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IAG Workshop on the Trends and Impact of AI in the Labour Markets and Skills Needs

Turin, 14-15 May 2025

THE EU AGENCY SUPPORTING COUNTRIES TO DEVELOP THROUGH LEARNING

AI'S IMPACT ON THE LABOUR MARKETS: WHAT DO WE KNOW SO FAR FROM THE LITERATURE?

Key stylised facts summarised from the literature review

14 May 2025, Session 1

Ummuhan Bardak, ETF and Mauro Pelucchi, Lightcast

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Defining AI and its main components

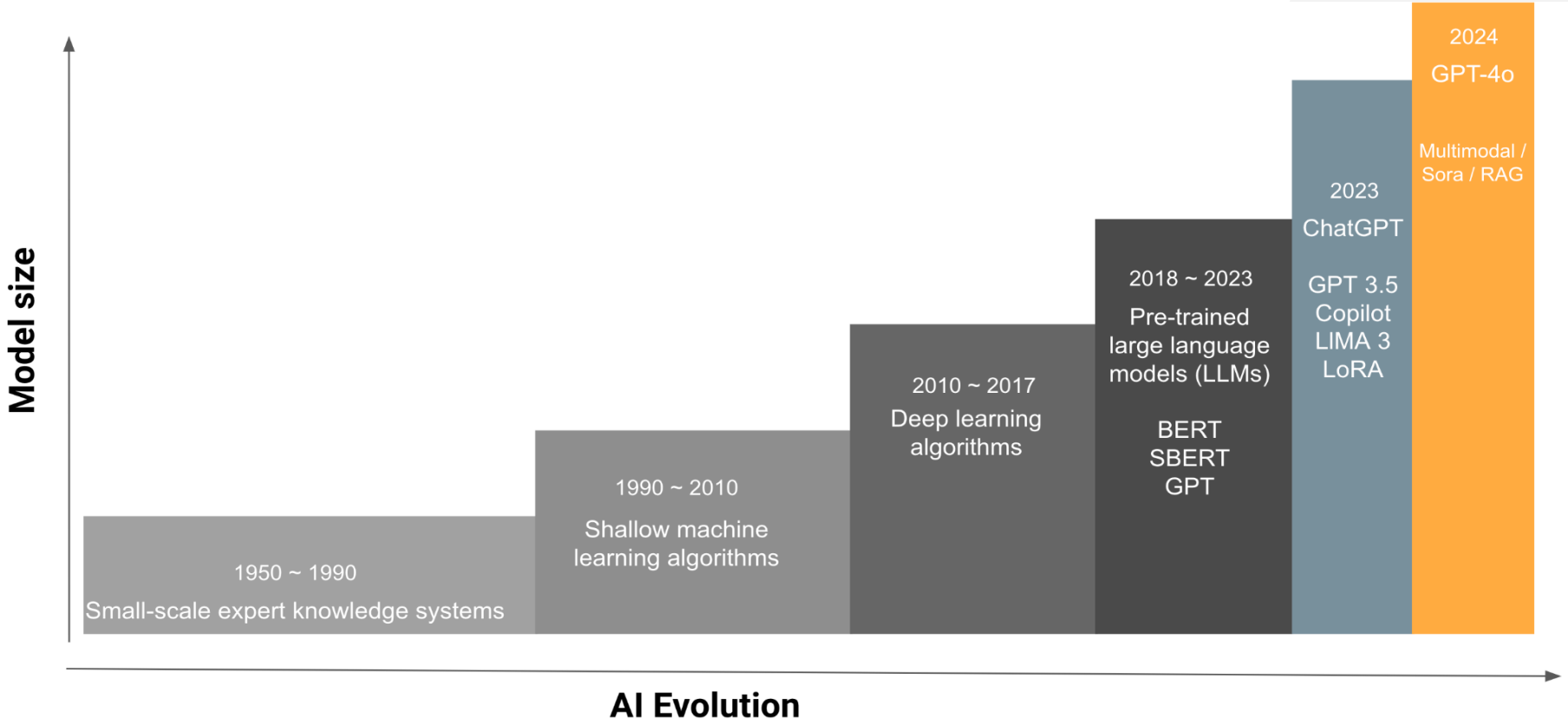
AI is machine-based systems designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments (EU AI Act, 2024).

