

How AI reshapes skill demand in European firms

Rather than replacing jobs, AI is reshaping skill requirements within occupations

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Public debate often frames artificial intelligence (AI) as a threat to jobs. The reality looks different. Using more than 75 million online job vacancies posted in Belgium, France, Germany, and Luxembourg between 2018 and 2023, this brief shows that AI is mostly reshaping the content of jobs rather than eliminating them. Demand for AI, data, and prediction skills has grown fastest— with vacancies requiring AI skills increasing by 29% between 2018 and 2023. In parallel, employers require more judgment, decision-making, and leadership skills bundled with AI, data and prediction skills. Overall, job advertisements in occupations exposed to AI did not decline, but rather increase -- indicating that no skill group becomes obsolete. Instead, AI exposure appears to narrow the skill mix within jobs, concentrating requirements around a more technical core. Reskilling within existing occupations should be the policy priority.

75M

job ads analysed

4M

unique skills extracted

8

broad skill groups defined

4

European countries

AI has rapidly expanded its capabilities and reach in recent years. From automating routine analytical tasks to generating text, images and code, AI is reshaping what firms can do and what they ask of their workers. Yet, evidence on how AI actually changes the demand for skills in European labour markets is very limited. Are AI-related skills replacing others in employer demand? Are interpersonal skills becoming more or less important? And is the adjustment occurring through rising or declining demand for certain occupations; or through the same occupations demanding a different skill mix?

This brief summarises new evidence on these important questions, based on 75 million online job advertisements from Belgium, France, Germany, and Luxembourg posted between 2018 and 2023. By extracting and classifying skills directly from job postings with state-of-the-art language models, we can track employers' demand for occupations and skills requirements in unusually granular detail—and link these patterns to the diffusion of AI technologies.

Key findings

1. Demand for AI, prediction, and data skills is rising fast—but social skills still dominate hiring

Averaged across the 2018–2023 period, social skills (such as communication and teamwork) appear in around 87% of job ads. Decision-making (59%), leadership (35%), judgment (28%) and data (28%) skills also appear in a substantial share of postings. AI and prediction skills remain rarer in absolute terms—appearing in 2% and 4% of ads respectively—but they have grown fastest. Between 2018 and 2023, AI skills demand grew by 29%, prediction by 21%, judgment by 17%, and data by 16% (Figure 1). Even decision-making (+13%), leadership (+10%) and social (+8%) expanded, reflecting a broader tendency for employers to ask for a wider mix of competencies: the average number of skill groups per posting rose by 7.3% over the period.

+29%in AI
skill demand**+21%**Prediction
skills**+17%**Judgment
skills**+16%**Data
skills

Data and methods

Data

We analyse 75 million online job vacancies from Lightcast posted in Belgium, France, Germany, and Luxembourg between September 2018 and December 2023. An update extending the analysis through 2025 is currently in progress. Vacancies are scraped from over 300 websites, including EURES (the EU's official job portal), large commercial platforms, and the websites of recruitment agencies and employers. Each ad is assigned an occupation, industry, and location, and the sample is reweighted to match the structure of actual hiring flows from the EU Labour Force Survey.

