



ELSEVIER

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Learning analytics: Dataset for empirical evaluation of entry requirements into engineering undergraduate programs in a Nigerian university



Jonathan A. Odukoya^a, Segun I. Popoola^{b,*},
 Aderemi A. Atayero^b, David O. Omole^c, Joke A. Badejo^b,
 Temitope M. John^b, Olalekan O. Olowo^b

^a Department of Psychology, Covenant University, Ota, Nigeria

^b Department of Electrical and Information Engineering, Covenant University, Ota, Nigeria

^c Department of Civil Engineering, Covenant University, Ota, Nigeria

ARTICLE INFO

Article history:

Received 23 January 2018

Received in revised form

6 February 2018

Accepted 12 February 2018

Available online 15 February 2018

Keywords:

Smart campus

Learning analytics

Sustainable education

Nigerian university

Education data mining

Engineering

ABSTRACT

In Nigerian universities, enrolment into any engineering undergraduate program requires that the minimum entry criteria established by the National Universities Commission (NUC) must be satisfied. Candidates seeking admission to study engineering discipline must have reached a predetermined entry age and met the cut-off marks set for Senior School Certificate Examination (SSCE), Unified Tertiary Matriculation Examination (UTME), and the post-UTME screening. However, limited effort has been made to show that these entry requirements eventually guarantee successful academic performance in engineering programs because the data required for such validation are not readily available. In this data article, a comprehensive dataset for empirical evaluation of entry requirements into engineering undergraduate programs in a Nigerian university is presented and carefully analyzed. A total sample of 1445 undergraduates that were admitted between 2005 and 2009 to study Chemical Engineering (CHE), Civil Engineering (CVE), Computer Engineering (CEN), Electrical and Electronics Engineering (EEE), Information and Communication Engineering (ICE), Mechanical Engineering (MEE), and Petroleum Engineering (PET) at Covenant University, Nigeria were randomly selected.

* Corresponding author.

E-mail addresses: segunpopoola15@gmail.com, segun.popoola@covenantuniversity.edu.ng (S.I. Popoola).

Entry age, SSCE aggregate, UTME score, Covenant University Scholastic Aptitude Screening (CUSAS) score, and the Cumulative Grade Point Average (CGPA) of the undergraduates were obtained from the Student Records and Academic Affairs unit. In order to facilitate evidence-based evaluation, the robust dataset is made publicly available in a Microsoft Excel spreadsheet file. On yearly basis, first-order descriptive statistics of the dataset are presented in tables. Box plot representations, frequency distribution plots, and scatter plots of the dataset are provided to enrich its value. Furthermore, correlation and linear regression analyses are performed to understand the relationship between the entry requirements and the corresponding academic performance in engineering programs. The data provided in this article will help Nigerian universities, the NUC, engineering regulatory bodies, and relevant stakeholders to objectively evaluate and subsequently improve the quality of engineering education in the country.

© 2018 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license

(<http://creativecommons.org/licenses/by/4.0/>).

Specifications Table

Subject area	<i>Engineering Education</i>
More specific subject area	<i>Learning Analytics</i>
Type of data	<i>Tables, graphs, figures, and spreadsheet file</i>
How data was acquired	<i>For the five-year period of admission reported in this data article (2005–2009), the entry age, SSCE aggregate, UTME score, CUSAS score, and the CGPA of the undergraduates were obtained from the Student Records and Academic Affairs unit</i>
Data format	<i>Raw, analyzed</i>
Experimental factors	<i>Engineering undergraduates without all of the required variables (entry age, SSCE aggregate, UTME score, CUSAS score, and the CGPA) were excluded in this study</i>
Experimental features	<i>On yearly basis, first-order descriptive statistics of the dataset are presented in tables. Box plot representations, frequency distribution plots, and scatter plots of the dataset are provided to enrich its value. Furthermore, correlation and linear regression analyses are performed to understand the relationship between the entry requirements and the corresponding academic performance in engineering programs</i>
Data source location	<i>The dataset provided in this article were obtained at Covenant University, Canaanland, Ota, Nigeria (Latitude 6.6718° N, Longitude 3.1581° E)</i>
Data accessibility	<i>In order to facilitate evidence-based evaluation of the entry requirements into engineering programs, the comprehensive dataset is made publicly available in a Microsoft Excel spreadsheet file</i>

Value of the data

- The data is highly imperative for empirical evaluation of the relationship between entry qualifications and the academic performance of engineering undergraduates in Nigerian universities. This will help in determining the suitability and appropriateness of the admission policy set by universities and the NUC to engineering education in Nigeria [1,2].

- Sound exploration of the data provided in this data article will help Nigerian universities, the NUC, engineering regulatory bodies, and relevant stakeholders to objectively evaluate and subsequently improve the quality of engineering education in the country [3–6].
- Most of work that are published in this regard are mostly based on arguments that are void of empirical evidences [7]. On the contrary, availability of this vital data will encourage evidence-based studies are capable of stimulating informed, valid and reliable decisions.
- On yearly basis, first-order descriptive statistics of the dataset are presented in tables. Box plot representations, frequency distribution plots, and scatter plots of the dataset are provided to enrich its value. Furthermore, correlation and linear regression analyses are performed to understand the relationship between the entry requirements and the corresponding academic performance in engineering programs [8–11].

