Executive Summary

The Destinations of Leavers from Higher Education (DLHE) survey, carried out by HESA each year, has for several years shown CS with the worst unemployment level of the 19 subject areas. Whilst our employment rates are actually comparable with other subjects, this unemployment level is a matter of considerable concern. We commissioned Robin Mellors-Bourne, from CRAC, the graduate recruiters organisation, to carry out some research in this area, as he had recently developed an analysis of STEM graduates for BIS. Our concern was to investigate whether there was some clear explanation, from the HESA data, of the unemployment rate amongst Computer Science graduates. This is a question that has been raised on a number of occasions in our discussions with government, in particular, over the decline in student numbers studying CS and the need to improve the pipeline from schools, through Universities, into the workforce.

Our goal was twofold, to provide information for members of CPHC to be able to respond to questions about the unemployment level of CS graduates, and to identify any actions that we could take to remedy them. This summary highlights the key findings from the report, the full body of which then follows, to provide members with a full picture.

Key Findings

Firstly, we can clearly make the argument that we are victims of our own success, as we have made CS a route into HE for the under-represented.

- CS has been extremely successful in attracting a higher proportion of Black and Minority Ethnic (BME) students to study, to the extent that we have significantly higher proportions of BME Students than the average across all subjects
- The widening access agenda, predominantly adopted by post-92 institutions, has not only been successful in attracting higher proportions of BME students, but also means that a higher proportion of students study CS at post-92 institutions (64.4% of CS students study at post-92, as opposed to 49.9% across all subjects –Russell Group accounts for 25% of all students, but only 13% of CS)

There is no single contributory factor identified that specifically explains the higher unemployment amongst CS graduates, but we can identify a number of contributory factors:

- Gender – There is almost no difference in performance between male and female students inCS, but massive difference in female representation against other subject areas (16.8% v. 57.1%), and in general female students perform better and have higher employment rates
- Age distribution – CS students tend to be slightly older than the norm, but the variation is predominantly in the 21-29 age group rather than older, and this group has a higher unemployment level than older graduates.
- The growth in the number of BME students studying CS in post-92 institutions results in a higher percentage of graduates in CS than other subjects, generally around 10-15% higher. The Russell Group and 1994 group take fewer students in CS than in

other subjects, and they take around half as many BME students in CS against all subjects (17.6% v. 33.7%)

- Another contributory factor is degree classification, and here the smaller percentage of students in upper tier institutions counts against the cohort, as those institutions award over 70% 1st/2:1, whereas other pre-92 and all post-92 institutions award around 60%. In CS the figures are around 5% lower.
- Considering ethnicity and degree class together, previous studies have shown that students of ethnic minority background tend to obtain lower degree classes than white students[1]. This is also demonstrated in the DLHE data (Table 10), where we can see 51% of BME graduates obtained 1st or 2:1 degree classes compared with 67% of white graduates, across all subjects. Within Computer Science, the pattern was similar with fewer than half of BME CS graduates obtaining these 'good' degree classes compared with 63% of white CS graduates.
- The survey identified that a key difference between white and BME CS graduates was in their take-up of full-time employment, rather than other study, or part time work (whilst acknowledging a significantly greater percentage of BME Students from post-92 institution taking part-time work). In considering the figures, it is clear that not even the acknowledged bias of employers for Russell Group graduates can overcome their bias against BME graduates (with Russell Group BME students suffering a 16.7% unemployment rate), and we actually see a relatively poorer performance by all pre-92 institutions for BME graduates against post-92s

Conclusion

In conclusion, there is no single contributory factor, rather some factors that combine to cause issues:

- Ethnicity - in particular BME students have, in general, poorer outcomes and poorer employment prospects
- University type – post-92 institutions have higher percentages of BME students and represent over 64% of the HE CS cohort, so their outcomes have a greater influence than in other subjects. By comparison, Russell and 1994 Groups only have 22% of the CS cohort, compared with 37% across all subjects, so their influence is far less (see table 7).
- Degree Classification -Over 70% of Russell Group students get a 1st/2:1, and the rest of the sectoris less than 60%.
- Other factors, such as age, gender, location, can all have an influence on employment outcomes, but the impact is not significant.

Actions

The message is that the unemployment level of CS graduates is a result of the success of CS in reaching out to groups under-represented in HE in the UK, andthere is work to be done on:

- Improving the performance of under-represented groups
- Encouraging employer take-up of good BME graduates

- Assisting the development of CS companies/organisations in under-represented communities, includingcommunity-led social enterprises.
- Developing and improving the quality of teaching in secondaryschools to encouragemore students to undertake CS degrees.

If we can make progress on these key actions, then we can impact the unemployment level of CS graduates. We still need to work on the match between graduate skills and industry needs, to ensure that our graduates are able to fill the growing requirement for skilled personnel in the UK IT market.

CPHC Committee July 2012

An exploration of unemployment statistics within Computer Science graduate 'destinations' data

1. Introduction

The Council of Professors and Heads of Computing (CPHC) has commissioned this study as it seeks to understand and potentially explain the relatively high percentage of Computer Science graduates that are unemployed within HESA 'Destinations of Leavers from Higher Education' (DLHE) statistics. In recent years Computer Science has consistently been the subject discipline with the highest level of graduate unemployment in these figures.

2. The DLHE survey

The annual DLHE survey obtains information from UK and EU graduates (only) on a census basis. For the 2009/10 survey, for example, this involved two 'sweeps' of data collection; those students completing their courses between 1 August and 31 December 2009 had a census date in April 2010, and those completing between 1 January and 31 July 2010 in January 2011.The data are collected by the universities, i.e. targeting their own UK and EU graduates, using a combination of an online questionnaire, postal questionnaires and telephone interviewing. The information obtained is passed back to HESA and matched with the graduates' Student Record data.

The DLHE data therefore record certain information about the graduates' circumstances provided by them at an average of six months after graduation. Very high response rates are achieved so the dataset obtained is large (>200,000 full-time UK graduates, which is about two-thirds of the total cohort) and is considered highly representative.

For this project we purchased from HESA data for selected DLHE fields for graduates responding to the 2009/10 DLHE survey of UK and EUfirst-degree graduates and basic Student Record data for those respondents.