- Any AI system must have the capability of perception, reasoning/ decision-making, actuation.

Remember three key components in the development of AI systems:

- **Learning algorithms and models** developed by scientists to analyse data
- **The Big Data** needed to train and validate these models, which depends on IT for collection and storage. Big Data is the fuel of AI and provided by humans
- **The computational power / energy** needed to process Big Data. Only relatively recently have computers become powerful enough to analyse large amounts of data fast enough

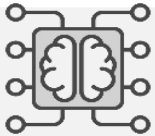
A brief history of AI developments: from symbolic reasoning to generative intelligence



Foundational concepts: From algorithms to intelligence

Narrow AI / Weak AI

Spam filters, Recommendation engine, Siri, Alexa, etc.

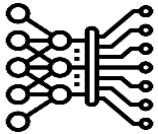


Machine Learning

Fraud detection, credit scoring, customer churn, demand forecasting, etc.

Neural network

Image classification, speech-to-text, medical diagnostic, etc.



Deep learning

Self-driving cars, semantic similarities, GPT, etc.

Artificial General Intelligence

Hypothetical AI with human-like reasoning across diverse tasks and environments.

Main AI subfields and applications

Natural language processing (NLP)

Combines machine learning, linguistics, and computer science to enable machines to understand, interpret, and generate human language.

Large language models (LLM)

AI models trained on massive text datasets to generate and understand human-like language.

Generative AI (GenAI)

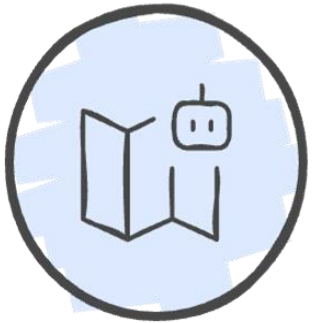
AI systems that create new content—text, images, audio, or video. Examples: ChatGPT, Stable Diffusion, GANs

Retrieval-augmented generation (RAG)

Combines language models with search/ retrieval systems to access external data in real time.

Emerging paradigms to make complex AI models accessible to all:

“from reactive systems to autonomous intelligence”



Agentic AI

Enables autonomous and adaptive decision-making (automating workflows, managing projects, assisting employees with task prioritisation, and dynamically responding to customer needs)

Foundation Models

Provides general-purpose building blocks for diverse tasks (power tools like ChatGPT, Copilot, or Claude that assist in drafting content, analysing data, writing code, and generating insights across domains like HR, marketing, finance, and research…)

What distinguishes AI from other technologies?

1. AI as general-purpose technology

Expectations on GenAI's potential to become a general-purpose technology, comparable to computing, electrification and the steam engine.

2. The non-rivalry of algorithms

When one algorithm acquires the knowledge or skills for a specific task, it can be used in any production process anytime anywhere.

3. AI automating non-routine cognitive tasks

AI's reasoning and perception capacity enables the performance of non-routine cognitive tasks, particularly hitting the white-collar and highly educated professions.

What makes the research on AI impact more challenging?

1. Diversity of AI technologies

AI is not a single, uniform technology; it comprises a range of different systems, which can impact workers in different ways.

