

Ray A. O. Sinurat (Ray Andrew)

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Research Interests

Distributed & Storage Systems (improving reliability, scalability and performance)
Machine Learning for Systems (applying ML to improve scalability in the clusters)

Education

- 2021 – 2026 **University of Chicago** – Chicago, IL, USA
Ph.D. in Computer Science
Advisors: Professor Haryadi S. Gunawi and Sandeep S. Maddireddy
- 2015 – 2019 **Institut Teknologi Bandung** – Bandung, Indonesia
B.S. in Computer Science
Advisors: Achmad I. Kistijantoro, Ph.D. and Dr. Eng. Ayu Purwarianti

Employments

- 2021 – Present **Research Assistant at University of Chicago** – Chicago, IL, USA
- Current project: **Drift Mitigation and Storage Optimization** in collaboration with Argonne National Laboratory. Improving the usage optimization of storage systems using an ML-based approach and adapting to drift in production systems.
 - Past project: **LIBROS** (published in **IEEE Cloud '22**), an ecosystem of tail-latency mitigation with supports from library, runtime, and operating system layers. **LIBROS** is able to **improve multi-storage applications speed by 5-70%**, starting at 90th percentile
- Summer 2023 **Research Aide at Argonne National Laboratory** – Lemont, IL, USA
- Bootstrapped project with an aim to improve order robustness of continual learning in several datasets
 - Researched about continual learning and its usability in computer systems
- 2019 – 2021 **Remote Research Assistant at GIK Lab** – Bandung, Indonesia
- Remote mentorship program in collaboration with the Computer Systems group at **University of Chicago**
 - Studied system-related bugs, such as **scalability, distributed concurrency and cascading failure**, focusing specifically on **scalability bugs**
 - Researched how **Java Virtual Machines (JVMs) can share memory to reduce memory usage**, especially in a virtualized environment, using **Linux system calls** such as mmap and madvise
 - Implemented **predictive model for Garbage Collection (GC) Time using live and dead objects** from OpenJDK8 ParallelGC algorithm to **reduce tail latencies**
- 2019 – 2021 **CS Researcher at Emmerich Research Center** – Jakarta, Indonesia
- Implemented **Fungi Processing Automation Systems for Leather Production**, such as: **Automated Tending Machine** and **Contamination Detection**
 - Researched **Black Soldier Fly's lifecycle**, a popular biomass for alternative protein, using **Deep Learning** approach

- 2018 **Software Engineer Intern** at **Dekoruma** – Jakarta, Indonesia
- Developed **Mobile Web Marketplace**, such as **Product Details and After Order**, using **React JS and React Native Web**
 - Implemented company’s **new React infrastructure** by developing **Server Side Rendering with Code Splitting Strategy** (accessible through NodeJS library **Centarius**)
 - Developed **novel modal implementation for React Native** (accessible through NodeJS library **Modal React Native Web**)

Publications

- Anonymous Author(s). **FlashNet: Cutting Storage Tail Latency with Machine Learning Engineered on Extensible Data-Science Framework**. *In Preparation*.
 - Anonymous Author(s). **Concept Drift Detection with Large Language Models**. *Near Submission*.
- Manuscript Ready Yuyang Huang*, **Ray A. O. Sinurat***, Nanqinqin Li, Mark Powers, Michael Sherman, Kate Keahey, Haryadi S. Gunawi. **STORREP: Storage Research Experiment Patterns on Chameleon Cloud and Trovi**. 2023.
- ML for Systems’22 **Ray A. O. Sinurat**, Anurag Daram, Haryadi S. Gunawi, Robert B. Ross, Sandeep Madireddy. **Towards Continually Learning Application Performance Models**. *Workshop on ML for Systems at NeurIPS, 2022*.
- IEEE CLOUD’22 Meng Wang, Cesar A. Stuardo, Daniar H. Kurniawan, **Ray A. O. Sinurat**, and Haryadi S. Gunawi. **Layered and Uniform Contention Mitigation Capabilities for Cloud Storage**. *In the Proceedings of the 15th IEEE International Conference On Cloud Computing, 2022*.
- UChicago TR’20 Daniar H. Kurniawan, Cesar A. Stuardo, **Ray A. O. Sinurat**, and Haryadi S. Gunawi. **Notification and Prediction of Heap Management Pauses in Managed Languages for Latency Stable Systems**. *In The University of Chicago Technical Report, 2020*.

