THE HUMAN CAPITAL BEHIND AI

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AI-related vacancies are identified using
1) the list of AI-related keywords of Baruffaldi et al. (2020) and
2) a list of AI-related software and repositories validated by experts at UK BEIS.

“AI-related” jobs are those featuring at least two AI-related skills belonging to different concepts or methodologies in the online job description.

One of these keywords may or may not be a software-related skill.
HOW MANY AI-RELATED SKILLS ARE DEMANDED IN AI-RELATED JOBS?

The total number of AI-related jobs increased over time.

A growing number of jobs requires a growing number of AI-related skills.

In all countries considered in the analysis, the overall **average share of AI software-related skills increased** between 2012 and 2018.

**Note:** The database lacks job postings from the UK for December 2018.

Source: Nachtigall and Squicciarini (forthcoming). Authors' own compilation based on BGT data.
Over time, we observe an increase in demand for some specific technical and socio-emotional skills.

Machine Learning and Python continue to be frequently demanded, but the picture is more balanced in terms of specific AI-related skills compared to 2012.

Note: In 2012 and 2018, the frequency of the top 30 AI-related skills accounts for around 98% and 96%, respectively, of the frequency of all AI-related skills. The frequency of the top 30 non-AI skills accounts for around 31% of the frequency of all non-AI skills in both years. Source: Nachtigall and Squicciarini (forthcoming). Authors’ own compilation based on BGT data.
How are these skills linked?

- Skill bundles are interrelated;
- Central node: Neural networks;
- A methodological / core developments part of the network, advancing AI itself, emerges (blue);
- An application-related part of the cluster emerges (orange);
- A robotics-related part of the cluster emerges (grey);
- Support functions / software bundles of skills emerge (green)

Top 50 skills appearing in AI-related jobs tend to be rather “general”, and many of them relate to the “tools of the job”, i.e. are software-related (e.g. MATLAB, R, SAS, Java);

This is also confirmed by Python and SQL being the most central nodes;

A number of non-cognitive skills are also required in most AI-related jobs.

Source: Squicciarini, Samek and Cammeraat (forthcoming). Authors’ own compilation based on BGT data.
Skills related to AI are in demand across almost all sectors of the economy, though to varying degrees.

"Information and Communication" (J), "Financial and Insurance Activities" (K) and "Professional, Scientific and Technical Activities" (M) rank at the top in terms of AI-job intensive sectors, in all countries considered.

Source: Nachtigall and Squicciarini (forthcoming). Authors' own compilation based on BGT data.
### AI-related jobs, UK, by ISCO 08 Occupational Group, 2012-2018

<table>
<thead>
<tr>
<th>ISCO</th>
<th>ISCO Name</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Managers</td>
<td>112</td>
<td>92</td>
<td>124</td>
<td>359</td>
<td>417</td>
<td>1,118</td>
<td>1,317</td>
</tr>
<tr>
<td>2</td>
<td>Professionals</td>
<td>3,163</td>
<td>4,150</td>
<td>4,530</td>
<td>9,406</td>
<td>13,554</td>
<td>23,751</td>
<td>22,982</td>
</tr>
<tr>
<td>3</td>
<td>Technicians and associated professionals</td>
<td>251</td>
<td>358</td>
<td>361</td>
<td>657</td>
<td>1,068</td>
<td>1,987</td>
<td>2,221</td>
</tr>
<tr>
<td>4</td>
<td>Clerical support workers</td>
<td>33</td>
<td>33</td>
<td>61</td>
<td>65</td>
<td>139</td>
<td>146</td>
<td>151</td>
</tr>
<tr>
<td>5</td>
<td>Service and sales workers</td>
<td>25</td>
<td>30</td>
<td>45</td>
<td>67</td>
<td>158</td>
<td>311</td>
<td>324</td>
</tr>
<tr>
<td>6</td>
<td>Skilled agricultural, forestry and fishery workers</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Craft and related trade workers</td>
<td>13</td>
<td>20</td>
<td>60</td>
<td>103</td>
<td>191</td>
<td>331</td>
<td>439</td>
</tr>
<tr>
<td>8</td>
<td>Plant machine operators, and assemblers</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>20</td>
<td>44</td>
<td>122</td>
</tr>
<tr>
<td>9</td>
<td>Elementary occupations</td>
<td>1</td>
<td>2</td>
<td>11</td>
<td>14</td>
<td>17</td>
<td>27</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Total (all jobs)</td>
<td>3,647</td>
<td>4,745</td>
<td>5,300</td>
<td>10,839</td>
<td>15,794</td>
<td>28,181</td>
<td>27,704</td>
</tr>
</tbody>
</table>

Note: No AI-related jobs are found in Armed Forces; not all AI-related jobs can be allocated and hence total does not necessarily equal sum of row values.

Source: Nachtigall and Squicciarini (forthcoming). Authors’ own compilation based on BGT data.
AI-related jobs are mainly clustered in relatively few areas. Over time, new clusters are emerging and existing clusters are growing.
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Source: Samek, Squicciarini, and Cammeraat (forthcoming). Authors’ own compilation based on BGT data.
The demand for AI skills and jobs has increased over time. Jobs requiring AI-related skills can be found in all occupational categories. Cognitive as well as socio-emotional skills are key for AI-related workers.

Some “how to” questions in need of an answer:

- How to subdivide core from non-core skills, to inform education and training policies?
- How to best match industry needs and human capital availability when it comes to AI?
- Familiarity fosters acceptance. How to help people familiarise with AI and get the skills to work with AI?
- How to foster trust in AI and use it in a societally and economically enhancing fashion? Which role do skills play in this respect?
- Dietmar Harhoff (MPI), in his intervention, advocated that a share of the population be trained in AI (as in Finland). How to best do so?