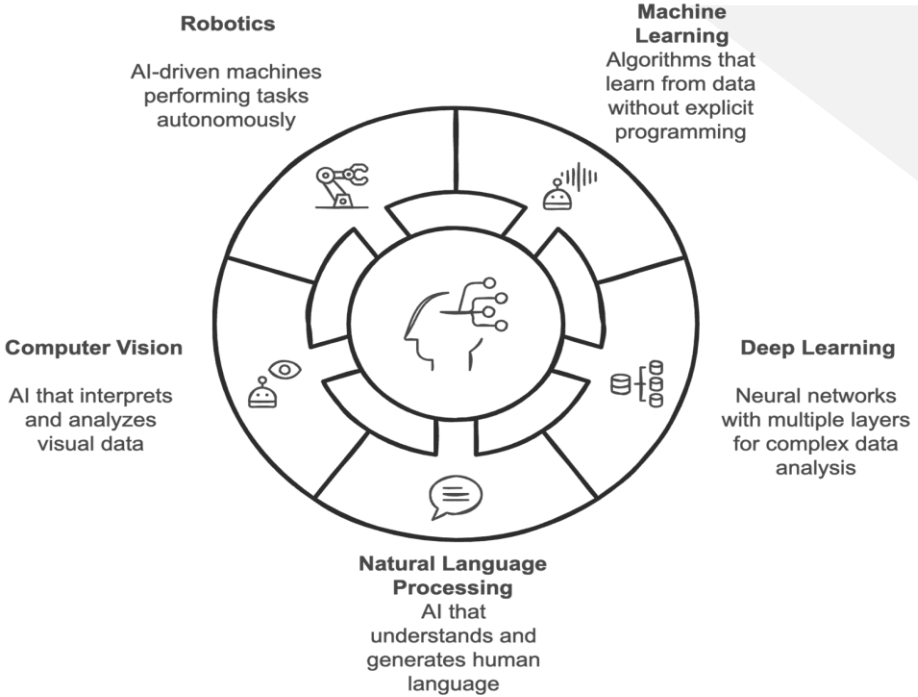
2. Context-dependent impact

Economic structure, labour market institutions, regulations, education systems, and technology adoption shape the extent of changes and impact of AI.

3. AI in its infancy

With constant evolutions every day, it is reasonable to say that we are still far from seeing the full impact of AI on the labour markets.

Main AI applications and examples from sectors



Customer Service & Interaction: Chatbots, virtual assistants, and automated helpdesks handle routine inquiries. Improve response time, reduce operational costs, and personalise engagement.

Manufacturing & Logistics: Predictive maintenance, robotics, and inventory optimisation. Increases efficiency, reduces downtime, and enhances safety.

Finance & Risk Management: Fraud detection, algorithmic trading, and credit scoring. Delivers real-time insights and supports high-stakes decision-making.

Creative Industries: Text, image, and video generation for marketing, content creation, and design. Supports ideation and accelerates production pipelines.

Healthcare: Diagnostic support, medical image analysis, personalised treatment planning. Enhances accuracy and speeds up clinical workflows.

Education & Training: Adaptive learning platforms, AI tutors, and curriculum recommendation tools. Supports individualised pathways and continuous skill development.

Recruitment & Talent Matching: AI-driven screening, CV parsing, and candidate ranking. Used by PES and private firms to optimise hiring and reduce bias (if well-governed).

What is AI really doing at work?

Redefining workflows, decisions, human roles and organisational models

1.Data analytics and business intelligence Uses AI for predictive analytics and data-driven decision-making, aiding in business strategy and forecasting	**2.Enhanced communication and collaboration** Improves workplace interactions via AI-powered collaboration tools, language translation, and sentiment analysis	**3.Automation of tasks** Automates both routine and non-routine tasks like customer service, data entry, and scheduling, improving efficiency and accuracy
4.Recruitment and HR management Enhances recruitment through AI-driven candidate screening and interview automation, reducing bias and streamlining hiring	**5.Employee well-being and development** Supports employee well-being with AI-driven personalized learning and stress monitoring for improved work-life balance	**6.Agentic AI** Deploys agentic AI to act as intelligent workplace companions that support planning, content generation, task execution, and decision-making

What is AI really doing at work?

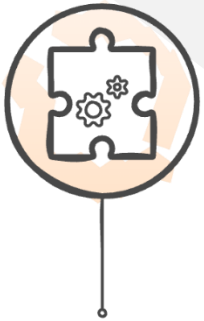
AI Use case	Benefits	Challenges	Examples of AI tools
1.Data analytics and business intelligence	Provides actionable insights, forecasts trends, and enhances business intelligence.	Data privacy issues, model transparency, and high computational costs.	Tableau with Einstein AI, SAS Viya, Google AutoML Tables, Amazon SageMaker AI
2.Enhanced communication and collaboration	Facilitates global teamwork, improves communication, and enhances employee engagement.	Dependence on AI accuracy, risk of misinterpretation, and cultural adaptation challenges.	Microsoft Teams Copilot, Google Meet AI, Zoom IQ, Grammarly Business
3.Automation of tasks	Increases efficiency, reduces human error, and optimizes resource allocation.	Risk of job displacement, integration complexity, and reliance on high-quality data.	UiPath, IBM Watson Assistant, Amelia, Microsoft Power Automate
4.Recruitment and HR management	Speeds up hiring, ensures fairer recruitment, and improves talent matching.	Potential bias in AI algorithms, privacy concerns, and resistance to automated hiring.	HireVue, Pymetrics, SeekOut, LinkedIn Talent Insights
5.Employee well-being and development	Promotes continuous learning, detects well-being issues, and enhances workforce productivity.	Ethical concerns in employee monitoring, potential data misuse, and need for regulatory oversight.	Coursera with AI recommendations, Workday Learning
6.Agentic AI	Reduces cognitive load, enhances productivity, supports strategic tasks.	Trust in AI output, integration into workflows, risk of overreliance.	Microsoft 365 Copilot, Google Duet AI, ChatGPT Enterprise, Salesforce Einstein GPT