Posters

- ML for Systems’22 **Ray A. O. Sinurat**, Anurag Daram, Haryadi S. Gunawi, Robert B. Ross, Sandeep Madireddy. **Towards Continually Learning Application Performance Models**. *Workshop on ML for Systems at NeurIPS, 2022*.

Projects

- CLUSTEROPTIM Detecting performance changes and optimize clusters utilization.
- LIBROS **[IEEE CLOUD’22]** Implementing Java GC predictor to give delay prediction that is then used as cancellation mechanisms for reducing tail-latencies.
- Bug Study Studying and analyzing scalability bugs in numerous distributed systems, such as Hadoop, HBase, Cassandra, ZooKeeper, Spark, HDFS, Flume, and Storm.
- Indonesian Image Captioning Preparing the first Indonesian dataset captions and implementing the first deep-learning based Indonesian automated image captioning using Semantic Compositional Networks in partnership with Prosa AI and Microsoft Indonesia.

Teaching Assistantship

- Win 24 CMSC 144: Systems Programming II (University of Chicago)
- Aut 21, (Aut, Spr) 23 CMSC 230: Operating Systems (University of Chicago)
- Aut 22 CMSC 154: Introduction to Computer Systems (University of Chicago)
- 2018 IF 3140: Database Management (Institut Teknologi Bandung)
- 2017 IF 2240: Databases (Institut Teknologi Bandung)

*The authors contribute an equal amount of work and are sorted alphabetically based on their last names.

Student Mentorship

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| 2023- Summer 2023 | William Nixon (CS Undergrad at Institut Teknologi Bandung) |
| 2022-2023 | Jax Alemu (Wylie High School, Texas; DSI Summer Lab Research Assistant) |
| 2021-2022 | Kangrui Wang (Master of CS at University of Chicago) |
| | Nathanael Timothy (B.Eng. in Electrical Engineering at Universitas Pelita Harapan Jakarta) |

Awards

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| 2023 | FAST '23 Travel Awards |
| 2021 | Crerar Fellowship (University of Chicago) <i>Identified as one of the strongest Ph.D. applicants.</i> |

Skills

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| AI | PyTorch, Keras, Tensorflow |
| Testbed | Emulab, Chameleon Cloud |
| Systems | Hacking Cassandra, Hadoop, Kafka, HBase Using ZooKeeper, HDFS, Kafka, Cassandra, MongoDB, MapReduce |
| Runtime | Hacking JVM (Hotspot, Garbage Collection, JNI Agent) |
| OS | Hacking LINUX KERNEL |
| PL | C, C++, Python, Java, [Type/Java]script, C#, PHP, Bash |
| Cloud | Google Cloud, AWS, Microsoft Azure, Heroku, DigitalOcean |
| Database | MongoDB, MySQL, PostgreSQL, Google Firebase, RethinkDB, SQLite, Redis |
| Search Engine | Algolia, Meilisearch, RediSearch |
| IOT | Arduino, Raspberry Pi |
| IaC & PaaS | Hashicorp Terraform, Docker, Docker Compose |

References

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| Haryadi S. Gunawi (Ph.D. Advisor) Associate Professor, Computer Science Department, University of Chicago |
| Sandeep Madireddy Assistant Computer Scientist, Mathematics and Computer Science Division, Argonne National Laboratory |
| Cesar A. Stuardo Network System Engineer, ByteDance |