1. Data

Ability to correctly predict students' performance in tertiary institutions at the point of entry usually play a vital role in career guidance and appropriate placements. This will ultimately avert frustrations cum wastage of material and financial resources which often trail wrong students' placement. The spate of dismal indigenous national development in many developing nations could be partly attributed to wrong students' placement in tertiary institutions. In Nigerian universities, enrolment into any engineering undergraduate program requires that the minimum entry criteria established by the NUC must be satisfied. Candidates seeking admission to study engineering discipline must have reached a predetermined entry age and met the cut-off marks set for SSCE, UTME, and the post-UTME screening. However, limited effort has been made to show that these entry requirements eventually guarantee successful academic performance in engineering programs because the data required for such validation are not readily available. Dataset for empirical evaluation of entry requirements into engineering undergraduate programs in a Nigerian university is provided and explored in this data article.

Descriptive statistics of the entry qualifications and the corresponding academic performance of the undergraduates admitted into the seven engineering programs at Covenant University between 2005 and 2009 are presented in Tables 1–5. Each of the tables shows the mean, median, mode, standard deviation, variance, kurtosis, skewness, range, minimum, maximum, and sample size of the entry age, UTME score, CUSAS score, SSCE aggregate, and the CGPA. The boxplot representations of the entry qualifications and the CGPA are shown in Figs. 1–5 to show the variations across the year of study.

Table 1
Descriptive statistics of entry requirements in 2005 and the CGPA.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Mean	18.34	217.40	67.53	3.33	3.60
Median	18	218	67.2	3.375	3.675
Mode	18	214	55.8	3.75	3.73
Standard Deviation	1.34	29.46	8.90	0.60	0.70
Variance	1.80	867.80	79.27	0.37	0.49
Kurtosis	3.85	2.42	2.49	2.44	2.64
Skewness	0.87	−0.14	−0.03	−0.10	−0.45
Range	7	146	41.6	2.81	3.01
Minimum	16	133	45.8	1.72	1.84
Maximum	23	279	87.4	4.53	4.85
Total Samples	184	184	184	184	184

Table 2

Descriptive statistics of entry requirements in 2006 and the CGPA.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Mean	18.55	215.05	60.66	3.21	3.45
Median	18	213	59.6	3.205	3.47
Mode	18	238	57.6	3.13	2.69
Standard Deviation	1.20	28.88	7.56	0.60	0.74
Variance	1.43	834.24	57.14	0.35	0.55
Kurtosis	5.05	2.41	3.21	2.31	2.04
Skewness	0.94	0.30	0.72	-0.09	0.01
Range	8	136	34.5	2.56	2.91
Minimum	16	162	46.8	1.88	1.97
Maximum	24	298	81.3	4.44	4.88
Total Samples	136	136	136	136	136

Table 3

Descriptive statistics of entry requirements in 2007 and the CGPA.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Mean	17.91	220.05	70.71	3.29	3.54
Median	18	218	70	3.21	3.58
Mode	18	205	70	3.13	3.07
Standard Deviation	1.18	21.76	8.55	0.54	0.61
Variance	1.39	473.71	73.12	0.30	0.37
Kurtosis	4.32	2.59	3.85	2.47	2.44
Skewness	0.87	0.15	0.09	0.33	-0.18
Range	7	109	64.4	2.89	2.87
Minimum	15	163	45.6	1.88	1.92
Maximum	22	272	110	4.77	4.79
Total Samples	371	371	371	371	371

Table 4

Descriptive statistics of entry requirements in 2008 and the CGPA.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Mean	17.85	230.68	69.65	3.29	3.56
Median	18	231	70	3.28	3.59
Mode	17	227	71	2.5	3.75
Standard Deviation	1.20	21.12	8.04	0.64	0.67
Variance	1.44	446.23	64.66	0.41	0.44
Kurtosis	4.33	2.66	3.06	2.21	2.26
Skewness	0.96	-0.17	0.13	-0.03	-0.08
Range	7	116	44	3.14	3.13
Minimum	15	169	49	1.74	1.8
Maximum	22	285	93	4.88	4.93
Total Samples	393	393	393	393	393

Table 5

Descriptive statistics of entry requirements in 2009 and the CGPA.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Mean	17.57	222.61	72.42	3.16	3.69
Median	17	221	73	3.13	3.71
Mode	17	218	73	3.13	3.83
Standard Deviation	1.01	17.96	8.38	0.63	0.55
Variance	1.02	322.70	70.17	0.40	0.30
Kurtosis	5.43	2.55	3.60	2.42	3.09
Skewness	1.06	0.36	-0.31	0.12	-0.37
Range	7	88	54	3.1	2.86
Minimum	15	183	41	1.67	2
Maximum	22	271	95	4.77	4.86
Total Samples	361	361	361	361	361

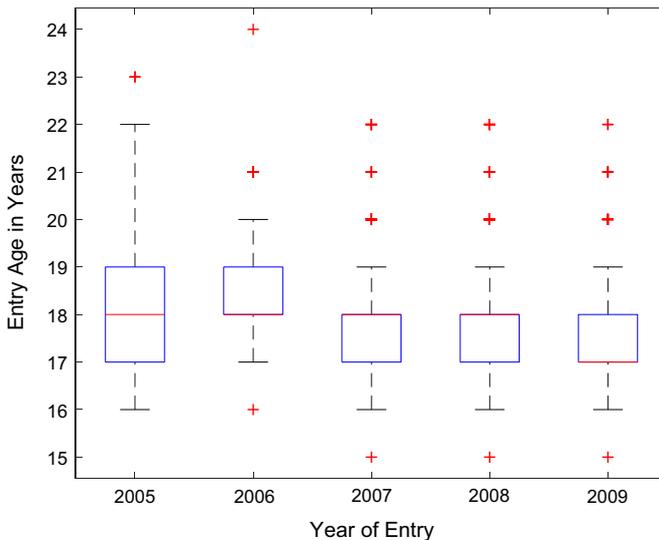


Fig. 1. Boxplot of entry age of undergraduates enrolled in 2005–2009.