AI-driven restructuring in production and services:

Reimagining value chains, workflows and service delivery

Predictive Maintenance

AI identifies potential equipment failures early, minimising disruptions.

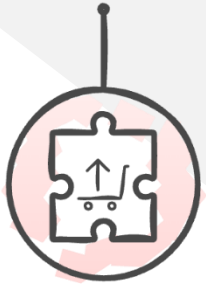


Digital Twins

Virtual models simulate and improve real-world operational efficiency.

Demand Forecasting

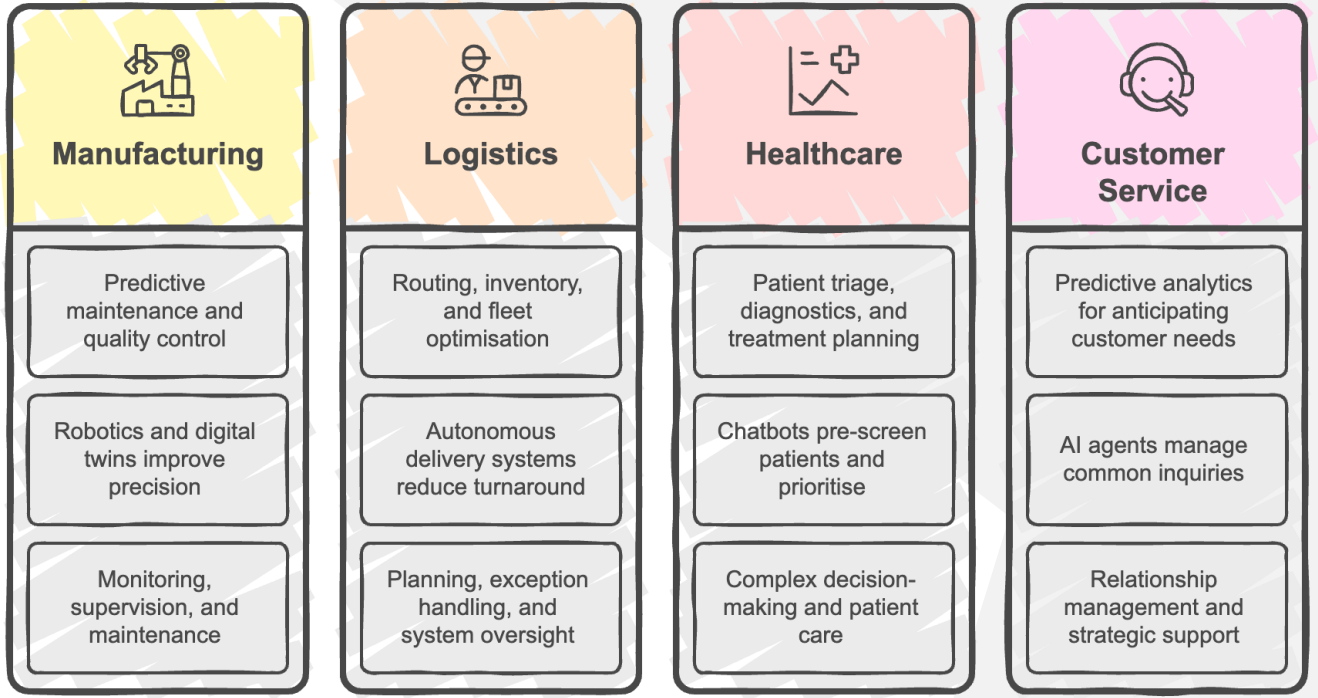
Analytics matches production output to real-time consumer demands.