3. 'Destinations' data: employment and unemployment rates

The most commonly reported graduate 'destination' statistics (i.e. whether they were in employment, further study, unemployment or other activity on the census date) tend to be for full-time,first-degree graduates of UK domicile, so we focused our analytical work on this particular sample.It should be noted that we are therefore ignoring both EU respondents and also all respondents who undertook part-time degrees, essentially for simplicity.

Table 1 shows the typical presentation by HESA of destinations by degree subject. The relatively high unemployment rate of 14.7% for Computer Science (CS) graduates, compared with other subject areas and the 9.1% 'total' rate for all graduates, is visible.

Using the data we purchased, we were able to replicate the percentages in the table to 0.1% or better using our own analysis of the data (i.e. our calculated unemployment rate is 14.6% for Computer Science graduates and 9.1% for all graduates, which we consider our key reference points). The 0.1% difference is thought to be due to different rounding strategies in handling the data.

Table 1Destinations of UK domiciled full-time first degree leavers by subject area, 2009/10

	Work only	Work and further study	Further study only	Assumed to be unemployed	Not available for employment and Other	**Total**
Medicine & dentistry	90.7%	3.9%	4.7%	0.1%	0.5%	**100.0%**
Subjects allied to medicine	76.3%	7.7%	7.7%	5.5%	2.7%	**100.0%**
Biological sciences	58.0%	8.2%	20.3%	8.4%	5.1%	**100.0%**
Veterinary science	88.0%	2.8%	3.7%	4.5%	0.9%	**100.0%**
Agriculture & related subjects	67.6%	7.6%	11.8%	7.9%	5.1%	**100.0%**
Physical sciences	49.0%	6.3%	29.2%	10.3%	5.2%	**100.0%**
Mathematical sciences	46.9%	12.8%	25.1%	9.8%	5.4%	**100.0%**
Computer science	67.0%	4.6%	10.4%	14.7%	3.2%	**100.0%**
Engineering & technology	64.9%	5.0%	13.9%	11.8%	4.5%	**100.0%**
Architecture, building & planning	65.2%	7.2%	11.1%	11.6%	4.9%	**100.0%**
Social studies	62.8%	8.1%	14.4%	9.7%	4.9%	**100.0%**
Law	40.7%	10.7%	37.1%	7.0%	4.5%	**100.0%**
Business & administrative studies	67.4%	9.1%	7.9%	10.5%	5.2%	**100.0%**
Mass communications & documentation	71.3%	3.6%	6.6%	13.2%	5.3%	**100.0%**
Languages	57.5%	6.9%	21.8%	8.6%	5.1%	**100.0%**
Historical & philosophical studies	53.5%	7.2%	24.6%	9.3%	5.4%	**100.0%**
Creative arts & design	68.7%	6.0%	9.1%	11.2%	5.0%	**100.0%**
Education	75.7%	6.4%	9.7%	4.8%	3.4%	**100.0%**
Combined	62.0%	6.3%	16.8%	9.7%	5.2%	**100.0%**
Total	**64.1%**	**7.2%**	**15.0%**	**9.1%**	**4.5%**	**100.0%**

Source: Destinations of Leavers from Higher Education 2009/10, HESA

It is worth noting that HESA's tabulation of results includes some grouping of response options for simplification, including full- and part-time 'Work' and 'Further study'options as well as a variety of 'Other' activities and also categories for those unable to work. Graduates 'Assumed to be unemployed' are the respondents who identified the 'Unemployed' response in the DLHE questionnaire; this category does not include graduates taking time out to travel or waiting to start employment or a course of further study (for which there are specific options, hence shown under 'Other').

3.1 Single and combined subjects

It is also worth noting here the way that HESA handles single subject and combined degree courses in DLHE data. For all subject groups, the total is the number of graduates of a single subject in that group together with the summation of 'partial' graduates who took combined subject courses. For example, a graduate qualifying from a combined Computer Science and French course (with equal weights) counts as half a graduate for Computer Science and half a graduate for French. In line with all HESA data, in fact all DLHE data are rounded to the nearest 5 graduates, prior to deriving percentages.

In order to assess whether the inclusion of combined degree graduates made any substantial impact on the destination figures, we subdivided graduates into those on single subject and combined degree courses. In Table 2 we compare the percentage of graduates of these two types both overall and within Computer Science, as well as the respective percentages 'assumed to be unemployed', which is the key statistic used throughout this study.

There is little difference between the unemployment rates for single subject or combined degrees overall but some difference for CS graduates, with a higher rate amongst single subject graduates. A slightly higher proportion of CS graduates studied single subject degrees (86.9%) than overall (82.3%), but these differences are not thought sufficient to have significant impact on the overall unemployment rate for CS graduates (in fact if anything this difference might serve to reduce the overall rate for CS graduates).

Table 2 Proportion of graduates with single subject and combined degrees amongst key graduate cohorts, and their unemployment rate

	% of cohort		% unemployed	
	All	CS	All	CS
Single subject	82.3	86.9	9.1	15.0
Combined	17.7	13.1	9.0	12.0
Total / mean	100.0	100.0	9.1	14.6
Number of cases	*201165*	*7436*	*18248*	*1088*

Because routine reporting of DLHE statistics does not distinguish between these two types of graduates, we elected to analyse our UK data in the same way (i.e. combining data for those on both single subject and combined degree courses).

3.2 Subject classification

Respondents classified as Computer Science were qualifiers from first degree courses grouped in JACS Principal Subjects G400 (Computer Science), G500 (Information Systems), G600 (Software Engineering) and G700 (Artificial Intelligence). Only 9 graduates were in the G920 (Others in Computing Science) group and these were not included. Table 3 shows how the CS graduate cohort within the dataset comprised these sub-groups, and the mean unemployment percentage for each.

Table 3Computer Science graduates by Principal Subject, and their unemployment rates

	Number of graduates	% of CS cohort	% unemployed
G4: Computer Science	5279	71.0	14.4
G5: Information Systems	1492	20.0	14.8
G6: Software Engineering	603	8.1	16.3
G7: Artificial intelligence	60	0.1	8.2
Total / overall	7434	100.0	14.6

This shows that the majority of the graduates were on G4xxcourses, for whomthe percentage unemployed (14.4%) was close to that of the total CS group (14.6%). The unemployment rate for those on G7xxcourses was significantly lower but these are a tiny proportion (only 60 graduates in number) of the total CS cohort.

Some additional analytical work was carried out at Principal Subject level, which is reported in Appendix A.

