

Skill Demand Trends: Insights from Online Job Vacancy Data ¹

Introduction. This bulletin presents a comprehensive analysis of skill demand trends from 2020 to June 2024 utilizing online job vacancy (OJV) data collected by [Lightcast](#). To classify individual skills, the analysis utilizes [ESCO](#) framework for skill classification. Additionally, we employed two other taxonomies to further aggregate the skills into fewer categories. First, is the “Education Taxonomy,” which is based on the World Bank (2024) and Deming and Khan (2018, p. 11) taxonomies. Second, is the “Digital Skill Taxonomy,” which follows the methodology outlined in the upcoming paper prepared by Angel-Urdinola, Chinen, and Rodon (2024). Table 1 provides a detailed description of these two taxonomies.

Table 1: Taxonomies For Classifying OJV Data: Education and Digital Categorizations

Skills Taxonomies	
I. Education	II. Digital
<ul style="list-style-type: none"> • Cognitive: Refers to mental processes or knowledge that are relatively straightforward to automate and teach (e.g., writing, reading, languages, economics, law, social sciences). • Socio-emotional: Encompass the ability to effectively navigate interpersonal interactions, regulate one’s emotions, and maintain constructive attitudes in various social contexts (e.g., emotions, relations, attitudes). • Higher-order cognitive: Involves advanced mental processes, including problem-solving, critical thinking, and analytical skills. • Specialized: Involve targeted expertise in job specific areas. These skills require in-depth knowledge and proficiency tailored to industry needs and functions, including customer service, finances, manual tasks, people and project management, and digital skills. 	<ul style="list-style-type: none"> • Non-digital: Refer to competencies that do not rely on digital technologies. This category includes manual and traditional craftsmanship, etc. These competencies are essential for tasks requiring hands-on work, face-to-face interaction, and traditional tools and methods. • Basic ICT: Involves the ability to use fundamental information and communication technologies and digital content creation (e.g., database searching, audio technology management, and basic printing operations, e-mail writing, internet browsing, social media, etc.). • Advanced ICT: Involves the ability to develop and manage complex software solutions, perform data analytics, utilize cloud computing services, implement security measures, and integrate advanced technologies such as artificial intelligence (e.g., programming language or specialized software, cloud computing, security, AI). • Transversal: Includes a broad range of higher-order cognitive skills that are essential for the adequate interaction and communication in digital environments. Includes abilities such as creative thinking, logical reasoning, effective communication, and analytical thinking, which are critical for problem-solving and decision-making in all digital interactions.

Information presented. The bulletin provides insights into the skill demand trends in the labor market of the specific country. It includes figures illustrating the number of unique job postings, the share of job postings by occupation, and the top job titles, including those with digital or advanced information and communication technology (ICT) skills. Additionally, it highlights the trends in skill requirements using both the Education and Digital Skills Taxonomies, as well as the share of postings with AI and Data Science skill requirements. The annex on page 10 contains more detailed descriptions of each figure presented in this bulletin.

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Figure 1: Trends in the number of unique job postings