2. Materials and methods

A total sample of 1445 undergraduates that were admitted between 2005 and 2009 to study Chemical Engineering (CHE), Civil Engineering (CVE), Computer Engineering (CEN), Electrical and Electronics Engineering (EEE), Information and Communication Engineering (ICE), Mechanical Engineering (MEE), and Petroleum Engineering (PET) at Covenant University, Nigeria were randomly selected. Entry age, SSCE aggregate, UTME score, CUSAS score, and the CGPA of the undergraduates were obtained from the Student Records and Academic Affairs unit and Center for Systems and Information Services (CSIS). In order to facilitate evidence-based evaluation, the robust dataset is made publicly available in a Microsoft Excel spreadsheet file. On yearly basis, first-order descriptive statistics of the dataset are presented in tables. Box plot representations, frequency distribution plots, and scatter plots of the dataset are provided to enrich its value. Furthermore, correlation and linear regression analyses are performed to understand the relationship between the entry requirements and the corresponding academic performance in engineering programs.

Figs. 6–10 show the boxplots of the entry qualifications and the CGPA to represent the dataset across the seven engineering programs. Frequency distributions of entry age, SSCE aggregate, UTME score, CUSAS score, and the CGPA of the engineering undergraduates are depicted in Figs. 11–15 respectively.

Linear regression and correlation analyses are performed to understand the relationship between the entry requirements and the corresponding academic performance in engineering programs. Figs. 16–19 show the relationship between the entry requirements (entry ages, UTME scores, CUSAS scores, SSCE aggregates) and the academic performance (CGPA) using scatter plots. Linear regression equations are also provided. Furthermore, correlation coefficients and their p-values of entry requirements and CGPA for year 2005–2009 are presented in matrix form in Tables 6–15. The correlation coefficient is said to be significant when an off-diagonal element of the p-value matrix is smaller than the significance level of 0.05. The results of the correlation analyses show that the relationships between the entry qualification parameters and the corresponding academic performance are not really as ‘strong’ as expected. The SSCE aggregate is more highly correlated to the

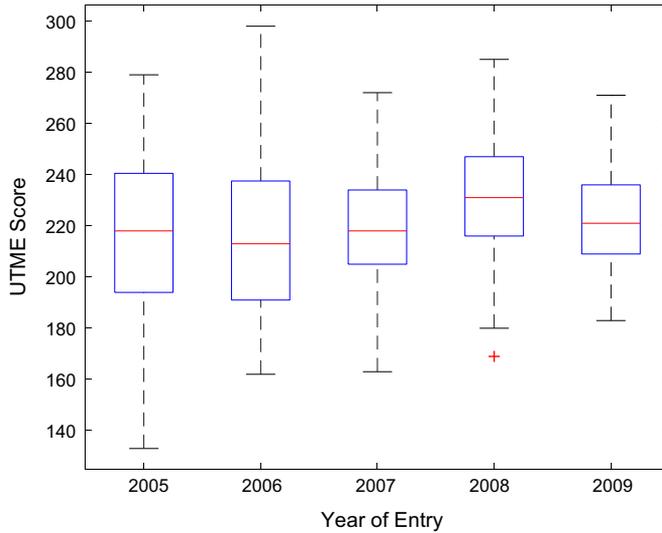


Fig. 2. Boxplot of UTME score of undergraduates enrolled in 2005–2009.

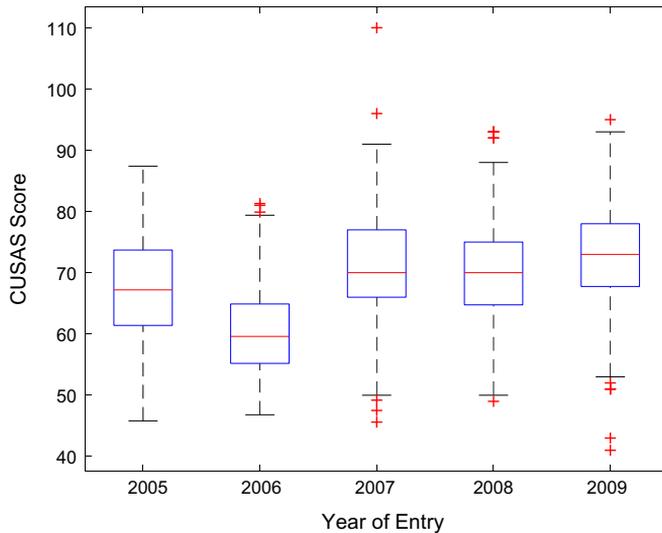


Fig. 3. Boxplot of CUSAS score of undergraduates enrolled in 2005–2009.

academic performance (CGPA) with minimum p-value, relative to other entry qualification parameters. The entry age parameter seems to be least relevant to academic performance throughout the study period. In order to uphold quality of engineering education in Nigeria, there is an urgent need for relevant bodies to review the entry requirements into engineering undergraduate programs in Nigerian universities.

