

Classifying occupations using web-based job advertisements: an application to STEM and creative occupations

Antonio Lima^{1,2} and Hasan Bakhshi^{1,2}

¹Economic Statistics Centre of Excellence

²Nesta

ESCoE Discussion Paper 2018-08

July 2018

About the Economic Statistics Centre of Excellence (ESCoE)

The Economic Statistics Centre of Excellence provides research that addresses the challenges of measuring the modern economy, as recommended by Professor Sir Charles Bean in his Independent Review of UK Economics Statistics. ESCoE is an independent research centre sponsored by the Office for National Statistics (ONS). Key areas of investigation include: National Accounts and Beyond GDP, Productivity and the Modern economy, Regional and Labour Market statistics.

ESCoE is made up of a consortium of leading institutions led by the National Institute of Economic and Social Research (NIESR) with King's College London, innovation foundation Nesta, University of Cambridge, Warwick Business School (University of Warwick) and Strathclyde Business School.

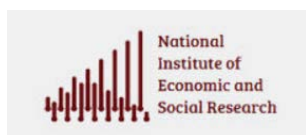
ESCoE Discussion Papers describe research in progress by the author(s) and are published to elicit comments and to further debate. Any views expressed are solely those of the author(s) and so cannot be taken to represent those of the ESCoE, its partner institutions or the ONS.

For more information on ESCoE see www.escoe.ac.uk.

Contact Details

Economic Statistics Centre of Excellence
National Institute of Economic and Social Research
2 Dean Trench St
London SW1P 3HE
United Kingdom

T: +44 (0)20 7222 7665
E: escoeinfo@niesr.ac.uk



Classifying occupations using web-based job advertisements: an application to STEM and creative occupations

Antonio Lima^{1,2,3} and Hasan Bakhshi^{1,2}

¹Economic Statistics Centre of Excellence, ²Nesta

³The author has changed affiliation since the work was carried out.

Abstract

Rapid technological, social and economic change is having significant impacts on the nature of jobs. In fast-changing environments it is crucial that policymakers have a clear and timely picture of the labour market. Policymakers use standardised occupational classifications, such as the Office for National Statistics' Standard Occupational Classification (SOC) in the UK to analyse the labour market. These permit the occupational composition of the workforce to be tracked on a consistent and transparent basis over time and across industrial sectors. However, such systems are by their nature costly to maintain, slow to adapt and not very flexible. For that reason, additional tools are needed.

At the same time, policymakers over the world are revisiting how active skills development policies can be used to equip workers with the capabilities needed to meet the new labour market realities. There is in parallel a desire for more granular understandings of what skills combinations are required of occupations, in part so that policymakers are better sighted on how individuals can redeploy these skills as and when employer demands change further.

In this paper, we investigate the possibility of complementing traditional occupational classifications with more flexible methods centred around employers' characterisations of the skills and knowledge requirements of occupations as presented in job advertisements. We use data science methods to classify job advertisements as STEM or non-STEM (Science, Technology, Engineering and Mathematics) and creative or non-creative, based on the content of ads in a database of UK job ads posted online belonging to Boston-based job market analytics company, Burning Glass Technologies. In doing so, we first characterise each SOC code in terms of its skill make-up; this step allows us to describe each SOC skillset as a mathematical object that can be compared with other skillsets. Then we develop a classifier that predicts the SOC code of a job based on its required skills. Finally, we develop two classifiers that decide whether a job vacancy is STEM/non-STEM and creative/non-creative, based again on its skill requirements.

Key words: labour demand, occupational classification, online job adverts, big data, machine learning, STEM, STEAM, creative economy

JEL classification: C18, J23, J24

Contact Details

Hasan Bakhshi

Nesta

58 Victoria Embankment

London, EC4Y 0DS

United Kingdom

Email: anto87@gmail.com, hasan.bakhshi@nesta.org.uk

This ESCoE paper was first published in July 2018.

© Antonio Lima and Hasan Bakhshi

Classifying occupations using web-based job advertisements: an application to STEM and creative occupations

Antonio Lima and Hasan Bakhshi, Nesta

July 2018

Abstract

Rapid technological, social and economic change is having significant impacts on the nature of jobs. In fast-changing environments it is crucial that policymakers have a clear and timely picture of the labour market. Policymakers use standardised occupational classifications, such as the Office for National Statistics' Standard Occupational Classification (SOC) in the UK to analyse the labour market. These permit the occupational composition of the workforce to be tracked on a consistent and transparent basis over time and across industrial sectors. However, such systems are by their nature costly to maintain, slow to adapt and not very flexible. For that reason, additional tools are needed.

At the same time, policymakers over the world are revisiting how active skills development policies can be used to equip workers with the capabilities needed to meet the new labour market realities. There is in parallel a desire for more granular understandings of what skills combinations are required of occupations, in part so that policymakers are better sighted on how individuals can redeploy these skills as and when employer demands change further.

In this paper, we investigate the possibility of complementing traditional occupational classifications with more flexible methods centred around employers' characterisations of the skills and knowledge requirements of occupations as presented in job advertisements. We use data science methods to classify job advertisements as STEM or non-STEM (Science, Technology, Engineering and Mathematics) and creative or non-creative, based on the content of ads in a database of UK job ads posted online belonging to Boston-based job market analytics company, Burning Glass Technologies. In doing so, we first characterise each SOC code in terms of its skill make-up; this step allows us to describe each SOC skillset as a mathematical object that can be compared with other skillsets. Then we develop a classifier that predicts the SOC code of a job based on its required skills. Finally, we develop two classifiers that decide whether a job vacancy is STEM/non-STEM and creative/non-creative, based again on its skill requirements.

1 Introduction

There is growing recognition amongst policymakers that technological, social and economic changes are having major implications for the job market. Occupations and the types of skills and knowledge required to perform particular jobs are seemingly continuously evolving, as is the terminology used to refer to them. In such a fast-paced environment, it is crucial to monitor the evolution of occupations and required skills frequently and at high resolution, but in a way that is cost effective. Traditional classification systems, such as the SOC and the US Department of Labor's ONET service, do not meet these requirements as they are labour-intensive and heavily reliant on manual reviews.

In this paper, we propose a set of methodologies that, used in combination with existing occupation classification systems, may help to meet these requirements. These data-led methodologies introduce important novelties into the field of labour market analysis. Firstly, they make use of web-based labour market information and specifically job advertisements posted by employers online. While the use of this noisy and potentially unrepresentative data source faces obvious challenges, it also presents important opportunities, for example the possibility of detecting changes in the labour market cheaply and in real time. Policymakers would therefore be well advised to increase their understanding of the value of this type of data, and this paper represents a step in that direction. Secondly, the methodologies we propose are based on machine learning. It is worth emphasising this point because it makes possible the analysis of massive datasets with minimal human intervention. Finally, the methodologies exploit job content data based on employers' detailed descriptions of the skills as well as knowledge requirements of jobs. By anchoring occupation classifications more deeply in skills requirements, they align closely with

policymakers' growing interest in using active skills development policies to develop a more productive and resilient workforce. This flexible skill-centric approach is potentially very powerful: jobs which fall into two very different SOC codes might instead be very closely related to each other, in terms of their skillset; conversely, occupations that are within the same occupational family might have very different skillsets.

The Burning Glass data we use includes the job title, tags based on the skills, knowledge and other keywords mentioned within the body of the advertisement as well as the 4-digit SOC2010 code relating to the vacancy advertised, which Burning Glass infers from the job title.

We describe our proposed methodology in detail throughout the manuscript; here, we summarise the three main contributions of the paper:

1. **The skill make-up of occupations.** We characterise each SOC code in terms of the skills typically required, according to both how frequently they appear in job advertisements that are assigned that SOC code and also how often they appear in advertisements that are assigned other SOC codes, using a technique called Term Frequency Inverse Document Frequency (tf-idf). This process can be used to analyse the skills composition associated with each SOC code. It can also be used to check any possible systematic errors in the dataset. For example, inconsistencies arising from when SOC codes are assigned to job advertisements using text-based methods that look only at the job title to classify the occupation.
2. **A skill-based SOC classifier.** Using a similar methodology, again based on tf-idf, we identify jobs that are likely well classified or likely misclassified. We manually label a random sample of them and we show that the skill-based classifier manages to identify likely errors or correct classifications. Then, we use this set of manually checked jobs as 'ground truth' data. We build a machine-learning classifier that is able to 'guess' which 4-digit SOC code each occupation belongs to based on its associated skillset. We evaluate the performance of this system against the job title-inferred SOC codes and show that our system increases accuracy.
3. **A STEM/Creative classifier.** We then develop two machine-learning classifiers that classify jobs as creative (or not) and/or STEM (or not), respectively, based on their skillset, rather than on their SOC code. These classifiers can be used to characterise individual jobs by their 'STEM-ness' and creativity; they can also be used to understand which SOC codes are mixed STEM/non-STEM and creative/non-creative, and which of them might have been mislabelled in the data. This should be of considerable interest to policymakers that are aiming to promote STEM or creative occupations in the workforce.

2 Related work

Occupational coding is not trivial. National Statistical Institutes employ expert occupational coders who are trained so that they can determine the best occupational category typically on the basis of survey responses. However, one study [10] found that two independent coders only agree in 61% of the cases. This paper also explored the use of supervised machine learning techniques in the survey exercise to improve the accuracy of the coding.

Several methodologies and computer-based tools are already available to automatically classify occupations using job titles, for example the ONS Occupation Coding tool¹ and Warwick's CASCOT². These tools assign a code to an occupation by comparing an inputted job title to a directory of job titles that have already been coded. The performance of CASCOT has been measured against manually coded data³. The tool gives a measure of the level of certainty associated to its code assignment, on a scale from 0 to 100. It turns out that 80% of the jobs that receive a score of greater than 40 on this scale match manually assigned codes, although the authors warn that this is highly dependent on the quality of the input data. A recent working paper [2] has found that the error rate of these automated assignments is at least 33%-40%, even when considering 1-digit level International Standard Classification of Occupations (ISCO) codes. In the case of data drawn from multiple sources on the web, which we might expect are noisier than data sourced from a single systematically collected dataset, it is reasonable to expect an even higher error rate.