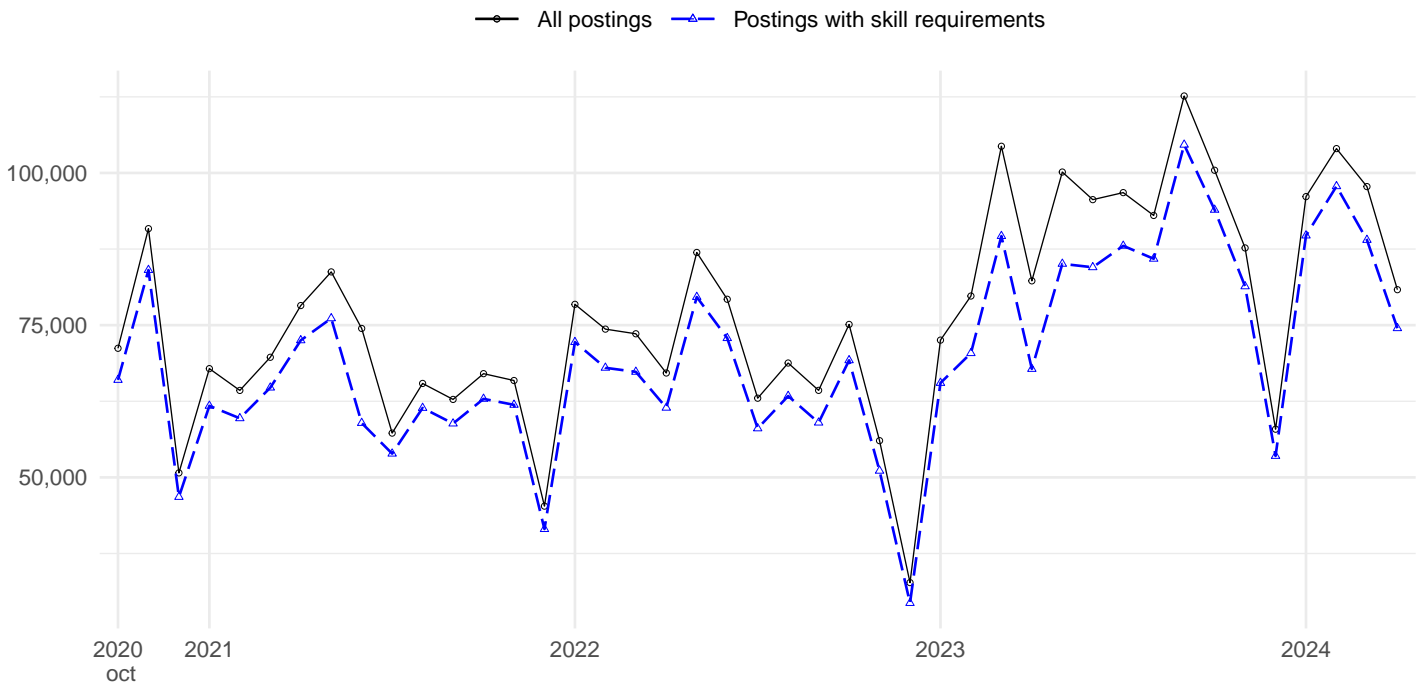


Figure 2: Trends in the share of job postings by occupation

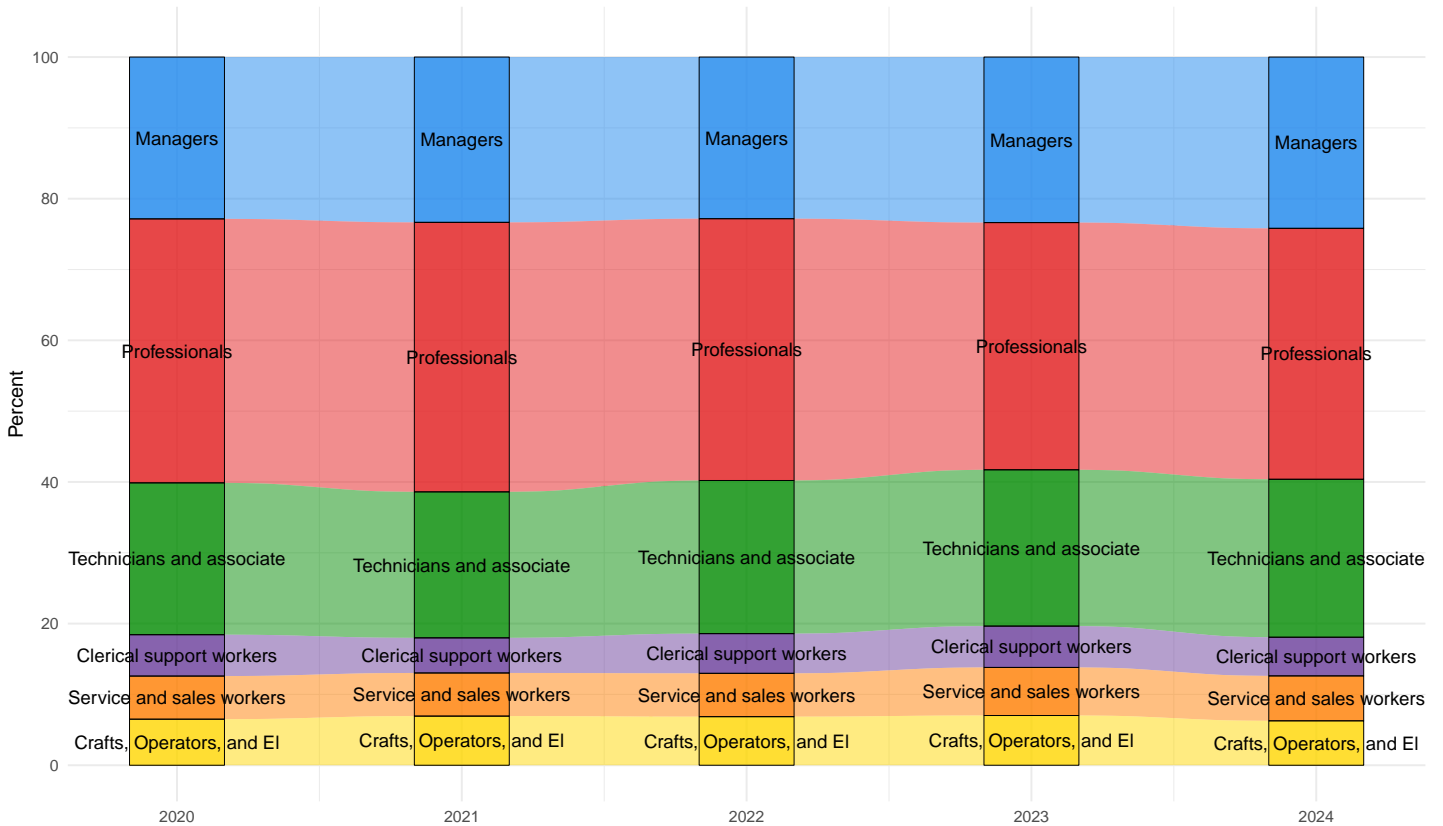


Figure 3: Trends in the top 10 job titles

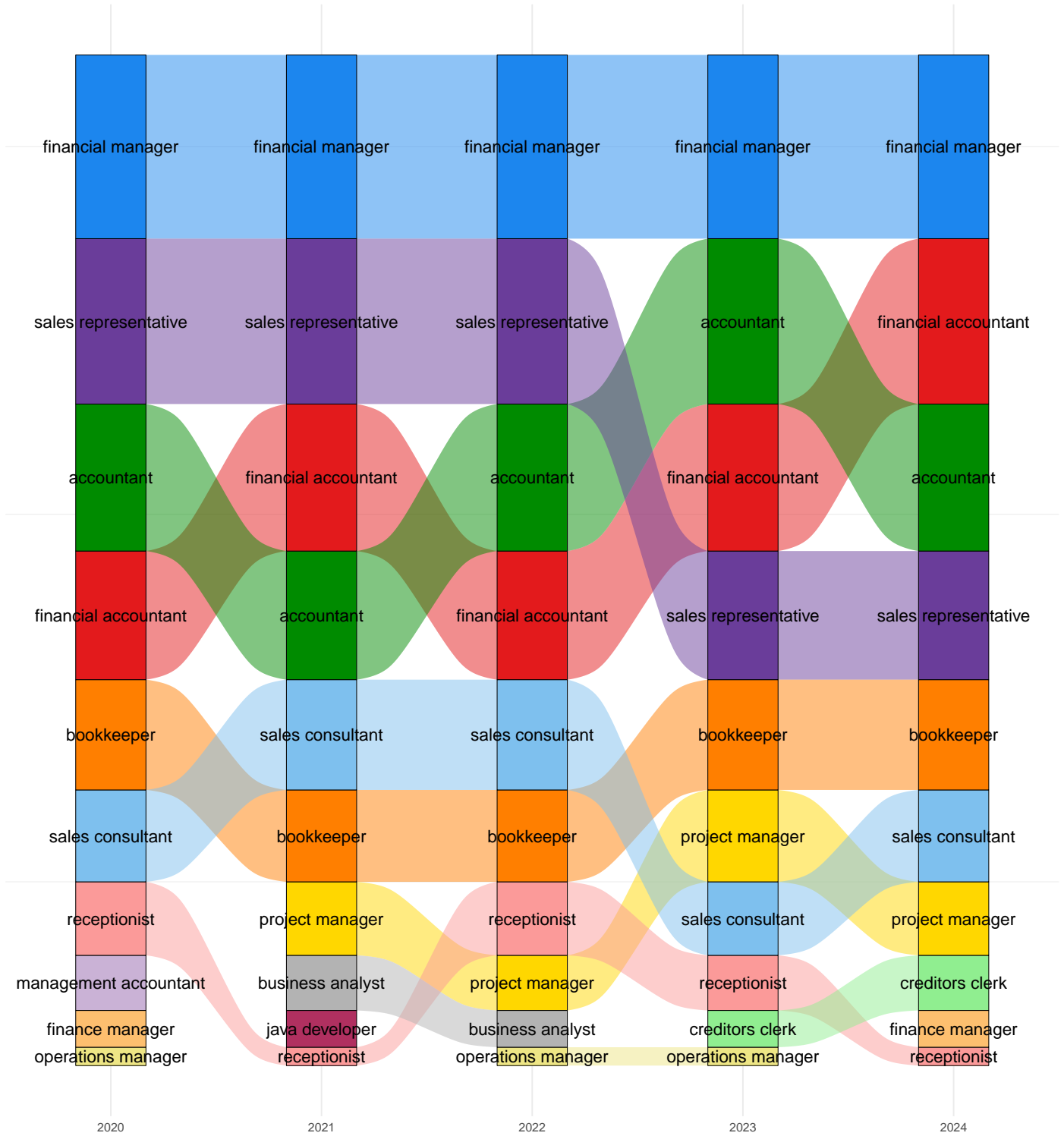




Figure 4: Trends in the top 10 job titles (for postings with Digital/Advanced ICT skills)

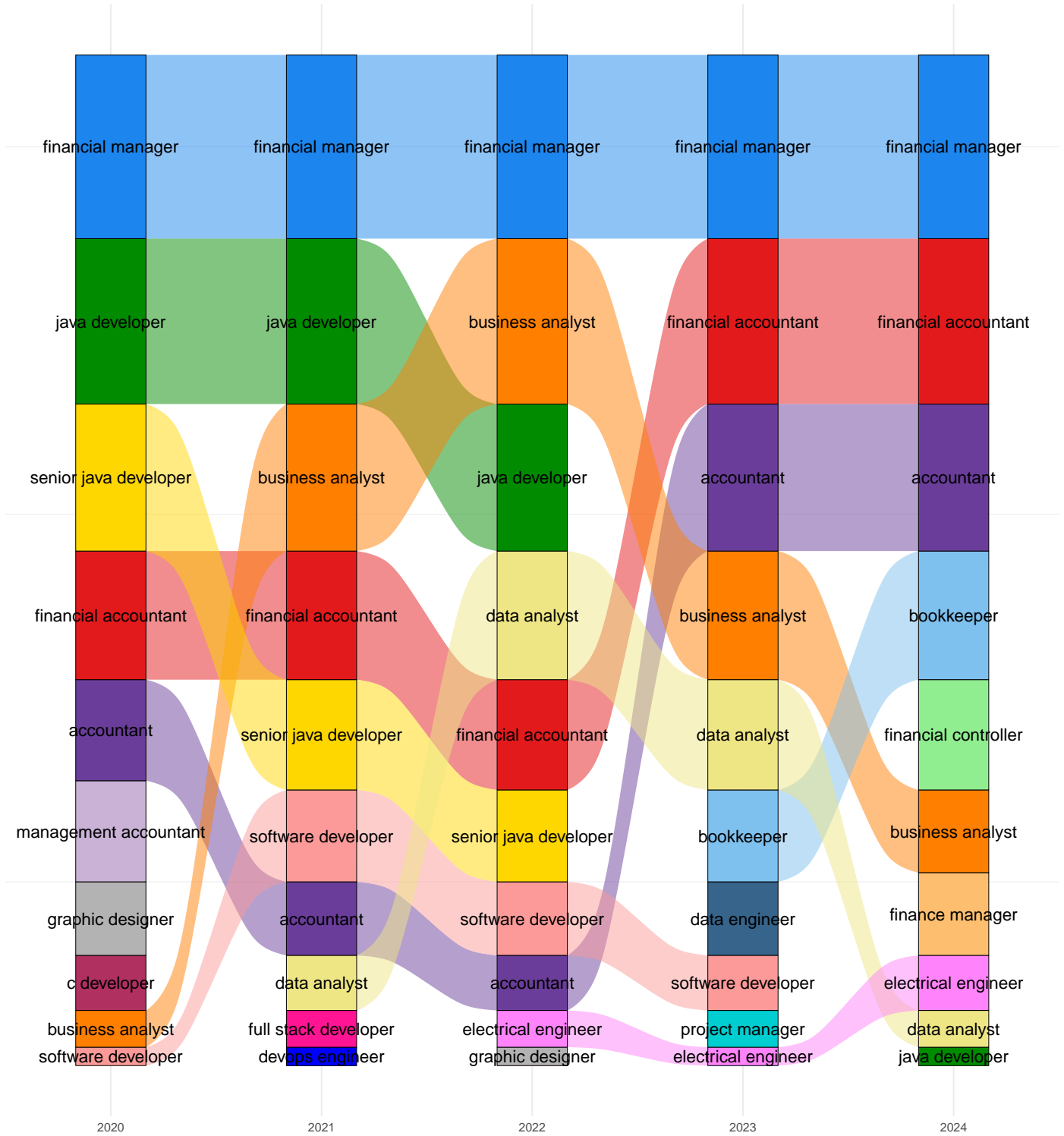
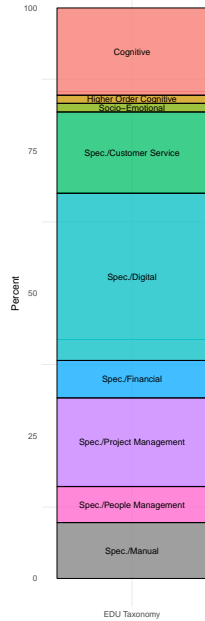


