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Navigating the AI Engineering Hiring Boom in 2024

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Introduction

Although AI is not new, we're currently seeing a boom in AI development and innovation that's causing many companies to prioritize incorporating AI into their products and solutions. As a result, there are more organizations looking to create AI teams for the first time or expand existing ones.

To help you navigate hiring AI engineers, this report gives you insight into the current market for AI talent, lays out the challenges that you can expect to face, and provides solutions. You'll also gain the tools and knowledge to recruit AI engineers, successfully interview and assess candidates, and close the deal by offering the appropriate compensation.

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Types of AI Engineers

The traditional AI software engineer role, one that's focused on developing AI, isn't the only type of AI engineer. There are currently four main types of AI engineers that range from generalist engineering roles that can work with AI to highly specialized AI roles.

Engineers Who Can Leverage AI as Part of Their Jobs

AI is unlikely to entirely replace software engineers, but it will change the nature of their jobs. Gartner estimates that 75% of enterprise software engineers will use AI code assistants by 2028, and 63% of organizations are currently piloting, deploying, or have already deployed AI code assistants.[1] It's clear that engineers are increasingly being expected to leverage AI to work more efficiently, helping companies reduce costs, improve employee retention, and go to market faster.

With the increased use of AI, companies are also concerned about overreliance on it. To prevent this, companies also need to make sure that engineers understand the code being produced. When interviewing, this means incorporating AI tools into the technical interview or using code reviews to assess how the candidate analyzes AI-generated code.

Engineers Who Train New AI Models

Developing new AI models is the most cutting-edge AI work being done today. There are only about 200 people in the world with real expertise in this, and they're working for companies like OpenAI to do deep machine learning with massive datasets.

Training AI models is "the process of feeding curated data to selected algorithms to help the system refine itself to produce accurate responses to queries."[2] This iterative process depends on both the quality of the input data and the ability of trainers.[3]

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[1] "Gartner Says 75% of Enterprise Software Engineers Will Use AI Code Assistants by 2028," Gartner, April 11, 2024,
https://www.gartner.com/en/newsroom/press-releases/2024-04-11-gartner-says-75-percent-of-enterprise-software-engineers-will-use-ai-code-assistants-by-2028.

[2] Michael Chen, "What Is AI Model Training & Why Is It Important?," Oracle, December 6, 2023, https://www.oracle.com/artificial-intelligence/ai-model-training/.

[3] Ibid.

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Organizations that are developing and updating their own proprietary models need people who understand the theory behind this work and have hands-on expertise.

Machine Learning and Data Engineers

Outside of software engineers who can leverage AI tools, machine learning and data engineering are the biggest areas of growth we're seeing in AI. While the two work together, machine learning uses data to develop AI models, and data engineering refers to the collection, storage, and preparation of data.[4]

Making sure the data that's going into your models is clean and your outputs are tracking with your intended outcomes is critical for any organization's AI efforts, so you'll need both machine learning and data engineers to know if your AI is working.

Machine Learning Operations Engineers

Machine learning operations (MLOps) combines operations practices with machine learning in order to streamline deploying, maintaining, and monitoring machine learning models. MLOps engineers are responsible for building and maintaining the infrastructure that machine learning engineers use to develop and scale models, increasing reliability and reducing risk. To do this, MLOps engineers need to be knowledgeable about machine learning frameworks and models and have programming skills. They also need to be strong communicators and collaborative, as they work with data scientists, machine learning engineers, and other team members.

Demand for AI Engineers

The boom in AI is similar to the mobile app development boom 15 years ago that created an urgent demand for mobile app developers. There were few engineers with extensive experience in iOS and Android development, just as there are currently few experienced AI engineers. Due to the similarities between these two time periods, companies can apply the same lessons and strategies that they used to navigate hiring mobile app developers back then to hiring AI engineers now.

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[4] "Data Engineering vs. Machine Learning," International Association of Business Analytics Certification, last updated August 17, 2023, https://iabac.org/blog/data-engineering-vs-machine-learning.

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When mobile apps took off, hiring attempts often fell short due to the limited talent pool, leading to high competition and increasing salaries. They also failed to succeed due to poorly conceived hiring strategies and job descriptions.

The current market for AI engineers presents many of the same challenges. AI jobs make up 22% of job postings in the U.S. software development sector.[5] That percentage is rapidly rising, as the share of AI jobs in March 2024 nearly reached its previous peak in March 2022.[6] Demand is outstripping supply though — there are more than 10 job ads per AI professional in some states.[7]

To overcome the shortage of mobile app developers, many companies adopted a hybrid approach. They targeted a select number of expert hires, focusing on securing a few highly skilled and experienced developers despite the high costs. They also leaned into upskilling current employees by using expert hires to train engineers on the skills needed for mobile app projects.

This hybrid strategy allowed companies to build capable teams without solely relying on the limited pool of external talent. It also fostered a culture of continuous learning and adaptation, which is crucial in rapidly evolving technological landscapes.

Companies that want to successfully navigate the AI boom should adopt a similar approach, which we'll cover in the next section.

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[5] Nick Bunker, "March 2024 US Labor Market Update: AI Jobs Are on the Rebound," Hiring Lab, March 14, 2024, https://www.hiringlab.org/2024/03/14/march-2024-us-labor-market-update/.
[6] Ibid.
[7] Dr. Pantelis Koutroumpis, "AI demand is booming for the right skills and for the technology 'glue-guys'," Oxford Martin School, October 13, 2023, https://www.oxfordmartin.ox.ac.uk/blog/ai-demand-is-booming-for-the-right-skills-and-for-the-technology-glue-guys.