¹http://www.neighbourhood.statistics.gov.uk/HTMLDocs/dev3/ONS_SOC_occupation_coding_tool.html

²<http://www2.warwick.ac.uk/fac/soc/ier/software/cascot/>

³<http://www2.warwick.ac.uk/fac/soc/ier/software/cascot/details/>

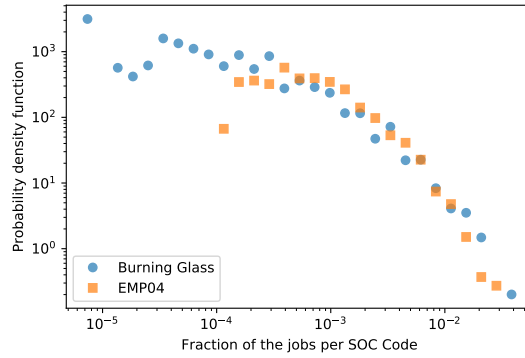


Figure 1: Share of the jobs in each SOC Code, according to Burning Glass and the “Employment by Occupation” EMP04 dataset published by the Office for National Statistics.

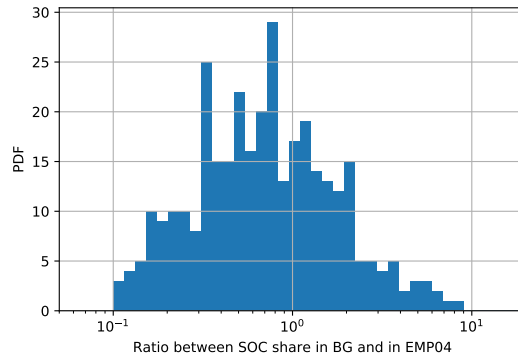


Figure 2: Ratio between each SOC share in the Burning Glass dataset in year 2015 and in the workforce in months April-June 2015, according to the “Employment by Occupation” EMP04 dataset published by the Office for National Statistics.

New sources of data are making it possible to use not only job titles, but also information such as skills and knowledge requirements. This is particularly useful when assigning labels like how ‘STEM’ or ‘creative’ an occupation is, as these concepts are only loosely connected with educational qualifications (which policymakers often take to be a proxy for skills) [9]. A related paper by Grinis [6] attempts to move beyond the binary classification of jobs as STEM and non-STEM. Grinis, using vacancy data also from Burning Glass, builds a list of STEM keywords by using degree qualification requirements of job vacancies and uses these to identify non-STEM occupations that have high STEM requirements.

3 Online job ad data

The data that we use in this paper is a list of UK job advertisements published in 2015, collected from by Burning Glass⁴ from web sources. Each of the 8,173,962 job postings is assigned a 4-digit SOC2010 code⁵, based on the job title⁶. As a first characterisation of the Burning Glass dataset (BG) we analyse its occupational composition, in terms of SOC code. The distribution of the number of jobs in each SOC code in BG is heavy-tailed, as shown in Fig. 1. For comparison, we show also the same distribution generated from the ONS Dataset EMP04 for April-June 2015 [7], which represents how the stock of individuals employed was distributed across SOC codes during that period. The two distributions are strikingly similar. To determine whether a SOC code is over-represented (or under-represented) in BG, compared with the workforce composition, we determine for each code the ratio of its share in BG to its

⁴<http://burning-glass.com/>

⁵<https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010>

⁶Two online coding tools that allow to do this are the [ONS Coding Tool](#) and [Warwick’s CASCOT](#).

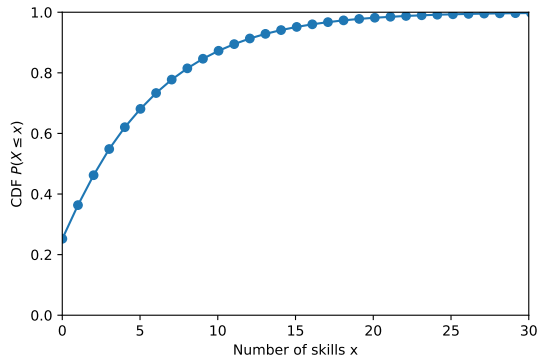


Figure 3: Cumulative distribution of the number of skills associated with each job advertisement. 25.26% of the advertisements do not mention any skills. Most of the remaining advertisements have between 1 and 20 skills tags. The median of the non-null values is 5 and its interquartile range is 6.

share in the EMP04 dataset. The distribution of this statistic is plotted in Fig. 2.

Additionally, Burning Glass assigns each job advertisement one or more of 9,996 tags derived directly from the job ad text. What employers require of individuals to perform particular jobs of course includes skills, attitudes, competencies and knowledge, etc. In this paper, we sometimes use the word “skills” to describe the tags more generally derived by Burning Glass from a job advertisement, but it is important to note that the tags in many cases refer to a knowledge or some other requirement, not skills. We remove some tags that appear to be wrongly assigned to job postings because of their occurrence within the job advertisement; one example of these ambiguous skills is “javascript”, which might appear in a page that requires a JavaScript-enabled browser. We show in Fig. 3 how about one quarter of jobs do not mention any skills in their text at all. For those that mention at least one skill, the number mentioned rarely goes beyond 20.

There are a number of good reasons why a massive job advertisements database like the one we are using will contain SOC code errors, including the use by employers of uncommon, ambiguous or misspelt job titles. Operating directly on the full dataset \mathcal{D} would therefore lead to invalid results. Instead, we will build a smaller dataset, which we call the “valid sample” \mathcal{D}_v , for which we know SOC labels are robust; we will use it to propagate its robust assignment to the full dataset.

To that end, we first collect the ten most common job titles occurring in each SOC code and we manually check if the SOC code assignment for each of those job titles is valid. \mathcal{D}_v is composed of all job postings that have job titles in the valid list. It constitutes 20% of all the job postings in the data; we assume that the skill make-up of this subset is not very different from the skill composition of the remaining jobs. It is not possible to test this assumption, as it would require us to compare, for each SOC code, the skillsets of the most common job with the rest of the jobs in the same code. However, we cannot use those less common jobs reliably for this task, as they are more likely to have a wrong SOC code.

In order to convert skillsets to a mathematical representation, we use a vector space model (VSM) based on the term frequency-inverse document frequency (*tf-idf*) [8]. This model is typically used to measure the importance of a word within a textual document. It works by assigning each word-document pair a value directly proportional to how often the word appears in the document and inversely proportional to how often it appears in other documents. In this paper we use it to measure the importance of skills both in job postings and in SOC codes.

Each dimension in the VSM space represents a unique skill. We can use the VSM to represent a whole SOC code (in which case we will refer to the *SOC vector*) or a job posting (*job vector*). The bigger a vector’s component is along a particular dimension, the more important that skill is for that occupation or job. Table 1 (see Appendix) shows the most relevant skills for each SOC vector, according to their weights in the VSM; the skills included belong to the 99% top percentile (weight > 0.15).

This table is a useful way of summarising the dataset and it allows us to perform a sanity check on the quality of the SOC classification in the valid sample. Most of the SOC vectors appear to be intuitive.

4 Assigning SOC codes: from job titles to skills

We have seen in the previous section how the tags from online job advertisements can be used to characterise an occupational category in great detail. In this section, we investigate whether skills can also be used to *determine* the occupational category of a job. To that end, we build a classifier that assigns a 4-digit SOC code based on the required skillset of the job, rather than just the advertised job title. We then compare the performance of this classifier against the SOC codes in the dataset which are determined only based on their job title.

We use a Multinomial Naive Bayes classifier for this purpose. This classifier is trained to accept a skillset tf-idf vector as input and to return an estimated SOC code as output. Once the classifier is trained, we are able to assign a SOC code to any skillset. By means of 3-fold cross-validation we obtain the optimal parameter $\alpha = 4.64 \times 10^{-3}$, which identifies the optimal model.

Evaluating the performance of this model is not straightforward because we do not have a ground truth dataset (i.e., a list of job ads that are assigned to the best possible SOC code). For this reason we adopt a different approach: for each SOC code we select a single job ad for which the original SOC assignment (the assignment originally available in the Burning Glass dataset, stemming from the job title) is *likely wrong* and another job ad for which it is *likely correct*. This selection is operated by comparing the skill content of the particular job advertised to the skill content of the assigned SOC code and selecting, respectively, the job with the minimum (likely wrong) and maximum (likely correct) cosine similarity. From these two groups, we then select a random sample A of $n = 20$ job postings that are likely to be originally assigned to the correct SOC code and another sample B of $n = 20$ vacancies that are likely to have a wrong code originally assigned. We generate these two groups to evaluate the model in two very different scenarios, one when the original assignments were already likely to be correct and another where they were likely to be incorrect.

We then use the classifier to make new SOC code assignments from the skill content. We finally manually determine for elements in these samples which of the two kinds of assignment are correct. It is worth emphasising that during this manual evaluation we could not distinguish the original assignment, determined from the job title, from the assignment generated by the skills-based classifier (i.e., the test was blind). The table below summarises the results of this manual evaluation. The two rows represent the two random samples, each composed of 20 elements. The two columns represent how many of the assignments coming from each of the two methods were determined to be correct. These results suggest that the skills-based classifier does not worsen the classification of jobs that are already likely classified well (all 20 of the original correct SOC assignment in A are also correctly labelled by the model), while it improves the classification of jobs that are likely poorly classified in B (from 3 correct SOC original assignments to 13 correct assignments operated by the model).

		Number of correct assignments	
		Original assignments (from title)	Model assignments (from skills)
Likely	correct (sample A)	20 (100%)	20 (100%)
	wrong (sample B)	3(15%)	13 (65%)

We can use again the tf-idf vectors to evaluate the correctness of the assignments on a much larger group of job advertisements. In particular, given a job advertisement and its vector representing its skill content, we can find the cosine distance between them. A smaller cosine distance would be an indication that the job advertisements are close to their assigned SOC in terms of skillset. Figure 4 shows us that the assignments generated by the Multinomial Naive Bayes classifier are an improvement over the original assignments, while best-case and worst-case baselines are provided for comparison.

5 Identifying creative and STEM jobs by their skillset

While so far we have used skillsets to determine the SOC code, a related question is whether a similar methodology can be used to detect other properties of jobs, for example those that may span across multiple, potentially very different, occupation categories. Two good examples of interest to policymakers are whether or not a job can be characterised as being 'STEM' and/or 'creative'. Could we train a machine learning model with examples of STEM and creative skillsets (and negative examples, too) and then let it decide on other skills combinations?