Figure 5: Illustration of the skill taxonomy: education and digital skill categories

(a) Education categories



(b) Mapping of Education into Digital categories

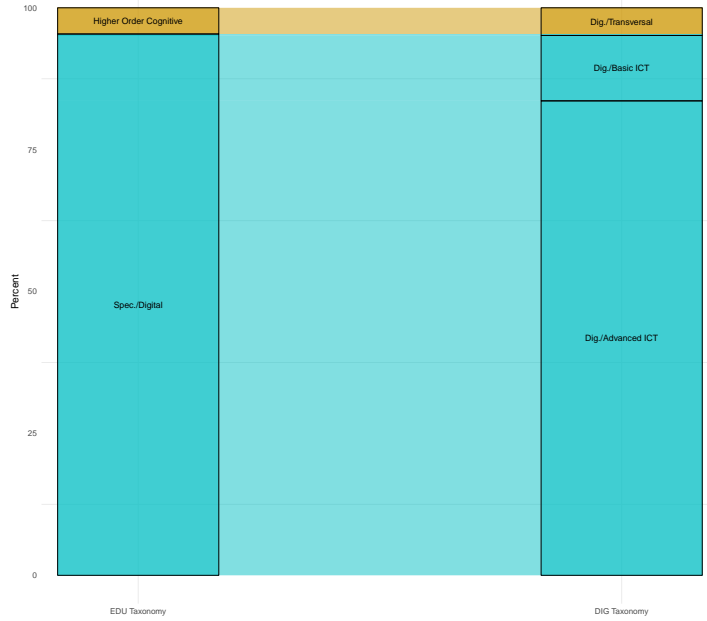


Figure 6: Top 50 skill requirements (total skill requirement frequencies)

(a) By education category

(b) By digital category

- Cognitive
- Spec./Customer Service
- Spec./People Management
- Spec./Project Management
- Higher Order Cognitive
- Spec./Digital
- Spec./Financial
- Socio-Emotional

- Dig./Transversal
- Dig./Basic ICT
- Dig./Advanced ICT
- Non Digital

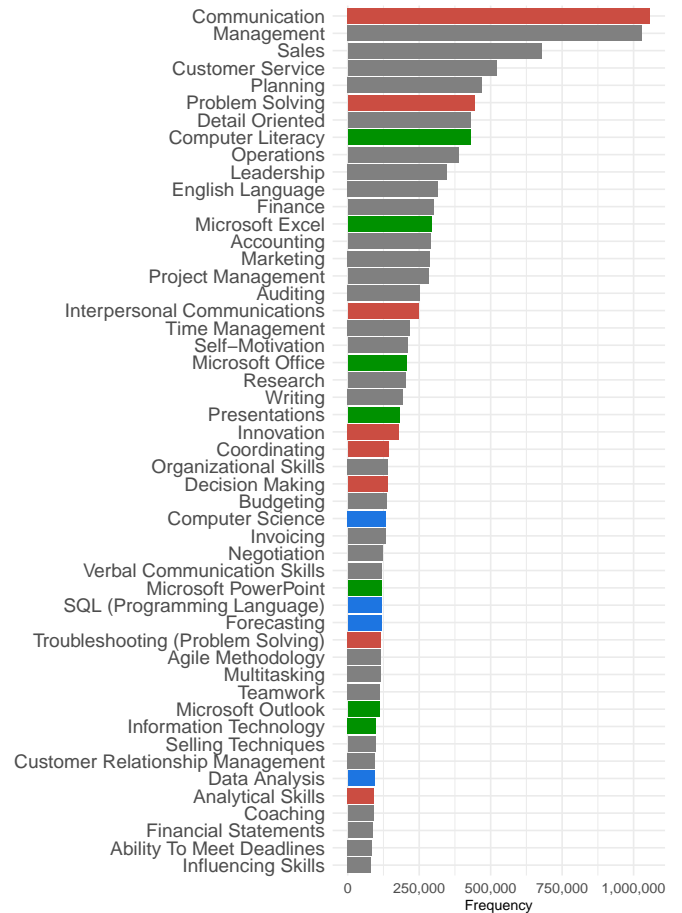
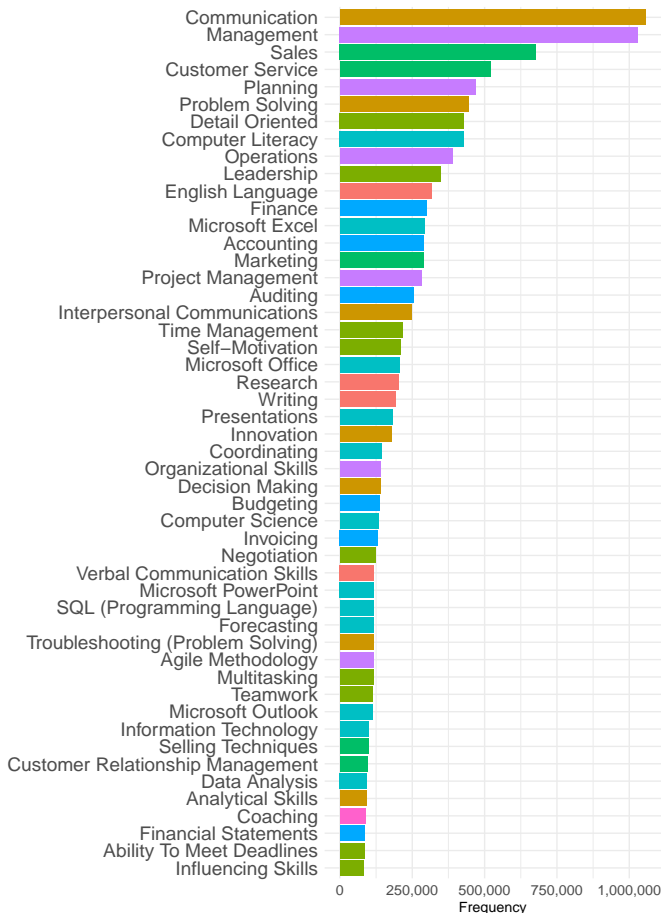
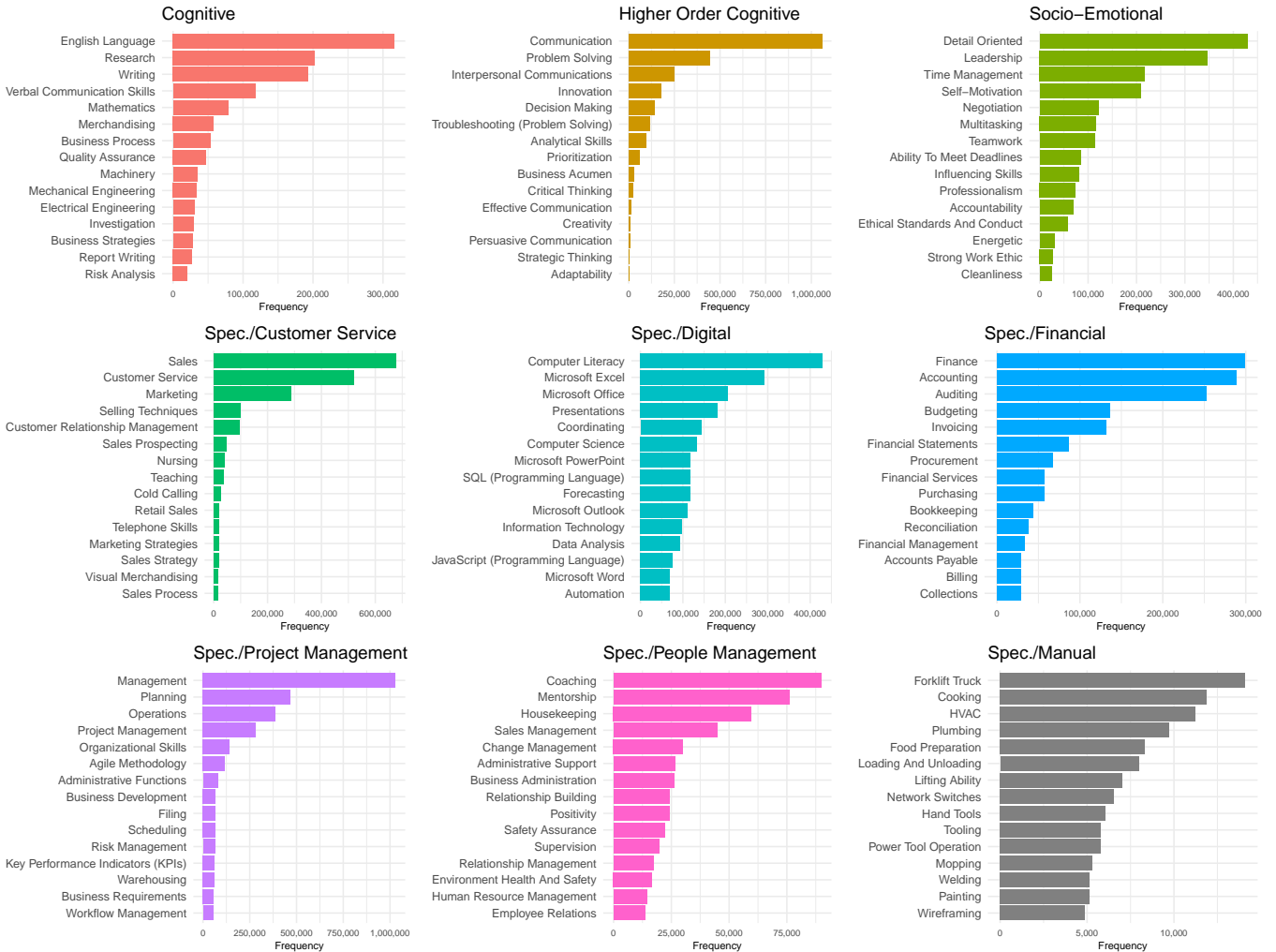