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Hiring AI Engineers

Given the limited number of experienced AI engineers and the high demand for them, companies need to adopt a hybrid approach, as mentioned in the previous section. This consists of two components:

Strategic hiring of AI experts.
Focus on recruiting a select group of top-tier AI engineers with significant experience. These experts will be the cornerstone of your AI initiatives, providing the necessary expertise and leadership.

Comprehensive upskilling programs.
Leverage the skills of your existing software engineers by investing in intensive training programs. Encourage them to learn through a variety of methods, including online courses and workshops, and get mentorship from the AI experts you hired. This not only builds internal capabilities, but also enhances employee retention and satisfaction.

Let's take a look at exactly how you can find AI experts and turn your current employees into skilled AI engineers.

Where to Recruit AI Engineers

Given the current demand, companies can't simply put up a job listing and wait for candidates to come to them. Instead, they need to take a more proactive approach. Aside from searching for individuals on LinkedIn, there are several places where recruiters and hiring managers can look to find talented candidates: universities that specialize in AI, cities that are establishing themselves as AI hubs, and AI bootcamps.

Universities Specializing in AI

Universities are keeping up with the boom in AI, making it an obvious place to recruit AI engineers. While some offer AI courses under their computer science department, there's a growing number that now have four-year AI degrees.[8] Others limit AI to

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[8] Cheryl Winokur Munk, "Colleges are touting AI degree programs. Here's how to decide if it's worth the cost," CNBC, March 2, 2024, https://www.cnbc.com/2024/03/02/college-ai-degree-programs-are-booming-will-jobs-exist-for-graduates.html.

graduate programs or minors.[9] However, as this is a fast-developing area, how universities think about their AI programs will likely change in the coming years.

To narrow down which universities you should look at, U.S. News & World Report ranks the best undergraduate and graduate AI programs in the United States. Across both lists, the following universities rank in the top 10:[10, 11]

![CMU seal]	Carnegie Mellon University	![Georgia Tech seal]	Georgia Institute of Technology
![Stanford seal]	Stanford University	![Illinois seal]	University of Illinois Urbana-Champaign
![MIT seal]	Massachusetts Institute of Technology	![UW seal]	University of Washington
![Berkeley seal]	University of California, Berkeley	![Cornell seal]	Cornell University

All of these universities don't just excel in AI, but they're also among our top 50 schools to hire all types of software engineers.

Best Schools To Hire Software Engineers

2024 University Recruiting

[9] Sim Tumay, "10 Great Colleges For Studying Artificial Intelligence," Forbes, August 29, 2023, https://www.forbes.com/sites/simtumay/2023/08/29/10-great-colleges-for-studying-artificial-intelligence/?sh=46646a1669ef.

[10] "Best Undergraduate Artificial Intelligence Programs," U.S. News & World Report, https://www.usnews.com/best-colleges/rankings/computer-science/artificial-intelligence.

[11] "Best Artificial Intelligence Programs," U.S. News & World Report, https://www.usnews.com/best-graduate-schools/top-science-schools/artificial-intelligence-rankings.

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While 32 out of our top 50 universities are located in the U.S., there's plenty of talented AI students and graduates around the world. If your company is able to hire internationally, this expands your talent pool and potentially decreases the amount of competition you face from other companies. Consider these universities in Canada, Asia, Europe, and India that specialize in AI:[12]

	University of Tokyo (Japan)		University of Toronto (Canada)
	Peking University (China)		Indian Institute of Technology Madras (India)
	Shanghai Jiao Tong University (China)		University of British Columbia (Canada)
	Technical University of Munich (Germany)		Nanyang Technological University (Singapore)

Cities That Have Emerged as AI Hubs

As universities are adapting to the rise of AI, cities across the world are racing to cement themselves as hubs for AI talent and innovation.

U.S. AI Hubs

There are some obvious locations such as San Francisco, Seattle, and New York. These cities are prominent tech hubs in the U.S. and some of the best cities in the world to hire software engineers, so they would also naturally become centers for AI.

● **San Francisco:** There are several signs that indicate San Francisco and the surrounding Silicon Valley area are leading the way in AI. In 2021, San Francisco and San Jose accounted for about 25% of AI conference papers, patents, and companies.[13] They also had four times as many AI companies, job postings, and

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[12] "Best Schools to Hire Software Engineers," Karat, https://karat.com/resource/best-schools-to-hire-software-engineers/.

[13] Mark Muro, Julian Jacobs, & Sifan Liu, "Building AI cities: How to spread the benefits of an emerging technology across more of America," The Brookings Institution, July 20, 2023, https://www.brookings.edu/articles/building-ai-cities-how-to-spread-the-benefits-of-an-emerging-technology-across-more-of-america/.

job profiles compared to the averages of the next 13 metro areas.[14] The Bay Area has two of the top universities in AI research in the world: Stanford University and the University of California, Berkeley. The area's concentration of AI talent was reflected in the 2024 Forbes 50 AI list, which showed that "San Francisco alone is home to 20 of the best-funded AI companies — more than the rest of America combined."[15]

- **Seattle:** Seattle ranks second in the country for AI talent density, where Meta, Google, and Apple employ thousands of AI researchers and engineers.[16] The state's most well-known public university, the University of Washington, is also one of the top universities for AI and attracts leading AI researchers.[17] Lastly, Seattle is home to the Allen Institute for AI (AI2), a non-profit founded in 2014 "with the mission of conducting high-impact AI research and engineering in service of the common good."[18] Some of the world's best AI talent are part of the AI2 team, and the non-profit's incubator has created more than 20 AI companies.[19]

- **New York:** New York City has its sights set on becoming an AI hub that could challenge San Francisco and Seattle "as the go-to destination for cutting-edge technology."[20] In early 2024, the governor of New York announced a historic agreement to establish Empire AI, "a first-of-its-kind consortium to secure New York's place at the forefront of artificial intelligence research."[21] The consortium is made up of seven New York-based universities and institutions, and it will use a

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[14] Ibid.