Table 3 also shows the number of UK full-time CS graduates in the 2009/10 DLHE dataset (over 7400).This was a sufficiently large dataset for us to conduct detailed analysis.

4. Variations in unemployment rate with key graduate characteristics

The project specification suggested our first task should be to determine the characteristics of the group of 14.6% of CS graduates who were assumed to be unemployed in the 2009/10 DLHE survey. We did this by comparing a series of key demographic and other characteristics of this group with those of three other groups within the DLHE sample (all of UK full-time first degree graduates):

- the (9.1% of) all graduates who were unemployed graduates (i.e. of all subjects)
- all graduates in Computer Science (CS)
- all graduates (of all subjects)

We hoped that identification of differences inherent in the group of unemployed CS graduates might provide initial directions for further analysis, in order to obtain deeper understanding of the issue of unemployment in relation to Computer Science.

Table 4 shows variations by gender, within which we see the strong under-representation of females amongst CS graduates (16.8% of graduates compared with 57.1% overall).Averaged across all subjects, a lower proportion of female graduates is unemployed (7.4%) compared with male graduates (11.2%). The proportionsofboth male and female CS

graduatesunemployed areboth higher than overall and rather similar (males 14.7%, females 14.2%).This suggests that the relatively high unemployment of CS graduates as a whole is not greatly affected by the inherent under-representation of females.

Table 4Proportions of graduates by gender, and unemployment rates

	as % of cohort		as % of unemployed graduates		unemployment rate %	
	All	CS	All	CS	All	CS
Male	42.9	83.2	53.1	83.7	11.2	14.7
Female	57.1	16.8	46.9	16.3	7.4	14.2
Total / overall	100.0	100.0	100.0	100.0	9.1	14.6
Number of cases	*201165*	*7436*	*18248*	*1088*	*18248*	*1088*

Table 5 shows data for the age of graduates at commencement of their degree courses, broadly grouped for this analysis. The age profile of CS graduates is slightly older than of graduates as a whole. Unemployment rates are slightly higher for older graduates,overall,and considerably higher for older CS graduates. The proportions unemployed amongst CS graduates are significantly higher than for all graduates in allthe age categories. Given this, and the relatively similar CS age profile to the overall age distribution, it is clear that the high unemployment rate for CS graduatesas a whole is little affected by their age profile.

Table 5 Proportions of graduates by age, and unemployment rates

	% of cohort		as % of unemployed graduates		unemployment rate %	
Years	All	CS	All	CS	All	CS
20 or less	82.1	80.6	78.1	73.0	8.6	13.2
21-29	12.0	15.7	7.0	20.8	10.6	19.4
30 or over	5.9	3.8	7.9	6.3	12.1	24.4
Total / overall	100.0	100.0	100.0	100.0	9.1	14.6
Number of cases	*201165*	*7436*	*18248*	*1088*	*18248*	*1088*

Table 6 Proportion of graduates* by ethnicity, and unemployment rates

	as % of cohort		as % of unemployed graduates		unemployment rate %	
	All	CS	All	CS	All	CS
Asian	9.4	17.2	14.6	25.2	13.8	21.1
Black	3.6	5.4	6.8	8.2	16.5	21.9
Other inc mixed	3.5	3.2	4.5	3.9	11.6	17.4
White	81.8	72.4	74.0	62.5	8.0	12.4
Total / overall	100.0	100.0	100.0	100.0	9.1	14.6
Number of cases	*201165*	*7436*	*18248*	*1088*	*18248*	*1088*

*of known ethnicity

In Table 6 we can see a distinctive ethnicity profile for CS graduates, which is different from that for all graduates, with a higher proportion of graduates of ethnic minority background (referred to here as BME graduates for brevity). For example the proportion of the CS cohort of Asian ethnicity (17.2%) is almost double the percentage for all graduates.

Averaged across all subjects, there are significant differences between the unemployment rates for graduates in different ethnic minority groups, all of which are higher than for white graduates. These differences also persist within the CS graduate cohortand the rate is higher for CS graduates than overall in every ethnic grouping. This pattern is such that the ethnicity profile of CS graduates could contribute to the high overall CS unemployment figure. In other words, Computer Science has a higher proportion of BME graduates than overall, and on average BME graduates have higher unemployment than others, so these trends could reinforce to produce a high overall unemployment rate for the CS graduate cohort.

From the outset of the project we were aware that there could be differences between the employment and unemployment statistics for graduates of different institutions (and types of institutions). It is also well known that many employers take into account the individual university when sifting and selecting applications to graduate schemes or jobs. We grouped the universities into four broad ‘mission’ or otherdescriptive groupings (Russell Group, 1994 Group, Other pre-92 institutions and Post-92 institutions. An alternative approach would be to group universities in relation to their entry tariffs.

Using our broad categorisation, several observations emerge from the data in Table 7. First, there is a clear difference in the distribution of CS graduates (and presumably students) in terms of university type compared with graduates as a whole, with 64% studying in Post-92

institutions compared with half of all graduates, and only 13% in Russell Group institutions compared with about 25% across all subjects. Second, a trend is clear in the unemployment rates for graduates in different university groups, both across all subjects and within CS, with the lowest rate for Russell Group graduates and the highest for those of Post-92 institutions.

Table 7 Proportions of graduates by university type, and unemployment rates

	as % of cohort		as % of unemployed graduates		unemployment rate %	
	All	CS	All	CS	All	CS
Russell Group	24.9	13.2	19.9	7.6	7.2	8.6
1994 Group	12.1	8.9	11.3	5.9	8.4	9.8
Other pre-92	13.1	13.5	12.7	14.9	8.9	14.5
Post-92	49.9	64.4	56.1	71.6	10.2	16.6
Total / overall	100.0	100.0	100.0	100.0	9.1	14.6
Number of cases	*201165*	*7436*	*18248*	*1088*	*18248*	*1088*

These two trends could well reinforce to contribute to the high overall rate of unemployment for CS graduates; i.e. most CS graduates studied in Post-92 institutions which are those with higher average graduate unemployment. This results in a relatively high (16.6%) rate of unemployment for this group of CS graduates. Interestingly, by comparison, the unemployment rates for CS graduates from Russell and 1994 Group institutions are both below 10%, which is close to the overall 'national' graduate unemployment figure.

This seems to suggest that the high unemployment of CS graduates is strongly related to the type of institution in which they studied. Some analysis of data for individual institutions has been performed and is presented in Section 8.