Figure 7: Top 15 skill requirements by category (skill requirement frequencies)

(a) Education categories



(b) Digital categories

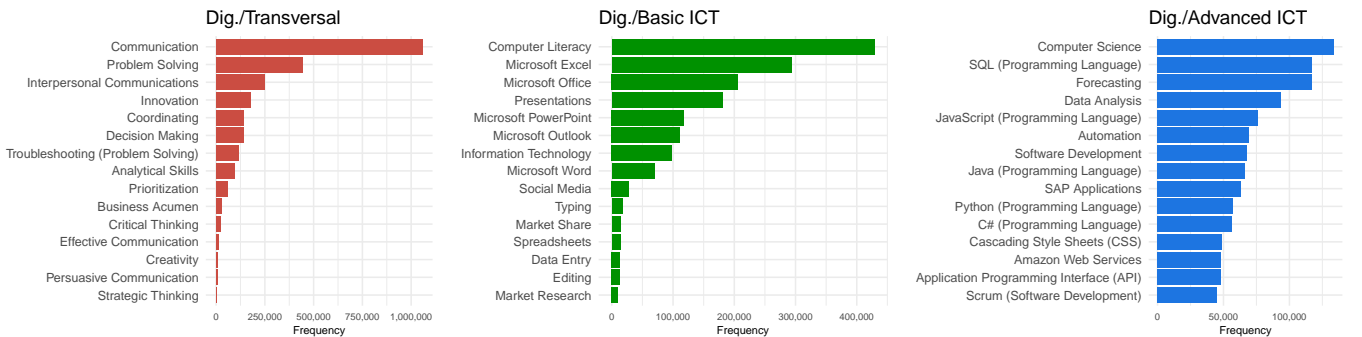
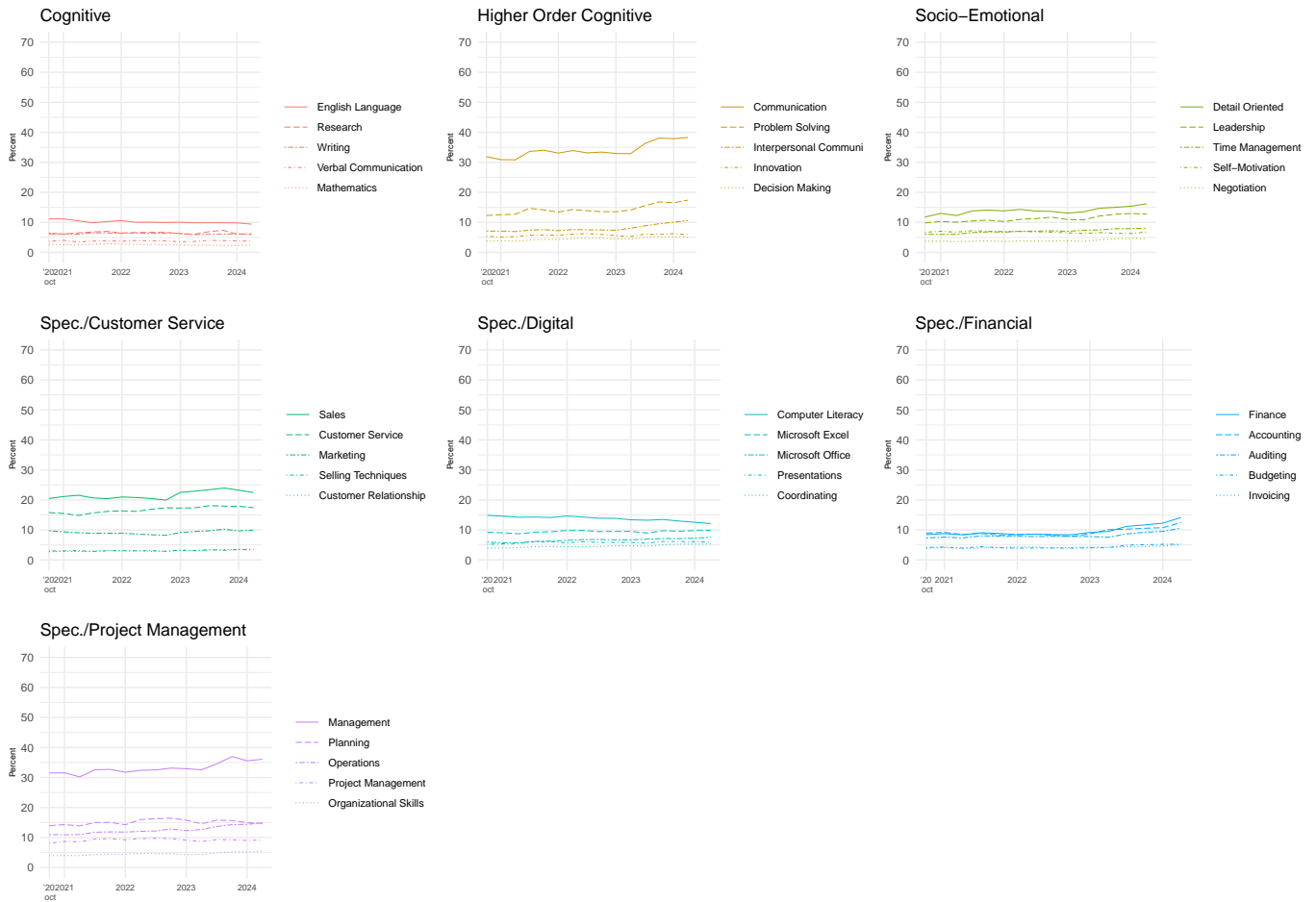


Figure 8: Trends in the share of postings with the top 5 skill requirements in each category

(a) Education categories^a



^aCategories with skill requirements having shares of postings $\leq 10\%$ are shown in Figure 14 in the Annex.