[15] Ryan Heath, "AI boom's big winners are all in four states," Axios, July 24, 2023, https://www.axios.com/2023/07/24/ai-goldrush-concentrated-4-states.

[16] Taylor Soper, "Is Seattle an AI hub? City is missing from national conversation about the new tech economy," GeekWire, September 11, 2023, https://www.geekwire.com/2023/is-seattle-an-ai-hub-city-is-missing-from-national-conversation-about-the-new-tech-economy/.

[17] Ibid.

[18] "About — Allen Institute for AI," https://allenai.org/about.

[19] Taylor Soper, "Is Seattle an AI hub? City is missing from national conversation about the new tech economy," GeekWire, September 11, 2023, https://www.geekwire.com/2023/is-seattle-an-ai-hub-city-is-missing-from-national-conversation-about-the-new-tech-economy/.

[20] "New York City Dreams of Being Silicon Valley," PYMNTS, May 10, 2024, https://www.pymnts.com/news/artificial-intelligence/2024/new-york-city-that-never-sleeps-dreams-being-silicon-valley/.

[21] "Governor Hochul Launches Empire AI Consortium to Make New York a Global Leader in Artificial Intelligence as Part of FY 2025 Budget," New York State, April 22, 2024, https://www.governor.ny.gov/news/governor-hochul-launches-empire-ai-consortium-make-new-york-global-leader-artificial.

$275 million state investment to launch a state-of-the-art AI computing center at the University of Buffalo.[22] New York also already has plenty of AI talent that new initiatives and investments such as Empire AI can help catalyze. The city has 40,000 AI professionals and is second in the U.S. for venture capital investment in AI.[23] Cohere, a leading Canadian AI company, opened a New York office in March 2024 to connect to its partners in the city, reach a diverse range of talent and enterprises, and support the city's AI initiatives, while OpenAI is looking to expand to New York in 2025.[24, 25]

International AI Hubs

The U.S. continues to be the top destination for AI talent, but other countries like the United Kingdom (UK), China, and India are actively working to cement their spot.[26]

- **United Kingdom:** The AI market in the UK is currently valued at more than $21 billion, making it the third-largest in the world after the U.S. and China.[27] To grow this, the government is playing a large role in fostering AI development and staying ahead on regulation. The British Prime Minister pitched the UK "as a global center for artificial intelligence and regulation of the technology" in 2023, and prior to that, the government published a white paper on its plan for AI regulation.[28] A large number of government initiatives have been announced this year, including nine new research hubs, 10 studies that will help define responsible AI, and a £118 million funding boost that will support postgraduate research centers, international scholarships, and efforts to encourage students to pursue AI

[22] Ibid.

[23] "How generative AI will unlock big value in the Big Apple," Accenture, 2024, https://static1.squarespace.com/static/568af8d2d82d5e25a610856b/t/6632eeec0a0bfe62383b3fad/1714613999864/Accenture+TechNYC+Generative+AI+2024.pdf.

[24] "Cohere Opens New York Office," Cohere, March 1, 2024, https://cohere.com/blog/cohere-new-york-office.

[25] Kali Hays, "ChatGPT maker OpenAI plans will open an NYC office as it speeds up growth," Business Insider, April 15, 2024, https://www.businessinsider.com/openai-growth-plans-to-open-nyc-office-more-hiring-2024-4.

[26] "Scramble for AI talent puts cities in the spotlight," Jones Lang LaSalle, October 20, 2023, https://www.us.jll.com/en/trends-and-insights/cities/scramble-for-ai-talent-puts-cities-in-the-spotlight.

[27] "UK Government Creates AI Hub," Association for Talent Development, April 1, 2024, https://www.td.org/magazines/td-magazine/uk-government-creates-ai-hub.

[28] Ryan Browne, "British Prime Minister Rishi Sunak pitches UK as home of A.I. safety regulation as London bids to be next Silicon Valley," CNBC, last updated June 12, 2023, https://www.cnbc.com/2023/06/12/pm-rishi-sunak-pitches-uk-as-geographical-home-of-ai-regulation.html.

careers.[29, 30] Additionally, many AI companies are either located in London or planning to expand there. DeepMind, the AI company owned by Google, was founded in London in 2010, while OpenAI established its first international office there too.[31, 32] In April 2024, Microsoft announced its plan to open an AI hub in London that will be focused on product development and research.[33]

- **China:** China is quickly catching up to the U.S. in terms of AI talent. In 2019, Chinese AI researchers made up 10% of the most elite AI researchers.[34] In 2022, this grew to 26%, while American researchers accounted for 28%.[35] This is partly due to the expansion of AI programs across Chinese universities over the last three years, as well as the development of an AI industry that's able to absorb all of that talent.[36] The country has also set ambitious goals, seeking to become the world's "primary" AI innovation center with a core AI industry gross output of $150.8 billion by 2030.[37] China is facing challenges with a shortage of talent though. It's estimated that "demand for individuals skilled in building AI products in China will outpace supply by a factor of three to one" by 2030, and universities and existing talent will only supply one-third of the talent needed.[38]

- **India:** India has emerged as a global tech hub and it's now positioning itself to be a leader in AI too. Harvard Business Review ranked Bangalore as fifth for diversity

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[29] "£100m boost in AI research will propel transformative innovations," UK Research and Innovation, February 6, 2024, https://www.ukri.org/news/100m-boost-in-ai-research-will-propel-transformative-innovations/.