In this section, we develop machine learning classifiers that decide whether or not a job is STEM and whether or not it is creative, based on the list of skills and other requirements specified by employers in

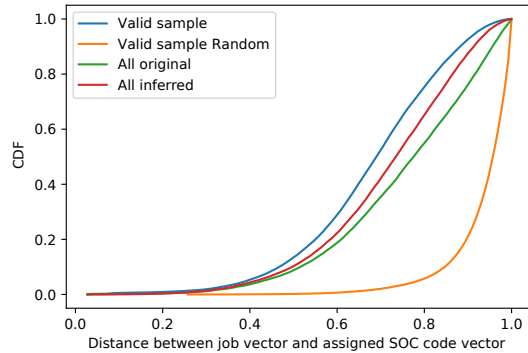


Figure 4: Cumulative distribution function of the distance between each job vector and the vector describing its assigned SOC code, according to different criteria. The blue line represents this measure for jobs in the valid sample and is a theoretical best-case baseline, while the yellow line is for SOC assignments randomly shuffled, provided for comparison as a worst-case baseline. The green line describes the original SOC code assignments and the red line describes the assignments generated by the Multinomial Naive Bayes classifier. This figure shows that the classifier is an improvement over the original assignments.

the job advertisement. We assign each occupation either to the ‘creative’ or to the ‘non-creative’ group, according to a definition set by DCMS [5], based on the Dynamic Mapping proposed by Nesta [1]. We in addition label each occupation as ‘STEM’ or ‘non-STEM’, according to the definition adopted by the University of Warwick, which has also been used in government [4].

The training data is obtained by assigning STEM/creative labels to the job advertisements based on their SOC code. A job advertisement that belongs to a ‘creative’ SOC code is automatically labelled as ‘creative’ for the purposes of model training regardless of its skills content. Similarly, a job advertisement is classified as ‘STEM’ if it belongs to a ‘STEM’ occupation, regardless of its skillset. These labelled entries then serve as ‘ground truth’ to train two classifiers, which independently decide whether or not a job is STEM and creative. These classifiers make this decision based only on their skill content, without knowing which SOC code the job advertisement is assigned to.

5.1 Model selection and training

We use linear SVM (support vector machine) model and logistic regressions, trained using SGD (Stochastic Gradient Descent), since such models can scale easily to problems with many data points (in this case, the number of job advertisements) and features (in this case, the number of possible skills). We set the learning rate to the optimal $\eta = (\alpha * (t + t_0))^{-1}$ according to the heuristic suggested by Léon Bottou [3]. We use 5-fold cross-validation to determine the best model and the best regularisation parameter α . In order to speed up this phase, the cross validation is run on a 4% sample of the dataset, which contains 51,835 data points. The best results are given by a linear SVM model and $\alpha = 7.28 \times 10^{-6}$, which will be used for the next steps.

We then randomly partition the full initial dataset \mathcal{D} into two: 75% of data points to be used for training and the remaining 25% to be used for evaluation. The trained models have a training accuracy of 0.9569 and 0.9436 for STEM and creative labels, respectively, and a test accuracy of 0.9567 and 0.9434⁷.

Now that we have a fully trained model, we can compare the labels predicted by the model, which are assigned based only on their skills, with those that are assigned based only on their SOC codes. In particular, we can identify for which SOC codes the skill-based classifiers conflict with the initial labels. We call ‘false positives’ (FP) those jobs advertisements that are classified as creative (or STEM) while their SOC code is not in the group of creative (STEM) occupations; similarly, we call ‘false negatives’ (FN) those job advertisements that are classified as not-creative (or not-STEM) while their SOC code appears in the list of creative (STEM) occupations. The tables below list those SOC codes that have the

⁷Accuracy typically measures how *correctly* a model classifies datapoints, assuming that the initial labels are correct. In this case, the initial STEM/Creative labels are assigned by only looking at the SOC code. Therefore accuracy here measures how the model classifications are in accordance with the initial SOC-based classifications. If the models achieved a perfect accuracy of 1, it would mean that the skill-based classification fully agrees with the SOC classification and that skills do not add information that is already available in SOC codes (for example, because skills are very specific to each occupation code). In this case, instead, for about 5% of the occupations the model disagrees with initial classification.

highest number of false positives/negatives for STEM and creative jobs, limited to the 95% top percentile of false classifications. As the tables show the majority of classification disagreements occur in a few SOC codes.

SOC Code	SOC Name	STEM FN fraction
1121	production managers and directors in manufacturing	0.4515
2431	architects	0.3947
3218	medical and dental technicians	0.3276
2112	biological scientists and biochemists	0.2952
3111	laboratory technicians	0.2667
3131	it operations technicians	0.2297
5249	electrical and electronic trades n.e.c.	0.2271

SOC Code	SOC Name	STEM FP fraction
8133	routine inspectors and testers	0.5000
2461	quality control and planning engineers	0.2081
8125	metal working machine operatives	0.1691
2133	it specialist managers	0.1176
5449	other skilled trades n.e.c.	0.1091
2426	business and related research professionals	0.1083
5113	gardeners and landscape gardeners	0.1071

SOC Code	SOC Name	Creative FN fraction
5449	other skilled trades n.e.c.	0.9455
2432	town planning officers	0.4415
2431	architects	0.4211
3543	marketing associate professionals	0.2657
1132	marketing and sales directors	0.2409

SOC Code	SOC Name	Creative FP fraction
3131	it operations technicians	0.1488
8133	routine inspectors and testers	0.07692
4151	sales administrators	0.06843
2139	information technology and telecommunications professionals n.e.c.	0.05090
3539	business and related associate professionals n.e.c.	0.04811
3545	sales accounts and business development managers	0.02967
4131	records clerks and assistants	0.02857
3132	it user support technicians	0.02805

6 Conclusion

In this paper we have shown that it is possible to use machine-learning methods to analyse web-based job advertisements with the goal of understanding their skill composition, of increasing the accuracy of the occupational classification and of identifying cross-occupational job properties, such as their ‘STEM-ness’ and creativity.

It is an example of how policymakers can mine web-based labour market data, using machine-learning methods, to develop timely and detailed insights related to employment. We have shown how such data can be of great value for classification purposes if used in combination with traditional classification approaches, such as the SOC, that rely on less timely and more human-intensive methods.

Acknowledgements

The authors thank John Davies, Bledi Taska and Cath Sleeman for useful and fruitful discussions. The authors thank Burning Glass for providing access to their online job adverts data.

References

- [1] Hasan Bakhshi, Alan Freeman, and Peter Higgs. *A Dynamic Mapping of the UK’s Creative Industries* / Nesta. Tech. rep. Jan. 2013. URL: <http://www.nesta.org.uk/publications/dynamic-mapping-uks-creative-industries> (visited on 06/27/2016).

- [2] M Belloni et al. *Measurement Error in Occupational Coding: an Analysis on SHARE Data*. Ca'Foscari University of Venice, Department of Economics. Tech. rep. Working Paper 24. Doi: <http://dx.doi.org/10.2139/ssrn.2539080>, 2014.
- [3] Léon Bottou and Olivier Bousquet. “The Tradeoffs of Large Scale Learning”. In: *Advances in Neural Information Processing Systems*. Ed. by J.C. Platt et al. Vol. 20. NIPS Foundation (<http://books.nips.cc>), 2008, pp. 161–168. URL: <http://leon.bottou.org/papers/bottou-bousquet-2008>.
- [4] Innovation & Skills Department for Business. *Technical Apprenticeships: Research into Supply and Demand - Publications - GOV.UK*. Mar. 2014. URL: <https://www.gov.uk/government/publications/technical-apprenticeships-research-into-supply-and-demand>.
- [5] DCMS. *Creative Industries Economic Estimates*. Jan. 2014. URL: <https://www.gov.uk/government/statistics/creative-industries-economic-estimates-january-2014> (visited on 01/04/2017).
- [6] Inna Grinis. “The STEM Requirements of Non-STEM Jobs: Evidence from UK Online Vacancy Postings and Implications for Skills & Knowledge Shortages”. In: *SSRN Electronic Journal* (2016). DOI: [10.2139/ssrn.2864225](https://doi.org/10.2139/ssrn.2864225). URL: <https://doi.org/10.2139/ssrn.2864225>.
- [7] Office for National Statistics. *Dataset EMP04: Employment by occupation, April - June 2015*. <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/employmentbyoccupationemp04>. Accessed: 2017-11-15.
- [8] Anand Rajaraman and Jeffrey David Ullman. *Mining of Massive Datasets*. Cambridge: Cambridge University Press, 2011. ISBN: 978-1-139-05845-2. URL: <http://ebooks.cambridge.org/ref/id/CB09781139058452>.
- [9] Jonathan Rothwell. “The hidden STEM economy”. In: *Washington: Brookings Institution* (2013).
- [10] Malte Schierholz, Miriam Gensicke, and Nikolai Tschersich. *Occupation coding during the interview*. IAB-Discussion Paper 17/2016. 2016, p. 30.

Table 1: List of occupations and required skills obtained from the valid sample \mathcal{D}_v