Extracting and classifying skills

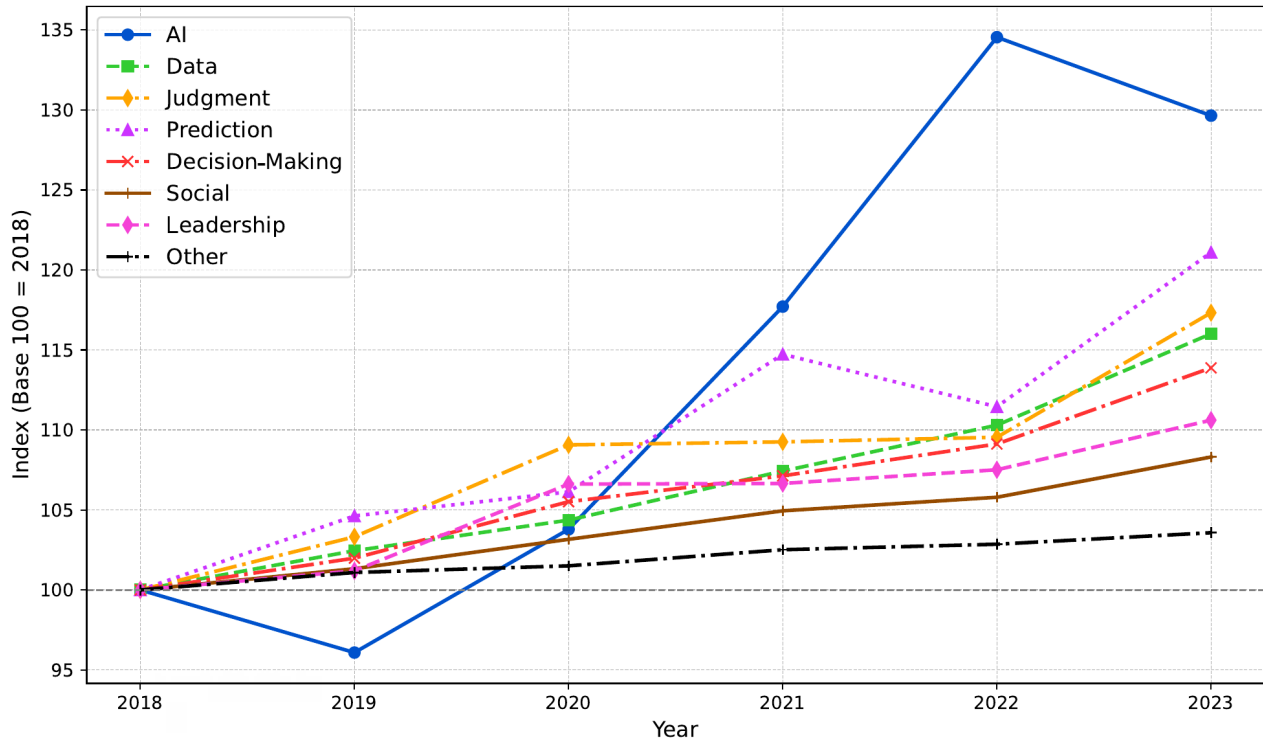
We use the multilingual large language model (LLM) Mixtral to extract skills from raw job text, translate them into English, and merge near-duplicates, yielding 4 million unique skills. We then train a neural network classifier (a Multi-Layer Perceptron) on 526 manually labelled skills to assign each skill to one of eight groups: AI, data, prediction, judgment, decision-making, social, leadership, and a residual other category. The classifier does not delegate the decision to the LLM but bases the classification on a set of input variables (called 'features' in machine learning) that the LLM helps construct, ensuring a transparent and reproducible process. Validated against a human-labelled benchmark, the skill extraction agrees with human annotators on around 85% of cases.

Measuring occupational exposure to AI

We use the Dynamic AI Occupational Exposure (DAIOE) index of Engberg et al. (2024), which links yearly performance improvements across nine AI sub-domains to the underlying abilities required by an occupation, yielding an exposure score for each occupation. To ensure we are picking up AI's effect on skill demand — and not the other way around — we anchor occupational AI exposure to earlier computer science research, drawing on 10 million scientific publications in the OpenAlex database. Because this research predates today's hiring decisions, it reflects AI's genuine progress.

Figure 1 – Growth in demand by skill group, 2018–2023.

AI grows fastest at +29%, followed by Prediction at +21%, Judgment at +17%, and Data at +16%.



*Note: Lines show how employer demand for each skill group has changed since 2018, with 2018 set to 100. A value of 129 means demand has grown by 29% over the period.
Source: Authors' calculations based on Lightcast online job vacancy data, adjusted to match official EU hiring patterns (EU Labour Force Survey).*

SKILL CATEGORIES AT A GLANCE

Every skill extracted from a job ad is assigned to one of eight broad groups.