[30] "UK Government Creates AI Hub," Association for Talent Development, April 1, 2024, https://www.td.org/magazines/td-magazine/uk-government-creates-ai-hub.

[31] Tim Smith, "Why top AI talent is leaving Google's DeepMind," Sifted, November 15, 2023, https://sifted.eu/articles/deepmind-talent.

[32] "Introducing OpenAI London," OpenAI, June 28, 2023, https://openai.com/index/introducing-openai-london/.

[33] Martin Coulter, "Microsoft to launch AI hub in London," Reuters, last updated April 8, 2024, https://www.reuters.com/technology/microsoft-launch-ai-hub-london-2024-04-08/.

[34] Zeyi Yang, "Four things you need to know about China's AI talent pool," MIT Technology Review, March 27, 2024, https://www.technologyreview.com/2024/03/27/1090182/ai-talent-global-china-us/.

[35] Ibid.

[36] Ibid.

[37] Bruno Maçães, "Europe's AI delusion," Politico, March 19, 2018, https://www.politico.eu/article/opinion-europes-ai-delusion/.

[38] Wouter Maes & Alex Sawaya, "How businesses can close China's AI talent gap," McKinsey & Company, May 5, 2023, https://www.mckinsey.com/capabilities/quantumblack/our-insights/how-businesses-can-close-chinas-ai-talent-gap.

among AI workers and the second-largest AI talent pool.[39] Other cities like Hyderabad benefit from government support that can help foster innovation, drive AI job opportunities, and establish a thriving ecosystem for AI companies and startups.[40] However, competition to hire is fierce and the rush for AI skills is now leaving the country with not enough talent to meet demand. Companies also face a unique hiring challenge in India: the 60- to 90-day notice window. Candidates may receive a better offer during their notice period, resulting in companies losing out on candidates who had previously agreed to join. The combination of fast-paced hiring and a long notice period means that hiring managers need to be better about following up and engaging with candidates, even after they've accepted an offer.

AI Bootcamps

Graduating from undergraduate or graduate AI programs isn't the only way for people to gain AI engineering skills and knowledge. Several universities offer bootcamps, including Columbia Engineering, California Institute of Technology, and University of Houston.[41] Some tech bootcamp companies also have AI and machine learning tracks now.

Coding bootcamps commonly partner with organizations to help their graduates get placed in a job, and this may extend to AI bootcamps as well. By partnering with bootcamps, you may be able to establish a steady candidate pipeline and be one of the first companies to access up-and-coming AI engineers.

Upskilling Current Employees

Companies can reduce their reliance on hiring new AI talent by upskilling existing engineers. There might be a surprisingly large number of current employees who could fill the AI engineering roles you have, as "more than 60% of a company's future roles can be filled by current employees, assuming that adequate programs are in

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[39] Bhaskar Chakravorti, Ajay Bhalla, Ravi Shankar Chaturvedi, & Christina Filipovic, "50 Global Hubs for Top AI Talent," Harvard Business Review, December 21, 2021, https://hbr.org/2021/12/50-global-hubs-for-top-ai-talent.

[40] "Hyderabad: Top City to Hire Software Engineers," Karat, April 15, 2024, https://karat.com/hyderabad-top-city-to-hire-software-engineers/.

[41] Alyse Maguire, "10 AI bootcamps taught by top schools, companies, and tech experts," Fortune, February 21, 2024, https://fortune.com/education/articles/ai-bootcamps/.

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Considering that 44% of employers' top challenge to finding talent has been a lack of well-qualified applicants, upskilling might actually be a better option than hiring new talent.[42] Upskilling has proven to be easier and more cost-effective than hiring a new employee. Many of the skills that AI engineers need overlap with skills that software engineers already have. Although specialized AI roles are critical, fostering generalist engineers who can adapt to evolving technologies is ultimately what will make your organization AI-ready. Also, existing engineers are already familiar with your technical practices, processes, and infrastructure, and you know how they work within your team and company culture.

Upskilling is clearly an effective way to overcome the limited supply of AI talent, but it relies on truly setting employees up for success. You can achieve this by figuring out the best way to help your employees gain new skills and following best practices.

Learning Methods

One-on-One Development

One of the most convenient ways that software engineers can learn how to become an AI engineer is by gaining skills and experience on the job. Think of ways you can pair learning with application so that employees get hands-on experience. By allowing engineers to apply their newly acquired skills on real-world projects under the guidance of AI experts, you'll accelerate their learning and help them build confidence. This benefits both you and your employees, since engineers can start contributing while they learn.

Learning and Development Stipend

Companies can take a more hands-off approach by offering a stipend that engineers can use on self-paced courses and bootcamps. Resources like Coursera and edX create structured learning paths and develop comprehensive training programs that cover fundamental AI concepts, machine learning algorithms, and practical applications, saving you the time it takes to create these programs yourself. However, this method requires employees to draw from their personal time. This may be difficult for some employees, such as those who have children.

