Kristina P. Sinaga

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SUMMARY

I earned my PhD in Applied Mathematics, in June 2020. I am passionate about developing intelligent pattern recognition algorithms, especially for single and multi-view learning. I have a proven publication track record of success in this area and am proficient in designing and analyzing algorithms for mathematical optimization and unsupervised machine learning algorithms such as modeling for complex design, curse of dimensionality problems, and developing clustering algorithms in non-federated and federated environments. To test my proposed algorithms on large dataset, mostly I used programming tools like Matlab and Python. In November 2020, I moved back to Indonesia for teaching in information systems management department, BINUS (Bina Nusantara) university. In March 2023, I moved back to Taiwan for a postdoc in the Department of applied mathematics, CYCU (Chung Yuan Christian University). Apart of work, I like to go for a walk, bike, hike, and cook. I typically refer to myself as an autodidact and observational learning (based on past experiences, as a beginner or the youngest member in the group, I was learning by observing specifically in a team environment).

PROFESSIONAL EXPERIENCE

Post-doctorate Fellow
Department of Applied Mathematics, CYCU, Taiwan **Mar. 2023 – Mar. 2024**

- Primarily works in an office environment and working from home using personal PC for much of the day.
- Work independently and weekly meeting with PI to discuss a new idea or new accomplishment related to the research works.
- Proposed a new objective function of soft and hard clustering to address multiple resources, clients or users data.
- Designed new algorithms of multi-view k-means (MVKM) and multi-view fuzzy c-means (MVFCM) in non-federated and federated environments.
- Provided (Matlab) codes for the problems of multiple resources and multiple clients or users data.
- Conducted experiment/simulation on different publicly available multi-view data sets and interpret the results.
- Wrote academic papers that implemented a soft or hard clustering algorithm to assure efficiency, repeatability, and standardization in the use of multiple-resources data over multiple clients or users.
- Served as a reviewer of IEEE Access.

Lecturer Specialist - S3
Information Systems Management Department, **Nov. 2020 – Mar. 2022**
BINUS Graduate Program, Indonesia

- Primarily works in an office environment and working from home (WFH) using personal PC for much of the day (Attending meeting and class online/virtually).
- Work in a team or work independently.
- Actively doing research and publications.

- Updating course' materials in the dashboard (for both regular and online of undergraduate program of computer science and master management system information).
- Created or modified or reviewed a syllabus of business intelligence and analytics' course.
- Teaching Undergraduate (Computer science) and graduate students in regular and online program (Master of information management system).
- Providing and grading undergraduate and graduate students examinations and their other assessment items.
- Supervised graduated students to participate in the International conferences.
- Perform as a consultant to present machine learning/deep learning methods to the state electricity company, West Jakarta, Indonesia (in Bahasa: Perusahaan Listrik Negara (PLN)).
- Created, provided, and presented module to serve communities in Indonesian society, specifically in the region of west Jakarta, Indonesia.
- Participated in some university' activities as a lecturer.
- Participated in some seminars inside or outside university for self development purposes.
- Moderating guess lecturer events [2020-2021].
- Served as a board member of international conference (not remember the organization/conference name).
- Served as a reviewer of Applied Soft Computing (Elsevier), Information Fusion (Elsevier), IEEE Access, IEEE TKDE, WCCI2022, and IJCNN2023.

Staff (Badge: Supervisor)
BINUS University, Indonesia **Nov. 2020 – Mar. 2022**

- Work in a team or work independently.
- Primarily works in an office environment and working from home (WFH) using personal PC for much of the day.
- Attending a bunch of meeting (mostly participated by some senior level and important staffs).
- Participating in event meetings and other staff meetings.
- Create all close-out reports related to the meetings such as summary of evaluations and finalized event reports.
- Take responsibilities as a person in charge (PIC) for some duties in order to improve the accreditation of master of management system information, BINUS university, Indonesia.
- Extensively multitasking ability to manage many items in various stages at the same time.
- Inviting a guest lecturer for graduate events in Business intelligence and analytics' course.
- Communicating with guest lecturer about event information and emailing link.
- Satisfied the needs of others in a fast paced environment, including fellow colleagues, management, and guests.

