

# Bibliography

- [1] Aabha Chaubey and Bani Bhattacharaya. “Learning Management System in Higher Education”. In: *IJSTE - International Journal of Science Technology & Engineering* | Volume 2 | Issue 3 | September 2015 ISSN (online): 2349-784X 2 (Sept. 2015), pp. 158–162.
- [2] Amy Antonio and David Tuffley. “YouTube a valuable education tool, not just cat videos”. In: *The Conversation* (Jan. 2015).
- [3] Kimkong Heng and Koemhong Sol. “Online learning during COVID-19: Key challenges and suggestions to enhance effectiveness”. In: (Dec. 2020).
- [4] Lokanath Mishra, Tushar Gupta, and Abha Shree. “Online teaching-learning in higher education during lockdown period of COVID-19 pandemic”. In: *International Journal of Educational Research Open* 1 (2020), p. 100012. ISSN: 2666-3740. DOI: <https://doi.org/10.1016/j.ijedro.2020.100012>. URL: <https://www.sciencedirect.com/science/article/pii/S2666374020300121>.
- [5] Suzanne Young, Helen Nichols, and Ashley Cartwright. “Does Lecture Format Matter? Exploring Student Preferences in Higher Education”. In: *Journal of Perspectives in Applied Academic Practice* 8.1 (2020), pp. 30–40. DOI: 10.14297/jpaap.v8i1.406. URL: [https://www.researchgate.net/publication/344062295\\_Does\\_Lecture\\_Format\\_Matter\\_Exploring\\_Student\\_Preferences\\_in\\_Higher\\_Education](https://www.researchgate.net/publication/344062295_Does_Lecture_Format_Matter_Exploring_Student_Preferences_in_Higher_Education).
- [6] R. Benjamin Hollis and Christopher A. Was. “Mind wandering, control failures, and social media distractions in online learning”. In: *Learning and Instruction* 42 (2016), pp. 104–112. ISSN: 0959-4752. DOI: 10.1016/j.learninstruc.2016.01.007. URL: <https://doi.org/10.1016/j.learninstruc.2016.01.007>.

- [7] Erol Ozcelik et al. "An eye-tracking study of how color coding affects multimedia learning". In: *Computers & Education* 53.2 (2009), pp. 445–453. ISSN: 0360-1315. DOI: 10.1016/j.compedu.2009.03.002. URL: <https://www.sciencedirect.com/science/article/pii/S0360131509000712>.
- [8] Anthony Picciano and Jeff Seaman. "K-12 online learning: A survey of U.S. School district administrators". In: *Online Learning* 11 (Jan. 2007). DOI: 10.24059/olj.v11i3.1719.
- [9] Daniel Onah, Jane Sinclair, and R Boyatt. "Dropout Rates of Massive Open Online Courses: Behavioural Patterns". In: July 2014. DOI: 10.13140/RG.2.1.2402.0009.
- [10] Indira Dhull and Sakshi Arora. "Online Learning". In: 3 (May 2019), pp. 32–34.
- [11] Pauline Muljana and Tian Luo. "Factors Contributing to Student Retention in Online Learning and Recommended Strategies for Improvement: A Systematic Literature Review". In: *Journal of Information Technology Education: Research* 18 (Jan. 2019), pp. 19–57. DOI: 10.28945/4182.
- [12] Scott A. Jensen. "In-Class Versus Online Video Lectures: Similar Learning Outcomes, but a Preference for In-Class". In: *Teaching of Psychology* 38.4 (2011), pp. 298–302. DOI: 10.1177/0098628311421336. URL: <https://doi.org/10.1177/0098628311421336>.
- [13] Dimitrios Vlachopoulos. "COVID-19: Threat or opportunity for online education?" In: *Higher Learning Research Communication* 10.1 (2020), pp. 16–19. DOI: 10.18870/hlrc.v10i1.1179. URL: [https://www.researchgate.net/publication/342127177\\_COVID-19\\_Threat\\_or\\_Opportunity\\_for\\_Online\\_Education](https://www.researchgate.net/publication/342127177_COVID-19_Threat_or_Opportunity_for_Online_Education).
- [14] Sonja Folker, Helge Ritter, and Lorenz Sichelschmidt. "Processing and integrating multimodal material—the influence of color-coding". In: *Proceedings of the annual meeting of the Cognitive Science Society*. Vol. 27. 27. 2005.
- [15] Tanja Keller et al. "Information visualizations for knowledge acquisition: The impact of dimensionality and color coding". In: *Computers in Human Behavior* 22.1 (2006). Instructional Design for Effective and Enjoyable Computer-Supported Learning, pp. 43–65. ISSN: 0747-5632. DOI: 10.1016/j.chb.2005.01.006. URL: <https://www.sciencedirect.com/science/article/pii/S074756320500006>.

//www.sciencedirect.com/science/article/pii/S0747563205000105.