Service Delivery

Digital agents for faster, smarter, and more personal services

AI in manufacturing, logistics, healthcare and customer services



Analysing AI impact on the number of jobs

Accelerated automation => Substitution vs. Complementarity?

AI Occupational Exposure Index (Felten et al, 2021; IMF 2024; Eloundou et al, 2023)

- High exposure/high complementarity (i.e. judges, doctors)
- High exposure/low complementarity (i.e. clerical workers)
- Low exposure (i.e. agricultural workers, elementary occupations)

Task-based approach (OECD, ILO 2023, JRC 2018, ECB 2023, Hampole et al 2025)

Analysing the creation, destruction, and reorganisation of tasks in jobs

- **Job displacement:** AI to fully perform tasks that were previously performed by humans (full automation)
- **Job creation:** AI to create completely new jobs that do not exist before
- **Job transformation:** reorganising tasks between automatable and non-automatable tasks

✓ *Job augmentation*
✓ *Job upgrade/ up-skilling*
✓ *Job downgrade/ down-skilling*

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Who will be affected most by AI

"**White collar occupations**, **highly skilled professions**, typically requiring several years of formal training and/or tertiary education"

Examples of most exposed occupations	Examples of less exposed occupations
• Engineering occupations • IT technology/ software professionals • Chief executives/ business professionals • Life sciences (e.g. medicine, biology, zoology) • Banking, insurance, auditors • Physics/ mathematics/ data sciences • Legal professions • Social scientists • Authors, writers, printing, translators • Creative industry (e.g. graphic designers) • Marketing, communication and public relations • Clerical/ office/ secretarial workers • Plant and system operators • Transportation workers • Customer services, wholesale/ retails workers	• Cooks • Helpers/ cleaners • Care workers • Food/ beverage service workers • Food preparation workers • Agricultural, forestry and fishery workers • Elementary occupations • Labourers • Trade workers? • Construction trades?

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Will AI kill jobs?

ILO, WEF, IMF, OECD… findings suggest AI will displace some jobs, but more will be transformed or newly created

Study owner	Approach/methodology /region	Job creation	Job destruction
Frey & Osborne (2017)	Task-based analysis of 702 US occupations	Not addressed	47% of US jobs at high risk
McKinsey Global Institute (2017) **McKinsey, 2023**	Executive surveys, scenario modelling/ global US economy Proxy: Midpoint automation adoption by 2030 as a share of time spent on work activities, US	Up to 375 million jobs may need to switch occupational categories	Up to 800 million jobs displaced by 2030 Share of time spent on work activities without GenAI: 21.5% of hours worked by 2030
WEF (2020, 2023, 2025)	Employer surveys, market forecasts /global	97 million new jobs by 2025	85 million jobs displaced without upskilling
OECD (2023) two reports	Online job postings analysis+ interviews of companies in finance and manufacturing in 7 countries	Rising demand for AI roles, esp. in high-tech Self-reported numbers from workers and employers	Sector-specific task displacement 20% of workers are very/ extremely worried about job loss
ILO (2023)	ISCO-08 exposure modeling across 160+ countries	13.4% of jobs in high-income countries may be AI-augmented	5.5% of jobs at risk in high-income countries; 0.4% in low-income countries
Hering (2023) – Indeed AI Report	Analysis of 55M job ads & 2,600 skills	Augmentation dominant in most roles	19.8% of jobs highly exposed; admin. roles most at risk
Eloundou et al., 2023	Exposure as a proxy for potential economic impact (without distinguishing labour augmenting/displacing effects)	Maximum: 80% exposure Minimum: 19% exposure	Human annotators and GPT-4 are used as classifiers to apply this rubric to US occupational data (O*NET database)
McNelly & Smith (2023)	Case studies in retail, manufacturing	New roles in logistics/AI support	Operational roles thinned by automation
Hui et al 2023 **EPC 2024**	Loss of jobs after launch of ChatGPT based on OJV analysis		The demand for freelance knowledge workers on online platforms saw 2% decline in job vacancies and 5.2% drop in monthly earnings – especially for writing, image creation, software programming tasks.