EDUCATION

Doctor of Philosophy, Applied Mathematics
Chung Yuan Christian University (CYCU), Taiwan 2020
Thesis title: *Multi-view fuzzy clustering algorithms for multi-view data*
Thesis' PPT: *Click here*
CGPA: 3.842 out of 4.000

Master of Science, Mathematics in Operation Research
University of Sumatera Utara (USU), Indonesia 2015
CGPA: 3.78 out of 4.000

Bachelor of Science, Mathematics in Statistics
University of Sumatera Utara (USU), Indonesia 2013
CGPA: 3.30 out of 4.000

RESEARCH SUMMARY

Research Interests

- Clustering: I work on developing k-means and fuzzy c-means (FCM) algorithms for addressing single and multi-view data. I occasionally build a new developed clustering algorithm based on the new objectives of mathematics formulation. Prior to that, I also provided and publicly shared the codes of my proposed algorithms on my GitHub page. Most recently, I am leveraging my research interests into graph clustering, manifold regularizations, and kernel-based approaches to separate data points into different clusters.
- Pattern Recognition: I work on clustering-based algorithms such as k-means and FCM for dimensionality reduction. I facilitate the principal analysis of un-wanted, less likely, and relevant features phenomena on single and multi-view data. Specifically, I create a collaborative approach to select informative features with single/multi-view features representation and unsupervised learning. In such a way, the implementation of this feature selection-based dimension reduction technique can effectively provide the optimal number of clusters k but also significantly improve the accuracies.
- Federated Learning: Currently, I work on federated learning (FL), developed and designed conventional multi-view clustering algorithms into parallel algorithms for mathematical optimization of recognizing data pattern from multiple clients' multi-view data. Unlike my previous works on non-federated unsupervised machine learning techniques, in this topic, I organized, brought creative/innovative perspectives by proposing new algorithmic approaches to address multiple clients' multi-view data with privacy and effective communication concerns.

Research Activity

Total refereed papers:	5
Total books / book chapters:	0 / 2
Journals reviewed for:	0
Conference / workshop chairs:	4 / 0

PUBLICATIONS

According to Google Scholar Citations, my h-index is **5** and I have **1,447** citations.

My top cited publications (with over 100 citations) are: "Unsupervised k-means clustering algorithm" (with over 1,212 citations); "A feature-reduction multi-view k-means clustering algorithm" (cited by 112). My top second cited publications (with over 20 citations) are: "Collaborative feature-weighted multi-view fuzzy c-means clustering" (cited by 39); "Entropy k-means clustering with feature reduction under unknown number of clusters" (cited by 31). My top third cited publications are: "Poverty data modeling in North Sumatera Province using geographically weighted regression (GWR) method (cited by 7)"; "Modified relational mountain clustering method (cited by 3)", "Spatial variation in infant mortality with geographically weighted poisson regression (GWPR) approach (cited by 3)"; "Machine learning approaches for marketing campaign in Portuguese banks (cited by 2)"; "Unsupervised multi-view fuzzy c-means clustering algorithm (cited by 1)".

Hussain, Ishtiaq, **Sinaga, Kristina P**, and Yang, Miin-Shen (2023). Unsupervised multi-view fuzzy c-means clustering algorithm. *Electronics*, *12*, 4467.

Yang, Miin-Shen and **Sinaga, Kristina P** (2021). Collaborative feature-weighted multi-view fuzzy c-means clustering. *Pattern Recognition*, *119*, 108064.

Sinaga, Kristina P, Hussain, Ishtiaq, and Yang, Miin-Shen (2021). Entropy k-means clustering with feature reduction under unknown number of clusters. *IEEE Access*, *9*, 67736–67751.

D. Yuniati and **Sinaga, Kristina P**(2021). Analytics-based on classification and clustering methods for local community empowerment in Indonesia. *(eds) Soft Computing in Data Science, SCDS 2021*, *Communication in Computer and Information Science*, *vol. 1489*, Springer, Singapore.

A. Jennifer and **Sinaga, Kristina P**(2021). Machine learning approaches for marketing campaign in Portuguese banks. *2021 3rd International Conference on Cybernetics and Intelligent System (ICORIS)*, Makasar, Indonesia, 1–6.

W. Henwy and **Sinaga, Kristina P**(2021). Telecommunication analytics based on customer segmentation using unsupervised algorithms. *2021 3rd International Conference on Cybernetics and Intelligent System (ICORIS)*, Makasar, Indonesia, 1–6.

Sinaga, Kristina P and and Yang, Miin-Shen (2020). Unsupervised k-means clustering algorithm. *IEEE Access*, *8*, 80716–80727.

Yang, Miin-Shen and **Sinaga, Kristina P** (2019). A feature-reduction multi-view k-means clustering algorithm. *IEEE Access*, *7*, 114472–114486.

Sinaga, Kristina P, Benjamin, J.B.M., and Yang, Miin-Shen (2018). Modified relational mountain clustering method. *Artificial Intelligence and Soft Computing: 17th International Conference, ICAISC 2018*, Zakopane, Poland, June 3-7, *Part I 17*, 690–701.