SOC Code	SOC Name	Skills
1116	elected officers and representatives	organisational skills (0.41), fundraising (0.34), business development (0.26), strategic leadership (0.23)
1121	production managers and directors in manufacturing	engineering management (0.36), communication skills (0.34), lean methods (0.30), key performance indicators (0.26), planning (0.25), organisational skills (0.23), leadership (0.22), lean manufacturing (0.20)
1122	production managers and directors in construction	first aid (0.52), contract management (0.47), construction management (0.33), project management (0.25), communication skills (0.24)
1123	production managers and directors in mining and energy	energy management (0.56), energy reduction (0.24), energy consumption (0.22), contract management (0.22), communication skills (0.20), organisational skills (0.19)
1131	financial managers and directors	accountancy (0.36), budgeting (0.29), budget forecasting (0.28), financial accountancy (0.26), communication skills (0.23), forecasting (0.22), balance sheet (0.22), statutory accounts (0.21), cash flow forecasting (0.20)
1132	marketing and sales directors	brand experience (0.41), marketing (0.30), brand management (0.28), building relationships (0.22), communication skills (0.22), brand marketing (0.20)
1133	purchasing managers and directors	supply chain (0.71), procurement (0.33), supply chain management (0.23), purchasing (0.23)
1134	advertising and public relations directors	public relations (0.68), fundraising (0.46), communication skills (0.19), building relationships (0.19)
1135	human resource managers and directors	employee relations (0.49), organisational skills (0.32), hr strategy (0.29), communication skills (0.27), performance management (0.27), business management (0.23), building relationships (0.22), human resource management (0.19)
1136	information technology and telecommunications directors	itil (0.43), communication skills (0.30), it strategy (0.24), organisational skills (0.22), project management (0.19), information systems management (0.19)
1139	functional managers and directors n.e.c.	communication skills (0.37), regulatory affairs (0.29), vat returns (0.26), organisational skills (0.23), business management (0.21), tax preparation (0.21), building relationships (0.20), planning (0.20)
1150	financial institution managers and directors	accountancy (0.33), communication skills (0.28), budgeting (0.27), budget forecasting (0.22), financial accountancy (0.21), organisational skills (0.20)
1161	managers and directors in transport and distribution	communication skills (0.40), planning (0.31), key performance indicators (0.31), organisational skills (0.28), management (0.20), traffic management (0.19)
1162	managers and directors in storage and warehousing	warehouse management (0.60), logistics management (0.28), communication skills (0.26), logistics (0.24), planning (0.22), organisational skills (0.22), key performance indicators (0.20), warehouse operations (0.20)
1171	officers in armed forces	organisational skills (0.39), communication skills (0.35), working with patient and/or condition: dementia (0.31), building relationships (0.26), procurement (0.25), project management (0.24), contract management (0.24), planning (0.20), research (0.19)
1172	senior police officers	dcis (0.56), inspection (0.50), prevention of criminal activity (0.21)
1173	officers in fire, ambulance, prison and related services	communication skills (0.50), supervisory skills (0.32), loss prevention (0.32), security industry knowledge (0.31), customer service (0.23), organisational skills (0.21)
1181	health services and public health managers and directors	communication skills (0.40), organisational skills (0.26), file management (0.21), project management (0.20), microsoft excel (0.19), care planning (0.18)
1184	social services managers and directors	social work (0.40), communication skills (0.32), child protection (0.27), budget management (0.26), organisational skills (0.25), planning (0.23), building relationships (0.21), contract management (0.20), budgeting (0.19), working with patient and/or condition: learning disabilities (0.19), mental health (0.19)
1190	managers and directors in retail and wholesale	store management (0.72), operations management (0.27), retail management (0.25), key performance indicators (0.22), communication skills (0.22)
1211	managers and proprietors in agriculture and horticulture	farm management (0.96)
1213	managers and proprietors in forestry, fishing and related services	planning (0.26), regulatory documents (0.25), biodiversity (0.25), organisational skills (0.25), communication skills (0.24), budget planning (0.21), supervisory skills (0.20), grass cutting (0.19)
1221	hotel and accommodation managers and proprietors	guest services (0.80), communication skills (0.27), budgeting (0.22), budget management (0.20)
1223	restaurant and catering establishment managers and proprietors	restaurant management (0.97)
1224	publicans and managers of licensed premises	contract management (0.40), communication skills (0.37), organisational skills (0.36), stock control (0.26), customer service (0.23), restaurant industry experience (0.19)
1225	leisure and sports managers	communication skills (0.53), organisational skills (0.24), customer service (0.23), patient care (0.23), perioperative (0.23), front office (0.21), english (0.20), operating department practitioner (0.20)

SOC Code	SOC Name	Skills
1226	travel agency managers and proprietors	communication skills (0.31), money management (0.30), sales goals (0.27), cost management (0.27), customer service (0.27), building relationships (0.25), budget management (0.23), organisational skills (0.23), leadership (0.22), stock control (0.21), cost control (0.21), budgeting (0.21), prioritising tasks (0.20), creativity (0.18)
1241	health care practice managers	home management (0.42), working with patient and/or condition: learning disabilities (0.33), care planning (0.30), communication skills (0.28), budget management (0.26), budgeting (0.24), organisational skills (0.22), contract management (0.19)
1242	residential, day and domiciliary care managers and proprietors	home management (0.82), nursing home (0.40), working with patient and/or condition: dementia (0.18)
1251	property, housing and estate managers	facility supervision (0.46), communication skills (0.34), contract management (0.30), property management (0.28), organisational skills (0.27), facility management (0.26), budgeting (0.18)
1252	garage managers and proprietors	paint sprayer (0.44), business management (0.35), sales management (0.33), leadership (0.28), store management (0.27), repair (0.26), administration management (0.25), budgeting (0.20)
1253	hairdressing and beauty salon managers and proprietors	therapy (0.38), english (0.32), customer service (0.30), organisational skills (0.29), motivational speaking (0.26), beauty industry experience (0.21), supervisory skills (0.19), collection industry knowledge (0.19)
1254	shopkeepers and proprietors – wholesale and retail	store management (0.71), organisational skills (0.34), order correction (0.34), customer service (0.26)
1255	waste disposal and environmental services managers	communication skills (0.38), contract management (0.29), oncology experience (0.27), clinical study (0.26), organisational skills (0.25), budget management (0.23), budgeting (0.21), good clinical practices (gcp) (0.20)
1259	managers and proprietors in other services nec	project management (0.75), communication skills (0.27), contract management (0.22), planning (0.19)
2111	chemical scientists	chemistry (0.64), analytical chemistry (0.43), high performance liquid chromatography (0.31), high performance liquid chromatography (0.31)
2112	biological scientists and biochemists	microbiology (0.60), ecological consultancy (0.30), research (0.27), communication skills (0.21), biology (0.20)
2113	physical scientists	geophysics (0.74), geology (0.34), physics (0.26), teaching physics (0.24)
2114	social and humanities scientists	teaching geography (0.81), teaching (0.47), gis (0.27)
2119	natural and social science professionals n.e.c.	research (0.41), machine learning (0.31), r (0.25), python (0.23), data science (0.22), apache hadoop (0.22)
2121	civil engineers	civil engineering (0.50), communication skills (0.33), project management (0.31), geotechnical engineering (0.23), structural design (0.20)
2122	mechanical engineers	mechanical engineering (0.82), mechanical design (0.19)
2123	electrical engineers	electrical engineering (0.81), electrical design (0.19)
2124	electronics engineers	electronic engineering (0.94)
2126	design and development engineers	mechanical design (0.54), computer aided draughting/design (cad) (0.47), mechanical engineering (0.27), electrical design (0.22)
2127	production and process engineers	process engineering (0.69), lean methods (0.24), manufacturing processes (0.23), chemical engineering (0.21)
2129	engineering professionals n.e.c.	project management (0.46), communication skills (0.42), mechanical engineering (0.22), planning (0.20), organisational skills (0.19)
2133	it specialist managers	itil (0.43), communication skills (0.36), organisational skills (0.20), planning (0.20)
2134	it project and programme managers	programme management (0.87), project management (0.31)
2135	it business analysts, architects and systems designers	systems engineering (0.40), communication skills (0.28), microsoft windows (0.21), sql (0.20)
2136	programmers and software development professionals	java (0.36), software engineering (0.34), sql (0.31), microsoft c# (0.30), software development (0.26), c++ (0.19)
2137	web design and development professionals	web development (0.75), jquery (0.23), hypertext preprocessor (php) (0.22), web site development (0.22), javascript (0.21)
2139	information technology and telecommunications professionals n.e.c.	network engineering (0.43), cisco (0.32), firewalls (0.29), communication skills (0.25), software testing (0.21), sql (0.19)
2141	conservation professionals	ecological consultancy (0.77), field surveys (0.30), project management (0.22), communication skills (0.19), report writing (0.19)
2142	environment professionals	environmental consultancy (0.48), site investigations (0.32), environmental management (0.31), environmental science (0.29), communication skills (0.25), project management (0.18)
2150	research and development managers	communication skills (0.35), process design (0.34), research (0.31), project management (0.25), planning (0.25), contract management (0.25), organisational skills (0.19)
2211	medical practitioners	surgery (0.61), psychiatry (0.48), global positioning system (gps) (0.24), occupational health and safety (0.22)
2212	psychologists	clinical psychology (0.76), psychology (0.55), mental health (0.23)

SOC Code	SOC Name	Skills
2213	pharmacists	pharmacist (0.96)
2214	ophthalmic opticians	optometry (0.97)
2215	dental practitioners	dentistry (0.98)
2216	veterinarians	surgery (0.96)
2217	medical radiographers	radiography (0.69), ultrasound (0.40), radiology (0.31), communication skills (0.20), mammography (0.19)
2218	podiatrists	podiatry (0.93)
2219	health professionals n.e.c.	dietetics (0.69), occupational health and safety (0.47), surveillance (0.28), case management (0.21)
2221	physiotherapists	physiotherapy (0.82), clinical reasoning (0.22), therapy (0.19), communication skills (0.19)
2222	occupational therapists	occupational therapy (0.95)
2223	speech and language therapists	dysphagia (0.66), speech therapy (0.52), therapy (0.34)
2229	therapy professionals n.e.c.	strabismus (0.48), binocular vision (0.37), physiology (0.24), exercise programmes (0.23), amblyopia (0.22), teaching (0.22), optometry (0.20)
2231	nurses	care planning (0.49), communication skills (0.40), nursing home (0.30), working with patient and/or condition: dementia (0.23), medication administration (0.21), nursing (0.20)
2232	midwives	midwifery (0.99)
2311	higher education teaching professionals	lecturer (0.60), teaching (0.56), research (0.45)
2312	further education teaching professionals	teaching (0.64), lecturer (0.56), psychology (0.32), religious education (0.27)
2314	secondary education teaching professionals	teaching (0.72), teaching english (0.36), teaching mathematics (0.28), teaching science (0.28), english (0.25), mathematics (0.21)
2315	primary and nursery education teaching professionals	teaching (0.92)
2316	special needs education teaching professionals	teaching (0.92), working with patient and/or condition: autism (0.20)
2317	senior professionals of educational establishments	teaching (0.71), communication skills (0.37), business management (0.30), organisational skills (0.21)
2318	education advisers and school inspectors	academic advisement (0.70), communication skills (0.43), teaching (0.24), organisational skills (0.24)
2319	teaching and other educational professionals n.e.c.	teaching (0.81), tutoring (0.24), teaching english (0.20), communication skills (0.20), organisational skills (0.19)
2412	barristers and judges	communication skills (0.46), building relationships (0.40), cash handling (0.31), customer service (0.31), organisational skills (0.24), energetic (0.23), civil litigation (0.21), leadership (0.20)
2413	solicitors	commercial litigation (0.42), business development (0.40), communication skills (0.36), litigation (0.31), building relationships (0.25), acquisitions (0.23), mergers and acquisitions (0.21)
2419	legal professionals n.e.c.	communication skills (0.44), litigation (0.41), building relationships (0.32), business development (0.30), organisational skills (0.21), mergers and acquisitions (0.21), team work/ collaboration (0.19)
2421	chartered and certified accountants	accountancy (0.61), balance sheet (0.29), financial accountancy (0.22), microsoft excel (0.21), account reconciliation (0.21), budget forecasting (0.20), budgeting (0.18)
2423	management consultants and business analysts	business analysis (0.74), business process (0.24), communication skills (0.24), business management (0.19)
2424	business and financial project management professionals	communication skills (0.33), risk management (0.31), business management (0.29), project management (0.27), planning (0.23), organisational skills (0.23), budgeting (0.20), building relationships (0.20), portfolio management (0.18)
2425	actuaries, economists and statisticians	pricing (0.42), statistics (0.37), communication skills (0.29), biostatistics (0.27), mathematics (0.24), sas (0.22), bioinformatics (0.22)
2426	business and related research professionals	research (0.80), market research (0.28), communication skills (0.26)
2429	business, research and administrative professionals n.e.c.	financial reporting (0.49), operations analysis (0.29), international financial reporting standards (0.27), communication skills (0.27), accountancy (0.26), financial accountancy (0.25), statutory accounts (0.19)
2431	architects	revit (0.42), project architecture (0.41), landscape architecture (0.33), communication skills (0.27), sketchup (0.26), planning (0.22), google sketchup (0.19)
2432	town planning officers	planning (0.60), primavera (0.44), project planning and development skills (0.42), microsoft project (0.22), communication skills (0.22), project management (0.19)
2433	quantity surveyors	procurement (0.40), contract management (0.38), communication skills (0.26), contract preparation (0.25), civil engineering (0.21), procurement contracts (0.21), contract accountancy (0.21), cost control (0.20)
2434	chartered surveyors	contract administration (0.39), communication skills (0.35), project management (0.31), contract management (0.30), repair (0.26)