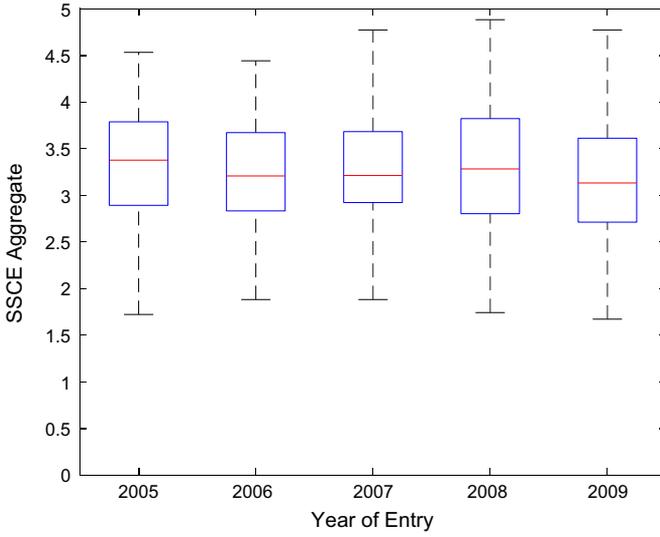


Fig. 4. Boxplot of SSCE aggregate of undergraduates enrolled in 2005–2009.

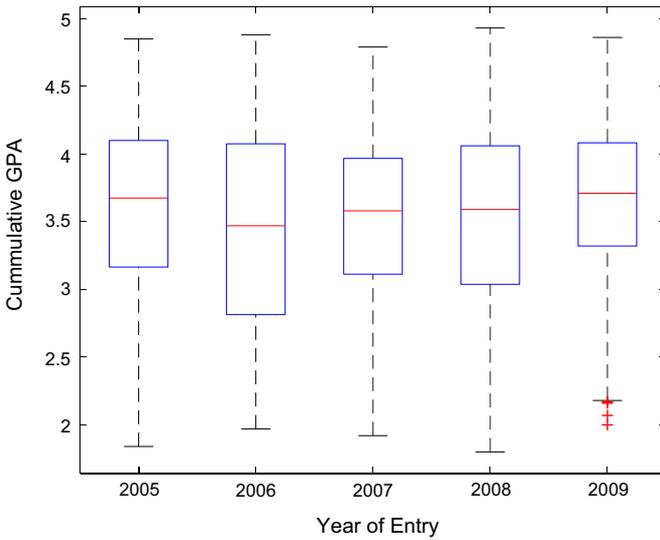


Fig. 5. Boxplot of CGPA of undergraduates enrolled in 2005–2009.

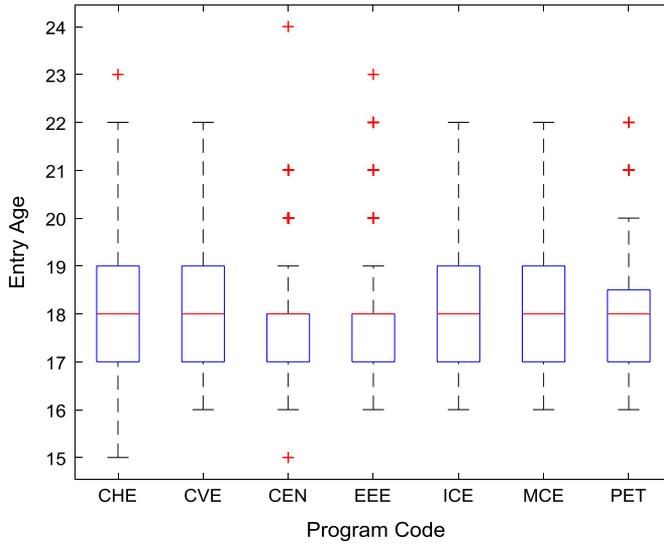


Fig. 6. Boxplot of entry age of undergraduates across engineering programs.

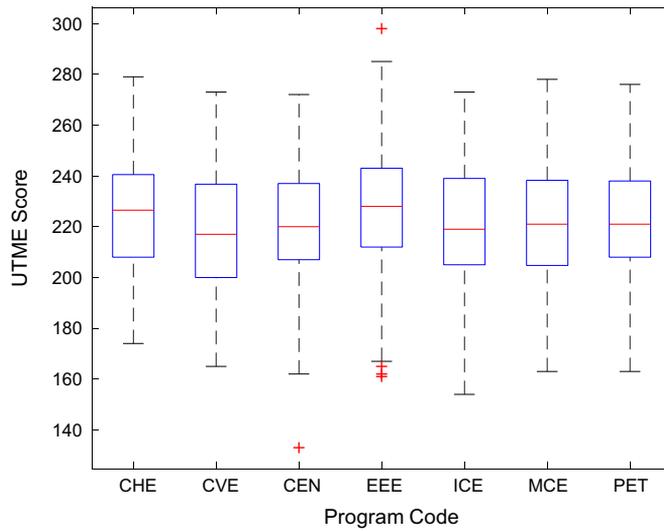


Fig. 7. Boxplot of UTME score of undergraduates across engineering programs.

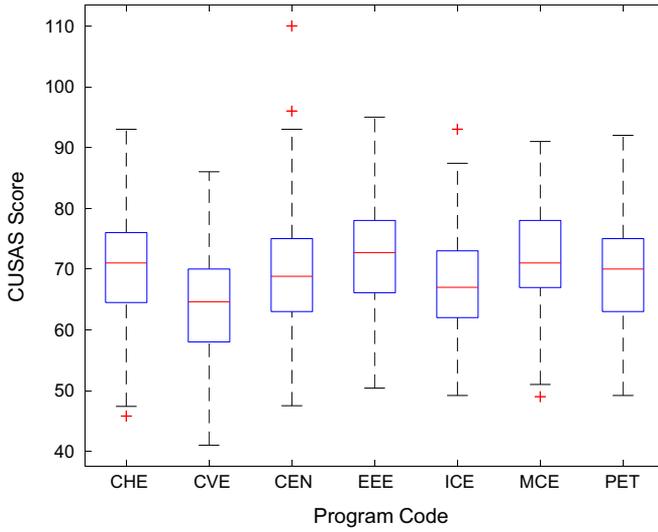


Fig. 8. Boxplot of CUSAS score of undergraduates across engineering programs.