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KPMG, 2023 UK labour market	Identify three main applications of GenAI: classification/ summary, technical content creation, subjective works. Contrasted with the range of tasks that make up the UK labour market	60% of jobs facing no effect	10% of jobs facing impact on over 5% of tasks
ECB, 2023 16 European countries	Used occupational indices to measure AI exposure on different occupations (task-based framework)	The scale of the impact varies substantially across countries, due to differences in underlying economic factors. The degree of exposure is as much as an opportunity at it is a risk.	Around 25% of all jobs are highly exposed to AI-enabled automation.
EY-Parthenon (2024)	O*NET + industry classification	New high-wage AI roles emerging	8 million US jobs highly exposed (5% of total)
Autor (2024)	Historical comparison of tech revolutions	Middle-tier roles may return with AI	Clerical, admin jobs in steep decline
IMF (2024)	Cross-country labour exposure modelling- 142 countries using ILO employment database	Varies by income & skill level 40% in emerging market economies (with the corresponding shares of 16% and 24%) 26% in low-income countries (with the corresponding shares of 8% and 18% respectively)	**40% of global jobs affected, with half of those tasks automatable.** **Advanced economies:** 60% of jobs are exposed (27% of jobs in high-exposure/complementarity, 33% in high-exposure/ low-complementarity jobs).
Hampole et al, 2025 US economy	Task-based approach for workers exposure to AI between 2010-2023 by using LLM and NLP techniques applied to resume and job posting data and comparison with ONET data	AI exposure accounts for roughly 14% of the variation in occupational employment growth AI appears to be reallocating labour across tasks and firms, with the magnitude depending on the structure of AI adoption at the firm level.	Jobs in business, financial, engineering declined by 2% to 2.5%.

Main results of studies on the quantity of jobs

- **Overall modest employment effect** (small decline or even small increase) – **Job transformation** as the most widely impact
- **Increase of workers' productivity** with the use of GenAI – by increasing the *quality of outputs* and *reducing time to finish tasks* (e.g. software developers, customer support workers)
- **Less-experienced or lower-skilled workers might gain most** from AI support, with potential to make some high-skilled jobs more accessible to wider group of people (Acemoglu 2023; Autor 2024; Nurski 2024)

Critics on task-automation models:

- Tend to potentially overestimate the extend of job displacement: focus on technical feasibility, ignoring economic viability, social/ regulatory barriers
- Miss the system redesign perspective with new management/ operational models (e.g. creating new processes, handling coordination tasks, decision-making capabilities)

Jury is still out there!

AI impact on job quality

What is job quality?

- Working conditions (work environment, working time/ intensity, job safety, OSH, compensation, benefits, career growth, wages)
- Job demands and workload (physical, psychological, social, organisational)
- Job autonomy and control
- Skills variety and use
- Job feedback and related work characteristics
- Social and relational aspects of work

Benefits

- Increased productivity, especially for novice workers and low-skilled workers (Brynjolfsson et al, 2023)
- Increased safety and health at workplace (e.g. automating dangerous tasks, detecting hazards, monitoring workers' fatigue)
- Increased job satisfaction with more fulfilling and interesting jobs with AI-assisted tools

Benefits can increase with how jobs are reorganised/ redesigned by employers and/ or workers

- Example: job crafting

Risks of AI use on the workplace

- **Increased worker monitoring and surveillance**
- **Decreased autonomy and creativity**
- **Privacy breaches and security of data collected**
- **Discrimination and bias** for less-advantaged groups
- **Decreasing liability and accountability** if something goes wrong
- **Lacking transparency and explainability** in decisions
- **Rising (income) inequality** within occupations/ sectors/ countries
- **Challenges to social dialogue** and power balance
- **Increasing non-standard/ atypical employment** with more task-based approach

Degree of risks identified in the Australian labour market (Walkowiak& MacDonald, 2024)

- Safety and physical/ psychological harm: 26.4%
- Liability and accountability: 26%
- Unethical or harmful bias: 14.1%
- Cybersecurity: 13.7%
- Breach in professional standards: 13.6%
- Privacy breaches: 12.4%
- Misinformation/ manipulation risks: 10.6%
- Intellectual property risks: 9.8%

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Sources: OECD, 2024; ILO, 2023; JRC, 2018

Between Empowerment and Surveillance

AI tools can empower or disempower depending on how they're used – without safeguards, these systems can become sources of stress rather than support