(b) Digital categories

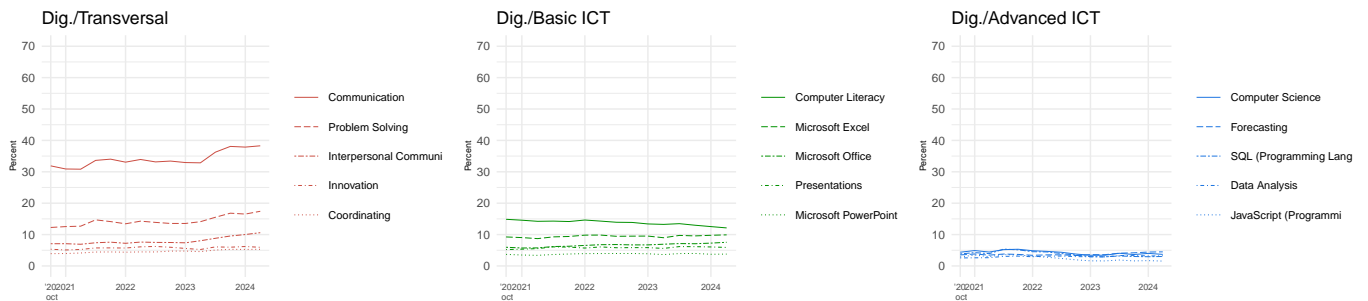
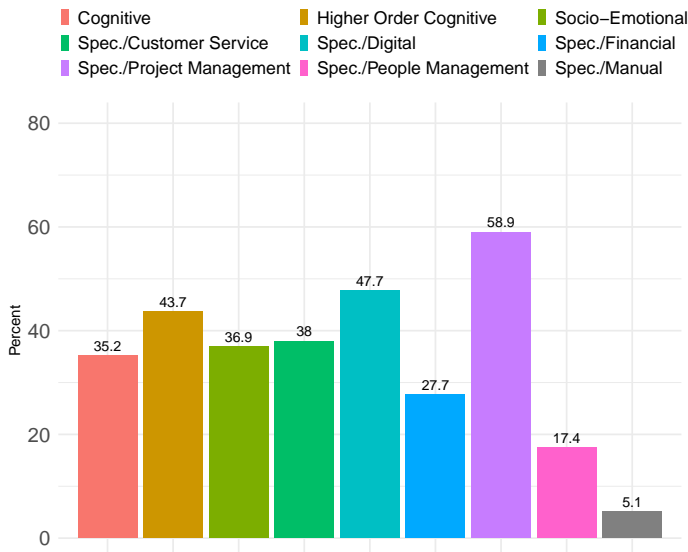
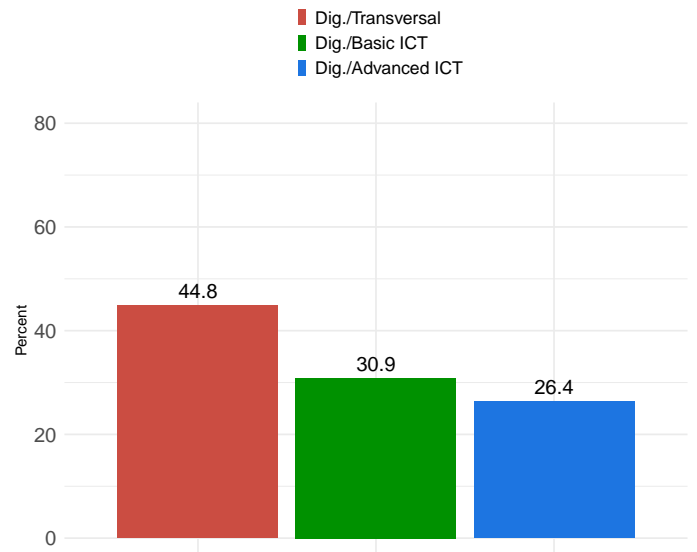


Figure 9: Share of postings with skill requirements of given categories

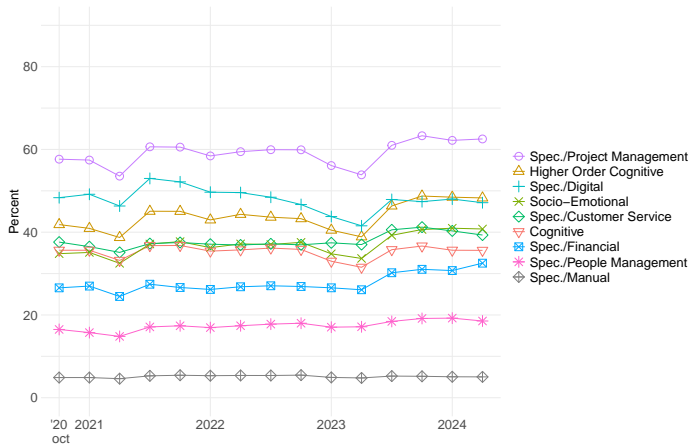
(a) Education categories



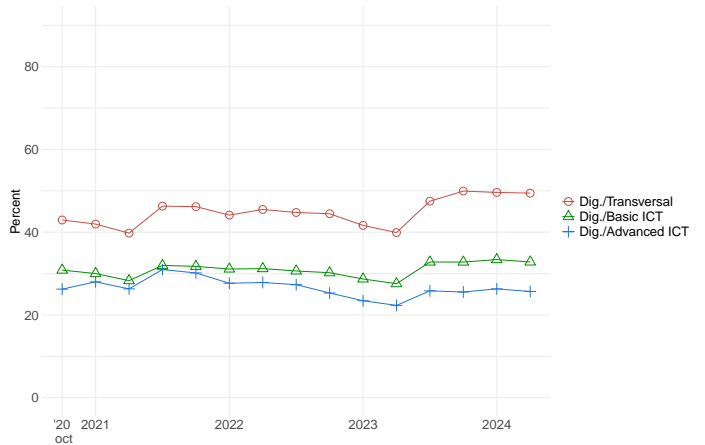
(b) Digital categories



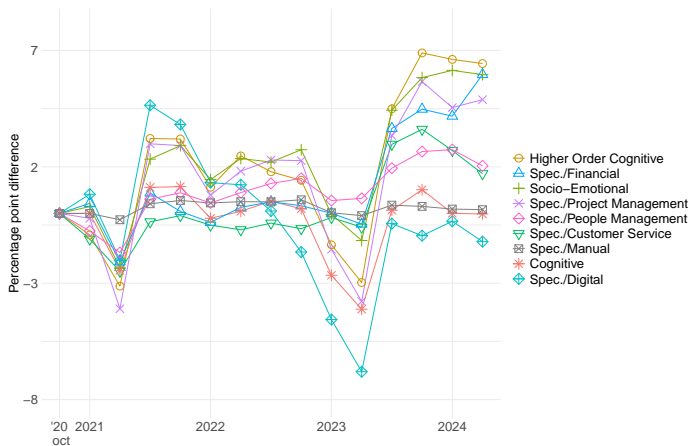
(c) Education categories, over time



(d) Digital categories, over time



(e) Education categories, perc pt diff wrt sep 2020



(f) Digital categories, perc pt diff wrt sep 2020

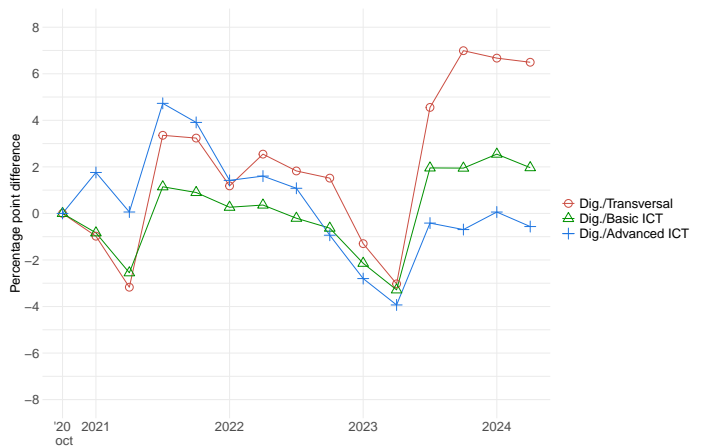
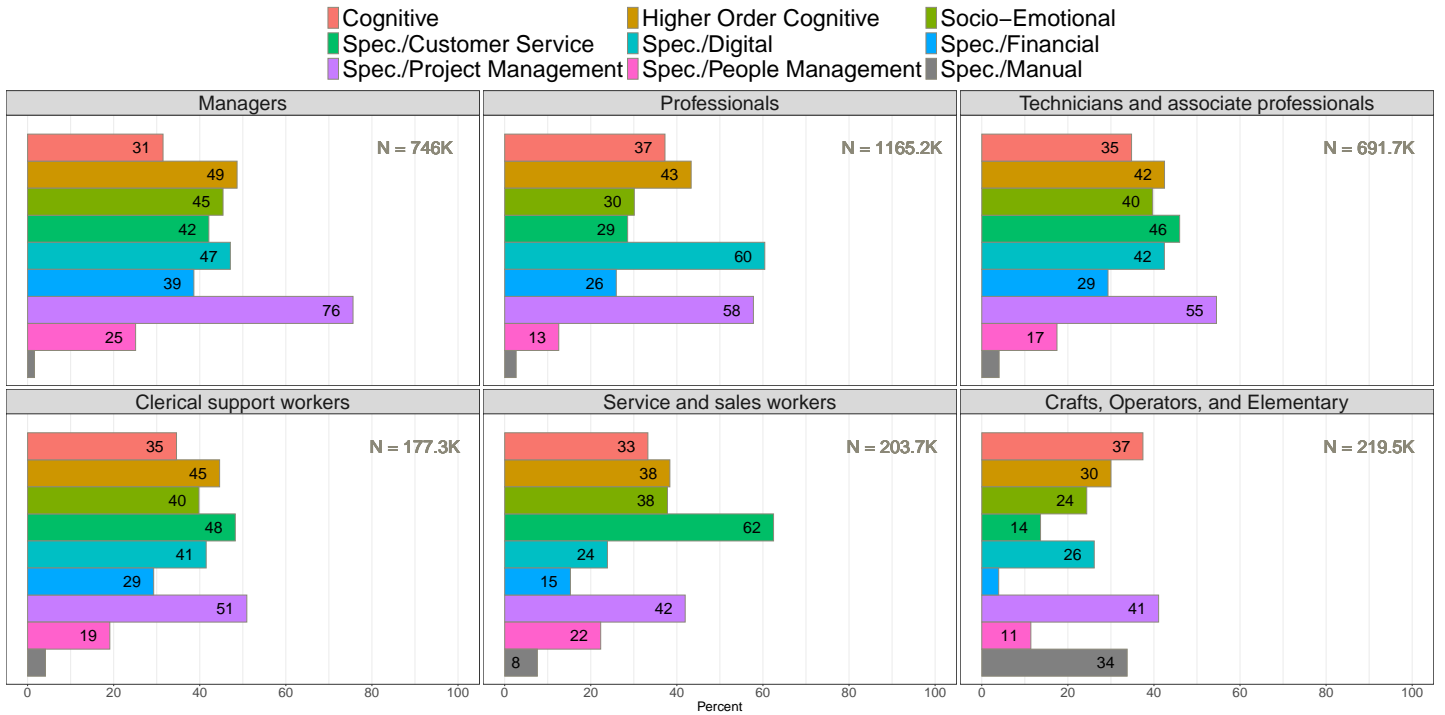