SOC Code	SOC Name	Skills
2435	chartered architectural technologists	project management (0.66), contract management (0.27), communication skills (0.26), planning (0.23)
2436	construction project managers and related professionals	transportation planning (0.72), transport planning (0.47), planning (0.30), transyt (0.21)
2442	social workers	social work (0.88), family support (0.36), child protection (0.21)
2443	probation officers	case management (0.60), criminal justice (0.47), order packing and shipping (0.36), writing (0.29), social work (0.28)
2444	clergy	teaching (0.65), communication skills (0.42), teaching science (0.24), organisational skills (0.21), english (0.20)
2449	welfare professionals n.e.c.	teaching (0.50), communication skills (0.47), child development (0.31), planning (0.26), child protection (0.22), organisational skills (0.21), building relationships (0.20), social services (0.19)
2451	librarians	photo processing (0.65), communication skills (0.40), retail management (0.27), integrated library systems (0.22), organisational skills (0.21), teaching (0.21), library resources (0.20)
2452	archivists and curators	communication skills (0.49), organisational skills (0.44), research (0.42), archival principles (0.20)
2461	quality control and planning engineers	quality assurance and control (0.48), iso 9001 standards (0.31), failure modes and effects analysis (fmea) (0.27), planning (0.26), problem solving (0.25), communication skills (0.24), inspection (0.22)
2462	quality assurance and regulatory professionals	quality assurance and control (0.60), communication skills (0.31), compliance management (0.30), iso 9001 standards (0.26), organisational skills (0.20)
2463	environmental health professionals	environmental inspection (0.64), environmental health and safety (0.38), public health and safety (0.28), inspection (0.25), gas exploration (0.23), food safety (0.20)
2471	journalists, newspaper and periodical editors	editing (0.54), writing (0.43), communication skills (0.26), medical writing (0.23)
2472	public relations professionals	public relations (0.83), social media (0.19)
2473	advertising accounts managers and creative directors	campaign management (0.69), marketing (0.43)
3111	laboratory technicians	communication skills (0.34), chemistry (0.32), laboratory equipment (0.22), organisational skills (0.22), detail-orientated (0.21), sample preparation (0.21), microsoft excel (0.20)
3112	electrical and electronics technicians	repair (0.38), wiring (0.37), electrical engineering (0.34), electrical systems (0.20), inspection (0.19)
3113	engineering technicians	repair (0.39), machinery (0.38), preventive maintenance (0.32), communication skills (0.24), lean methods (0.21), mechanical engineering (0.19), manufacturing processes (0.19)
3114	building and civil engineering technicians	revit (0.68), computer aided draughting/design (cad) (0.44), structural drawings (0.36), civil engineering (0.21), communication skills (0.20)
3115	quality assurance technicians	inspection (0.61), quality assurance and control (0.41), capability maturity model (cmm) (0.33), coordinate measuring machine (cmm) (0.26), communication skills (0.20)
3116	planning, process and production technicians	production planning (0.97)
3119	science, engineering and production technicians n.e.c.	repair (0.46), communication skills (0.43), organisational skills (0.23), research (0.22)
3121	architectural and town planning technicians	revit (0.65), planning (0.43), sketchup (0.27), computer aided draughting/design (cad) (0.23), communication skills (0.20), google sketchup (0.19)
3122	draughtspersons	computer aided draughting/design (cad) (0.75), stress analysis (0.25), nastran (0.25), communication skills (0.19)
3131	it operations technicians	systems administration (0.82), database administration (0.23), sql (0.19)
3132	it user support technicians	it support (0.38), microsoft windows (0.36), technical support (0.32), communication skills (0.26), application support (0.26), itil (0.21), troubleshooting (0.19), microsoft office (0.19), windows server (0.18)
3213	paramedics	paramedics (0.61), emergency care (0.43), occupational therapy (0.37), activities of daily living (adls) (0.24), communication skills (0.22)
3216	dispensing opticians	optometry (0.77), communication skills (0.37), customer service (0.21)
3217	pharmaceutical technicians	pharmacy technician (0.84), hospital pharmacy experience (0.47)
3218	medical and dental technicians	teeth examination (0.51), working with patient and/or condition: gum disease (0.43), oral healthcare (0.34), treatment evaluation (0.34), patient/family education and instruction (0.27), dental hygiene (0.20), treatment planning (0.20), dentistry (0.19), x-rays (0.19)
3219	health associate professionals n.e.c.	caregiving (0.47), communication skills (0.38), toileting (0.27), therapy (0.24), supportive care (0.22), massage (0.22), care planning (0.19)
3231	youth and community workers	communication skills (0.50), community development (0.43), organisational skills (0.34), building relationships (0.34), candidate sourcing (0.19)
3233	child and early years of-ficers	teaching (0.83), communication skills (0.27), tutoring (0.26)
3234	housing officers	communication skills (0.61), organisational skills (0.38), customer service (0.27), repair (0.26), office management (0.19)

SOC Code	SOC Name	Skills
3235	counsellors	psychology (0.78), clinical psychology (0.41), mental health (0.29)
3239	welfare and housing associate professionals n.e.c.	fundraising (0.48), caregiving (0.44), communication skills (0.40), working with patient and/or condition: learning disabilities (0.27), organisational skills (0.21), mental health (0.19)
3311	ncos and other ranks	mergers and acquisitions (0.67), corporate recruiting (0.53), corporate finance (0.33), communication skills (0.20)
3312	police officers (sergeant and below)	intelligence analysis (0.38), research (0.30), communication skills (0.27), market analysis (0.26), geospatial intelligence (0.25), product research (0.22), microsoft excel (0.19), organisational skills (0.19), remote sensing (0.19)
3313	fire service officers (watch manager and below)	meeting deadlines (0.73), fire detection (0.30), communication skills (0.23), fire protection (0.23), engineering calculations (0.20)
3314	prison service officers (below principal officer)	communication skills (0.62), operations management (0.32), english (0.26), questionnaires (0.26), building relationships (0.23), national offender management service (0.22), hm prison service (0.21)
3315	police community support officers	extended family (0.62), prk (0.29), problem solving (0.26), lasik (0.26), communication skills (0.22)
3319	protective service associate professionals n.e.c.	information security (0.49), communication skills (0.42), organisational skills (0.24), project management (0.24), planning (0.21), building relationships (0.21)
3411	artists	3d modelling/ design (0.35), creativity (0.35), animation (0.29), adobe photoshop (0.28), 3d studio max (0.24), traditional animation (0.23), motionbuilder (0.23), cryengine (0.23), zbrush (0.22), art direction (0.22), character design (0.19), maya (0.19), motion capture (0.19)
3412	authors, writers and translators	writing (0.64), copy writing (0.38), technical writing / editing (0.25), editing (0.22), communication skills (0.22)
3413	actors, entertainers and presenters	english (0.76), music (0.41), comedy (0.36)
3414	dancers and choreographers	teaching dance (0.84), child behaviour (0.37), teaching (0.29), lesson planning (0.20)
3415	musicians	guitar (0.83), music (0.42), typing (0.29)
3416	arts officers, producers and directors	creativity (0.58), project management (0.25), communication skills (0.24), organisational skills (0.21), budgeting (0.18)
3417	photographers, audio-visual and broadcasting equipment operators	photography (0.81), camera operation (0.26), videography (0.25)
3421	graphic designers	adobe photoshop (0.42), creativity (0.38), graphic design (0.36), adobe indesign (0.36), digital design (0.30), adobe acrobat (0.22), typesetting (0.19)
3422	product, clothing and related designers	creativity (0.34), adobe photoshop (0.32), interior design (0.30), sales (0.28), computer aided draughting/design (cad) (0.27), communication skills (0.25), packaging (0.21), adobe indesign (0.20)
3441	sports players	customer contact (0.68), facebook (0.67)
3442	sports coaches, instructors and officials	football (0.85), teaching (0.31), communication skills (0.20)
3443	fitness instructors	tutoring (0.57), mentoring (0.54), instruction (0.44), marketing sales (0.26)
3511	air traffic controllers	air traffic management (0.76), planning (0.30), flight training (0.23), communication skills (0.20)
3512	aircraft pilots and flight engineers	workshops (0.64), document review (0.33), physics (0.28), flight training (0.20), systems engineering (0.19), air ambulance (0.19)
3513	ship and hovercraft officers	communication skills (0.39), organisational skills (0.28), invoice processing (0.24), customer accounts (0.19)
3520	legal associate professionals	litigation (0.44), communication skills (0.43), organisational skills (0.30), bill preparation (0.23), case management (0.21), detail-orientated (0.21), job costing (0.19), legal research (0.19)
3531	estimators, valuers and assessors	estimating (0.52), communication skills (0.34), kerridge (0.27), repair (0.25), customer service (0.25), organisational skills (0.18)
3532	brokers	cemap (0.61), communication skills (0.34), mortgage advice (0.33), maq (0.30), building relationships (0.21)
3533	insurance underwriters	insurance underwriting (0.81), communication skills (0.32), building relationships (0.31)
3534	finance and investment analysts and advisers	financial analysis (0.49), cemap (0.28), microsoft excel (0.24), communication skills (0.24), pricing (0.21), mortgage advice (0.19)
3535	taxation experts	tax planning (0.46), tax compliance (0.43), tax preparation (0.34), tax returns (0.27), accountancy (0.20), corporate tax returns (0.20), portfolio management (0.20)
3536	importers and exporters	invoicing (0.40), communication skills (0.35), export compliance (0.30), organisational skills (0.30), customer service (0.27), sales (0.26), freight forwarding (0.24), microsoft excel (0.20)
3537	financial and accounting technicians	account auditing (0.58), communication skills (0.29), accountancy (0.28), audit planning (0.26), audit experience (0.20), tax preparation (0.20), planning (0.19)
3538	financial accounts managers	communication skills (0.33), building relationships (0.32), planning (0.30), account auditing (0.28), account management (0.25), audit planning (0.22), business management (0.21), organisational skills (0.19)