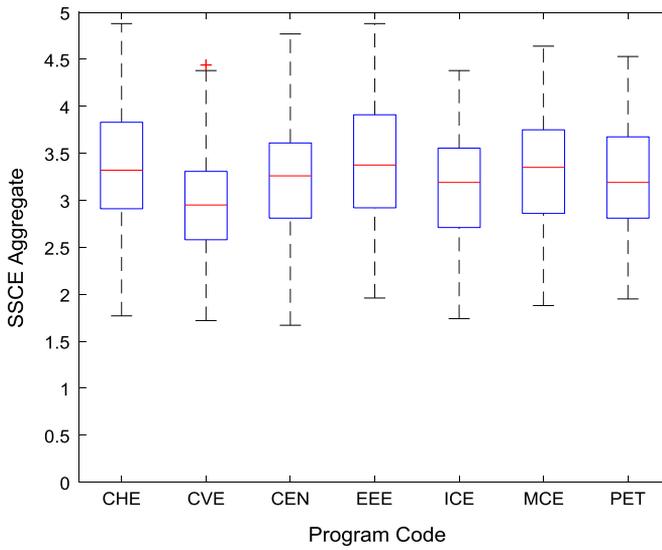


Fig. 9. Boxplot of SSCE score of undergraduates across engineering programs.

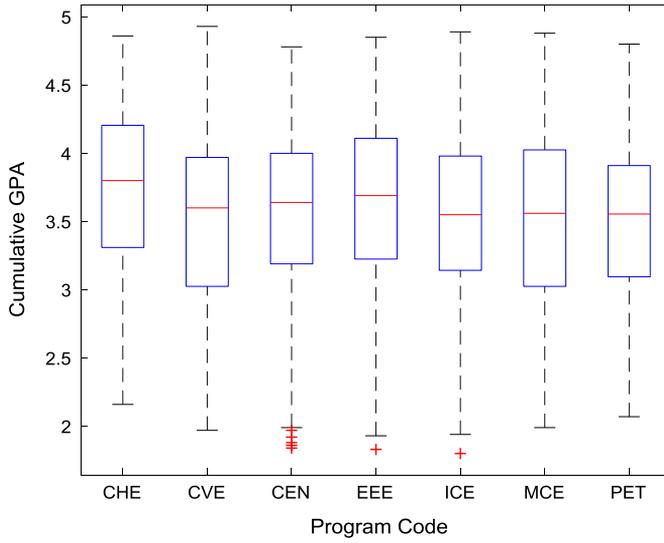


Fig. 10. Boxplot of CGPA of undergraduates across engineering programs.

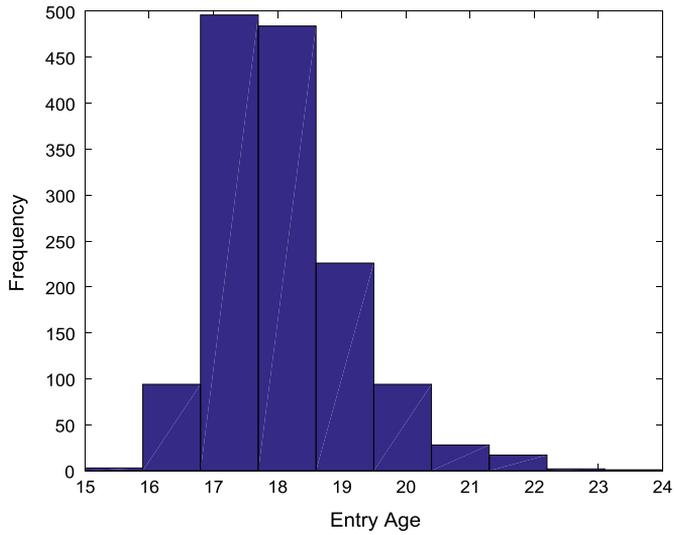


Fig. 11. Frequency distribution of entry age of undergraduates in engineering programs (2005–2009).

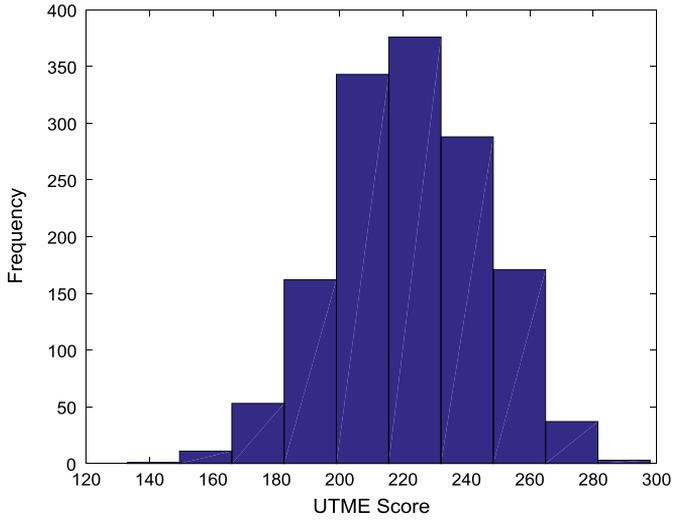


Fig. 12. Frequency distribution of UTME score of undergraduates in engineering programs (2005–2009).