- [16] Patricia Deubel. “An investigation of behaviorist and cognitive approaches to instructional multimedia design”. In: *Journal of educational multimedia and hypermedia* 12.1 (2003), pp. 63–90.
- [17] Rick T Richardson, Tara L Drexler, and Donna M Delparte. “Color and contrast in E-Learning design: A review of the literature and recommendations for instructional designers and web developers”. In: *MERLOT Journal of Online Learning and Teaching* 10.4 (2014), pp. 657–670.
- [18] Pramodini Punde, Mukti Jadhav, and Ramesh Manza. “A study of eye tracking technology and its applications”. In: Oct. 2017, pp. 86–90. DOI: 10.1109/ICISIM.2017.8122153.
- [19] João Antunes and Pedro Santana. “A Study on the Use of Eye Tracking to Adapt Gameplay and Procedural Content Generation in First-Person Shooter Games”. In: *Multimodal Technologies and Interaction* 2.2 (May 2018), p. 23. ISSN: 2414-4088. DOI: 10.3390/mti2020023. URL: <http://dx.doi.org/10.3390/mti2020023>.
- [20] Oleg Špakov and Darius Miniutas. “Visualization of eye gaze data using heat maps”. In: *ELEKTRONIKA IR ELEKTROTECHNIKA MEDICINE TECHNOLOGY* 115 (Jan. 2007). URL: [https://www.researchgate.net/publication/228354465\\_Visualization\\_of\\_eye\\_gaze\\_data\\_using\\_heat\\_maps](https://www.researchgate.net/publication/228354465_Visualization_of_eye_gaze_data_using_heat_maps).
- [21] Teresa Busjahn et al. “Eye Tracking in Computing Education”. In: *Proceedings of the Tenth Annual Conference on International Computing Education Research*. ICER ’14. Glasgow, Scotland, United Kingdom: Association for Computing Machinery, 2014, pp. 3–10. ISBN: 9781450327558. DOI: 10.1145/2632320.2632344. URL: <https://doi.org/10.1145/2632320.2632344>.
- [22] Philip J. Guo, Juho Kim, and Rob Rubin. “How Video Production Affects Student Engagement: An Empirical Study of MOOC Videos”. In: *Proceedings of the First ACM Conference on Learning @ Scale Conference*. L@S ’14. Atlanta, Georgia, USA: Association for Computing Machinery, 2014, pp. 41–50. ISBN: 9781450326698. DOI: 10.1145/2556325.2566239. URL: <https://doi.org/10.1145/2556325.2566239>.

- [23] Oluwakemi Olurinola and Omoniyi Tayo. “Colour in Learning: Its Effect on the Retention Rate of Graduate Students.” In: *Journal of Education and Practice* 6.14 (2015), pp. 1–5.
- [24] Quyin Fan. “The Effects of Beacons, Comments, and Tasks on Program Comprehension Process in Software Maintenance”. AAI3422807. PhD thesis. USA, 2010. ISBN: 9781124226545.
- [25] Marta Koć-Januchta et al. “Visualizers versus verbalizers: Effects of cognitive style on learning with texts and pictures – An eye-tracking study”. In: *Computers in Human Behavior* 68 (2017), pp. 170–179. ISSN: 0747-5632. DOI: <https://doi.org/10.1016/j.chb.2016.11.028>. URL: <https://www.sciencedirect.com/science/article/pii/S0747563216307695>.
- [26] Ana Isabel Molina et al. “Evaluating multimedia learning materials in primary education using eye tracking”. In: *Computer Standards Interfaces* 59 (2018), pp. 45–60. ISSN: 0920-5489. DOI: <https://doi.org/10.1016/j.csi.2018.02.004>. URL: <https://www.sciencedirect.com/science/article/pii/S0920548917303392>.
- [27] Meng-Lung Lai et al. “A review of using eye-tracking technology in exploring learning from 2000 to 2012”. In: *Educational Research Review* 10 (2013), pp. 90–115. ISSN: 1747-938X. DOI: <https://doi.org/10.1016/j.edurev.2013.10.001>. URL: <https://www.sciencedirect.com/science/article/pii/S1747938X13000316>.

# Appendix A

## Presentations

Each group was shown every other section in colour and the other in black and white. Images 1-11 are part of the first section, 12-16 the second, 17 is the third section and 18 is the fourth section.

### A.1 Group A

Group A were shown sections 1 & 3 in colour.

**The Rope Data structure**

A **rope** is a binary tree where each leaf node holds a string and the length of that string. All other nodes in the rope contain the sum of the length (or weight) of strings in the leaf nodes of its left sub-tree.

In comparison to a monolithic array string (stored in an array) the **rope** implementation allows for faster **Concatenation**, **Insertion** and **Deletion** all which can be performed in  $O(\log n)$  time, instead of  $O(n)$  which is the case for monolithic arrays. However some operations such as **Index** and **Split**, take longer time in a **rope**, namely  $O(\log n)$  in comparison to  $O(1)$  in the monolithic array implementation.

**Example:**  
The string "Hello\_World!" can be stored in a rope as shown in the image to the right. **Node A** has weight **5**, as its left sub-tree contains the two leaf nodes **B** and **C** with weights **2** and **3** respectively.

120 seconds

Fig. A.A.1 Image number 1 shown to group A.