

Assignment 1**SE3010 – SEPQM****Semester 1****Introduction**

As mentioned in the paper “*An Analytical Study of Cognitive Code-Level Object-Oriented Complexity Measures*” a majority of the cognitive code-level (CCL) object-oriented complexity measures have revolved around coupling, inheritance, size, types of basic control structures (TBCS), and nesting level of control structures (NLCS) factors to decide on the complexity of a code segment. However, **they have not concentrated enough on factors that are specific to object-oriented (OO) programming**. Thus, despite the advantages, the proposed CCL object-oriented complexity measures have their limitations.

Task – Publishing a research paper in a conference/journal

- Read the research paper “*An Analytical Study of Cognitive Code-Level Object-Oriented Complexity Measures*” to get an overall idea about the complexity calculation mechanisms of the existing CCL object-oriented measures.
- Write a research paper proposing **improvements** to one of the measures listed at the following link : <https://docs.google.com/spreadsheets/d/1UBuupMkriBzd23-cOPc6Fwfp0GU6hZIP/edit?usp=sharing&ouid=105994750101016457084&rtpof=true&sd=true>
Only a limited number of groups would be allowed to select a particular complexity measure. Hence, the allocation of measures would be done on a **first-come, first-serve basis**.
- In addition to the factors that has already been considered, the improved measure should be able to decide on the complexity of a program based on a **minimum of four new** factors.
- **At least two** out of the **new** factors should be **OO specific** factors (polymorphism, encapsulation, abstraction, association, aggregation, composition, method chaining, etc).
- Furthermore, the following factors **cannot be considered** as a **new** factor:
 - Coupling
 - Inheritance
 - Size as a count of tokens in a program (However, size as a distance between two program elements or as a count of LOC **can be considered**).
 - TBCS
 - NLCS
- Before writing the research paper, decide on a conference/journal you wish to publish the paper. Once a conference/journal is selected, the research paper can be structured based on the **template** provided by the conference/journal.

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➤ The research paper **must contain** the following main topics:

▪ **Abstract**

- An abstract is a teaser designed to convince the reader to read the entire research paper. Potential readers will use it to decide whether it is worth reading the rest of the paper. It is used to obtain an understanding of the paper. An abstract should give a **quick overview of the research paper**, allowing readers to decide if it will likely meet their needs and is worth their time to read the rest. Thus, an abstract is a highly crucial part of a research paper.
- Since there is a limitation of words, you should know how to describe your research concisely. You have no choice but to find a way to clearly summarize your paper in the fewest words possible.
- Although this is the first topic, **start writing the abstract once you have completed all the other parts of the research paper**. Then you will be able to give a much more accurate summary.

▪ **Introduction**

- This section can be structured as follows (If required, you can add more paragraphs):
 - First paragraph
 - ✓ Talk about the importance of measuring software complexity.
 - Second paragraph
 - ✓ Talk about the importance of using cognitive informatics for computing software complexity.
 - Third paragraph
 - ✓ Briefly discuss about the existing CCL object-oriented complexity measures and the surveys performed using them. Following is one way to start this paragraph:

A variety of cognitive code-level (CCL) object-oriented (OO) complexity measures have been proposed in the literature [1], [2], [3], [4]. In addition, a survey on existing CCL OO complexity measures can be found in [5].
 - ✓ Introduce the research topic
 - Fourth paragraph
 - ✓ Briefly discuss about the sections of the research paper.