Tuition Assistance or Reimbursement Programs

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[42] "About University of Phoenix Career Institute®," University of Phoenix, https://www.phoenix.edu/career-institute.html.

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For employees who want to dive really deep into AI, you can help them pursue a degree. Employers cover all of some of the tuition fees in a tuition assistance program, and some even pay for books and course materials. In a tuition reimbursement program, employers reimburse employees at the end of each school year or after the program has been completed. Tuition assistance programs minimize the upfront cost to employees, but both types of programs require employees to take on schoolwork in addition to their job. The high cost of higher education makes this a significant investment for companies, but it's been shown that employees who take advantage of these programs are much less likely to leave the company.[43]

Best Practices

Learn Through Practicing

Research has shown that performance in engineering increases with active learning, as opposed to the passive method of "teaching by telling."[44] While it's difficult to completely remove spoken instruction from upskilling programs, it's important to reinforce that information with opportunities to apply the learnings to real scenarios. Before having engineers try their hand at AI projects that will go into production, you can simulate the work through coding exercises. This also ensures that newly trained AI engineers feel confident and are comfortable once they jump into real AI development.

Establish the Desired Outcome and Measure Progress

Ultimately, upskilling should result in engineers actually building the skills they need to work with AI and applying those skills to AI projects at your company. You can ensure this by establishing concrete outcomes at the beginning and tracking progress along the way. Setting clear milestones and metrics also gives both managers and employees insight into the progress that's being made. This empowers employees to self-evaluate and take ownership of their learning while

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[43] Jessica Dickler, "Many companies are adding, expanding tuition assistance so workers can go back to college," CNBC, last updated May 29, 2023, https://www.cnbc.com/2023/05/26/many-companies-offer-tuition-assistance-for-workers-to-go-to-college.html.

[44] Scott Freeman et al., "Active learning increases student performance in science, engineering, and mathematics," Proceedings of the National Academy of Sciences of the United States of America, May 12, 2014, https://www.pnas.org/doi/full/10.1073/pnas.1319030111.

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involving managers and AI experts to give them feedback and review their performance.[45]

Interviewing AI Engineers

The interview process that you use for software engineers can be adapted for AI engineers. It still involves a technical assessment and live interview, and the interview content should be based on the job description. Here's a <u>guide that can help</u> you better understand these roles, identify and hire skilled AI engineers, combat bias that AI can introduce, and think through whether and how to use AI when hiring.

The one thing that companies do need to be aware of though is AI's impact on interviewing. Just as AI is changing how engineers work, it's also changing the way interviews are conducted. The most pressing question that companies need to answer currently is whether to allow candidates to use AI tools during the interview. Here's how to think through this important question, as well as the fundamental components that you need to <u>effectively interview</u> AI engineers.

Skills Required

When hiring for AI engineers, these are some of the hard and soft skills to look for in candidates.

- **Programming:** Common programming languages used in AI development are Python, Java, R, and C++.[46]

- **Big data:** AI engineers work with large volumes of data, so they need to be comfortable with efficiently retrieving, manipulating, cleaning, processing, and analyzing data. Knowing how to use big data tools like Hadoop, Apache Spark, and MongoDB is also crucial to their work.

- **Mathematics and statistics:** Developing AI involves calculating algorithms and an understanding of probability and data patterns, which is why

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[45] Susan R. Vroman & Tiffany Danko, "How to Build a Successful Upskilling Program," Harvard Business Review, January 18, 2022, https://hbr.org/2022/01/how-to-build-a-successful-upskilling-program.

[46] Austin Chia, "The 13 Essential AI Engineer Skills You Need to Know," DataCamp, December 2023, https://www.datacamp.com/blog/essential-ai-engineer-skills.

mathematics and statistics is an extremely skill.[47] Also, AI engineers use statistics, calculus, linear algebra, and numerical analysis to predict how AI programs will run.[48]

- **Machine learning:** AI engineers need to be knowledgeable about machine learning models and algorithms, machine learning techniques, and how to evaluate the performance of these models.[49]

- **Critical thinking and problem solving:** Working with AI involves a lot of trial and error. AI engineers build prototypes, run and test them, make tweaks, and troubleshoot errors.

- **Communication:** Because AI engineers often work cross-functionally, they need strong communication skills that enable them to communicate AI concepts to non-technical team members.

- **Teamwork:** Many AI projects are team efforts that require AI engineers to work with other engineers as well as other teams.

- **Adaptability:** Since the field of AI is constantly evolving and rapidly advancing, it's important for AI engineers to be able to adapt as new techniques and technologies are developed.

Job Description

When hiring AI engineers, it's important to start with a clear and realistic job description. Clearly outlining the skills and responsibilities required for the role helps in attracting candidates who are a good fit and reduces the likelihood of hiring mismatches.

Most AI engineering roles can be performed by full-stack software engineers who receive the appropriate on-the-job training. Many of the skills needed are substantially the same as building any other application, and the nuanced differences can be learned by a strong engineer on the job. Plus, our research shows

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[47] "How to Become an AI Engineer or Researcher," Gwynedd Mercy University, https://www.gmercyu.edu/academics/learn/become-artificial-intelligence-engineer.
[48] Ibid.
[49] Austin Chia, "The 13 Essential AI Engineer Skills You Need to Know," DataCamp, December 2023, https://www.datacamp.com/blog/essential-ai-engineer-skills.

that the most successful hiring companies are more likely to prioritize generalist roles than specialties that are more geared toward AI, such as machine learning or prompt engineering. For these reasons, you can use the job description for a full-stack engineer as a foundation.