<p>AI Building or running AI systems. <i>e.g. machine learning, NLP, computer vision</i></p>	<p>Data Managing, processing, and analysing data. <i>e.g. SQL, data cleaning, dashboards</i></p>
<p>Prediction Forecasting, classifying, scoring outcomes. <i>e.g. sales forecasting, credit scoring</i></p>	<p>Judgment Interpreting and weighing evidence. <i>e.g. assessing impact, evaluating KPIs</i></p>
<p>Decision-Making Choosing under uncertainty. <i>e.g. prioritising initiatives, weighing trade-offs</i></p>	<p>Social Interacting with people. <i>e.g. communication, teamwork, negotiation</i></p>
<p>Leadership Guiding people and resources. <i>e.g. motivating teams, setting direction</i></p>	<p>Other Skills that do not fall into the seven groups above. <i>residual category</i></p>

2. Analytical skills and white-collar occupations are the most exposed to AI

To assess which skills and which jobs are most directly affected by AI, we link each of the four million unique skills extracted from job ads to the 52 abilities catalogued by O*NET (the U.S. database of occupational abilities), and combine these with the DAIOE index of Engberg et al. (2024), evaluated at 2023 values.

Looking first at the broad skills (Figure 2, Panel A), we see that prediction and data skills emerge as the most exposed, followed by AI skills—consistent with the domains in which current AI systems perform particularly well. Judgment and decision-making skills also show positive exposure, reflecting that AI’s expanding capabilities now reach into cognitive evaluation tasks, not only data-intensive ones. By contrast, social and leadership skills are the least exposed, reflecting the persistent difficulty of automating relational and social-cognitive tasks.

Rather than individual skills, we can calculate how much occupations with certain skill bundles are exposed to AI. At the occupation level (Panel B), there is a sharp cognitive–manual divide. Clerical Support Workers and Professionals show the highest AI exposure, followed by Technicians and Managers—reflecting their reliance on analytical and information-processing tasks closely aligned with recent advances in AI. Manual and service-oriented occupations such as Elementary Occupations, Skilled Agricultural Workers, and Plant and Machine Operators are the least exposed, since their work depends more on physical dexterity, situational adaptability, and direct interaction with people. Quantitatively, the gap between Elementary Occupations and Clerical Support Workers spans roughly two standard deviations of occupational AI exposure—a sharp rise as you move from manual to cognitive jobs.

3. Within occupations, AI shifts demand towards analytical skills and away from social skills

How does employers’ skill demand respond to AI within detailed 4-digit ISCO occupations? To make sure we are isolating AI’s effect on demand—and not the reverse—we anchor AI exposure to earlier computer science research, which predates today’s hiring decisions and so is not influenced by recent hiring decisions of firms. Figure 3 shows the estimated effect on each skill group, with three distinct patterns.

Applied to the average annual rise in occupational AI exposure observed between 2018 and 2023, the estimates imply three patterns. AI, data and prediction skills increase: demand for AI skills rises by +13.2% per year, for prediction skills by +8.6%, and for data skills by +2.5% (Figure 3). Judgment, decision-making and leadership remain broadly unchanged: none of the three shows a clear standalone increase or decline, indicating that these cognitive capabilities remain in demand as the analytical core expands around them. Social skills decrease: demand for social skills falls by about 2.5% per year within exposed occupations. These patterns are even stronger in jobs that already rely intensively on AI-related skills.

Behind these aggregate shifts lies a single restructuring pattern. AI-exposed skills (AI, data, prediction) increasingly co-occur with complementary cognitive skills (judgment, decision-making, leadership) within job ads—the average annual increase in AI exposure between 2018 and 2023 raises the probability of seeing this bundle together by 3.6% per year relative to the mean. At the same time, this same bundle substitutes for social skills inside the same occupation. In short, firms increasingly seek workers who combine analytical tools with the judgement to apply them, and this combination is taking over part of the territory social skills used to occupy.