Figure 10: Share of postings with skill requirements of given categories, by **occupation**

(a) Education categories



(b) Digital categories

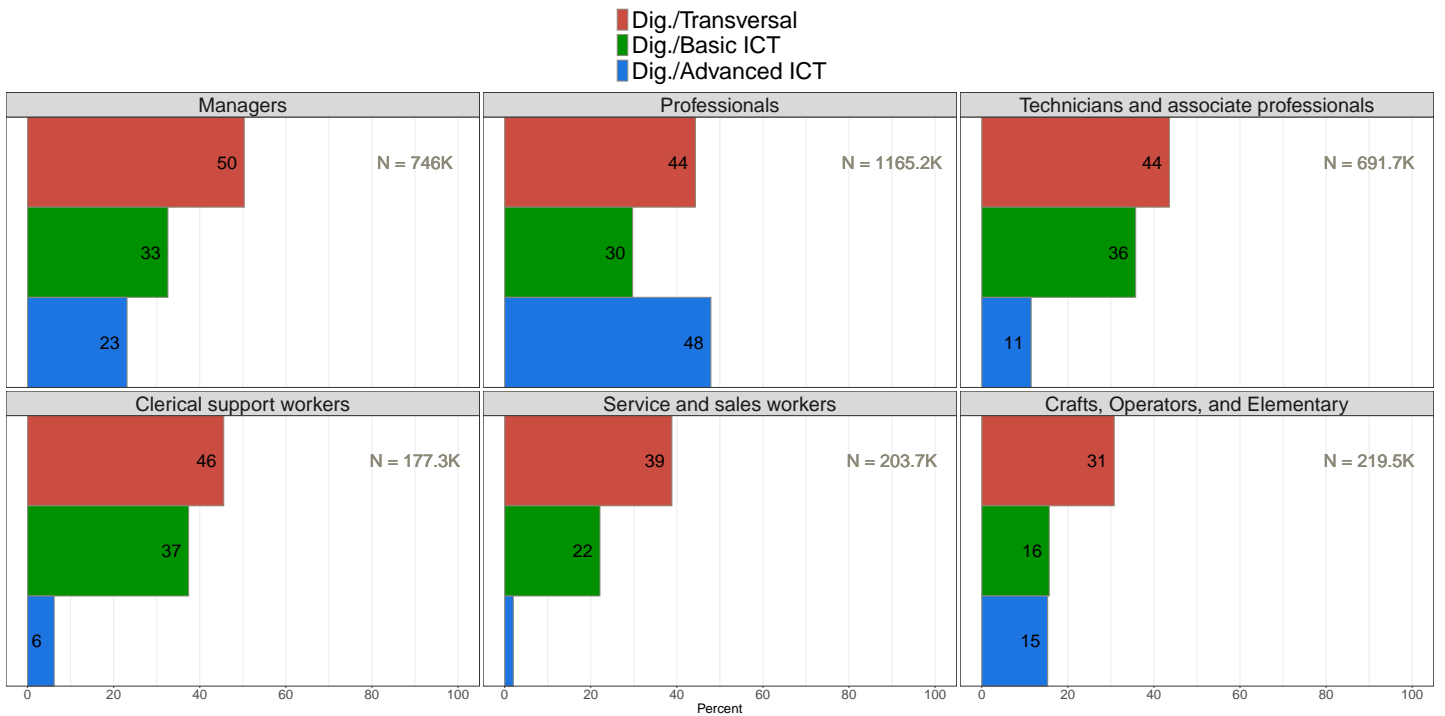
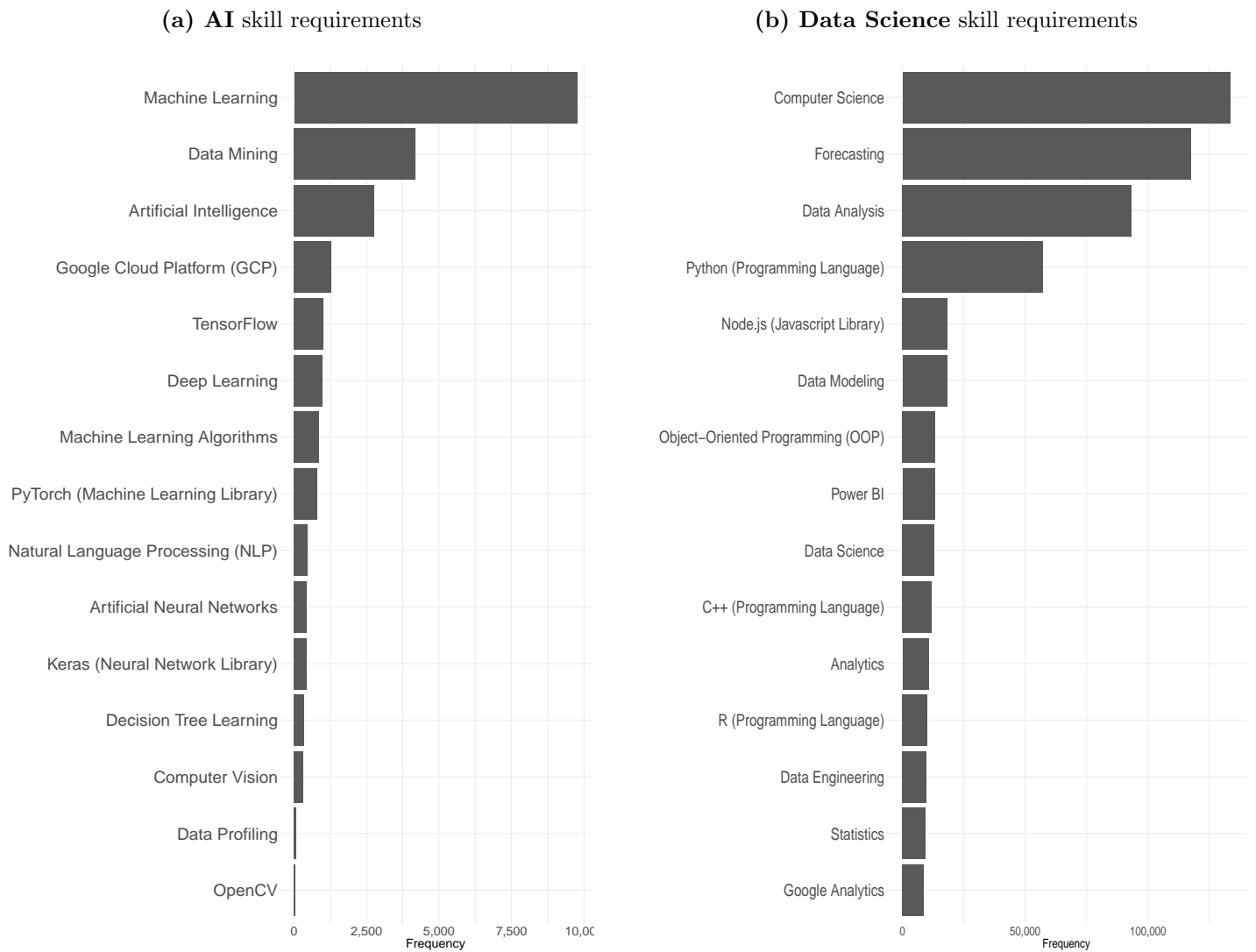


Figure 11: Top 15 AI and Data Science skill requirements (total skill requirement frequencies)²



²This figure presents the top 15 **AI** and **Data Science** skill requirements observed in the data. The full list and frequencies of AI and Data Science skill requirements observed in the data are shown in Figure 15 in the Annex, along with the keywords used to classify AI and Data Science skill requirements.