SOC Code	SOC Name	Skills
3539	business and related associate professionals n.e.c.	business systems (0.52), data analysis (0.33), communication skills (0.32), microsoft excel (0.30), project management (0.24), organisational skills (0.23)
3541	buyers and procurement officers	purchasing (0.48), procurement (0.46), communication skills (0.29), building relationships (0.19)
3542	business sales executives	sales (0.83), sales recruiting (0.21), communication skills (0.20)
3543	marketing associate professionals	marketing (0.90)
3544	estate agents and auctioneers	communication skills (0.54), organisational skills (0.36), sales (0.29), real estate experience (0.23), rental sales (0.21), insurance sales (0.20)
3545	sales accounts and business development managers	marketing (0.66), business management (0.34), business development (0.33)
3546	conference and exhibition managers and organisers	event management (0.86), communication skills (0.23), organisational skills (0.22)
3550	conservation and environmental associate professionals	environmental restoration planning (0.62), environmental restoration (0.39), environmental planning (0.24), communication skills (0.21)
3561	public services associate professionals	communication skills (0.45), organisational skills (0.39), microsoft office (0.22), information governance (0.22), customer service (0.19), microsoft excel (0.18)
3562	human resources and industrial relations officers	communication skills (0.44), building relationships (0.39), employee relations (0.34), organisational skills (0.31), business development (0.21), sales recruiting (0.19)
3563	vocational and industrial trainers and instructors	communication skills (0.43), training materials (0.35), organisational skills (0.34), training programmes (0.33), training (0.22), microsoft office (0.19)
3564	careers advisers and vocational guidance specialists	communication skills (0.61), organisational skills (0.24), teaching (0.21), building relationships (0.20), mathematics (0.20), microsoft excel (0.20)
3565	inspectors of standards and regulations	capability maturity model (cmm) (0.53), regulatory affairs (0.46), inspection (0.37), coordinate measuring machine (cmm) (0.32), communication skills (0.24)
3567	health and safety officers	workplace health and safety (0.53), communication skills (0.44), organisational skills (0.32), site inspection (0.19)
4112	national government administrative occupations	claims adjustments (0.76), communication skills (0.33), organisational skills (0.23), microsoft excel (0.19)
4113	local government administrative occupations	communication skills (0.47), organisational skills (0.41), customer service (0.22), microsoft excel (0.20), file management (0.20), administrative functions (0.19)
4114	officers of non-governmental organisations	communication skills (0.69), listening (0.54), organisational skills (0.21), leadership (0.20)
4121	credit controllers	communication skills (0.45), invoicing (0.43), microsoft excel (0.40), building relationships (0.22), customer accounts (0.20), organisational skills (0.20)
4122	book-keepers, payroll managers and wages clerks	payroll processing (0.50), invoicing (0.35), bank reconciliation (0.30), microsoft excel (0.29), accountancy (0.22), communication skills (0.22), payroll administration (0.19), account reconciliation (0.19)
4123	bank and post office clerks	communication skills (0.40), product sales (0.35), customer service (0.25), organisational skills (0.24), insurance sales (0.22), detail-orientated (0.21), building relationships (0.21), sales (0.19), team work/ collaboration (0.19), computer skills (0.18)
4124	finance officers	accountancy (0.43), bank reconciliation (0.33), microsoft excel (0.30), communication skills (0.26), invoicing (0.25), account reconciliation (0.23), financial accountancy (0.20), budgeting (0.20), organisational skills (0.20)
4129	financial administrative occupations n.e.c.	invoicing (0.39), bank reconciliation (0.36), microsoft excel (0.36), communication skills (0.30), accountancy (0.29), detail-orientated (0.21), account reconciliation (0.21), organisational skills (0.21)
4131	records clerks and assistants	communication skills (0.41), microsoft excel (0.35), organisational skills (0.32), file management (0.23), purchasing (0.23), microsoft office (0.21), document management (0.19), detail-orientated (0.19)
4132	pensions and insurance clerks and assistants	claims adjustments (0.82), communication skills (0.29)
4133	stock control clerks and assistants	stock control (0.39), materials planning (0.35), communication skills (0.34), planning (0.29), microsoft excel (0.26), organisational skills (0.24)
4134	transport and distribution clerks and assistants	logistics (0.57), communication skills (0.33), microsoft excel (0.27), supply chain (0.26), organisational skills (0.24), planning (0.21)
4135	library clerks and assistants	communication skills (0.55), integrated library systems (0.43), customer service (0.37), computer skills (0.27), organisational skills (0.24)
4138	human resources administrative occupations	organisational skills (0.39), communication skills (0.39), microsoft excel (0.31), detail-orientated (0.28), administrative functions (0.25), administrative support (0.24), contract administration (0.21), administration management (0.20), microsoft office (0.20), file management (0.20)
4151	sales administrators	marketing (0.77), sales (0.44)

SOC Code	SOC Name	Skills
4159	other administrative occupations n.e.c.	communication skills (0.36), microsoft excel (0.32), organisational skills (0.30), file management (0.28), administrative support (0.28), office administration (0.26), microsoft office (0.20), customer service (0.19), administrative functions (0.19), detail-orientated (0.19)
4161	office managers	office management (0.51), business management (0.48), organisational skills (0.31), communication skills (0.29), administration management (0.22)
4162	office supervisors	communication skills (0.46), organisational skills (0.37), customer service (0.28), microsoft excel (0.23), business management (0.21)
4211	medical secretaries	typing (0.62), medical terminology (0.39), secretarial skills (0.39), communication skills (0.29), organisational skills (0.24)
4212	legal secretaries	legal support (0.97)
4213	school secretaries	communication skills (0.46), organisational skills (0.40), teaching (0.31), secretarial skills (0.29), computer skills (0.21)
4214	company secretaries	secretarial skills (0.37), typing (0.36), calendar management (0.36), organisational skills (0.32), communication skills (0.27), microsoft excel (0.24), file management (0.23), microsoft powerpoint (0.21)
4215	personal assistants and other secretaries	calendar management (0.47), organisational skills (0.37), communication skills (0.30), administrative support (0.27), travel arrangements (0.24), microsoft powerpoint (0.22), microsoft excel (0.20), secretarial skills (0.19)
4216	receptionists	communication skills (0.54), customer service (0.38), organisational skills (0.33), telephone skills (0.19), computer skills (0.19), file management (0.19)
4217	typists and related keyboard occupations	data entry (0.72), typing (0.46), detail-orientated (0.27), microsoft excel (0.23)
5111	farmers	mathematics (0.59), english (0.42), animal care (0.32), first aid (0.31), cleaning (0.25), environmental conservation (0.23)
5112	horticultural trades	site inspection (0.49), grass cutting (0.43), mathematics (0.34), customer contact (0.29), agronomy (0.25)
5113	gardeners and landscape gardeners	grass cutting (0.79), machinery (0.42), communication skills (0.21)
5114	groundsmen and greenkeepers	machinery (0.53), grass cutting (0.50), mathematics (0.30), renovation (0.23), english (0.20)
5119	agricultural and fishing trades n.e.c.	acquisitions (0.66), communication skills (0.28), planning (0.26), geographic information system (gis) (0.26), inspection (0.23)
5211	smiths and forge workers	chisels (0.36), hammering (0.28), mathematics (0.27), welding (0.26), arc welding (0.26), zinc (0.24), english (0.20), power tools (0.19), technical drawings (0.19)
5212	moulders, core makers and die casters	repair (0.41), press materials (0.37), machining (0.34), lathes (0.34), computer numerical control (cnc) (0.30), injection moulding (0.25), grinders (0.24)
5213	sheet metal workers	welding (0.85), mig and tig welding (0.24)
5214	metal plate workers, and riveters	caulking (0.41), boilermaking (0.40), scanners (0.34), framing (0.30), welding (0.29), photography (0.21), keyboards (0.19)
5215	welding trades	welding (0.86), mig and tig welding (0.48)
5216	pipe fitters	pipng design (0.51), stress analysis (0.33), piping systems (0.25), engineering activities (0.23), communication skills (0.20)
5221	metal machining setters and setter-operators	computer numerical control (cnc) (0.86), machining (0.36)
5222	tool makers, tool fitters and markers-out	repair (0.46), press materials (0.38), injection moulding (0.37), machining (0.29), computer numerical control (cnc) (0.27), lathes (0.26), grinders (0.21)
5223	metal working production and maintenance fitters	repair (0.52), machinery (0.37), welding (0.34), hydraulics (0.27), mechanical engineering (0.27), communication skills (0.24)
5224	precision instrument makers and repairers	fuel meters (0.56), instrument design (0.33), hazop (0.22)
5225	air-conditioning and refrigeration engineers	repair (0.67), hvac (0.34), engineering industry background (0.30), communication skills (0.27)
5231	vehicle technicians, mechanics and electricians	automotive repair (0.67), repair (0.65)
5232	vehicle body builders and repairers	repair (0.68), automotive repair (0.64)
5234	vehicle paint technicians	paint sprayer (0.91), painting (0.25), repair (0.23)
5235	aircraft maintenance and related trades	repair (0.53), professional engineer (0.46), ventilation (0.23), pressure testing (0.20), aerospace industry knowledge (0.20)
5236	boat and ship builders and repairers	repair (0.60), test equipment (0.29), machinery (0.28), hand tools (0.25), technical drawings (0.19), carpentry (0.19)
5237	rail and rolling stock builders and repairers	tic (0.35), rolling stock (0.33), communication skills (0.27), teaching (0.24), organisational skills (0.22), supervisory skills (0.19)
5241	electricians and electrical fitters	electrical work (0.88), repair (0.23), wiring (0.19)
5242	telecommunications engineers	linux (0.35), puppet (0.33), chef (0.27), category 5 (cat5) cable (0.25), python (0.24), configuration management (0.20), ruby (0.20)