4. AI-exposed occupations expand, even as their skill mix changes

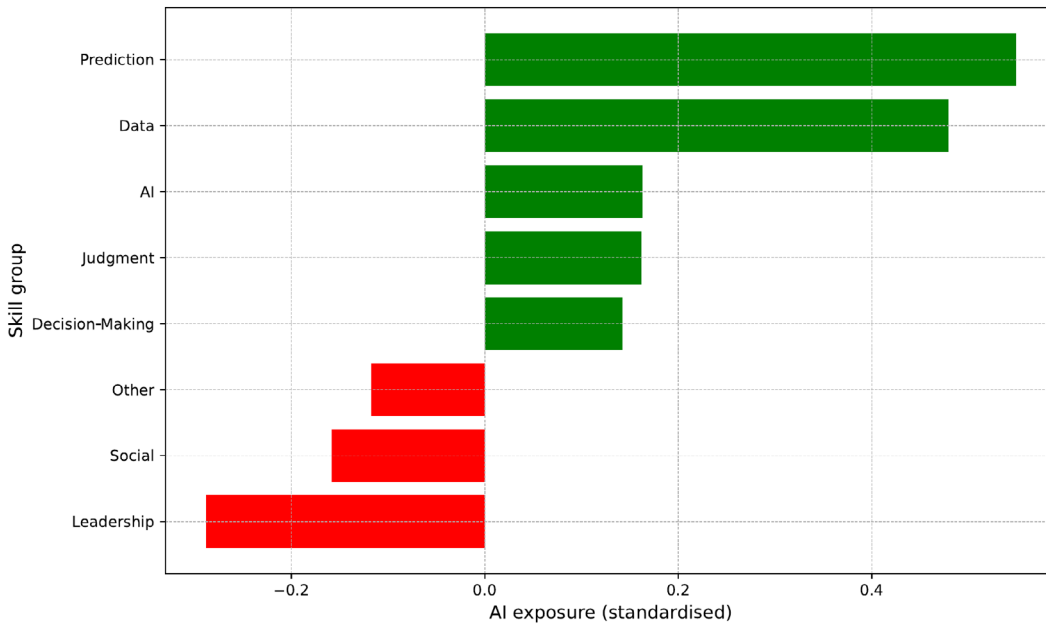
Across occupations, the picture is one of expansion, not displacement. Occupations that became more exposed to AI between 2018 and 2023 saw a marked increase in their number of job advertisements relative to less-exposed occupations. Applying the estimated effect to the average rise in occupational AI exposure observed between 2018 and 2023 implies a yearly 9% increase in job ads in AI-exposed occupations. AI is, in this sense, a boost to the occupations it most directly affects.

At the same time, within those occupations, skill requirements become more concentrated around a narrower, more technical core. Across the economy as a whole, no major skill group is becoming obsolete. Social skills fall within AI-exposed occupations (Finding 3), but the total number of job ads requiring them still grows because those occupations expand.

Figure 2 – AI exposure by skill group and occupation, 2023.

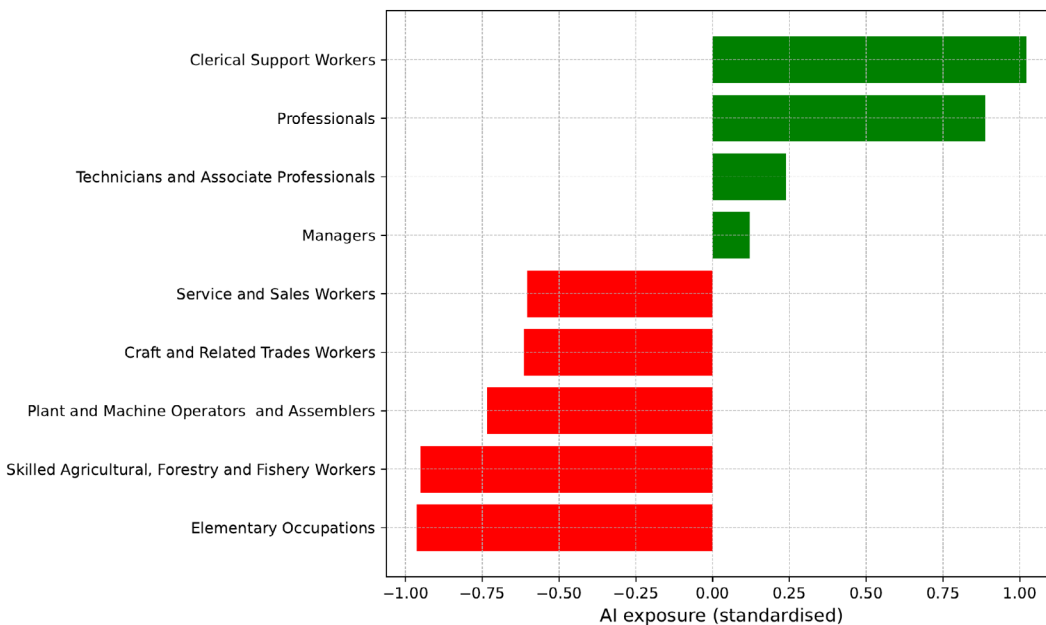
A. Skill groups, ranked by AI exposure (2023)