Another characteristic for which significant differences exist in both graduate profiles and unemployment rates is degree attainment (i.e. the class of degree obtained). This is not entirely surprisinggiven that many employers require 'good' degree attainment (which they consider to be 1st and 2:1 classes) when recruiting graduates. Table 8 shows the analysis by degree class.

Although a higher proportion of CS graduates obtained a 1st class degree (20.4%) than across all subjects (14.9%), this is potentially outweighed by a lower proportion of 2:1 class degrees (38.7% CS vs49.7% overall), which together lead to a lower proportion of CS graduates obtaining the 'good' degreeclasses that employers seek (c.59% CS vsc.65% across all subjects). Unsurprisingly, the unemployment ratesamongst all graduates with 'good' degree classes are significantly lower than for those with weaker degree classes. A

similar trend is seen for CS graduates, where there is a range in unemployment rate from 8% for those obtaining 1st class degrees to 24.9% for those with 3rd classes.

Table 8 Proportions of graduates by degree class obtained, and unemployment rates

	as % of cohort		as % of unemployed graduates		unemployment rate %	
	All	CS	All	CS	All	CS
1st	14.9	20.4	9.8	11.1	6.0	8.0
2:1	49.7	38.7	45.9	33.5	8.4	12.7
2:2	25.4	28.4	33.8	35.1	12.1	18.1
3rd	4.2	8.9	7.9	15.2	17.1	24.9
Unclassified	5.8	3.6	2.5	5.1	3.9	20.3
Total / overall	100.0	100.0	100.0	100.0	9.1	14.6
Number of cases	*201165*	*7436*	*18248*	*1088*	*18248*	*1088*

In parallel with the situation for university type, these trends are likely to reinforce to produce a high overall unemployment figure for CS graduates; a greater proportion of CS graduates obtains lower degree classes, and it is these graduates that exhibit higher unemployment rates.

The other main characteristic available for graduates was their domicile within the UK, defined as the nation and/or region in which they lived prior to entry to university. Although the unemployment rate for CS graduates displayed some variation between regions (over 18% for London, but below this and occasionally as low as 12% elsewhere) the number of CS graduates from certain regions was relatively small. The pattern was also broadly similar to that displayed for all graduates. There is also some doubt over the usefulness of regional domicile information as graduates are mobile and many move from their original region after university.Further analysis was not pursued using this characteristic.

4.1 Summary of initial findings

From this first stage of analysis we can see the following differences between certain key cohorts of graduates that are of interest to us:

- Compared with *all CS* graduates, a greater proportion of *unemployed CS* graduates are of ethnic minority background, attended broadly 'lower tier' universities and obtained lower degree classes (and were very slightly older)

- Compared with *all unemployed* graduates, a greater proportion of *unemployed CS* graduates are male, of ethnic minority background, attended broadly 'lower tier' universities and obtained somewhat lower degree classes (and were somewhat older)
- Compared with *all graduates* overall, a greater proportion of *all unemployed graduates* are of ethnic minority background, attended 'lower tier' universities and obtained lower degree classes, and more were male (and were slightly older).

The three factors that emerge strongly as of most interest for their potential impact on CS graduate unemployment are ethnicity, university type and degree class. It is important to recognise the particular characteristicsand demographic profile of the CS graduate cohort and the impact that this is likely to have on the overallunemployment rate for CS graduates as a result. As a subject cohort, Computer Science has:

- A higher than average proportion of ethnic minority students, who tend to display higher levels of unemployment across all subjects than white graduates
- A higher proportion of graduates with lower degree classes than average, who tend to display higher unemployment across all subjects than those with higher classes
- More courses and/or larger student populations in Post-92 universities, whose graduates across all subjectsdisplay the highest levels of unemployment, and fewer in the Russell and 1994 Group institutions whose graduates are favoured by employers and typically display low unemployment rates.

A particular note should be made about gender, because of the strong under-representation of females in CS (and females tend to display lower unemployment rates overall). We have discounted this as a major factor in this study due to the finding that the unemployment rates for male and female graduates *within CS* are similar.

However, the three main potential factors undoubtedly interact. At this stage it is not yet clear which factors are the strongest; for example, is it ethnicity itself which is a major factor in unemployment, irrespective of university attended or degree class obtained, or are these factors more deeplyrelated to each other? The next stage of analysis attempted to isolate the factors and unravel their effects.

5. Relationships between key factors

Before attempting to distil the impact of these factors on graduate unemployment, it is useful to understand how they relate to each other within the graduate cohort generally. For example, how does the ethnic profile of students vary with university type? Although this can be obtained from HESA Student Record data, we used our DLHE data to show the ethnicity of graduates in each of the university types (Table 9). To maintain sub-samples of reasonable size, some ethnicity groupings were combined.

This analysis reveals differences in the ethnicity profiles of graduates in the different university type groups. Overall, roughly one quarter of all graduates studied in Russell Group institutions and a half in Post-92 institutions, and for CS graduates these proportions were respectively 13% and 64%. Amongst BME graduates, slightly fewer studied in Russell Group universities and slightly more in other university types. However, when considering CS graduates of ethnic minority background, only 10% studied in the Russell Group and as many as 65% in Post-92 universities. If we consider only black CS graduates, fewer than 10% are in either Russell *or* 1994 Groups, but over 75% in Post-92 institutions.

Table 9 Graduateuniversity groups by ethnicity, overall and for CS graduates

	% of white graduates		% of BME graduates		% of black graduates		% overall	
	All	CS	All	CS	All	CS	All	CS
Russell Group	24.8	14.1	21.7	10.4	10.0	4.0	24.9	13.2
1994 Group	12.1	9.3	12.0	7.2	9.5	5.5	12.1	8.9
Other pre-92	13.0	14.0	14.8	17.3	13.8	14.0	13.1	13.5
Post-92	50.1	62.6	51.5	65.0	66.7	76.5	49.9	64.4
Total / overall	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	*164500*	*5386*	*33134*	*1914*	*7342*	*400*	*197634*	*7300*

Considering ethnicity and degree class together, previous studies have shown that students of ethnic minority background tend to obtain lower degree classes than white students[1]. This is also demonstrated in the DLHE data (Table 10), where we can see 51% of BME graduates obtained 1st or 2:1 degree classes compared with 67% of white graduates, across all subjects. Within Computer Science, the pattern was similar with fewer than half of BME CS graduates obtaining these 'good' degree classes compared with 63% of white CS graduates.