Figure 12: Trends in the share of postings with AI and Data Science skill requirements

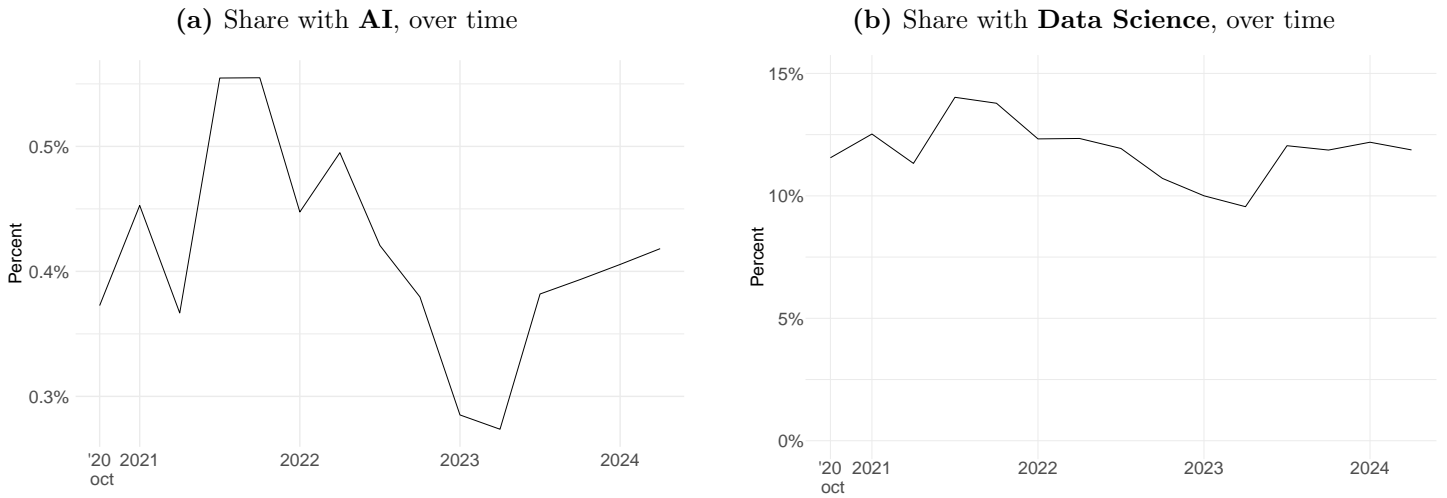
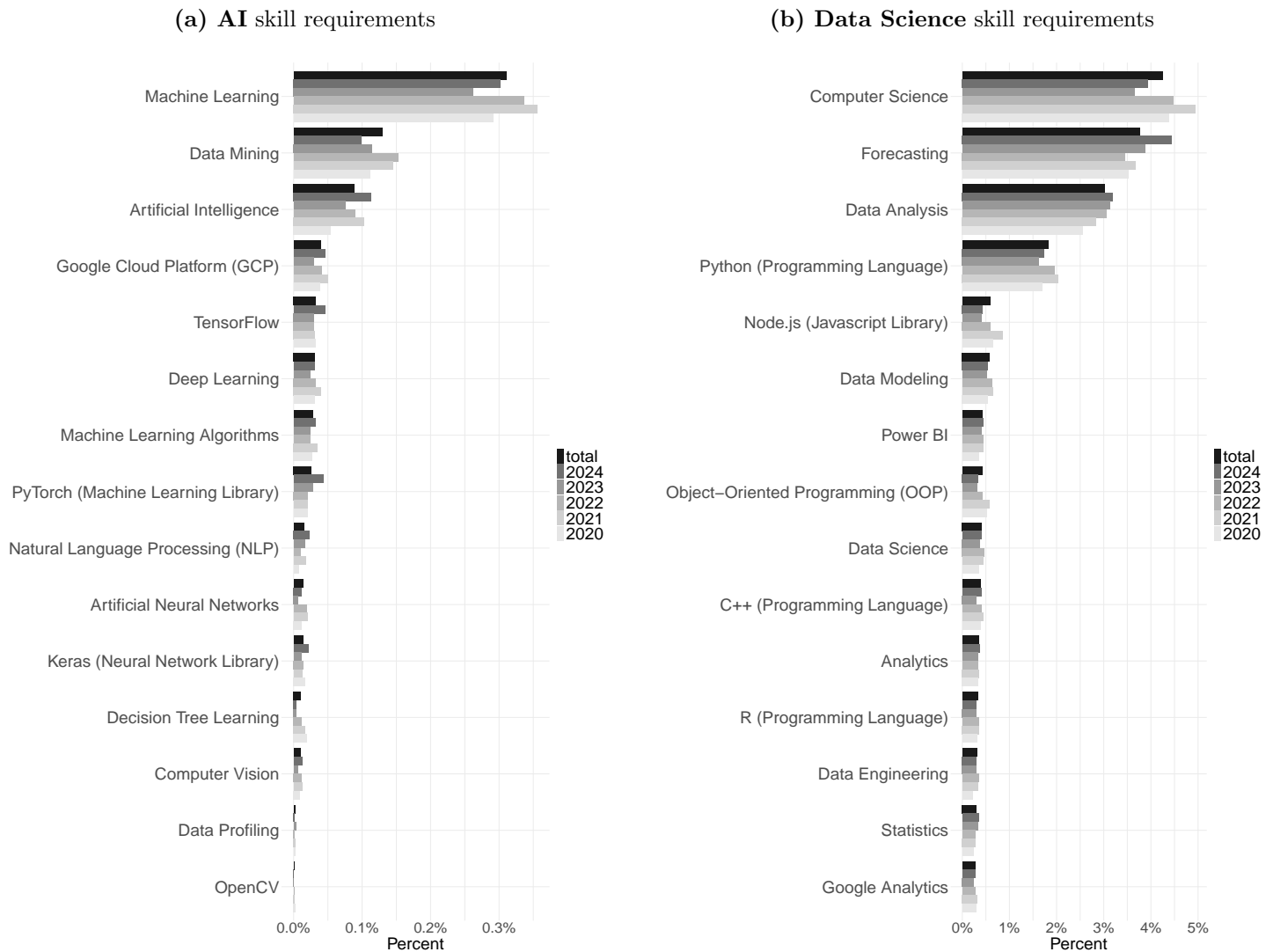


Figure 13: Top 15 AI and Data Science skill requirements (share of job postings)



Annex

Figure 1 shows the number of unique job postings observed in the Lightcast data in a given month. It plots the monthly count for all postings as well as only for postings that contain some skill requirements.

Figure 2 shows the occupational composition of job postings. The share of postings in a given occupation is computed for each year.

Figure 3 illustrates the top 10 job titles required in the job postings. The flow chart traces their presence and ranking over time. The greater the height of each rectangle, the higher the ranking of the associated job title.

Figure 4 is analogous to Figure 3 but focuses on job postings that require some Digital/Advanced ICT skills.

Figure 5 illustrates our working skill taxonomical framework. Figure 5a shows how granular skill requirements are distributed across the 9 categories of the **education** skill taxonomy (Cognitive, Higher Order Cognitive, Socio-Emotional, Specialized/Customer Service, Specialized/Digital, Specialized/Financial, Specialized/Project Management, Specialized/People Management, and Specialized/Manual). Whereas Figure 5b focuses on the subset of education skill categories (Higher Order Cognitive and Specialized/Digital) that are mapped to each of the 3 categories of the **digital** skill taxonomy (Digital/Transversal, Digital/Basic ICT, Digital/Advanced ICT, and Non Digital). In this latter graph, percentages refer to the distribution of Higher Order Cognitive and Specialized/Digital education categories over digital skill categories.

Figure 6 shows the top 50 skill requirements specified within job postings along with their total frequency (i.e., the total amount of times they appear in the data). Specifically, Figures 6a and 6b display the same top 50 skill requirements under two different color-coding schemes. The coloring used in Figure 6a represents the education category under which each skill requirement is classified. In turn, Figure 6b highlights the digital category under which the same requirements are classified.

Figure 7 illustrates the top 15 skill requirements (ranked by frequency) observed within each of the education categories (in Figure 7a) and digital categories (in Figure 7b).

Figure 8 zooms in on the top 5 skill requirements within each skill category in the education (Figure 8a) and digital (Figure 8b) taxonomies. For each of these specific skill requirements, the figures plot the percentage of job postings that require them and its evolution over time. (Note: specific skill requirements with percentages $\leq 10\%$ are shown separately in Figure 14 in the Annex).

Figure 9 provides several illustrations of the share of job postings that specify skill requirements of certain categories. Specifically, Figures 9a and 9b show the overall percentage of job postings with skill requirements of given education and digital categories, respectively. Figures 9c and 9d plot the same shares computed at the quarterly level and their trends over time. Figures 9e and 9f provide a similar illustration but here the trends are expressed in terms of percentage point changes with respect to the share recorded in the first quarter.

Figure 10 illustrates the share of job postings, within each occupation, that require skills of given categories. Occupation-specific shares of skill requirements are shown both for education categories (in Figure 10a) and for digital categories (Figure 10b).