Sinaga, Kristina P and Hutahaean, Manuntun and Gea, Petrus (2016). Spatial Variation in Infant Mortality with Geographically Weighted Poisson Regression (GWPR) Approach. *International Journal of Science and Research*, *5*(3), 96–100.

Sinaga, Kristina P(2015). Poverty Data Modeling in North Sumatera Province Using Geographically Weighted Regression (GWR) Method. *International Journal of Science and Research*, *4*(2), 1738–1742.

IN MANUSCRIPT

Yang, Miin-Shen and **Sinaga, Kristina P** (2024). Federated multi-view k-means clustering.

Yang, Miin-Shen and **Sinaga, Kristina P** (2024). Federated weighted multi-view fuzzy c-means.

Sinaga, Kristina P and Yang, Miin-Shen (2024). A globally collaborative multi-view k-means clustering.

Sinaga, Kristina P (2024). Rectified Gaussian kernel multi-view k-means clustering.

Yang, Miin-Shen, Josephine. B.M. Benjamin, **Sinaga, Kristina P** (2024). A survey of soft clustering.

Sinaga, Kristina P (2024). Personalized federated learning under collaborative multi-view k-means clustering.

Sinaga, Kristina P (2024). Tensor k-means clustering algorithm.

Sinaga, Kristina P (). etc...

HONORS & AWARDS

Honorary Member
The Phi Tau Phi Scholastic Honor Society of The Republic of China, CYCU, Taiwan 2020

Recipient
Japan Science and Technology Agency (JST), Niigata University, Japan 2018

Recipient
Japan Student Service Organization (JASSO), Niigata University, Japan 2017

Recipient
CYCU International Student Scholarship, CYCU, Taiwan 2016

PROFESSIONAL ACTIVITIES

Journals Reviews

- Information Fusion, Elsevier (2022 – 2023).
- IEEE Access (2021 –2023)
- Applied Soft Computing, Elsevier (2022).
- IEEE TKDE (2022)

Conference Reviews

- IJCNN2023.
- WCCI2022.

TEACHING EXPERIENCE

In my modules, I have taught over 80 undergraduate students, and over 100 graduate students (regular and online programs). In total, I have taught over 180 unique students. I moderated some events such as guest lecturer events (participated by undergraduate, graduate, doctorate students, lecturer, etc. from different university in-and-abroad). In total, I have moderated 4 events with uniques attendances from Indonesia and abroad (2020 - 2021).

Masters in Information Systems Management

- Regular and online program of Business Intelligence and Analytics (2020 - 2022)

Bachelors in Computer Science

- Calculus I (2021)
- Discrete Mathematics (2021 - 2022)

PROFESSIONAL MEMBERSHIPS

Member, The Institute of Electrical and Electronics Engineers (IEEE) [2020 – 2021]
Member, IEEE CIS [2020 – 2021]
Member, IEEE SPS [2020 – 2021]

CERTIFICATION

The Data Scientist's Toolbox
Johns Hopkins University — Coursera Nov 30, 2022
Instructor: Jeff Leek, PhD, Roger Peng, PhD, and Brian Caffo, PhD

Python Project for Data Science
IBM — Coursera Nov 25, 2022
Instructor: Azim Hirjani & Joseph Santarcangelo

Python for Data Science, AI & Development
IBM — Coursera Nov 24, 2022
Instructor: Joseph Santarcangelo

Tools for Data Science
IBM — Coursera Nov 22, 2022
Instructor: Aije Egwaikhide, Svetlana Levitan, and Romeo Kienzler

Deep Learning.AI TensorFlow Developer
DeepLearning.AI — Coursera Nov 15, 2022
Instructor: Laurence Moroney

Neural Networks and Deep Learning
DeepLearning.AI — Coursera Nov 5, 2022
Instructor: Andrew Ng, Kian Katanforoosh, and Younes Bensouda Mourri

Machine Learning Specialization
DeepLearning.AI — Stanford University — Coursera Oct 26, 2022
Instructor: Andrew Ng

Advanced Learning Algorithms
DeepLearning.AI — Stanford University — Coursera Oct 26, 2022
Instructor: Andrew Ng

Understanding and Visualizing Data with Python
University of Michigan — Coursera Oct 18, 2022
Instructor: Brenda Gunderson, Ph.D., Kerby Shedden, Ph.D., and Brady T. West, Ph.D.

Programming for Everybody (Getting started with Python)
University of Michigan — Coursera Oct 9, 2022
Instructor: Charles Russell Severance

Learning to Teach Online
University of New South Wales (UNSW) — Coursera 2020
Instructor: Assoc. Prof. Simon McIntyre & Dr Negin Mirriah

REFERENCES

Referees are available on request.