Support decision-making with real-time insights

Reduce **uncertainty** with better workload forecasting

Higher satisfaction for workers who **experience** AI as a supportive tool

Used for surveillance, behaviour monitoring, and performance ranking

Performance Tool ⟷ **Control Mechanism**

Enables better task tracking, feedback, and productivity analysis

Limit freedom through **rigid** task allocation and tracking

Increases performance **pressure** and sense of constant monitoring

Lower satisfaction where AI is perceived as **punitive** or opaque

'Datafication of workplaces'

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Evidence from the ground (Eurofound, 2025)

Highly automated manufacturing site

- In high-tech manufacturing environments, shop floor workers face increased task complexity and cognitive load
- Training is narrowly focused and delivered on the job.
- Despite relocation to advanced facilities, employment levels remain stable

Automated warehouse

- In automated warehouses, operators experience task simplification and underload, as AI manages workflows, reducing mental engagement
- Physical demands remain, while training focuses on safe technology use
- Managers rely more on data-driven decisions
- Employment levels are similar to non-automated warehouses

Impact depends on how AI is designed, governed and integrated into workflows

AI impact on inclusiveness: risk of increasing inequality

Advantaged groups of workers ✓ More educated, higher-income workers ✓ STEM professions and chief executives ✓ Dominance of white male workers in above ✓ Younger and prime-age workers	VS	**Disadvantaged groups of workers** ✓ Low-educated, low-income workers ✓ Elementary occupations/ human care work) ✓ Dominance of female workers in clerical/ admin jobs ✓ Old-age workers and disabled workers ✓ Marginalised groups (i.e. ethnicity, poverty, minority group, migrant)
Advanced economies ✓ Good level of digital infrastructure ✓ Widely accessible and low-cost broadband ✓ High digital skills base ✓ High share of white-collar occupations	VS	**Developing countries** ✓ Poor digital infrastructure and energy sources ✓ High costs of broadband connectivity ✓ Low digital skills base (digital divide) ✓ High share of elementary occupations

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Risk of increasing inequality is real: between worker groups (OECD, 2023 and 2024; Arora&Huang 2025) and between countries (ILO 2023; IMF 2024)

AI for inclusiveness: risk of discrimination and bias

Gender inequality in AI is a fact

- ✓ Very few women in the AI workforce (AI developers, total 0.3% in OECD)
- ✓ Very few women among the AI users and ICT graduates (81% of ICT workers are male in EU)
- ✓ Female workers less likely use AI tools (ChatGPT) than males
- ✓ Women report less positive perceptions about AI than men

Discrimination and bias by AI models

Historical discrimination and disadvantages of women and marginalised groups maybe reinforced and amplified by AI models

"Male-norm" in datasets is a default across contexts

Gender stereotypes are often applied by algorithms

- ✓ Recruitment tools favouring male candidates
- ✓ Education tools advising humanity courses to females
- ✓ Digital healthcare misdiagnosing women
- ✓ Financial tools declining female entrepreneurs to funding

Several types of bias are identified in AI models

Presentation bias, filter bias, selection bias, historical bias, aggregation bias, interaction bias

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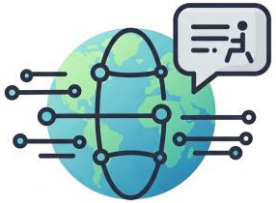
Sources: Arora&Huang 2025; OECD 202; UNESCO/OECD/IDB, 2022

Inclusive by design: AI's positive potential from barrier to enabler

AI-assisted technologies to support persons with disabilities (OECD 2023)

- ✓ Speech recognition for people with dysarthric voices
- ✓ Live captioning systems for deaf, hard-hearing people
- ✓ Image recognition devices for the blind
- ✓ NLP applications for neurodiverse workers in reading/writing