Prediction and Data show the highest exposure, followed by AI, Judgment, and Decision-Making; Other, Social, and Leadership show negative exposure.



B. Occupations, ranked by AI exposure (2023)

Clerical Support Workers and Professionals show the highest exposure, followed by Technicians and Managers; Elementary Occupations and Skilled Agricultural, Forestry and Fishery Workers show the lowest exposure.



Note: Panel A ranks the eight skill groups by their AI exposure score; Panel B ranks 1-digit ISCO occupations by their average AI exposure score. Both scores are standardised to a mean of 0 and a standard deviation of 1, using 2023 values. AI exposure concentrates on analytical skills (Prediction, Data, AI) and on cognitively intensive, white-collar occupations.

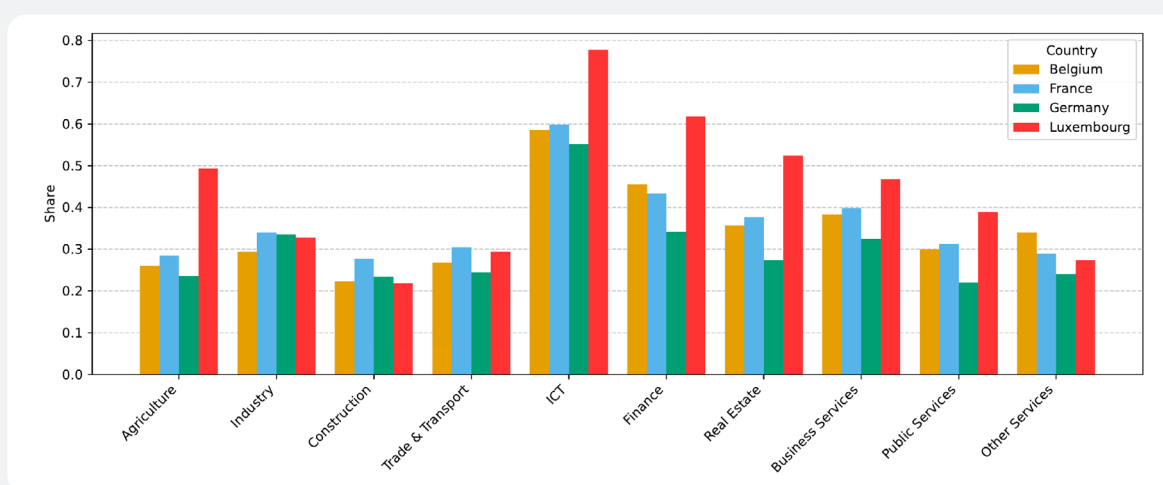
Source: Authors' calculations based on the Dynamic AI Occupational Exposure index of Engberg et al. (2024).