SOC Code	SOC Name	Skills
5244	tv, video and audio engineers	broadband (0.65), repair (0.40), communication skills (0.38), javascript (0.25)
5245	it engineers	computer aided draughting/design (cad) (0.77), revit (0.20)
5249	electrical and electronic trades n.e.c.	repair (0.68), communication skills (0.32), customer service (0.24), machinery (0.20)
5250	skilled metal, electrical and electronic trades supervisors	repair (0.40), supervisory skills (0.38), communication skills (0.33), organisational skills (0.33), management (0.20), customer service (0.20), planning (0.19)
5311	steel erectors	welding (0.77), construction industry knowledge (0.34), contract management (0.26)
5312	bricklayers and masons	construction industry knowledge (0.59), commercial construction (0.49), concrete finishing (0.44), masonry (0.29)
5313	roofers, roof tilers and slaters	roofing (0.96)
5314	plumbers and heating and ventilating engineers	plumbing (0.75), pipefitting (0.40), repair (0.27), boilers (0.27), heating systems (0.24)
5315	carpenters and joiners	carpentry (0.94), construction industry knowledge (0.21), commercial construction (0.19)
5316	glaziers, window fabricators and fitters	microsoft windows (0.94), window installation (0.21)
5319	construction and building trades n.e.c.	construction industry knowledge (0.44), pipe laying (0.34), commercial construction (0.30), repair (0.27), communication skills (0.22), preventive maintenance (0.21), contract management (0.21)
5321	plasterers	construction industry knowledge (0.62), commercial construction (0.59), repair (0.28), plasterboard (0.19)
5322	floorers and wall tilers	construction industry knowledge (0.59), commercial construction (0.59), javascript (0.35)
5323	painters and decorators	painting (0.93), gloss (0.31)
5330	construction and building trades supervisors	first aid (0.47), contract management (0.46), supervisory skills (0.39), organisational skills (0.22), communication skills (0.22), carpentry (0.21)
5411	weavers and knitters	repair (0.49), knot tying (0.38), product inspection (0.37), inspection (0.32), machinery (0.19), quality assurance and control (0.19), production management (0.19)
5412	upholsterers	sewing (0.66), hand tools (0.49), repair (0.32), machining (0.25), home repair (0.21)
5413	footwear and leather working trades	working with patient and/or condition: acute illness (0.59), communication skills (0.36), organisational skills (0.24), planning (0.23), commercial litigation (0.20), customer checkout (0.19)
5414	tailors and dressmakers	communication skills (0.36), sewing (0.36), chisels (0.35), sales goals (0.29), grinders (0.28), customer service (0.25), hand tools (0.22), detail-orientated (0.21), machining (0.18)
5419	textiles, garments and related trades n.e.c.	communication skills (0.43), computer numerical control (cnc) (0.38), marketing sales (0.32), forklift operation (0.28), management (0.24), visual merchandising (0.22), machinery (0.21), sales recruiting (0.20), inventory control (0.18)
5421	pre-press technicians	pre - press production (0.52), boring tools (0.48), scanners (0.21), planning (0.21)
5422	printers	printers (0.85)
5423	print finishing and binding workers	adobe photoshop (0.39), colour editing (0.32), machinery (0.29), packaging (0.28), creativity (0.25), detail-orientated (0.24), communication skills (0.20), print production (0.19)
5431	butchers	cleaning (0.42), food safety (0.29), communication skills (0.27), mathematics (0.26), merchandising (0.25), english (0.22), food service industry background (0.21), supervisory skills (0.21), cooking (0.20), organisational skills (0.19)
5432	bakers and flour confectioners	cooking (0.60), food safety (0.39), product and service information (0.39), customer service (0.26), sales goals (0.22), machinery (0.22)
5433	fishmongers and poultry dressers	waste reduction (0.39), due diligence (0.37), food safety (0.32), cleaning (0.30), merchandise labelling (0.29), communication skills (0.25), legal documentation (0.21), customer service (0.20), product knowledge (0.20)
5434	chefs	cooking (0.95)
5435	cooks	cooking (0.91)
5436	catering and bar managers	food safety (0.48), product sale and delivery (0.40), stock control (0.40), product sales (0.40), communication skills (0.29), leadership (0.22), detail-orientated (0.21)
5441	glass and ceramics makers, decorators and finishers	swift (0.41), physics (0.34), optometry (0.31), customer contact (0.30), phlebotomy (0.24), wound care/ treatment (0.24), care planning (0.19)
5442	furniture makers and other craft woodworkers	cabinetry (0.90), power tools (0.30)
5443	florists	creativity (0.46), floral design (0.34), communication skills (0.32), english (0.30), mathematics (0.27), cash handling (0.26)
5449	other skilled trades n.e.c.	paint sprayer (0.77), sustainability consultancy (0.27), communication skills (0.21), painting (0.20)
6121	nursery nurses and assistants	communication skills (0.48), planning (0.39), mathematics (0.31), teaching (0.26), english (0.25), first aid (0.23), building relationships (0.19), child development (0.19)

SOC Code	SOC Name	Skills
6122	childminders and related occupations	babysitting (0.86), housekeeping (0.31), english (0.24), first aid (0.21)
6123	playworker	teaching (0.66), communication skills (0.39), organisational skills (0.33), planning (0.23)
6125	teaching assistants	teaching (0.96)
6126	educational support assistants	teaching (0.79), communication skills (0.27), working with patient and/or condition: autism (0.24), mathematics (0.23)
6131	veterinary nurses	surgery (0.54), internet services (0.44), veterinary medicine industry experience (0.39), animal care (0.35), anaesthesiology (0.22)
6132	pest control officers	sales (0.48), communication skills (0.46), herbicides (0.35), cost estimation (0.22), cold calling (0.22), business writing (0.19)
6139	animal care services occupations n.e.c.	dog walking (0.59), animal care (0.48), communication skills (0.42), animal husbandry (0.25), cleaning (0.25), team work/ collaboration (0.24)
6141	nursing auxiliaries and assistants	phlebotomy (0.51), communication skills (0.38), physiotherapist assistance (0.34), medical assistance (0.26), caregiving (0.24), physiotherapy (0.20)
6142	ambulance staff (excluding paramedics)	leadership (0.55), communication skills (0.42), supervisory skills (0.30), property management systems (0.20)
6143	dental nurses	dentistry (0.57), surgery (0.52), ensuring patients comfort (0.27), communication skills (0.19)
6144	houseparents and residential wardens	communication skills (0.31), organisational skills (0.29), cleaning (0.23), teaching (0.22), leadership (0.19)
6145	care workers and home carers	caregiving (0.72), communication skills (0.27), working with patient and/or condition: learning disabilities (0.22), toileting (0.20)
6146	senior care workers	home care (0.53), caregiving (0.39), care planning (0.39), communication skills (0.27), senior care (0.24), home health (0.20), working with patient and/or condition: learning disabilities (0.19)
6147	care escorts	caregiving (0.44), toileting (0.35), communication skills (0.34), first aid (0.33), daycare (0.28), social work (0.27), laundry (0.23), meal preparation (0.20)
6148	undertakers, mortuary and crematorium assistants	detail-orientated (0.56), planning (0.32), telephone skills (0.28), organisational skills (0.28), computer skills (0.27), customer contact (0.24), communication skills (0.20), description and demonstration of products (0.18)
6211	sports and leisure assistants	communication skills (0.45), organisational skills (0.39), cleaning (0.38), first aid (0.36), customer service (0.32), creativity (0.26), fundraising (0.20)
6212	travel agents	business consultancy (0.61), customer service (0.33), communication skills (0.32), air travel industry background (0.32), detail-orientated (0.25), worldspan (0.21), sales (0.19)
6214	air travel assistants	product knowledge (0.41), transportation security (0.39), english (0.34), communication skills (0.29), team work/ collaboration (0.27), meal planning (0.22)
6215	rail travel assistants	communication skills (0.61), customer service (0.49), inspection (0.27), team work/ collaboration (0.19)
6219	leisure and travel service occupations n.e.c.	communication skills (0.70), customer service (0.41)
6221	hairstylists and barbers	hairstyling (0.96)
6222	beauticians and related occupations	therapy (0.82), english (0.25), communication skills (0.19)
6231	housekeepers and related occupations	housekeeping (0.99)
6232	caretakers	cleaning (0.90), communication skills (0.24)
6240	cleaning and housekeeping managers and supervisors	housekeeping (0.69), cleaning (0.63), supervisory skills (0.25)
7111	sales and retail assistants	sales (0.85), customer service (0.21)
7112	retail cashiers and check-out operators	customer service (0.54), cash handling (0.48), scanners (0.39), communication skills (0.29), bank reconciliation (0.20)
7113	telephone salespersons	telesales (0.75), sales (0.25), communication skills (0.25), telemarketing (0.24)
7114	pharmacy and other dispensing assistants	prescription filling (0.51), dispensing patients medication (0.48), pharmacist (0.30), communication skills (0.26), customer service (0.21), global positioning system (gps) (0.21), pharmaceutical industry background (0.20)
7115	vehicle and parts salespersons and advisers	automotive service (0.50), kerridge (0.41), customer service (0.29), communication skills (0.25), advertising copywriting (0.23), organisational skills (0.22), sales (0.19)
7121	collector salespersons and credit agents	sales (0.50), communication skills (0.46), product promotion (0.28), secret (mystery) shopping (0.24), energy saving products (0.22), direct sales (0.20), prospective clients (0.19)
7122	debt, rent and other cash collectors	sales (0.54), sales calls (0.45), organisational skills (0.33), customer service (0.29), meter reading (0.29), communication skills (0.29), building relationships (0.19)
7123	roundspersons and van salespersons	sales (0.80), communication skills (0.24), customer service (0.23), building relationships (0.23)
7124	market and street traders and assistants	vendor relations (0.74), communication skills (0.23), contract management (0.20)
7125	merchandisers and window dressers	merchandising (0.89), visual merchandising (0.21), communication skills (0.20)