Technical Assessment

Adaptive assessments and live interviews are typically used to assess the technical skills of an AI engineer. Adaptive assessments are a better method for screening technical skills than outdated methods like resume screens and code tests. Resume screens can introduce pedigree bias, while code tests are notoriously hated by engineers and suffer from a high drop-off rate. By adjusting questions in real time, adaptive assessments generate a nuanced hiring signal that's more predictive. For example, Karat Qualify, our top-of-funnel assessment, features research-backed questions and takes most candidates only 15 minutes to complete, which results in higher completion rates and fair, reliable results.

Live interviews consist of properly trained interviewers that ask candidates to solve a problem or write code and then discuss the approach they took or why they made certain choices. The human interaction that happens during live interviews is crucial for getting a true hiring signal on a candidate's logic and critical thinking skills, which are fundamental skills for AI engineers. By having trained interviewers conduct these interviews, it also helps weed out candidates who might be cheating. Coaching interviewers to recognize the signs of inorganic behavior is a simple and effective way to differentiate between candidates who have memorized or copied an answer and candidates who are solving a problem in real time.

Interview Questions and Scoring Rubric

Interview questions can introduce bias, so it's extremely important to get them right. Good interview questions have a scoring rubric, test for ability rather than knowledge, and focus on dealbreakers.

Common example interview questions ask candidates to explain a concept, technology, or method. For example, "Explain the difference between supervised and unsupervised learning" or "How can overfitting be prevented in an AI model?"[50]

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[50] "100 AI interview questions and answers for 2024," Turing, last updated July 9, 2024, https://www.turing.com/interview-questions/artificial-intelligence.

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However, these questions can be easily answered if the candidate has memorized information without truly understanding it.

You can turn knowledge questions into ability questions though by introducing a situation that the candidate has to analyze. Here are two examples to inspire your own interview questions:

- Come up with a relevant task where the candidate needs to train a model on data. Then, ask them whether they would use supervised or unsupervised learning to do so and why they selected that method. This requires the candidate to understand the right type of data needed and the relationship between the input data and the desired output, as well as to be familiar with what each learning technique is and when each should be applied.

- Describe a scenario where the AI has been overfitted and ask the candidate to explain what they would do to correct this. By painting a picture of what has happened without explicitly saying that the model has been overfitted, this question helps identify which candidates can recognize the signs of overfitting. Additionally, asking for a solution tests for problem-solving skills and whether the candidate knows which technique to prevent overfitting is applicable in this scenario.

Don't forget that it's important for AI engineers to also have <u>soft skills</u> such as communication and teamwork. Aside from asking technical questions, see how the candidate has demonstrated soft skills that are important for the job. These example behavioral questions from Insight Global ask candidates to show that they're team players, adaptable, and clear communicators:[51]

- Give an example of a time you collaborated with an interdisciplinary team on an AI project.
- Describe a challenging project — AI or otherwise — you've worked on. What challenges did you run into, and how did you overcome them?
- Describe a time you had to describe complex AI concepts to a non-technical coworker or client. How did you approach it?

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[51] Anna Morelock, "15+ AI Engineer Interview Questions," Insight Global, December 4, 2023, https://insightglobal.com/blog/ai-engineer-interview-questions/.

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Scoring rubrics ensure a fair and inclusive interview process by removing bias. With a rubric or scorecard, interviewers will ask similar questions to all candidates and compare candidates on the same criteria. Every rubric needs to be unique to the job's role and responsibilities. You should have already identified the competencies that are relevant to the role when you created the job description. Now, you'll turn those competencies into a scale of observable behaviors that interviewers can look for and check off on the rubric.

Let's go back to our example interview question above that asked the candidate to identify whether supervised or unsupervised learning would be the best approach to training a model for a specific task. Creating a great scoring rubric first requires you to figure out what matters when answering the interview question. In this case, we want:

- Candidates who can understand what is needed to train the model for the task described.
- Candidates who can accurately understand the difference between unsupervised and supervised learning.
- Candidates who can apply their understanding of the differences to identify the correct technique to use in the scenario.

From there, we can craft a rubric that describes what this specifically looks like:

- Award 1 point if the candidate correctly describes the difference between unsupervised and supervised learning.
- Award 1 point if the candidate identifies the correct method to use.
- Award 1 point if the candidate clearly explains why the method is most appropriate for the scenario.

How AI Is Impacting Interviews

While there's been a lot of interest in using AI for interviews and some companies are experimenting with integrating large language models (LLMs) into interviews, most are taking a cautious approach. Very few large organizations are enabling AI in technical interviews today, although we expect this number to grow alongside enterprise adoption of AI tools in the workplace.

With AI's potential impact on the way that engineers work, how does that affect the way that engineers should be interviewed? When deciding whether to allow

candidates to use AI in interviews, it's important to first understand that the impact AI has on interviews differs based on the format and content.

ChatGPT is very good at answering some questions and generating code samples. Asking someone to simply produce a working code sample and accepting their submission without human interactions invites the type of "cheating" that is concerning to hiring managers. However, AI isn't changing the way that technical assessments are conducted, since this type of cheating isn't a new problem. Candidates could previously break those interviews by getting a friend to write their code. Traditional code tests are particularly vulnerable to this form of cheating, which is why complicated "cheat detection tools" are increasing in prevalence.