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▪ Conclusion

- Conclusions are often the most difficult part to write, and many writers feel they have nothing left to say after having written the paper. However, you need to keep in mind that **most readers read the abstract and conclusion first**.
 - A conclusion is where you summarize the paper's findings and generalize their importance and recommend further research. An effective conclusion should provide closure for the research paper, leaving the reader feeling satisfied that the concepts have been fully explained.
 - Start this section by briefly restating the topic. Remind the reader why the article was written in the first place.
 - Then, briefly summarize the main points so that the reader is again reminded what was told in the body of the paper. You should be able to prove that your research is valuable. State your conclusions clearly and concisely. Be brief and stick to the point.
 - End this section by including a statement regarding further research. You could either write this statement by pointing out some important shortcomings of your work, which could be addressed by further researchers, or by indicating directions of further work.
 - **Do not** rewrite the abstract.
 - **Do not** introduce new arguments, evidence, new ideas, or information unrelated to the topic.
- You are free to decide on the **other topics** of the research paper. However, the following points **must be discussed** in the paper:
- An explanation of the measure that will be improved, including the factors that are currently being considered and how complexity is measured based on those factors.
 - The limitations of the measure that will be improved.
 - An explanation of how the limitations mentioned to the previous point can be overcome.
 - A brief explanation of the factors that could be considered by the improved complexity measure.
 - How the improved measure captures the complexity introduced by each factor discussed in the previous point.
 - The complexity calculation formula/equation of the improved complexity measure along with the meanings of the characters/symbols used in that.
 - Calculation of complexity for **two or more executable OO programs** using the improved complexity measure. You are free to decide on the number of LOCs of each program. An explanation of how complexity of each program was calculated should also be included.

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- The research paper should be written in your own words. **It must not include material directly copied from elsewhere** except where it is obviously presented as a ‘quote’. The ideas, information, data, diagrams, or tables taken from different sources must be acknowledged.

Note: Make sure to **list** the references under the **reference section** and to **cite** the references in the **body area** of the research paper. Number the reference items consecutively in square brackets (e.g. [1]). Examples of reference items for different categories are given below.

▪ **Example of a book:**

- [1]. S. M. Metev and V. P. Veiko, Laser Assisted Microtechnology, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.

▪ **Example of a book in a series:**

- [2]. J. Breckling, Ed., The Analysis of Directional Time Series: Applications to Wind Speed and Direction, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.

Example of a journal article:

- [3]. S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, “A novel ultrathin elevated channel low-temperature poly-Si TFT,” IEEE Electron Device Lett., 20 (8), pp. 569–571, Nov. 1999.

Example of a conference paper:

- [4]. M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, “High resolution fiber distributed measurements with coherent OFDR,” in Proc. ECOC’18, Germany, June 2018, pp. 109.

Example of a patent:

- [5]. R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, “High-speed digital-to-RF converter,” U.S. Patent 5 668 842, Sept. 16, 1997.

▪ **Example of a website:**

- [6]. (2002) The IEEE website. [Online]. Available: <http://www.ieee.org.htm>

▪ **Example of a web page:**

- [7]. M. Shell. (2002) IEEEtran homepage on CTAN. [Online]. Available: <http://www.ctan.org/tex-archive/macros/latex/contrib/supported/IEEEtran.htm> [Accessed: 6 July 2013]

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▪ Example of a databook as a manual:

[8]. FLEXChip Signal Processor (MC68175/D), Motorola, 1996.

▪ Example of a datasheet:

[9]. “PDCA12-70 data sheet,” Opto Speed SA, Mezzovico, Switzerland.

▪ Example of a master’s thesis:

[10]. Karnik, “Performance of TCP congestion control with rate feedback: TCP/ABR and rate adaptive TCP/IP,” M. Eng. thesis, Indian Institute of Science, Bangalore, India, Jan. 1999.

▪ Example of a technical report:

[11]. J. Padhye, V. Firoiu, and D. Towsley, “A stochastic model of TCP Reno congestion avoidance and control,” Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep. 99-02, 1999.