AI translators improving accessibility for migrants and multilingual workers

Broader profiling tools surfacing hidden or non-traditional talent

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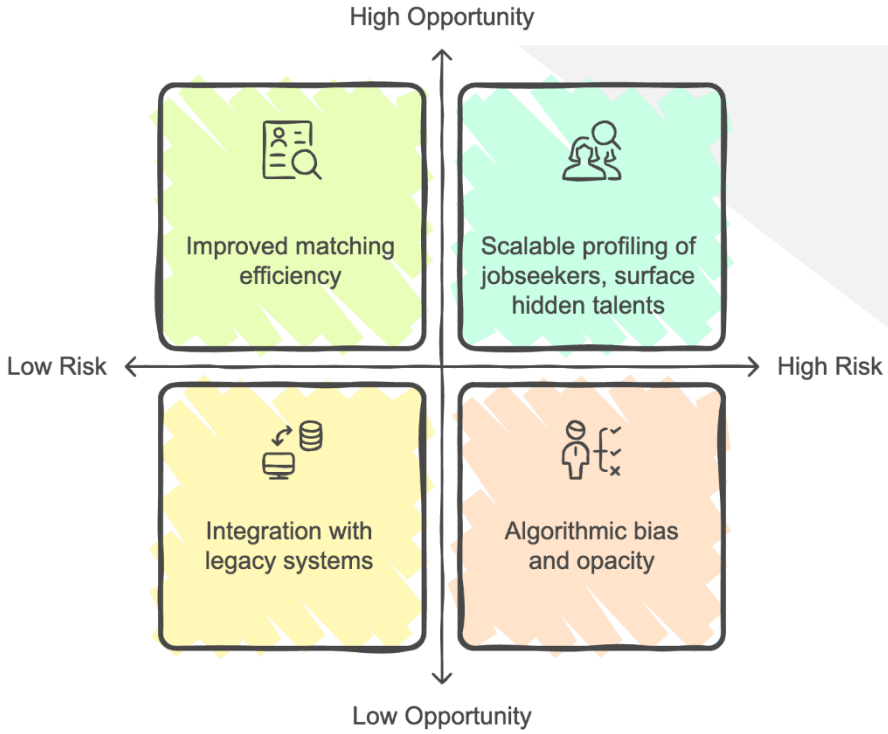
AI as a job connector

Enabling large-scale matching that was previously impossible, especially in PES

Example of Use Cases	Example Platform
AI-Driven Job Matching	LinkedIn Talent Solutions https://business.linkedin.com/talent-solutions
Automated Candidate Screening	HireVue, https://www.hirevue.com
AI-Generated Job Postings	Textio, https://textio.com
AI-Powered Resume Parsing	Resumeworded, https://resumeworded.com/
Automatic Telephone Interviews	MyInterview, https://www.myinterview.com/
Chatbots for Candidate Engagement	Paradox Olivia, https://www.paradox.ai
AI-Based Video Interview Analysis	HireVue AI Video, https://www.hirevue.com/
AI-Driven Salary and Offer Negotiation	Payscale, https://www.payscale.com/
Bias Detection and Diversity Enhancement	Pymetrics, https://www.pymetrics.ai/
Labour Market Analytics and Forecasting	Lightcast, https://lightcast.io/

Opportunities and risks in AI matching



Governance structures that ensure transparency, human oversight, and inclusivity are needed to make AI-powered matching fair and effective

Sources: EC 2025; OECD, 2023 and 2024; SAYE 2023

The rise of algorithmic management

Coevolution of AI and Human Work
Shaping the Future Through Mutual Adaptation

- AI-Human Coevolution is the continuous, reciprocal process in which human behaviours and AI systems mutually adapt and evolve
- Dynamic feedback loop where human decisions shape the training and outputs of AI, while AI-generated recommendations, in turn, influence human choices
- A new interdependence creating emergent, complex patterns that affect individual and societal outcomes
- Challenges traditional static models of human–machine interaction by emphasizing iterative co-adaptation
- Understanding AI-human coevolution helps for developing ethical, transparent, and resilient AI systems (Pedreschi et al, 2024)

Final Remarks: Governance and design matter

- **AI is transforming work, not eliminating it:** Most changes involve task reallocation and job redesign, not job loss

- **The human factor remains central:** Skills, empathy, and judgment are irreplaceable. People-centric integration is key to success

- **Governance and design determine quality, fairness and access:** Outcomes depend on how AI is built, deployed, and regulated. Risks to address are:
  - ✓ Opacity: Workers don't understand how decisions are made
  - ✓ Bias: Risk of discrimination due to flawed data or algorithm design
  - ✓ Redress: Lack of recourse when outcomes feel unfair

Ethical, transparent, and inclusive AI can improve job quality and access