Live interviews are different. Based on our extensive experimentation, we have found that allowing candidates to use AI tools does not disrupt or alter the results of well-designed live interviews with properly trained interviewers. There are two reasons for this.

- **AI responses are inconsistent.** Generative AI (GenAI) is not always correct when solving technical problems, and often its explanations don't match its solutions. Candidates that are overly dependent on GenAI may be able to "trick" a code test, but the approach falls apart in a live interview. LLMs have no notion of whether the answer is correct, only that the answer is plausible. In our experimentation, we found that ChatGPT and other systems frequently produced inconsistent responses. For example, saying one thing while doing another or claiming to fix an error while leaving the code entirely unchanged. Less skilled candidates who use GenAI to arrive at the right code or answer won't be able to discuss the approach they took or why they made certain choices.

- **Using AI isn't efficient in a timed interview.** Relying on AI to generate an approach and code isn't an efficient way to solve problems in a timed interview. Writing out your question in a way that LLMs can understand takes time, and in our experiments, the turnaround time for responses was usually longer than a web search. Candidates will also need to frequently refine their questions with one or two exchanges, which adds more time. As a result, candidates that rely on GenAI may not be able to answer within the time limit. On the other hand, skilled candidates that use GenAI can write code faster, resulting in more time in the interview spent on problem-solving and less on producing code.

Overall, if a live interview is conducted correctly, we don't think that GenAI will change a decision about an engineer who doesn't have the problem-solving skills that the role requires, and in many cases, over reliance on AI assistance will do more harm than good.

So should you allow candidates to use AI in interviews?

Our default recommendation is to mirror real-life working conditions in interviews wherever possible. This means allowing candidates to look up documentation and use AI if you would allow them to do so on the job. Remember, allowing candidates to consult AI tools during interviews doesn't degrade the hiring signal because candidates who are overly reliant on AI for coding will struggle with code reviews and explaining the choices they made. Also, GenAI doesn't do well with analysis, so this is an area where we see strong candidates differentiate themselves whether they use AI tools or not.

For organizations that don't use AI tools, they should monitor interviews for any signs of external help and make it clear to candidates that they can't use AI. At Karat, our Interview Engineers are trained to ask probing questions to determine what the candidate is doing, and they tag interviews and flag suspected cheating as needed for further review. This type of behavior is rare though, and the instances of it involving GenAI have been less frequent than candidates receiving help from third parties off camera.
At the end of the day, the introduction of AI doesn't change the fundamentals of hiring: hire people with strong problem-solving skills and give them enough context and autonomy to solve your business problems. Additionally, having strong interview content that's researched, tested, and continuously updated based on the latest developments is one way to ensure you're getting a true hiring signal on a candidate's abilities.

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Best Practices for Ensuring Effective Interviews in the Age of AI

1. Experienced Human Interviewers

Coach interviewers to ask probing questions about the candidate's approach and problem solving based on their code. Observe how candidates test code as they work and debug errors. Focus on code review and other areas of analysis that allow candidates to demonstrate the expertise they'll need in an AI-enabled coding environment. These are all inherently human elements that will be absent from a candidate copying AI-generated code.

2. AI-Resilient Interview Content

Interview formats that combine discussion with live coding create a robust profile of a candidate's abilities. This includes project discussions, code review, debugging, and live coding questions that require users to create a mental model of a solution as questions increase in difficulty throughout the interview.

One way to generate AI-resilient content is to design interviews that require completion of a multi-step task. Working with an LLM on a complex task requires breaking the task down into smaller components. This design will gauge a candidate's ability to explain the task and break it down into pieces small enough to prompt AI tools to offer the right assistance, so there is little risk of an inexperienced candidate succeeding on the basis of AI help alone. Another example would be to incorporate code security questions, since LLMs currently can't generate code that is consistently secure. Here you can challenge candidates to leverage an LLM to produce code without security vulnerabilities. Engineers who are familiar with secure coding practices will be able to successfully complete this task.

3. Ongoing Content Testing and Feedback Loops

After designing interview content, put your questions through ChatGPT and see how it does. Questions that are trivially solvable by GenAI are unlikely to be useful at discerning strong candidates from weak ones. If that's what you're seeing, try to focus more on problems that are about logic and critical thinking, where the candidate needs to generate a solution and then translate that into code. Another technique is to structure discussion questions around mini-code reviews. These

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questions require higher levels of cognition and produce highly reliable signals of a candidate's level of expertise.

Even if your interview content stood up against GenAI, it's important to put it to the test again after some time. GenAI is improving, which means that today's AI-resilient content may not be so resilient after several months. Karat is continuously testing, updating, and sunsetting interview content, and we recommend that you do so too. This includes aligning the performance of experienced engineers, early career engineers, students, and nontechnical interview candidates against our benchmarks to understand how coders of different skill levels should perform. We test with and without AI assistance to ensure that our results are consistently delivering a predictive hiring signal.