▪ Example of a standard:

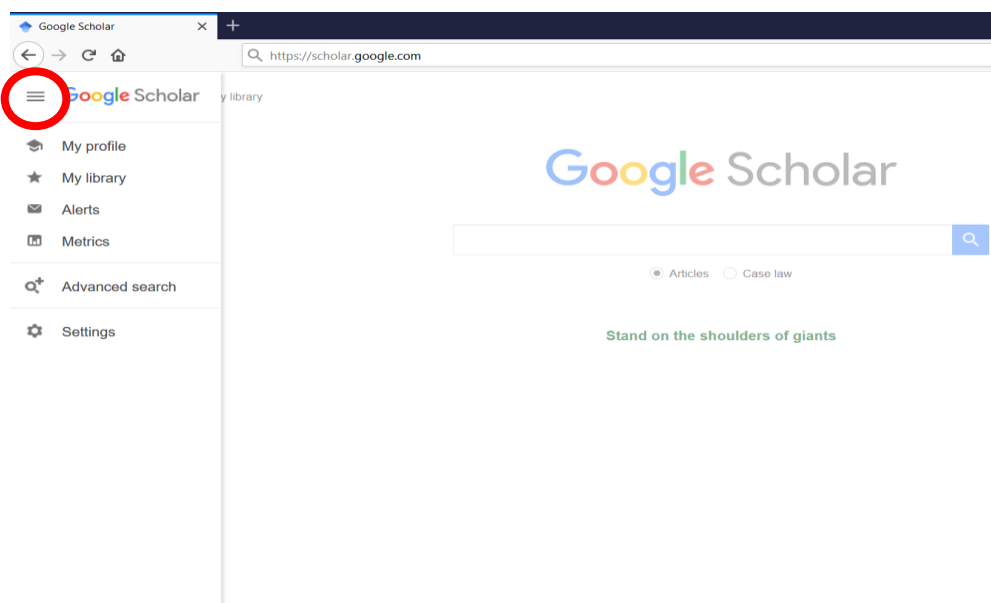
[12]. Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification, IEEE Std. 802.11, 1997.

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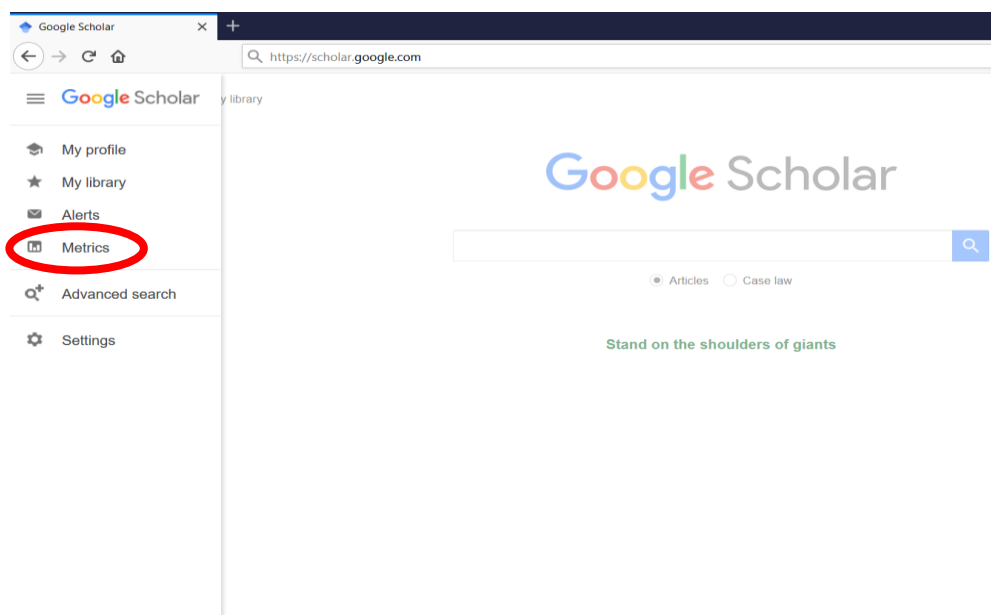
➤ Selection of a suitable conference or journal with a **h-index** can be done as follows:

▪ **Searching for a conference with a h5-index:**

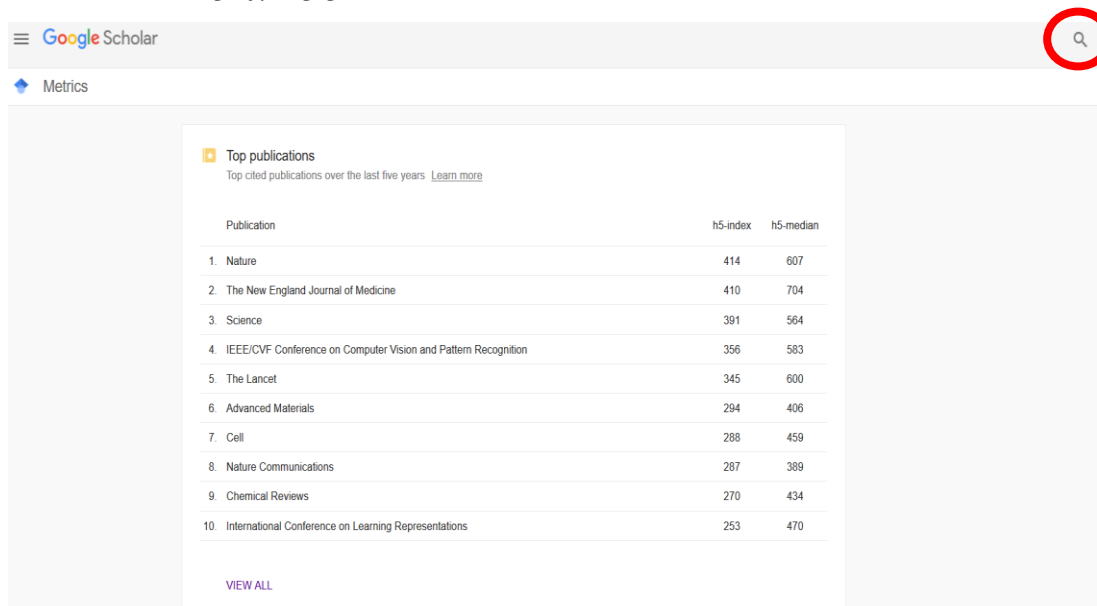
- Go to Google scholar (<https://scholar.google.com/>)
- Click on the 3 *horizontal bar* icon at the top left corner