[1] Fielding, A. et al. (2008) Degree attainment, ethnicity and gender: interactions and the modification of effects, Equality Challenge Unit & Higher Education Academy

Table 10 Graduate degree class variations by ethnicity, overall and for CS graduates

	% of white graduates		% of BME graduates		% overall	
	All	CS	All	CS	All	CS
First class	16.0	23.6	9.0	11.5	14.9	20.4
Upper second	51.3	39.8	42.2	35.6	49.7	38.7
Lower second	23.7	25.2	34.1	37.5	25.4	28.4
Third/pass	3.6	7.4	7.1	12.8	4.2	8.9
Unclassified	5.4	4.0	7.5	2.5	5.8	3.6
Total / overall	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	*164500*	*5386*	*33134*	*1914*	*197634*	*7300*

We can also see within our data that Post-92 institutions award somewhat fewer 'good' degrees (around 60% at 1st or 2:1) than those in the Russell and 1994 Groups (each over 70%), across all degree subjects, see Table 11. This trend is slightly exacerbated for CS degrees, with about 56% of CS graduates in Post-92 institutions obtaining 'good' degree classes compared with some 72% of CS graduates within Russell Group institutions.

Table 11 Proportion of graduates obtaining different degree classes by university type, overall and for CS graduates

	% of all graduates			% of CS graduates	
	1st & 2.1	2.2 & 3rd		1st & 2.1	2.2 & 3rd
Russell Group	71.1	17.3		72.2	26.9
1994 Group	74.5	22.2		64.6	34.6
Other pre-92	61.8	30.7		57.9	39.3
Post-92	59.7	37.2		55.9	39.6
Total / overall	64.6	29.6		59.1	37.3
Number of cases	*129976*	*59487*		*4393*	*2774*

Tables 9, 10 and 11 have demonstrated that there are complex inter-relationships between the ethnicity of graduates, the university types they attended and the degree classesthey obtained. As we have seen this is potentially significant as the trends are likely to reinforce in such a wayto result in a raised overall unemployment rate for CS graduates. Essentially CS has proportionally more students in the Post-92 universities, especially,which tend to award fewer'good' degree classes, and CS also has a higher proportion of BME graduates who also tend on average to obtain lower degree classes.

The next step is to attempt to distinguish between the respective impacts of these three factors independently upon graduate unemployment and to what extent this could affect or account for the high CS unemployment rate overall. This is investigated by sub-dividing the sample for analysis so as to 'control for' (i.e. eliminate) one of those variables at a time.

6. Second level analysis: attempting to isolate key factors

We first considered how the unemployment of graduates varied with ethnicity within eachof the university groups (combining individual ethnic minority groupings to avoid the sample becoming too small). The results are summarised in Table 12, showing that within the Russell and 1994 Groups, the rate of unemployment amongst white CS graduates is very similar to the rate for white graduates averaged across all subjects (i.e. the 'differential' for CS has disappeared amongst this sub-sample). On the other hand, the rate amongst white CS graduates in the Other pre-92 and Post-92 institutions is higher than for all graduates in those university types. Meanwhile for ethnic minority graduates, a higher unemployment rate for CS graduates than for all BME graduates persists in all university groups, with the highest amongst BME graduates in Post-92 universities (22%).

This tells us that the issue of differential unemployment of the CS graduate cohortoverall is driven partly by itsuniversity group profile but also strongly by the ethnicity profile.

Table 12Unemployment rateby ethnicity and university group, for all graduates and CS graduates

	% unemployed Russell		% unemployed 1994		% unemployed Other pre-92		% unemployed Post-92		% unemployed All groups	
	All	CS	All	CS	All	CS	All	CS	All	CS
BME combined	9.6	16.7	12.1	17.3	11.3	20.2	17.0	22.2	13.9	20.9
White	6.8	6.6	7.7	7.8	8.2	11.9	8.7	14.5	8.0	12.4
Total / overall	7.2	8.6	8.4	9.8	8.9	14.4	10.2	16.6	9.1	14.6
Number of cases	*48937*	*962*	*23976*	*636*	*25700*	*1088*	*99021*	*4614*	*197634*	*7300*

Interestingly, as something of an aside, within the Russell Group graduates, the sum of the proportions of full-time employed and unemployed CS graduates (69% + 7% = 76%) is very similar to the sum of those respective proportions amongst BME CS graduates (58% + 17% = 75%). The main difference between the destinations of white and BME groupsof CS graduates appears to relate to their full-time employment (or not), rather than to differences in their respective take-up of other activities such as part-time work or further study. The same broadly applies to graduates across all subjects within this university type.

However, this internal consistency is not observed in the Post-92 graduate sample (i.e. these sums are not similar). A significantly higher percentage of CS graduates of ethnic minority backgroundwere in part-time work (only) than of white CS graduates, whilerelatively fewer were in full-time work. The position across all subjects was more complicated still. However, we could tentatively observe that this reflected a particularly large difference between the full-time employment rate between white and BME CS graduates from Post-92 institutions.

Our analysis in this section so far has made no allowance for the degree classes obtained by the graduates. We next conducted a parallel analysis to investigate unemployment variations with degree class within each university group, obtaining the results in Table 13.

Table 13 Unemployment rate by degree class and university group, for all graduates and CS graduates

	% unemployed		% unemployed		% unemployed		% unemployed		% unemployed	
	Russell		1994		Other pre-92		Post-92		All groups	
	All	CS	All	CS	All	CS	All	CS	All	CS
1st	5.1	4.6	5.3	5.6	6.1	5.3	6.9	10.5	6	8
2:1	7.5	7.9	8.1	9.4	8.1	11.9	9.1	14.4	8.4	12.6
2:2	12.3	11.2	12.0	12.4	11.5	18.2	12.2	19.8	12.1	18.1
3rd	17.9	16.4	20.6	12.5	17.8	31.3	16.4	26.1	17.1	24.8
Total / overall	7.2	8.5	8.4	9.6	8.9	14.5	10.2	16.6	9.1	14.6
Number of cases	*48937*	*962*	*23976*	*636*	*25700*	*1088*	*99021*	*4614*	*197634*	*7300*

While this, in turn, ignores any impact due to ethnicity, it shows that the rate of unemployment of CS graduates with 'good' degree classes is no higher than for other subjects within Russell or 1994 Group institutions. Indeed the unemployment rate for these particular CS graduates is actually below the comparable rate for all subjects. On the other hand, within Post-92 institutions a difference between the unemployment rates of CS and all graduates persists for all degree classes obtained.