ICT and Finance lead the AI-related skill demand — with Luxembourg ahead of its neighbours

The 2023 cross-country snapshot below shows the share of job advertisements requiring at least one AI, data, or prediction skill across ten broad industry groups. ICT dominates across all four countries (55% in Germany to 78% in Luxembourg), and Finance comes second (34% in Germany to 62% in Luxembourg). Real Estate, Business Services, and Public Services also exceed 30% in most countries, indicating that AI-related skill demand has spread well beyond traditional tech sectors. By contrast, Construction, Trade & Transport, and Industry (manufacturing, mining, energy, water and waste) show the lowest shares.

Across almost every industry, Luxembourg sits at the top of the country ranking and leads even in less obvious sectors, including Agriculture (49%) and Business Services (47%). For a small, open economy in which ICT and Finance employ a sizeable share of the workforce, AI-related skills have become a broad-based requirement of the labour market, not a niche of a few specialised employers.

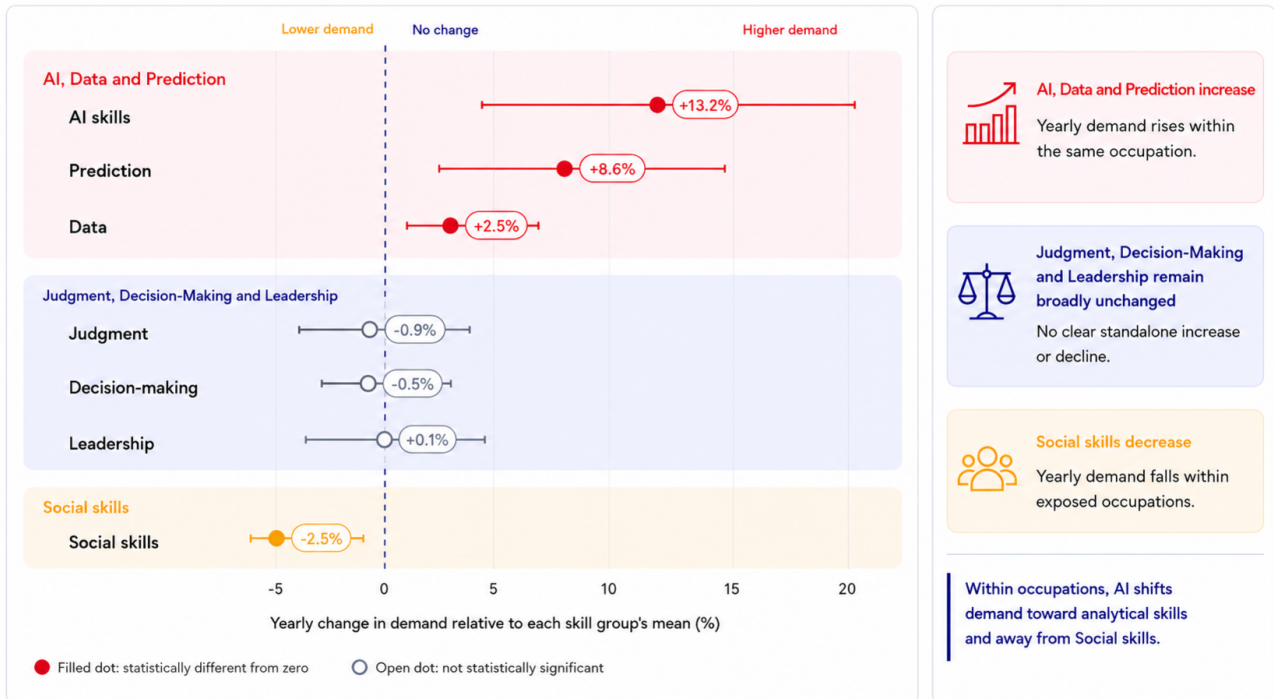
Share of job ads requiring AI, Data, or Prediction skills by industry and country, 2023.



Note: Bars show, for each broad NACE Rev. 2 industry group, the share of job advertisements requiring at least one skill in the AI, Data, or Prediction categories. ICT leads across all countries (55-78%), followed by Finance (34-62%). Construction and Trade & Transport show the lowest shares. Luxembourg sits at the top of the country ranking in most sectors.

