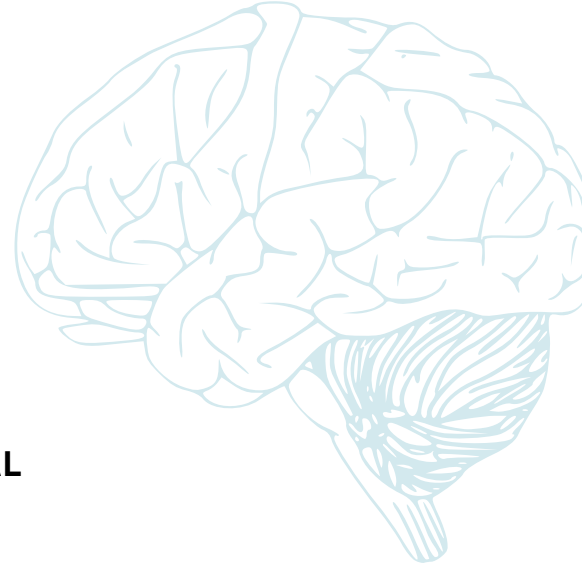
Even when women are portrayed on screen as AI scientists, they are still subject to unequal gender relations:

- Out of the eight female scientists and one female CEO, half of them are portrayed as subordinate to a man. In three films, the female AI scientist is the subordinate employee of a man (*I, Robot*, *The Machine*, and *Austin Powers*); in *Transcendence* and *Inspector Gadget*, the women are respectively the wife and daughter of a male genius AI creator.
- Furthermore, three out of the nine female scientists either sacrifice themselves or are sacrificed as part of the film's plot (*The Machine*, *Ghost in the Shell*, and *The Emoji Movie*).



Dr Dahlin's death scene in Ghost in the Shell (2017). Image Credits: Paramount

CASE STUDY: TRANSCENDENCE



WILL AND EVELYN CASTER'S UNEQUAL RELATIONSHIP

The married scientist couple Dr Will Caster (Johnny Depp) and Dr Evelyn Caster (Rebecca Hall) from the 2014 film *Transcendence* epitomises the unequal relations of subservience and sacrifice. Although both are researchers with doctorates, Evelyn is presented as inferior to Will in a way that makes it difficult to establish her role or skills. In a scene showing a public lecture, a groupie runs up to Will to ask if 'Dr Caster' could sign the magazine in which he (alone) appears; Evelyn is standing next to him, irrelevant to the interaction. Evelyn herself comes on stage, but only to introduce the audience to the keynote speaker, her "partner in science and in life, Dr Will Caster". Yet the plot requires Evelyn to be an AI expert too, well enough versed in Will's work to take apart the AI system he developed, PINN, and redeploy it as the system onto which his mind is uploaded. *Transcendence* ends with Evelyn Caster sacrificing herself in order to shut down the now rampaging, dictatorial Will-AI.



Will and Evelyn Caster in Transcendence, 2014.
Image credits: Warner Bros Studios.

CONCLUSION

Our study has shown the pressing need to both understand and counter the gendered representation of AI scientists in popular film. It has demonstrated that women are grossly underrepresented as AI scientists on screen, and that when they are shown as scientists, they are still subject to unequal and inferior portrayals.

We thus call for greater research into understanding and mapping the problem of gendered representations of AI scientists, and also further investigation into correctives and solutions for this problem. Only then can we shift the landscape of who does and does not 'count' as an AI scientist in the cultural construction of the AI engineer.

To learn more, visit DOI: [10.1177/09636625231153985](https://doi.org/10.1177/09636625231153985)



RoboCop (2014) Image Credits: Sony Pictures

ABOUT THE AUTHORS

Dr Stephen Cave is Director of the Leverhulme Centre for the Future of Intelligence at the University of Cambridge. His research focuses on philosophy and ethics of technology, particularly AI, robotics and life-extension. He is the author of *Immortality* (Crown, 2012), a New Scientist book of the year, and *Should We Want To Live Forever* (Routledge, 2023); and co-editor of *AI Narratives* (OUP, 2020), *Feminist AI* (OUP, 2023) and *Imagining AI* (OUP, 2023).

Dr Kanta Dihal is a Senior Research Fellow at the Leverhulme Centre for the Future of Intelligence at the University of Cambridge, and from March 2023, Lecturer in Science Communication at Imperial College London. Her research focuses on the role narratives play across cultures in making sense of disruptive new developments in science and technology, particularly quantum physics and artificial intelligence.

Dr Eleanor Drage was previously a Christina Gaw Postdoctoral Research Associate in Gender and Technology at the University of Cambridge Centre for Gender Studies and is currently a Research Fellow at the Leverhulme Centre for the Future of Intelligence. Her research investigates how AI relates to structural inequality, including systems of race and gender.

Dr Kerry McInerney is a Research Associate at the Leverhulme Centre for the Future of Intelligence. She is also a Research Fellow at AI NOW. She is the co-editor of *Feminist AI* (Oxford University Press), *The Good Robot: Feminist Voices on the Future of Technology* (Bloomsbury) and the co-host of The Good Robot podcast on feminism and technology.

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Dr Robotnik in Sonic the Hedgehog (2022). Image Credits: Paramount Pictures.

In this report we explore the gender of AI scientists on screen and the difference this makes. To see how gender shapes representation of AI scientists on screen, we analysed the 142 most influential films featuring AI from 1920 to 2020, of which 86 showed one or more AI researchers, totalling 116 individuals. Of these, only 9 were women (8%).



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