This suggests that it may be the (lower) proportion of graduates obtaining higher degree classes that may be affecting the higher overall unemployment rate for the CS graduate cohort, at least for the Russell and 1994 Group universities, in addition to or instead of the subject itself. However, the persistence of differential unemployment between CS and other graduates in the Other pre-92 and Post-92 universities indicates that within these university groups the high unemployment cannot be explained merely by the particular profile of degree classes awarded in Computer Science (and therefore would relate somehow to the degree subject).

Although this has provided some progress in understanding how these three factors inter-relate, we need to undertake a third level of analysis to investigate whether we can isolate each factor and see how it impacts on the unemployment issue.

7. Third level analysis

In this final stage of analysis we controlled for two factors simultaneously, university type and degree class, which should reveal the impact of ethnicity alone on the unemployment rate. As the sample being analysed becomes rather small for certain sub-groups, we combined degree classes into two groups, i.e. 1st and 2:1 classestogether ('good' degrees, in the eye of many employers) and 2:2 and 3rd classes together. Tables 14 (a) and (b) summarise these data, for 'good' degree classes and other degree classes, respectively.

Table 14 Unemployment rate for CS graduates and all graduates, by ethnicity and university type, for: (a) those obtaining 1st and 2:1 degree classes; (b) those obtaining 2:2 and 3rd degree classes

(a)

1st & 2:1	% unemployed		% unemployed		% unemployed		% unemployed		% unemployed	
	Russell		1994		Other pre-92		Post-92		All groups	
	All	CS	All	CS	All	CS	All	CS	All	CS
White	6.4	5.7	6.9	6.6	7.1	8.1	7.6	11.6	7.1	9.6
BME combined	9.5	11.5	10.6	13.6	9.4	14.4	14.2	17.9	11.8	16.1
Total / overall	6.9	6.6	7.4	7.8	7.6	9.7	8.6	13.1	7.8	11.1
Number of cases	*34729*	*696*	*17860*	*414*	*15907*	*632*	*59207*	*2582*	*127703*	*4270*

(b)

2:2 & 3rd	% unemployed		% unemployed		% unemployed		% unemployed		% unemployed	
	Russell		1994		Other pre-92		Post-92		All groups	
	All	CS	All	CS	All	CS	All	CS	All	CS
White	11.7	8.2	11.3	10.1	11.4	17.7	10.7	19.2	11.0	17.1
BME combined	17.9	22.9	17.4	16.9	15.2	24.1	19.5	25.7	18.5	24.6
Total / overall	13.0	13.0	13.0	12.3	12.3	20.4	12.9	21.4	12.8	19.7
Number of cases	*8524*	*265*	*5324*	*224*	*7879*	*422*	*36796*	*1828*	*58523*	*2739*

This indicates that for white students with 'good' degree classes, there is no difference between the unemployment rate for CS graduates compared with the average figure for all white graduates with these degree classes within Russell or 1994 Group universities, and little difference in Other pre-92 universities. It is only in the Post-92 universities where there

is substantial differential unemployment between CS graduates and those of other subjects (for this subset of graduates, but remembering that this is a larger subset within CS than average). Interestingly, when we look at all white graduates, there is now rather little difference in the unemployment rate between the different university types (a range of 6.4 to 7.6%), suggesting that for most graduates this is not the strongest factor impacting on their unemployment.

Amongst BME graduates with these 'good' degree classes, however, a moderate difference between the unemployment rates of CS and other graduates persists within all of the university type groups. In addition we see a continuing trend between the university types, with lowest unemployment in the Russell Group and highest in Post-92 universities, for both CS graduates and overall. These observations indicate that for this subset of graduates (i.e. of ethnic minority background and with 'good degrees'), the differential unemployment of CS graduates is related to their subject, their ethnicity and their university type.

When we analyse those with 'weaker' degree classes in Table 14(b), although several subsets are now very small, we note that the unemployment rate forwhite CS graduates varies little between university groups. For white CS graduates with these grades, the unemployment rate is lower than for all such graduates within Russell and 1994 Group universities, but higher in Other pre-92 and Post-92 universities. Again, this suggests that amongst this group both university type and subject impact on their unemployment.

Finally, for BME graduates with weaker degree classes, a difference between the unemployment rate of CS and other graduates persistsacross all university groups except the 1994 Group, but there is relatively little difference between those different groups. Again, however, there is evidence for an effect of ethnicity but less of an effect due to the subject itself. However, the small sizes of these sub-samples can be very small and may affect the analysis.

8. Analysis by geographical location and institution

Analysis of our (UK only) sample of HESA data can be undertaken by either nation/region of domicile (based on their home address prior to entry to university) or by region of the university itself. Analysis by 'home nation' and/or English region is not particularly revealing although there is some variation in unemployment rate, from under 12% for CS graduates from the South West to over 18% for CS graduates from London. The pattern closely mimics that for graduates of all subjects (although this is within the range 8 to 12%). Understanding the impact of domicile is complex due to both the distribution of different universities and also differing student and graduate mobility within the UK.

Potential analysis by region of institution is also somewhat unhelpful due to the co-location of multiple universities of different types within many regions.

Consideration of location was therefore been conducted by analysis of graduate cohorts within individual universities. This was somewhat arbitrarily restricted to those with over 50

CS graduates, to enable samples of at least modest size. The following observations emerged when these findings were collected into university groups:

- In Russell Group universities, overall (all subject) graduate unemployment rates in individual universities were more tightly clustered (range 5.4 - 9.5%) than for CS graduates (range 3.0 - 13.0%). In the majority but not all cases the rate for CS graduates was higher than the overall rate. There is no clear correlation of unemployment rate and ethnicity, although many of these universities are dominated by white students. In fact the Russell Group member with the highest ethnic minority proportion (Imperial) has the lowest unemployment rate for CS graduates (3.0%).
- Rather few of the 1994 Group universities had CS cohorts larger than the 50 graduate threshold. However, for those analysed, the overall unemployment rates rangedfrom 6.6 to 11.6% and for CS graduates a rather similar 7.7 to 12.0% range. Other than QMUL, which has a minority white population (27% white in CS; 35% white overall), and slightly the worst unemployment rate in the group, the university graduate cohorts are again predominantly white.
- It is in the 'Other Pre-92' university group where unemployment rates diverge. Across all subjects, the range of unemployment rates is 7.6 to 12.4 %; whereas for CS graduates the range is 4.5 (Kent) to 26.3 % (Bradford). Within this group there were instances of both high unemployment ratesand high ethnic minority composition, such as Aston, Brunel and City where minorities of their CS graduates are white but also their CS unemployment was double or more their overall unemployment rate (sometimes over 20%). In contrast, Hull and Ulster, with predominantly white cohorts, also had much higher (20%) unemployment amongst CS graduates than amongst their graduates overall.
- The group of graduates in Post-92 universities was much the biggest, this group comprising more institutions and with larger cohorts of graduates. Amongst these the unemployment rate ranges were wider still; for all graduates a range of 5.6 to 20.6%, and for CS graduates a range of 7.8 to 29.2%. For almost every university the unemployment rate for CS graduates was higher than thatfor its graduates as a whole. Notably some of the highest unemployment rates were in universities with high BME proportions (such as East London, Greenwich, Middlesex, Westminster and De Montfort, all with over 20% unemployment of CS graduates and over 60% of CS graduates of BME origin). On the other hand high unemployment rates also existed in predominantly white CS graduate cohorts such as West of Scotland and Glasgow Caledonian. Perhaps illustrative of the local variability of unemployment rates in CS is the North East; Teesside had 29% unemployment, Sunderland 12% and Northumbria 8%, all amongst their rather similar (90% white)CS graduate cohorts.

These detailed observations confirm certain trends in the wider analysis:

1) The issue of high CS unemployment is largely confined to Post-92 and Other Pre-92 universities

2) For almost all Other Pre-92 and Post-92 institutions there is higher unemployment amongst CS graduates than amongst their other graduates.

3) Ethnicity is a linked factor in these raised unemployment rates – exemplified by the observation that no universities with a 'BME-majority' CS graduate cohort displayed a low unemployment rate

To this we need perhaps to add that in some, but not all, instances location can also be an issue. This may well be integrally related to ethnicity in some cases (thinking about some Post-92 universities with high ethnic minority graduate populations which are drawn very locally) but may also relate to regional variation of employment opportunities. Of course we also need to remember that this analysis has been on the basis of failure to secure long-term employment, but that does not solely mean employment within the IT sector.

9. Preliminary conclusions

We have investigated and reported how certain characteristics of unemployed CS graduates (on average) differ from CS graduates as an overall group, and from graduates as a whole. This enabled identification of potential major factors involved in the unemployment rate.

Our analysis has shown some complex variations exist underneath the 'headline' observation of the high unemployment rate for CS graduates compared with graduates of other subjects. Analysing full-time, first degree graduates of UK domicile, we have seen that the high unemployment rate for the CS graduate cohort is partly a result of certain characteristics of this cohort:

- A higher than average proportion of CS graduates studied in Post-92 universities, within which unemployment rates are higher for all subjects
- A higher than average proportion of CS graduates are of ethnic minority background, and these graduates suffer higher unemployment rates irrespective of subject
- A lower proportion than average obtained 'good' degree classes, and there is a direct correlation between 'good' degree classes and lower unemployment for all graduates.

These factors are not independent but deeply inter-related, and in such a way that their effects on CS graduate unemployment reinforce, contributing to a high overall rate of unemployment for the CS graduate cohort. However, they do not entirely 'explain away' the raised unemployment rate for CS (i.e. purely as an artefact of the particular profile of students studying CS).

When we begin to control for these different potential factors and isolate different sub-groups of CS graduates, a complex picture emerges which means that no single factor is entirely responsible for the overall unemployment rate differential (compared with the 'average' graduate). Certain sub-groups can be identified within which that differential does not exist, such as 'stronger' white CS graduates (in terms of degree class and university type). In contrast, within many other sub-groups the differential persists. This leads to thefollowing inferences:

- In some sub-groups, the higher unemployment of CS graduates appears to be accounted for by the profile of the graduates studying CS (in terms of ethnicity, university type and degree class), and may not otherwise relate to the subject discipline or other 'hidden' factors of the graduates
- On the other hand this is not the case in some other sub-groups, where the degree subject itself or other factors about these graduates do have a distinct effect on unemployment rate, independent of or in addition to the main issues of ethnicity, university type and degree class
- The unemployment of CS graduates overall is affected by these graduates' ethnicity profile, but is not entirely a function of their ethnicity
- The unemployment of CS graduates is a particular issue for those studying in Post-92 universities, but not entirely a function of that environment
- There are instances where the particular location of the (usually Post-92) university may have an additional impact
- There can be significant differences between unemployment rates for individual universities which are close in proximity and appear to have similar CS graduate cohorts.

These observations and inferences lead us to suggest that any efforts to reduce the potential unemployment (i.e. to support improved employment outcomes) of CS graduates should be targeted towards graduates or students of ethnic minority background across all universities and all those studying within Post-92 universities.

However, beyond this there is certainly scope to investigate the 'hidden' factors inherent in CS graduates which may impact on their employability or unemployment.

Appendix A: Analysis by Principal Subject

Certain key characteristics of the Computer Science (CS) graduates were investigated at Principal Subject level, i.e. for those on degree courses grouped as G4xx (Computer Science), G5xx (Information Systems), G6xx (Software Engineering) and G7xx (Artificial Intelligence). The analysis for some of these groups must be treated with caution due to the small sample sizes (G7xx especially and G6xx).

Table A.1 summarises the breakdown of the overall CS graduate sample into these groups, showing that Computer Science (G4xx) qualifiers comprise 71% of the sample. The unemployment rate is also shown for each, demonstrating that the rate for graduates of G5xx courses (Information Systems) is slightly higher than for Computer Science graduates, although that for G6xx (Software Engineering) is higher still.It should be noted that as only 5 graduates from G7xx (Artificial Intelligence) courses were unemployed, analysis relating to unemployment within this particular group is not feasible with reliability.

Table A1Computer Science graduates in different Principal Subjects, and their unemployment rates

	Number of graduates	% of CS cohort	% unemployed
G4: Computer Science	5279	71.0	14.4
G5: Information Systems	1492	20.0	14.8
G6: Software Engineering	603	8.1	16.3
G7: Artificial intelligence	60	0.1	8.2
Total / overall	7434	100.0	14.6

When analysed by gender, the key observation is that a higher proportion of those on G5xx courses (Information Systems) are female (almost 30%), which is about twice the proportion for the other Principal Subjects (all below 15%). However, there are only modest differences in the unemployment rates by gender for the G4xx, G5xx and G6xx courses.