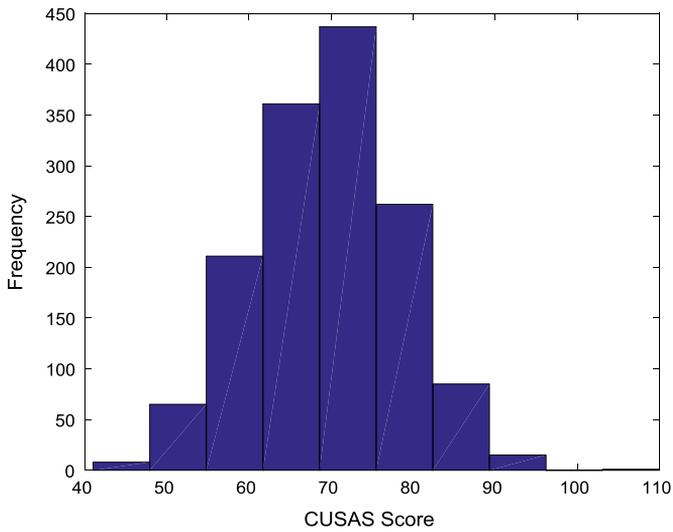


Fig. 13. Frequency distribution of CUSAS score of undergraduates in engineering programs (2005–2009).

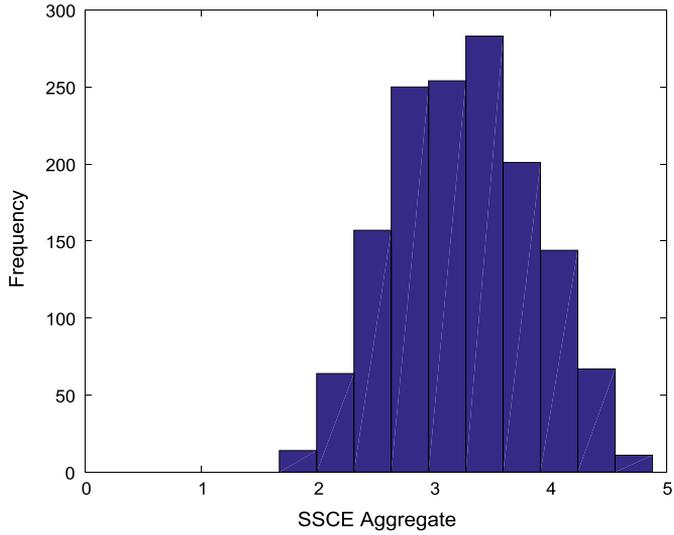


Fig. 14. Frequency distribution of SSCE aggregate of undergraduates in engineering programs (2005–2009).

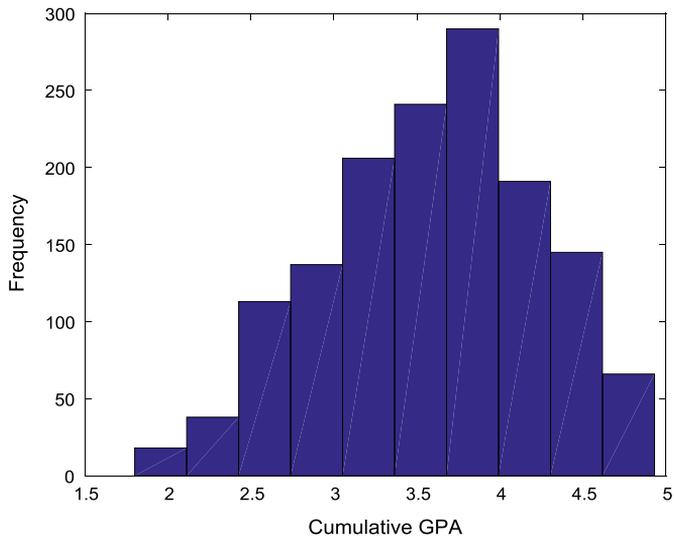


Fig. 15. Frequency distribution of CGPA of undergraduates in engineering programs (2005–2009).

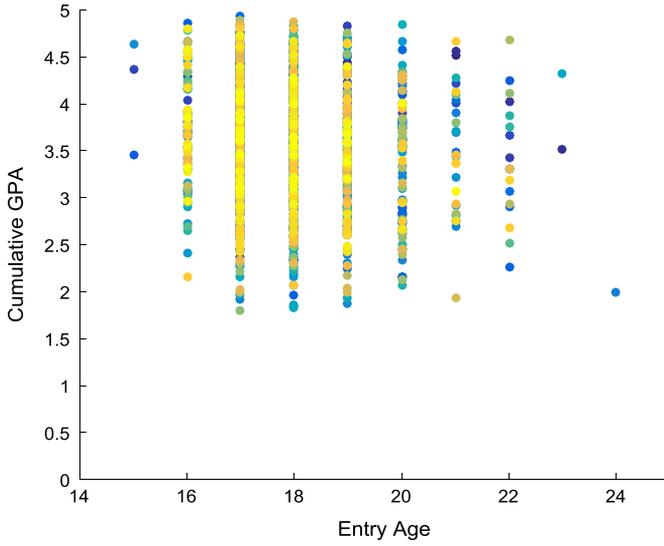


Fig. 16. Scatter plot showing the relationship between entry age and CGPA.