AI Engineer Compensation

With an increase in AI engineering roles and a shortage of qualified candidates, companies can expect to pay a premium for talent. This is reflected in some of the salaries that have been reported. The typical compensation for a level five engineer with 10 or more years of experience at OpenAI is about $925,000, which consists of a median $300,000 base salary and $625,000 in stock-based compensation.[52] Some higher-level engineers are paid as much as $1.4 million.[53] On the other hand, the lowest reported salary at OpenAI was $210,000 for a software engineer with two to four years of experience.[54]

While some articles say that salaries from large tech companies such as Apple and Alphabet pale in comparison to what OpenAI is providing, the reality is that base salaries for AI engineers aren't significantly more than that of a traditional software engineer.[55]
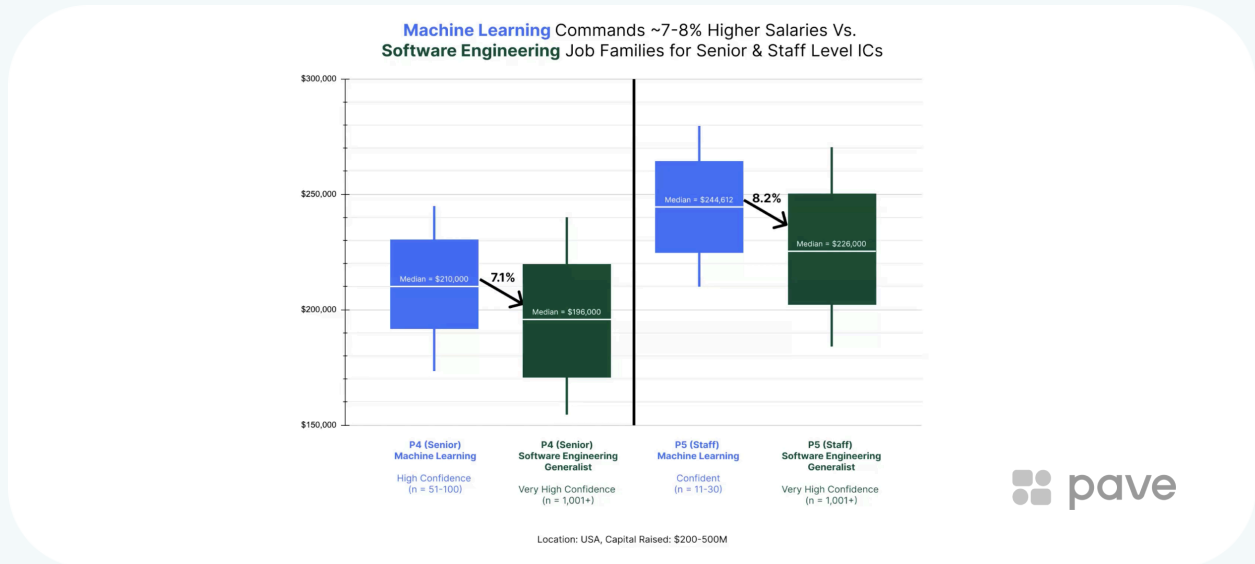
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[52] Max A. Cherney, "The typical OpenAI engineer makes $925,000," Bay Area Inno, last updated June 26, 2023, https://www.bizjournals.com/sanfrancisco/inno/stories/news/2023/06/26/open-ai-is-paying-3x-the-industry-median.html.

[53] Ibid.

[54] Ibid.

[55] Adam Eckert, "OpenAI's Gigantic Salaries Are Making Apple, Google, Microsoft Pay Look... Meh," Benzinga, November 7, 2023, https://www.nasdaq.com/articles/openais-gigantic-salaries-are-making-apple-google-microsoft-pay-look...-meh.

Machine Learning Commands ~7-8% Higher Salaries Vs.
Software Engineering Job Families for Senior & Staff Level ICs

Of course, there are outliers when it comes to compensation. However, compensation for the majority of the market is only slightly higher than software engineering generalist roles. Data from Pave, a compensation management platform, shows that senior- and staff-level machine learning engineers only have a base salary that's 7% to 8% higher than that of a software engineer of the same level.[56] The median salary for machine learning engineers is $177,238, while the median salary for software engineers is $166,000.[57] This will likely change fast though, as the data shows leading indicators that there's a lot of demand for machine learning, which can drive up salaries further.[58]

Companies should also keep in mind that not all AI roles are created equal. Within machine learning, there are specialty skill sets that only a few people have, so those jobs come at a much larger premium.

Additionally, base salary is only one part of the compensation package. Equity is likely where there's more differentiation between machine learning engineers and software engineering generalists. "Equity is the real differentiator for technical talent in general and definitely in the world of AI," said Matt Schulman, Founder and CEO of Pave.[59]

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[56] "2024 Benchmark Report: Software Engineer Salaries in the United States," Karat, https://karat.com/resource/engineering-salary-benchmark-report/.

[57] Ibid.

[58] Ibid.

[59] "2024 Benchmark Report: Software Engineer Salaries in the United States," Karat, https://karat.com/resource/engineering-salary-benchmark-report/.

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Conclusion

It is both a great and challenging time for companies to add AI engineers to their teams. The world has recognized how critical and impactful AI can be. From universities to government organizations, there's an increasing amount of resources that are being poured into developing AI talent. This has resulted in a shortage of skilled AI engineers though, making hiring extremely competitive and driving compensation up.

Now that you understand what the market is like and best practices for hiring, you're ready to take advantage of the talent that is available and overcome current challenges. By learning from the previous mobile app boom and keeping in mind interviewing fundamentals, you can strategically find the best talent and even develop talent from within.

With how competitive hiring AI engineers is, it's important to move fast and accurately identify the candidates who are most likely to succeed. As the world's leader in technical interviewing, Karat can help you not only hire faster and more efficiently, but our expertise can also help guide you through incorporating AI into your interview process. Leverage our innovative and equitable technical assessment, team of trained Interview Engineers, and experience conducting over 350,000 technical interviews today.

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