SOC Code	SOC Name	Skills
7129	sales related occupations n.e.c.	sales (0.88), communication skills (0.22)
7130	sales supervisors	sales management (0.51), leadership (0.36), communication skills (0.28), store management (0.27), retail setting (0.19), key performance indicators (0.19), organisational skills (0.18)
7211	call and contact centre occupations	customer service (0.78), communication skills (0.35), customer contact (0.27)
7213	telephonists	switchboard operator (0.64), communication skills (0.47), customer service (0.25)
7214	communication operators	internal communications (0.36), writing (0.33), communication skills (0.33), social media (0.29), organisational skills (0.28), marketing communications (0.25), editing (0.21)
7215	market research interviewers	market research (0.77), broadband (0.40), communication skills (0.21), product sale and delivery (0.21), research (0.20), product sales (0.18)
7219	customer service occupations n.e.c.	customer service (0.85), communication skills (0.32), customer contact (0.20)
7220	customer service managers and supervisors	customer service (0.64), communication skills (0.35), leadership (0.32), key performance indicators (0.20), organisational skills (0.20)
8111	food, drink and tobacco process operatives	secret (mystery) shopping (0.60), product sales (0.45), product sale and delivery (0.39), customer service (0.26), food service industry background (0.25), organisational skills (0.19)
8112	glass and ceramics process operatives	mathematics (0.47), sle (0.29), chisels (0.26), machinery (0.22), organisational skills (0.21), english (0.19), painting (0.19)
8113	textile process operatives	creativity (0.33), team work/ collaboration (0.24), communication skills (0.24), json (0.22), visual c++ (0.20), git (0.20), troubleshooting (0.19), store management (0.19), css (0.18)
8116	plastics process operatives	injection moulding (0.92), optimisation (0.19)
8117	metal making and treating process operatives	communication skills (0.43), organisational skills (0.32), business management (0.27), project management (0.23), treatment explanation (0.22), planning (0.21), building relationships (0.20), change management (0.20)
8118	electroplaters	paint sprayer (0.50), paint shop pro (0.30), painting (0.29), cleaning (0.22), gloss (0.22)
8119	process operatives n.e.c.	concrete mixing (0.71), plant safety (0.30), directional drilling (0.30), customer contact (0.29)
8121	paper and wood machine operatives	brand experience (0.76), machining (0.47)
8122	coal mine operatives	boring tools (0.70), grapples (0.32), logging arches (0.29), cable winches (0.25), equipment inspection (0.20)
8123	quarry workers and related operatives	well control (0.66), forklift operation (0.28), communication skills (0.24), offshore drilling (0.20)
8124	energy plant operatives	communication skills (0.44), leadership (0.42), working with patient and/or condition: dementia (0.39), organisational skills (0.21), project management (0.19)
8125	metal working machine operatives	machine operation (0.53), machining (0.51), computer numerical control (cnc) (0.50), lathes (0.24)
8126	water and sewerage plant operatives	water treatment (0.54), water sampling (0.41), cooling towers (0.40), working with patient and/or condition: legionella (0.25), water engineering (0.25), water distribution (0.20), plumbing (0.20)
8127	printing machine assistants	communication skills (0.55), home management (0.30), organisational skills (0.25)
8129	plant and machine operatives n.e.c.	communication skills (0.38), forklift operation (0.34), repair (0.26), organisational skills (0.25), machinery (0.23), preventive maintenance (0.22), detail-orientated (0.21), warehouse management (0.21), stock control (0.21)
8131	assemblers (electrical and electronic products)	mechanical assembly (0.68), wiring (0.55), soldering (0.35)
8132	assemblers (vehicles and metal goods)	soldering (0.78), hand tools (0.35), detail-orientated (0.23), wiring (0.21)
8133	routine inspectors and testers	software testing (0.51), product testing (0.29), selenium (0.27), communication skills (0.26), quality assurance and control (0.20)
8134	weighers, graders and sorters	capability maturity model (cmm) (0.80), coordinate measuring machine (cmm) (0.43), inspection (0.23)
8135	tyre, exhaust and windscreen fitters	repair (0.70), customer service (0.35), automotive industry experience (0.35), communication skills (0.29), wheel alignment (0.24), operations management (0.20)
8137	sewing machinists	sewing (0.84), machining (0.53)
8139	assemblers and routine operatives n.e.c.	communication skills (0.45), detail-orientated (0.33), hand tools (0.26), key performance indicators (0.19), organisational skills (0.19)
8141	scaffolders, staggers and riggers	construction industry knowledge (0.68), commercial construction (0.53), javascript (0.46)
8142	road construction operatives	motorway construction (0.59), paving (0.42), motorway maintenance (0.30), traffic management (0.24), motor vehicle operation (0.22), hand tools (0.19)
8143	rail construction and maintenance operatives	communication skills (0.40), repair (0.35), capability maturity model (cmm) (0.30), inspection (0.30), coordinate measuring machine (cmm) (0.30), cleaning (0.23), customer service (0.22), optical data storage (0.19), construction industry knowledge (0.19)
8149	construction operatives n.e.c.	plumbing (0.51), repair (0.47), painting (0.34), construction industry knowledge (0.24), forklift operation (0.22), communication skills (0.22), home management (0.19)

SOC Code	SOC Name	Skills
8211	large goods vehicle drivers	heavy/large goods vehicle driving (0.75), forklift operation (0.32), haulage (0.26), transportation logistics (0.25), lift trucks (0.21), communication skills (0.19)
8212	van drivers	delivery driving (0.61), communication skills (0.38), product sales (0.24), product sale and delivery (0.23), transportation logistics (0.23), customer service (0.22)
8213	bus and coach drivers	bus driving (0.90), bus/coach driving (0.33)
8214	taxi and cab drivers and chauffeurs	chauffeur (0.66), communication skills (0.33), passenger transport (0.30), transportation industry knowledge (0.29), transportation logistics (0.22)
8215	driving instructors	machine operation (0.45), transportation logistics (0.41), electrical engineering (0.36), computer aided draughting/design (cad) (0.35), teaching (0.34), faculty training (0.26)
8221	crane drivers	crane operation (0.98)
8222	fork-lift truck drivers	forklift operation (0.98)
8223	agricultural machinery drivers	agricultural tractors (0.98)
8229	mobile machine drivers and operatives n.e.c.	dump truck driving (0.89), construction industry knowledge (0.39), commercial construction (0.19)
8231	train and tram drivers	locomotive engineering (0.57), shunt (0.49), first aid (0.26), forklift operation (0.20), customer service (0.18)
8232	marine and waterways transport operatives	communication skills (0.52), injury prevention (0.38), organisational skills (0.26), building relationships (0.22), polish (0.19)
8233	air transport operatives	air freight (0.53), leadership (0.42), freight forwarding (0.30), organisational skills (0.27), sorting (0.21), communication skills (0.20), machinery (0.20)
8234	rail transport operatives	inspection (0.38), communication skills (0.37), planning (0.26), organisational skills (0.26), supervisory skills (0.25), shunt (0.19), forklift operation (0.19)
8239	other drivers and transport operatives n.e.c.	communication skills (0.46), organisational skills (0.35), microsoft excel (0.30), detail-orientated (0.23), planning (0.20)
9111	farm workers	farm management (0.64), farm machinery (0.31), machinery (0.24), agricultural industry experience (0.22), microsoft windows (0.19)
9112	forestry workers	grapples (0.43), logging arches (0.40), equipment operation (0.34), equipment inspection (0.34), cable winches (0.33), surgery (0.30), machinery (0.24)
9119	fishing and other elementary agriculture occupations n.e.c.	grass cutting (0.77), food safety (0.48), machinery (0.21)
9120	elementary construction occupations	construction industry knowledge (0.59), commercial construction (0.53), materials moving (0.49)
9132	industrial cleaning process occupations	cleaning (0.94), equipment cleaning (0.23)
9134	packers, bottlers, canners and fillers	labelling (0.47), detail-orientated (0.41), product sale and delivery (0.26), communication skills (0.24), product sales (0.24), cold calling (0.24), packaging (0.23), merchandise labelling (0.21)
9139	elementary process plant occupations n.e.c.	electrical work (0.46), plumbing (0.38), painting (0.37), repair (0.31), carpentry (0.28), grass cutting (0.24), construction industry knowledge (0.21), communication skills (0.19)
9211	postal workers, mail sorters, messengers and couriers	sorting (0.52), mail sorting (0.37), communication skills (0.31), facility supervision (0.29), detail-orientated (0.21)
9219	elementary administration occupations n.e.c.	communication skills (0.55), cleaning (0.43), customer service (0.32), cash handling (0.29)
9231	window cleaners	microsoft windows (0.83), cleaning (0.54)
9232	street cleaners	cleaning (0.82), communication skills (0.29), machinery cleaning (0.21), refuse collection (0.19)
9233	cleaners and domestics	cleaning (0.96), housekeeping (0.19)
9234	laundrers, dry cleaners and pressers	cleaning (0.65), laundry (0.65), ironing (0.29)
9235	refuse and salvage occupations	demolition (0.70), communication skills (0.34), hsg (0.31), project management (0.24)
9236	vehicle valeters and cleaners	cleaning (0.87), motor vehicle operation (0.21), repair (0.19)
9239	elementary cleaning occupations n.e.c.	cleaning (0.78), equipment cleaning (0.37), cash handling (0.20), soap (0.19)
9241	security guards and related occupations	communication skills (0.53), security industry knowledge (0.44), security experience (0.29), surveillance (0.28), security patrol (0.24), cctv monitoring (0.23), access and/or egress control (0.23), report writing (0.19)
9242	parking and civil enforcement occupations	payment collection (0.58), communication skills (0.52), negotiation skills (0.35), prioritising tasks (0.26), customer service (0.23), key performance indicators (0.19)
9244	school midday and crossing patrol occupations	supervisory skills (0.83), teaching (0.38), first aid (0.22)
9249	elementary security occupations n.e.c.	cleaning (0.66), communication skills (0.44), bed making and linen changes (0.28), security industry knowledge (0.27), crowd control (0.21), housekeeping (0.19)
9251	shelf fillers	food safety (0.73), secret (mystery) shopping (0.45), customer service (0.43), sales goals (0.21)

SOC Code	SOC Name	Skills
9259	elementary sales occupations n.e.c.	order tracking (0.56), cold calling (0.35), physical demand (0.33), customer checkout (0.32), advertising industry knowledge (0.31), product sale and delivery (0.23), product sales (0.21), order and invoice processing (0.20)
9260	elementary storage occupations	forklift operation (0.52), warehouse management (0.32), communication skills (0.30), detail-orientated (0.26), stock control (0.21), leadership (0.19), scanners (0.19), organisational skills (0.18)
9271	hospital porters	communication skills (0.66), patient transportation and transfer (0.47), english (0.19)
9272	kitchen and catering assistants	food service (0.52), cleaning (0.49), communication skills (0.32), cooking (0.28), cash handling (0.21), customer service (0.20), food service industry background (0.19), team work/ collaboration (0.19)
9273	waiters and waitresses	restaurant management (0.47), cash handling (0.38), staff coordination (0.37), communication skills (0.33), restaurant industry experience (0.28), food service industry background (0.21), food safety (0.20), customer service (0.19)
9274	bar staff	cash handling (0.63), staff coordination (0.46), customer service (0.30), bartending (0.23), team work/ collaboration (0.23), restaurant industry experience (0.21), product promotion (0.20), communication skills (0.19)
9275	leisure and theme park attendants	communication skills (0.51), customer service (0.46), cleaning (0.26), cash handling (0.23)
9279	other elementary services occupations n.e.c.	cleaning (0.48), guest services (0.47), communication skills (0.41), cash handling (0.27), customer service (0.19)