There were no significant differences between the age distributions of graduates inthese Principal Subject groups, or their respective unemployment rates.

Table A.2 Gender of CS graduates by Principal Subject, and unemployment rates

	as % of cohort					unemployment rate %				
	G4	G5	G6	G7	All CS	G4	G5	G6	G7	All CS
Male	86.0	70.3	90.1	85.5	83.2	14.5	15.3	16.3	7.5	14.7
Female	14.0	29.7	9.9	14.5	16.8	14.0	14.0	16.7	11.1	14.2
Total / overall	100.0	100.0	100.0	100.0	100.0	14.4	14.9	16.3	8.1	14.6
Number of cases	*5281*	*1492*	*606*	*62*	*7441*	*762*	*222*	*99*	*5*	*1088*

When analysed by ethnicity, a key difference was again apparent for G5xx course graduates, amongst whom there is a markedly higher percentage of graduates of ethnic minority background (over 40% compared with 25% for all CS graduates). Higher proportions of graduates in this group were of Asian (especially, 29%) and Black (7.9%) background, than for other Principal Subjects, see Table A.3.

The small sample sizes tend to restrict ability to analyseunemployment rates, but there appear to be some modest differences between those of different ethnic backgrounds. However, no particularly strong difference emerged from the percentages for the larger groups compared with those amongst the overall CS cohort.

Table A.3Ethnicity of CS by Principal Subject, and unemployment rates

	as % of cohort					unemployment rate %				
	G4	G5	G6	G7	All CS	G4	G5	G6	G7	All CS
Asian	14.4	29.0	12.4	12.9	17.2	21.8	20.3	20.0	12.5	21.1
Black	4.8	7.9	4.6	3.2	5.4	19.3	26.1	28.6	0.0	21.9
Other inc mixed	3.3	3.5	2.5	3.2	3.2	17.9	15.4	20.0	0.0	17.4
White	75.6	57.8	79.3	80.6	72.3	12.6	10.4	14.8	8.0	12.4
Total / overall	100.0	100.0	100.0	100.0	100.0	14.4	14.8	16.4	8.1	14.6
Number of cases	*5284*	*1497*	*605*	*62*	*7448*	*762*	*222*	*99*	*5*	*1088*

More substantial variations are seen in the proportions of graduates at Principal Subject level when analysed by university type group (Table A.4), which reflects differences in provision between universities. The majority of the (tiny) group who studied Artificial Intelligence courses were in Russell Group universities. In marked contrast, over 80% of the modest-sizedgroup who studied Software Engineering courses studied in Post-92

universities. For the larger Computer Science and Information Systems groups, the patterns are broadly similar and as a result broadly resemble the distribution for the overall CS cohort.

Table A.4 University type for CS graduates by Principal Subject, and unemployment rates

	as % of cohort					unemployment rate %				
	G4	G5	G6	G7	All CS	G4	G5	G6	G7	All CS
Russell Group	12.9	14.5	8.4	54.1	13.2	8.1	11.5	5.9	0.0	8.6
1994 Group	10.4	4.6	3.3	26.2	8.9	9.7	13.0	5.0	12.5	9.8
Other pre-92	15.7	16.6	6.6	6.6	13.5	14.3	15.7	10.0	0.0	14.5
Post-92	61.0	64.3	81.7	13.1	64.4	16.6	15.5	18.4	37.5	16.6
Total / overall	100.0	100.0	100.0	100.0	100.0	14.4	14.8	16.4	8.1	14.6
Number of cases	*5280*	*1496*	*605*	*61*	*7442*	*762*	*222*	*99*	*5*	*1088*

Comparing the two larger Principal Subject groups, unemployment rates are slightly higher for graduates on Information Systems courses (G5xx) than Computer Science (G4xx) courses within the Russell, 1994 and other Pre-92 universities, but slightly lower in Post-92 universities. Some of the more disparate figures within the G6xx and G7xx Principal Subjects may be artefacts of their small sample sizes.

Table A.5 gives the degree classes obtained by graduates of the different Principal Subjects, displaying broadly similar distributions, with a few exceptions in the smaller groups such as a high proportion of 1st class degrees obtained within the very small Artificial Intelligence subject group. In terms of unemployment rate, the rate amongst G4xx graduates was slightly lower than for G5xx graduates for all degree classes. Although only a small cohort, the unemployment rate for G6xx graduates with 3rd class degrees was particularly high at 38%.

Table A.5 Degree classes obtained by CS by Principal Subject, and unemployment rates

	as % of cohort					unemployment rate %				
	G4	G5	G6	G7	All CS	G4	G5	G6	G7	All CS
1st	20.7	17.8	22.7	33.9	20.4	7.6	10.2	8.0	4.8	8.0
2:1	38.1	40.0	40.7	37.1	38.7	12.6	12.9	13.0	8.7	12.6
2:2	28.5	30.6	22.4	19.4	28.4	18.3	16.6	21.3	16.7	18.1
3rd	9.0	8.0	10.4	8.1	8.9	23.0	25.0	38.1	20.0	24.8
Unclassified	3.7	3.6	3.8	1.6	3.6	21.1	20.4	13.0	0.0	20.3
Total / overall	100.0	100.0	100.0	100.0	100.0	14.4	14.8	16.4	9.7	14.6
Number of cases	*5280*	*1494*	*607*	*61*	*7443*	*762*	*221*	*99*	*6*	*1088*

Summary

This additional analysis by Principal Subject does not immediately offer many differences of significance, at least for the larger subjects that dominate the overall CS cohort. Analysis at this level does show a somewhat distinctive profile for G4xx (Information Systems) graduates compared with others, comprising a higher female proportion (30% not 15%) and a higher proportion with ethnic minority backgrounds (especially Asian at 29%). However, these do not appear to result in a distinctive or different unemployment rate, although this would be determined more fully by second-level analysis as performed on the whole dataset in this report. However the value of that further analysis is likely to be limited as many sub-sample sizes will be small, and it would not be feasible at all for some small Principal Subject groups.

Other findings of particular interest are the large proportion of Software Engineering students that studied within Post-92 universities and the reverse for the very small group studying Artificial Intelligence (of whom over half in the Russell Group universities).

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