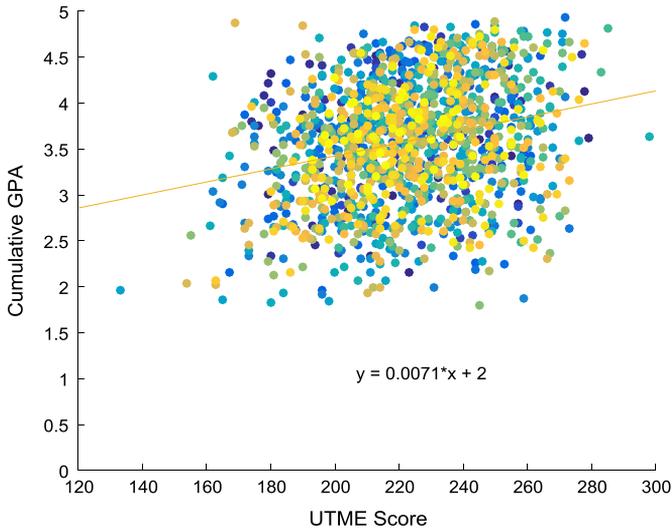


Fig. 17. Scatter plot showing the relationship between UTME score and CGPA.

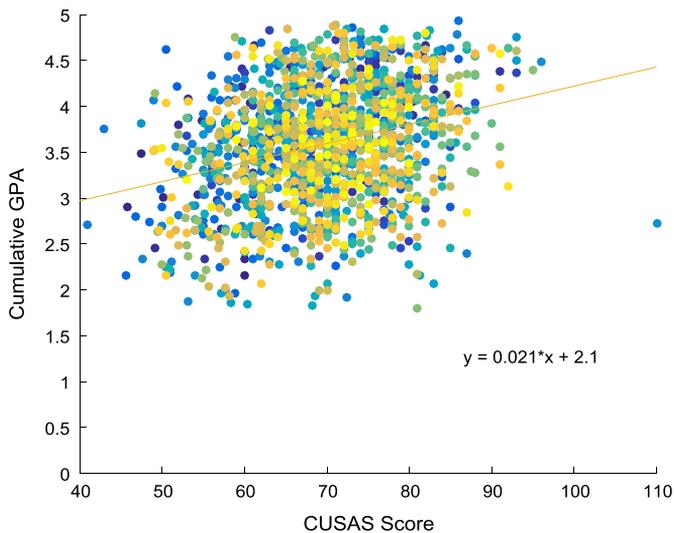


Fig. 18. Scatter plot showing the relationship between CUSAS score and CGPA.

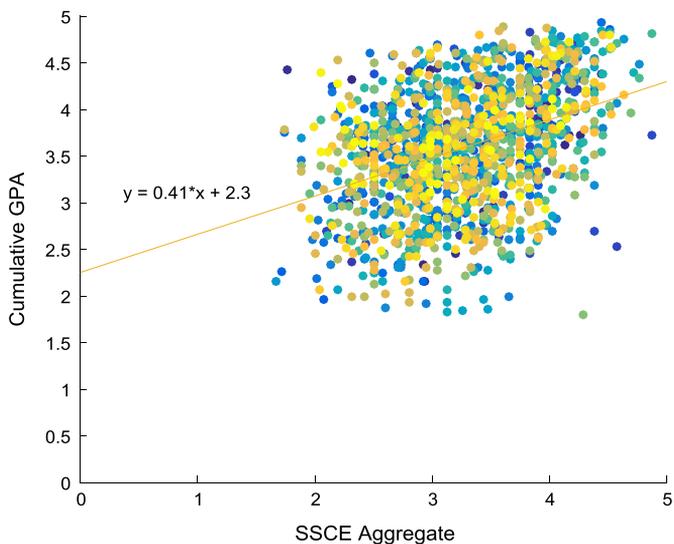


Fig. 19. Scatter plot showing the relationship between SSCE score and CGPA.

Table 6

Correlation coefficient matrix of entry requirement data and CGPA for 2005.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1				
UTME Score	0.0821	1			
CUSAS Score	0.0240	0.3705	1		
SSCE Aggregate	-0.2327	0.2873	0.3937	1	
Cumulative GPA	-0.1653	0.2954	0.3724	0.4076	1

Table 7

P-value matrix of entry requirement data and CGPA for 2005.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	0.2677	0.7468	0.0015	0.0249
UTME Score	0.2677	1	0.0000	0.0001	0.0000
CUSAS Score	0.7468	0.0000	1	0.0000	0.0000
SSCE Aggregate	0.0015	0.0001	0.0000	1	0.0000
Cumulative GPA	0.0249	0.0000	0.0000	0.0000	1

Table 8

Correlation coefficient matrix of entry requirement data and CGPA for 2006.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	−0.0265	−0.2203	−0.1232	−0.0040
UTME Score	−0.0265	1	0.2116	0.2406	0.2337
CUSAS Score	−0.2203	0.2116	1	0.3228	0.1595
SSCE Aggregate	−0.1232	0.2406	0.3228	1	0.3805
Cumulative GPA	−0.0040	0.2337	0.1595	0.3805	1

Table 9

P-value matrix of entry requirement data and CGPA for 2006.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	0.7592	0.0100	0.1529	0.9633
UTME Score	0.7592	1	0.0134	0.0048	0.0062
CUSAS Score	0.0100	0.0134	1	0.0001	0.0636
SSCE Aggregate	0.1529	0.0048	0.0001	1	0.0000
Cumulative GPA	0.9633	0.0062	0.0636	0.0000	1

