

**UCSC Research Quota - 2024**

**University of Colombo School of Computing**

**Progress Report for Research Projects conducted under UCSC Research Quota in 2024.**

| 1. **Name of the Research Group:** |
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| Interdisciplinary Molecular Communication & Sensing (IMCS) Research Group |
| 1. **Principle Investigator (PI)** |

| Dr. Asanka P. Sayakkara |
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| 1. **Research Team Member(s)** |
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| 1. Mr. Kenneth Thilakarathna 2. Dr. Randil Pushpananda 3. Dr. Lasanthi De Silva 4. Dr. Kasun Karunanayake 5. Dr. Chamath Keppitiyagama 6. Dr. Chaminda Ranasinghe 7. Ms. Gayathri Purage |
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| 1. **Title(s) of the Projects Conducted** |
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| Prototyping Platform for Molecular Communications (MC) Research |
| 1. **Research Interns Employed for 2024** |
| N/A |
| 1. **Research Assistants Employed for 2024** |

| Ms. S. A. V. S. Piyathilake |
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| 1. **Summary of Progress for 2024** |
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| The study makes initial strides toward addressing the limitations of traditional electromagnetic-based communication, which is often unsuitable in environments requiring strict electromagnetic interference control, such as covert operations, medical facilities, and sensitive research settings. Recognizing the potential of molecular communication (MC) as an alternative, the research seeks to overcome the existing challenges of high-cost, specialized equipment and complex chemical setups that have previously limited accessibility for broader research in MC.  A key development of this study is the implementation of a low-cost, user-friendly research platform designed to facilitate rapid prototyping and experimentation in MC. The platform leverages readily available chemical agents like Ethanol and Thinner for signal transmission, along with off-the-shelf gas sensors for reception, making it accessible for researchers without requiring extensive expertise in specialized hardware or embedded systems.  To evaluate the platform's effectiveness, a series of experiments were conducted, analyzing how sensors respond to chemical diffusion under various conditions. These experiments validated the platform’s capability to establish a reliable MC channel using wireless diffusion between computers. Progress continued with the successful demonstration of binary data transmission through chemical diffusion, followed by an enhanced test using Hamming-encoded ASCII data transmission to improve accuracy.  The results confirmed the successful reception of transmitted bit patterns across different distances and environmental settings, simulating realistic conditions by allowing free diffusion at room temperature. This foundational tool thus enables further exploration in molecular data communication. |
| 1. **Outcomes/ Deliverables (e.g.: Conference or Journal Publications)** |
| Publication Details;   * 1. **Conference**   Title of Paper/Poster (please attach a copy of the paper and acceptance letter):  A Low-Cost, Off-the-Shelf Prototyping Platform for Molecular Communications Research  …..………………………………………………………………………  Title of Conference~~:~~  17th International Conference on Signal Processing and Communication Systems  ………………………………………………………………….……….  URL of Conference  <https://icspcs2024.io.pbs.edu.pl/>  …………………………………………………………………..………  Conference Venue:  Place: Hilton Surfers Paradise Hotel & Residences  City: Queensland  Country: Australia |
| * 1. **Journal**  | ISSN: | ……………………………………… | | --- | --- | | Publisher Name: | ………………………………………. | | Publishers Address: | ……………………………………… | | URL: | ……………………………………… | | Vol. No | ……………………………………… | | Issue No. | ……………………………………… | | Pages: | ……………………………………… | | Is the Journal a Web of Science Indexed?: | **Yes No**  **If yes, please attach the evidence: (e.g;** [**http://mjl.clarivate.com/**](http://mjl.clarivate.com/)**)** |   other indexing of the journal (e.g Scopus): …………………………………… |
| 1. **Awards/ Patents (If any)** |
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| 1. **Total expenses as at 31.12.2024** |
| | **Approved amount (Rs.)** | **Utilized amount (Rs.)** | | --- | --- | |  |  |   I hereby declare that the details furnished above are true and correct to the best of my/ our knowledge.   | **Name of the principal investigator** | **Signature** | **Date** | | --- | --- | --- | | Dr. Asanka P. Sayakkara |  |  | |