- Click on Metrics



- Click on the *magnifying glass* icon



Google Scholar

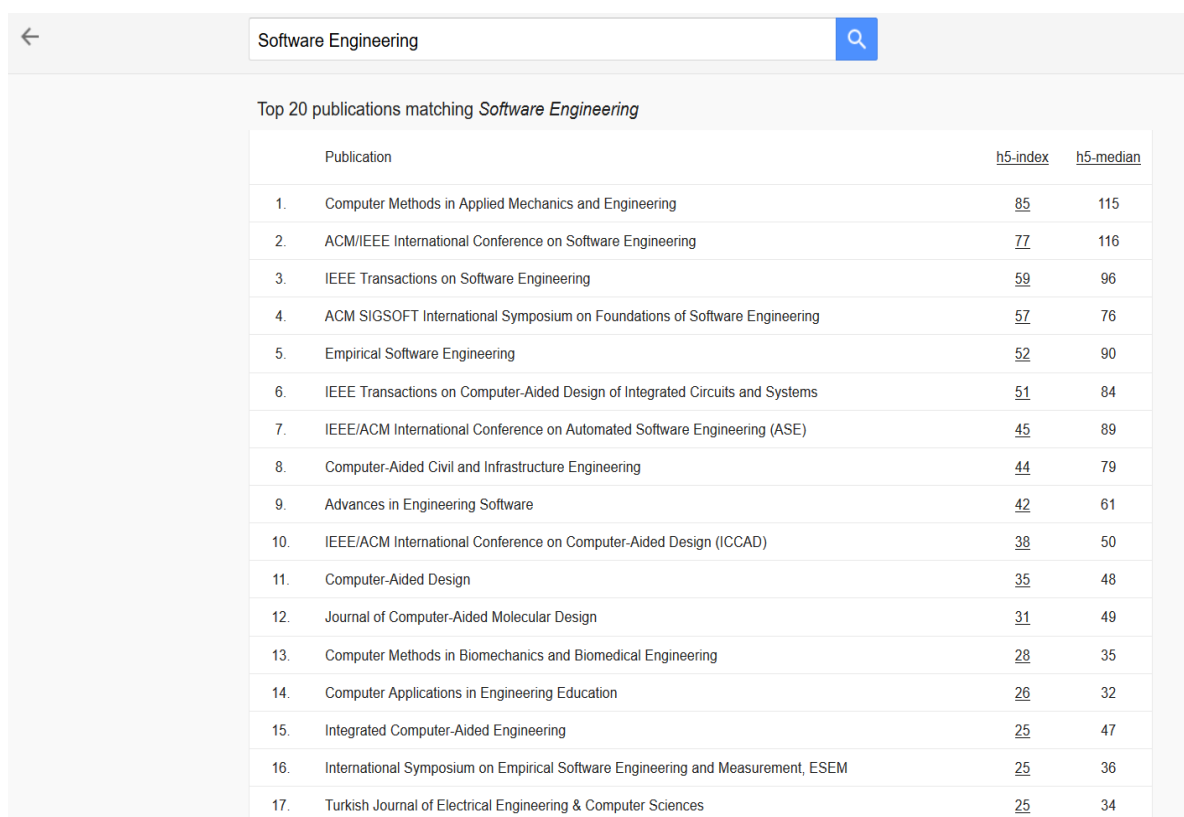
Metrics

Top publications
Top cited publications over the last five years [Learn more](#)

Publication	h5-index	h5-median
1. Nature	414	607
2. The New England Journal of Medicine	410	704
3. Science	391	564
4. IEEE/CVF Conference on Computer Vision and Pattern Recognition	356	583
5. The Lancet	345	600
6. Advanced Materials	294	406
7. Cell	288	459
8. Nature Communications	287	389
9. Chemical Reviews	270	434
10. International Conference on Learning Representations	253	470

[VIEW ALL](#)

- Search for a conference/journal by typing the name of a **research area** related to the paper:



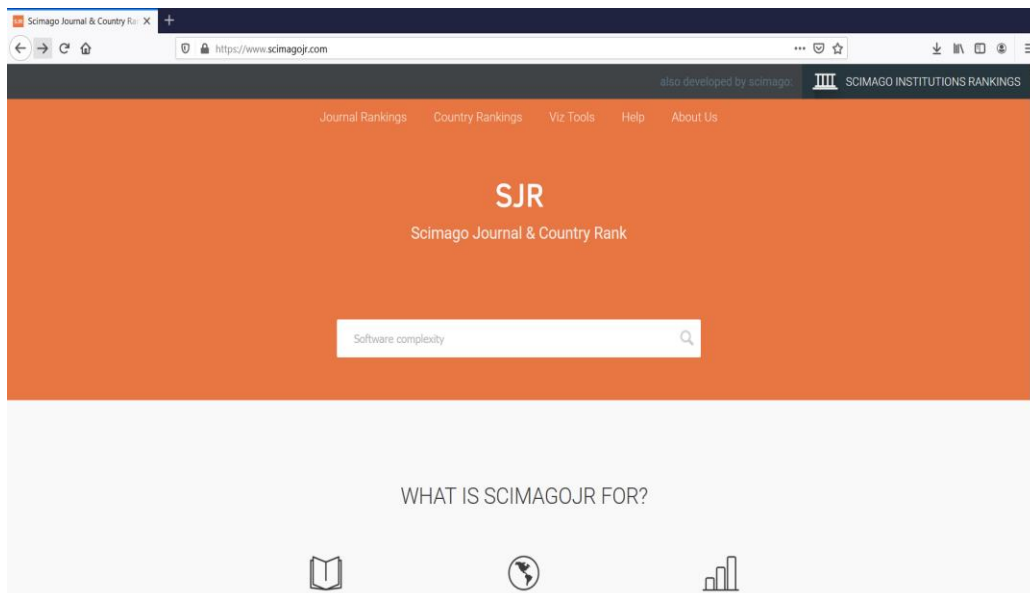
← Software Engineering

Top 20 publications matching *Software Engineering*

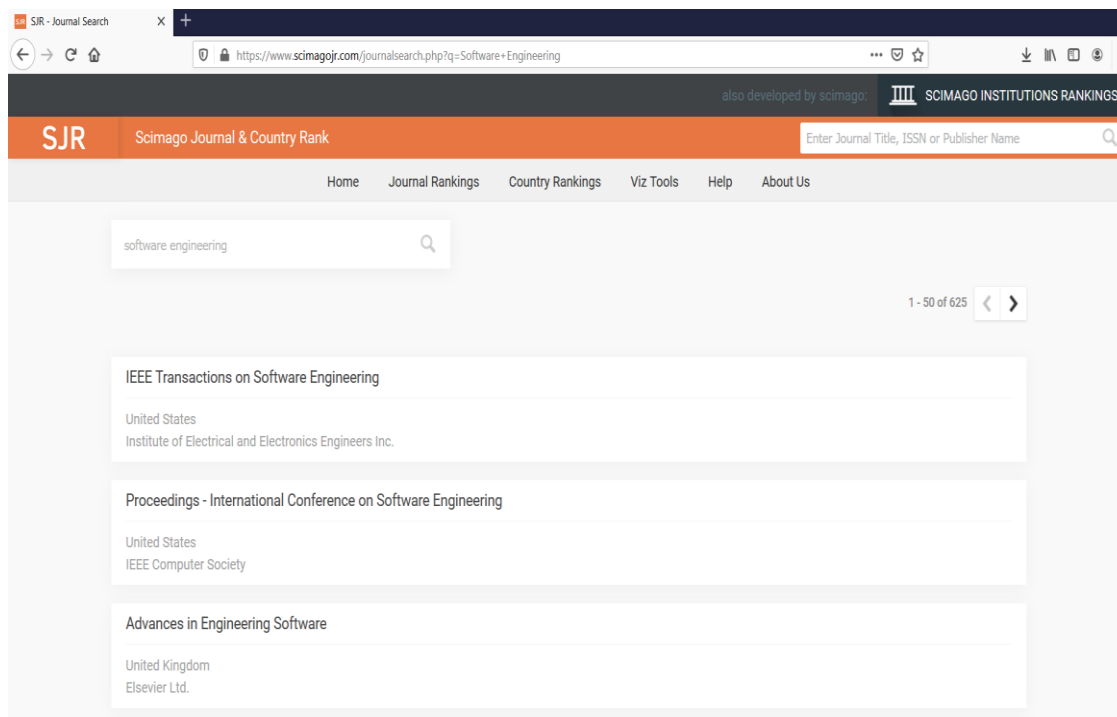
Publication	h5-index	h5-median
1. Computer Methods in Applied Mechanics and Engineering	85	115
2. ACM/IEEE International Conference on Software Engineering	77	116
3. IEEE Transactions on Software Engineering	59	96
4. ACM SIGSOFT International Symposium on Foundations of Software Engineering	57	76
5. Empirical Software Engineering	52	90
6. IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems	51	84
7. IEEE/ACM International Conference on Automated Software Engineering (ASE)	45	89
8. Computer-Aided Civil and Infrastructure Engineering	44	79
9. Advances in Engineering Software	42	61
10. IEEE/ACM International Conference on Computer-Aided Design (ICCAD)	38	50
11. Computer-Aided Design	35	48
12. Journal of Computer-Aided Molecular Design	31	49
13. Computer Methods in Biomechanics and Biomedical Engineering	28	35
14. Computer Applications in Engineering Education	26	32
15. Integrated Computer-Aided Engineering	25	47
16. International Symposium on Empirical Software Engineering and Measurement, ESEM	25	36
17. Turkish Journal of Electrical Engineering & Computer Sciences	25	34

▪ **Searching for a journal with a h-index:**

- Go to Scimago Journal Rankings (<https://www.scimagojr.com/>)



- Search for a journal by typing the name of a **research area** related to the paper:



Note: Once a research paper is submitted to a conference/journal, it would take a **minimum of 4 weeks** to receive the acceptance/rejection email. If the paper gets accepted to publish at a **conference**, it is **mandatory to present** it. However, it is **not required to present** a paper accepted to publish in a **journal**.