Table 10

Correlation coefficient matrix of entry requirement data and CGPA for 2007.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	0.0568	−0.1087	−0.1280	−0.1319
UTME Score	0.0568	1	0.2911	0.2927	0.3344
CUSAS Score	−0.1087	0.2911	1	0.3194	0.3741
SSCE Aggregate	−0.1280	0.2927	0.3194	1	0.4487
Cumulative GPA	−0.1319	0.3344	0.3741	0.4487	1

Table 11

P-value matrix of entry requirement data and CGPA for 2007.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	0.2752	0.0364	0.0136	0.0110
UTME Score	0.2752	1	0.0000	0.0000	0.0000
CUSAS Score	0.0364	0.0000	1	0.0000	0.0000
SSCE Aggregate	0.0136	0.0000	0.0000	1	0.0000
Cumulative GPA	0.0110	0.0000	0.0000	0.0000	1

Table 12

Correlation coefficient matrix of entry requirement data and CGPA for 2005.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	−0.0688	−0.1734	−0.1884	−0.1426
UTME Score	−0.0688	1	0.1675	0.3125	0.3036
CUSAS Score	−0.1734	0.1675	1	0.2978	0.2215
SSCE Aggregate	−0.1884	0.3125	0.2978	1	0.4184
Cumulative GPA	−0.1426	0.3036	0.2215	0.4184	1

Table 13

P-value matrix of entry requirement data and CGPA for 2005.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	0.1737	0.0006	0.0002	0.0046
UTME Score	0.1737	1	0.0009	0.0000	0.0000
CUSAS Score	0.0006	0.0009	1	0.0000	0.0000
SSCE Aggregate	0.0002	0.0000	0.0000	1	0.0000
Cumulative GPA	0.0046	0.0000	0.0000	0.0000	1

Table 14

Correlation coefficient matrix of entry requirement data and CGPA for 2005.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	0.0154	−0.1309	−0.0816	−0.1510
UTME Score	0.0154	1	0.0829	0.1489	0.0884
CUSAS Score	−0.1309	0.0829	1	0.3679	0.2511
SSCE Aggregate	−0.0816	0.1489	0.3679	1	0.3395
Cumulative GPA	−0.1510	0.0884	0.2511	0.3395	1

Table 15

P-value matrix of entry requirement data and CGPA for 2005.

	Entry Age	UTME Score	CUSAS Score	SSCE Aggregate	Cumulative GPA
Entry Age	1	0.7705	0.0128	0.1215	0.0040
UTME Score	0.7705	1	0.1159	0.0046	0.0934
CUSAS Score	0.0128	0.1159	1	0.0000	0.0000
SSCE Aggregate	0.1215	0.0046	0.0000	1	0.0000
Cumulative GPA	0.0040	0.0934	0.0000	0.0000	1

Acknowledgement

This work is carried out under the *SmartCU* and Covenant University Data Analytics Center (*CUDAC*) Research Clusters. This research is fully sponsored by Covenant University Centre for Research, Innovation and Development (*CUCRID*), Covenant University, Ota, Nigeria.

Transparency document. Supporting information

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.dib.2018.02.025>.

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.dib.2018.02.025>.

References

- [1] J.A. Odukoya, D.O. Omole, A.A. Atayero, J. Badejo, S. Popoola, M. John, et al., Learning attributes of summa cum laude students: experience of a Nigerian University, *Cogent Educ.* (2018) 1426675.
- [2] J. Odukoya, A. Osore, F. Osore, O. Okunlola, The content and predictive validity of Pneuma Engineering Aptitude Test, *Int. J. Social. Sci. Humanit. Rev.* 7 (2017).
- [3] P.O. Adewale, O.B. Adhuzo, Entry qualifications and academic performance of architecture students in Nigerian Polytechnics: are the admission requirements still relevant? *Front. Arch. Res.* 3 (2014) 69–75.
- [4] C.K. Ayo, J.A. Odukoya, A. Azeta, A review of open & distance education and human development in Nigeria, *Int. J. Emerg. Technol. Learn.* 9 (2014) 63–67.
- [5] J.A. Odukoya, O. Adekeye, A.O. Igbino, A. Afolabi, Item analysis of university-wide multiple choice objective examinations: the experience of a Nigerian Private University, *Qual. Quant.* (2017) 1–15.
- [6] J.A. Odukoya, O. Adekeye, O. Okunlola, Assessing the effectiveness of mobile learning devices in tertiary institutions: the experience of undergraduates in a Nigerian Private University, *Int. J. Interact. Mob. Technol.* 11 (2017) 160–169.
- [7] S. Oluigbo, Improving the quality of architecture graduates from Nigerian Universities, *AARCHES J.* 4 (2005) 72–76.
- [8] S.I. Popoola, A.A. Atayero, T.T. Okanlawon, B.I. Omopariola, O.A. Takpor, Smart campus: data on energy consumption in an ICT-driven university, *Data Brief* 16 (2018) 780–793.
- [9] S.I. Popoola, A.A. Atayero, N. Faruk, J.A. Badejo, Data on the key performance indicators for quality of service of GSM networks in Nigeria, *Data Brief* 16 (2018) 914–928.
- [10] S.I. Popoola, A.A. Atayero, N. Faruk, Received signal strength and local terrain profile data for radio network planning and optimization at GSM frequency bands, *Data Brief* 16 (2018) 972–981.
- [11] S.I. Popoola, A.A. Atayero, J.A. Badejo, T.M. John, J.A. Odukoya, D.O. Omole, Learning analytics for smart campus: data on academic performances of engineering undergraduates in a Nigerian Private University, *Data Brief* 17 (2018) 76–94.