Source: Authors' calculations based on Lightcast online job vacancy data, adjusted to match official EU hiring patterns (EU Labour Force Survey)

Figure 3 – AI shifts the skill mix inside occupations.



Note: Estimated change in demand for each skill group, applied to the average annual rise in occupational AI exposure observed between 2018 and 2023, shown as % change per year relative to the average demand for that skill. Estimates compare job ads within the same detailed occupation. Dots show the estimated effect; bars show 95% confidence intervals. Filled dots indicate effects significantly different from zero at the 5% level; open dots indicate no clear change for that skill on its own. Current AI exposure is anchored to earlier computer science research, so that the estimated effect reflects genuine technological progress.

Source: Authors' calculations based on Lightcast online job vacancy data.

Three mechanisms through which AI reshapes labour demand – and their net effect on jobs

Within-occupation substitution

AI technologies lower the cost of AI-exposed skills (data, prediction, AI), raising their demand and pushing social skills out of the same vacancies.

Within-occupation complementarity

Cognitive skills (judgment, decision-making, leadership) increasingly co-occur with AI-exposed skills—humans interpret and act on AI outputs.

Between-occupation reallocation

Occupations exposed to AI expand as they become cheaper to produce, drawing more hiring towards them.

Net effect on jobs

AI-driven restructuring happens largely *within* existing occupations rather than through mass occupational displacement.

Policy implications

Our findings point to three priorities for European policymakers, employers, and education systems.

1. AI adoption needs skills policy

- AI is reshaping skill requirements rather than eliminating jobs. Most adjustment occurs within existing occupations as the mix of required skills changes.
- Reskilling and upskilling programmes targeted at workers in their current occupational trajectories are likely to be more effective than schemes designed to manage large-scale occupational transitions.
- Lifelong-learning rights and short courses that workers can combine over time can help them pick up new AI-related skills while staying in their current field.

2. Invest in data, prediction, and AI competencies—not just in computer scientists

- The fastest growing skill demands are not narrowly defined AI engineering roles, but broader data and prediction competencies that increasingly appear across many occupations.

- Curricula at secondary, vocational, and tertiary levels should embed data literacy, basic statistical reasoning, and applied AI skills as cross-cutting competencies rather than confining them to computer science and other technical tracks.
- Continuing education programmes for mid-career workers should prioritise applied data, prediction, and generative AI tools, alongside the domain knowledge in which they will be used.

3. Protect and develop complementary cognitive skills

- Judgment, decision-making, and leadership skills are not displaced by AI and increasingly co-occur with AI-exposed skills in job ads—humans remain the layer that interprets, evaluates and acts on AI outputs.
- Training programmes should explicitly support the combination of analytical tools with critical judgement and managerial reasoning, rather than treating these as separate tracks.
- Workplace AI adoption strategies should preserve human authority over consequential decisions and invest in the skills required to exercise it.

References

- Feimi, N., Gathmann, C., Gregory, T., & Marguerit, D. (2026). "Skill Demand in the Age of AI: Evidence from Europe." mimeo.
- Acemoglu, D., Autor, D., Hazell, J., & Restrepo, P. (2022). Artificial intelligence and jobs: Evidence from online vacancies. *Journal of Labor Economics*, 40(S1), S293–S340.
- Agrawal, A., Gans, J., & Goldfarb, A. (2018). *Prediction Machines: The Simple Economics of Artificial Intelligence*. Harvard Business Review Press.
- Engberg, E., Görg, H., Lodefalk, M., et al. (2024). "AI Unboxed and Jobs: A Novel Measure and Firm Level Evidence from Three Countries." IZA Discussion Paper No. 16717
- Felten, E., Raj, M., & Seamans, R. (2018). "A Method to Link Advances in Artificial Intelligence to Occupational Abilities." *AEA Papers and Proceedings* 108: 54–57.
- Gathmann, C. (2025). "AI and Europe's Labor Market." *EconPol Forum*, 27(2), 33–38.

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