Figure 11 delves into skill requirements related to Artificial Intelligence (AI) (in Figure 11a) and Data Science (in Figure 11b). These skill requirements all belong to the Specialized/Digital category of the education taxonomy and to the Digital/Advanced ICT (Digital/Basic ICT for “Data Processing” and “Data Manipulation”) of the digital taxonomy. The classification of AI skill requirements is based on the seminal paper by Alekseeva et al. (2021, *Labour Economics*) “The Demand for AI Skills in the Labor Market”, while the classification of Data Science skill requirements was conducted internally by team experts. Specifically, Figures 11a and 11b display the total frequency of the top 15 classified AI and Data Science skill requirements that are observed in the data. The full list and frequencies of AI and Data Science skill requirements observed in the data are shown in Figure 15 in the Annex, along with the keywords used to classify AI and Data Science skill requirements.

Figure 12 plots the percentage of job postings that specify some AI and Data Science skill requirements in each year.

Figure 13 illustrates the percentage of job postings that require each specific AI (in Figure 13a) and Data Science (in Figure 13b) skill requirements overall and in each year.



Figure 14: Trends in the share of postings with the top 5 skill requirements in people management and manual categories (continuation of Figure 8)

(a) Education categories (with percentages $\leq 10\%$)

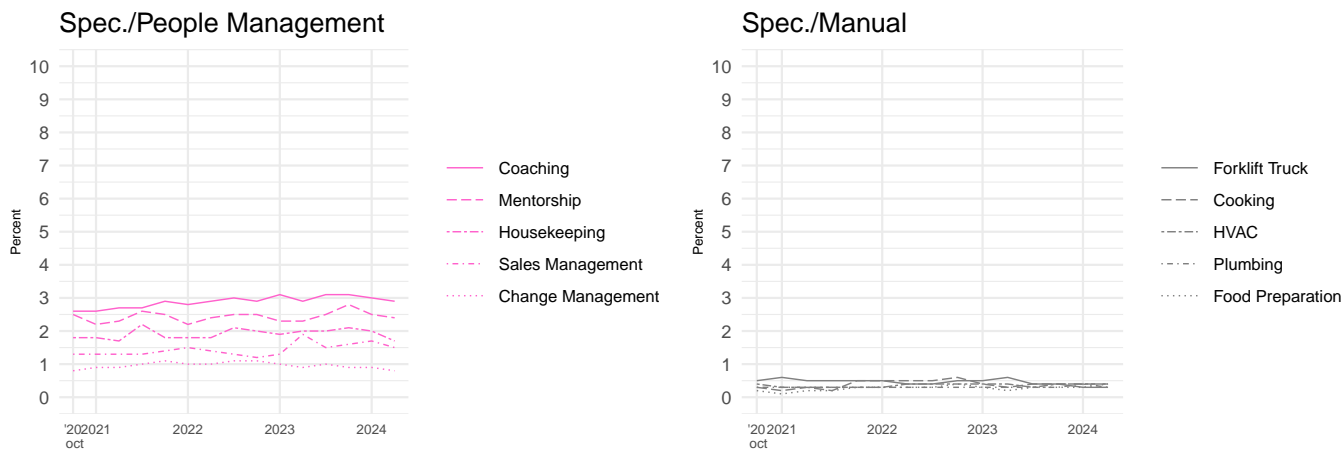
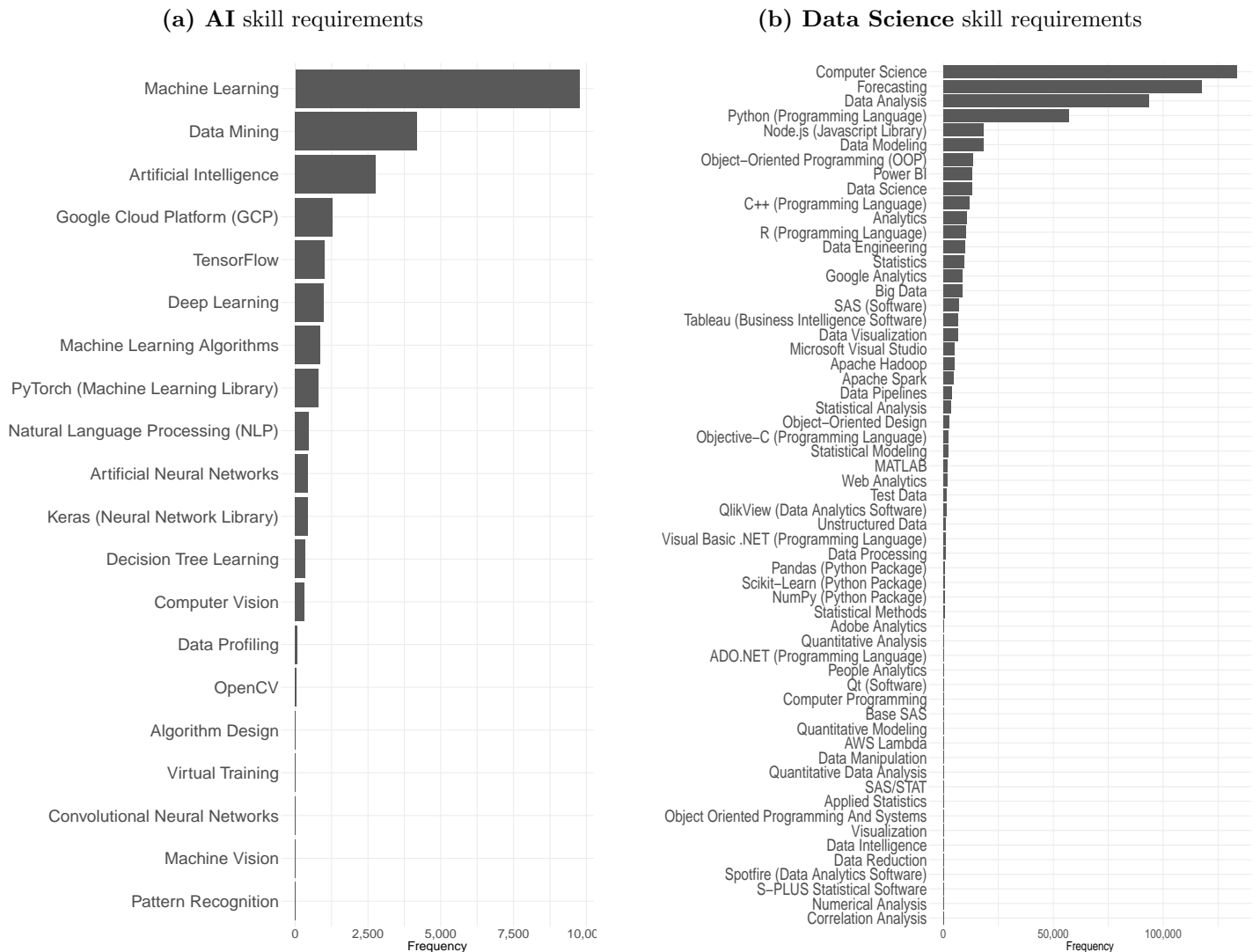


Figure 15: AI and Data Science skill requirements (total skill requirement frequencies; all skills matched)



Keywords used to classify Artificial Intelligence (AI) and Data Science skills

Artificial Intelligence (AI) skill requirements in Lightcast dictionary: Machine Learning, Artificial Intelligence, TensorFlow, Deep Learning, Computer Vision, OpenCV, Machine Vision, Pattern Recognition, Natural Language Processing (NLP), PyTorch (Machine Learning Library), Machine Learning Algorithms, Decision Tree Learning, Virtual Training, Data Mining, Google Cloud Platform (GCP), Artificial Neural Networks, Algorithm Design, Keras (Neural Network Library), Data Profiling, Convolutional Neural Networks.

Data Science skill requirements in Lightcast dictionary: Computer Science, Data Science, Qt (Software), SAS (Software), Google Analytics, Web Analytics, Data Pipelines, Object-Oriented Design, People Analytics, Statistical Analysis, Analytics, MATLAB, Computer Programming, Data Processing, Numerical Analysis, Data Intelligence, Data Reduction, Data Engineering, Adobe Analytics, Object-Oriented Programming (OOP), Microsoft Visual Studio, Data Modeling, Object Oriented Programming And Systems, Forecasting, Quantitative Data Analysis, Objective-C (Programming Language), Quantitative Analysis, Statistical Methods, Data Analysis, Python (Programming Language), ADO.NET (Programming Language), Correlation Analysis, Statistical Modeling, Scikit-Learn (Python Package), Visual Basic .NET (Programming Language), Apache Spark, Quantitative Modeling, Power BI, Data Visualization, Tableau (Business Intelligence Software), Base SAS, Spotfire (Data Analytics Software), Statistical Hypothesis Testing, QlikView (Data Analytics Software), Data Manipulation, C++ (Programming Language), Visualization, Node.js (Javascript Library), R (Programming Language), Statistics, Test Data, Big Data, Apache Hadoop, NumPy (Python Package), AWS Lambda, S-PLUS Statistical Software, Pandas (Python Package), SAS/STAT, Unstructured Data.