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Other Details

Weighting	The assignment is worth 30% of the overall marks for the unit																		
Deliverables	<ol style="list-style-type: none"> 1. A soft copy of the published/submitted paper in the form of a word document and pdf file. Rename the word document and pdf file as <REG/JUN>_<Group Number>_ Title of the paper 2. Acceptance letter 3. Confirmation of registration fee 4. Proof of H-index 																		
Due Date	16 th May 2022 11.30p.m																		
Contribution	All the group members are expected to make an equal contribution.																		
Method of submission	<ol style="list-style-type: none"> 1. Create a folder with the following format : <REG/JUN>_<Group Number> 2. Copy the following to the created folder: <ul style="list-style-type: none"> ▪ The two versions (word and pdf) of published/submitted paper ▪ Acceptance letter ▪ Confirmation of registration fee ▪ Proof of H-index 																		
Marks Allocation	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>H-Index</th><th>Marks</th></tr> </thead> <tbody> <tr> <td>$X > 30$</td><td>30</td></tr> <tr> <td>$24 \leq X \leq 30$</td><td>28</td></tr> <tr> <td>$17 \leq X \leq 23$</td><td>26</td></tr> <tr> <td>$12 \leq X \leq 16$</td><td>24</td></tr> <tr> <td>$7 \leq X \leq 11$</td><td>22</td></tr> <tr> <td>$4 \leq X \leq 6$</td><td>20</td></tr> <tr> <td>$1 \leq X \leq 3$</td><td>18</td></tr> <tr> <td>Publishing a paper in a conference/journal without an H-index</td><td>16</td></tr> </tbody> </table> <p>Note :</p> <ul style="list-style-type: none"> • X = H-index of the published conference/journal • The papers that get published in a conference/journal would be directly allocated marks, based on the above table, without any marking. • However, the papers that don't get published would be marked, and the maximum marks given for such research papers would be 15. 	H-Index	Marks	$X > 30$	30	$24 \leq X \leq 30$	28	$17 \leq X \leq 23$	26	$12 \leq X \leq 16$	24	$7 \leq X \leq 11$	22	$4 \leq X \leq 6$	20	$1 \leq X \leq 3$	18	Publishing a paper in a conference/journal without an H-index	16
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References

- [1]. D. S. Kushwaha and A. K. Misra, "Cognitive information complexity measure of object-oriented software – a practitioner's approach," in Proc. Fifth WSEAS International Conference on Software Engineering, Parallel and Distributed Systems, Madrid, Spain, Feb. 2006, pp. 174-179.
- [2]. S. Misra and K. I. Akman, "Weighted class complexity: a measure of complexity for object oriented system," Journal of Information Science and Engineering, vol. 24, no. 6, pp. 1689-1708, Nov. 2008.
- [3]. S. Misra, I Akman, and M Koyuncu, "An inheritance complexity metric for object-oriented code: a cognitive approach," Indian Academy of Sciences, vol. 36, no. 3, pp. 317-337, June 2011.
- [4]. D. I. De Silva, N. Kodagoda, S. R. Kodituwakku, A. J. Pinidiyaarachchi, "Enhancements to an OO Metric: CB Measure", Journal of Software, 13(1), pp. 72-81, January 2018.
- [5]. Dilshan I. De Silva, Saluka R. Kodituwakku, and Amalka J. Pinidiyaarachchi, "An Analytical Study of Cognitive Code-Level Object-Oriented Complexity Measures," International Journal of Computer Applications, vol. 183, no. 45, pp. 8-14, Dec. 2021.