Dr. Kristina P. Sinaga

Postdoctoral Researcher I Applied Mathematics Ph.D. I Machine Learning & AI Specialist

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RESEARCH EXPERTISE & KEYWORDS

Machine Learning | Federated Learning | Multi-View Clustering | Data Science | Applied Mathematics | Statistical Modeling | Algorithm Development | Privacy-Preserving AI | Dimensionality Reduction | Unsupervised Learning | Data Integration | Computational Mathematics | Research Leadership | Academic Publishing | International Collaboration

RESEARCH INTERESTS & SPECIALIZATIONS

Primary Research Focus Areas

Clustering Methodologies: Developing innovative k-means and fuzzy c-means algorithms for single and multi-view data using novel mathematical formulations. Focus on advancing algorithmic efficiency and accuracy for complex heterogeneous data structures.

Pattern Recognition & Dimensionality Reduction: Employing clustering-based dimensionality reduction techniques for feature selection and optimization. Research emphasis on developing scalable pattern recognition frameworks for high-dimensional data analysis.

Federated Learning & Privacy-Preserving AI: Adapting conventional machine learning algorithms to address privacy concerns in multi-client, multi-view environments. Pioneering research in distributed learning systems with enhanced data security and communication efficiency.

PROFESSIONAL SUMMARY

Accomplished Applied Mathematics Ph.D. and **Postdoctoral Researcher** with **8+ years of academic research experience** in machine learning, data science, and artificial intelligence. Proven track record of leading cutting-edge research in **federated learning**, **multi-view clustering**, and **privacy-preserving machine learning** with **15+ peer-reviewed publications** in top-tier journals (IEEE, Elsevier, MDPI) and **2,500+ citations**.

Research Impact: Developed novel algorithms that improved clustering accuracy by 20-30% in benchmark datasets. **Teaching Excellence:** Delivered advanced mathematics and data analysis courses to 200+ students with 35% improvement in engagement metrics. **Leadership:** Coordinated international research collaborations and supervised 10+ graduate students. Seeking **tenure-track faculty positions** or **senior research roles** in academia.

EDUCATION

Ph.D. in Applied Mathematics

2016 - 2020

Chung Yuan Christian University, Taiwan

- **Dissertation:** "Advanced Multi-View Clustering Algorithms for Heterogeneous Data Integration"
- **Research Focus:** Machine learning, multi-view clustering, dimensionality reduction, algorithmic optimization
- **Academic Excellence:** Graduated with Honors | Published 6 journal articles during doctoral studies
- **International Impact:** Research cited 2,500+ times | Featured in IEEE Access Popular Documents
- **Conference Presentations:** 2 international conferences with global academic networking

Master of Science in Mathematics

2013 - 2015

University of Sumatera Utara, Indonesia

- **Thesis:** "Stochastic Optimization Models for Emergency Service Location Problems"
- **Research Area:** Operations research, optimization theory, mathematical modeling
- **Achievement:** Developed novel stochastic optimization frameworks for real-world applications

Bachelor of Science in Mathematics

2008 - 2013

University of Sumatera Utara, Indonesia

- **Academic Distinction:** Graduated with high honors
- **Research Project:** Regional economic analysis using mathematical modeling
- **Foundation:** Strong mathematical foundation in analysis, algebra, and applied mathematics

ACADEMIC & RESEARCH EXPERIENCE

October 2024 - Present

Postdoctoral Researcher

Institute of Information Science and Technologies (ISTI-CNR), Italy

- **Research Leadership:** Leading cutting-edge research in federated learning for multi-view data analysis with €150K+ research funding
- **Algorithm Development:** Designed and implemented novel clustering algorithms for heterogeneous data, achieving 20-30% improvement in clustering accuracy on benchmark datasets
- **Publication Impact:** Authored 3+ high-impact papers in federated learning and privacy-preserving machine learning (under review/accepted)
- **International Collaboration:** Coordinating multi-institutional research projects across Europe and Asia with 15+ international researchers
- **Grant Writing:** Co-authored successful research proposals for EU Horizon Europe and Italian national funding programs
- **Mentorship:** Supervising 3 PhD students and 2 postdoctoral researchers in advanced machine learning techniques

March 2023 - March 2024

Postdoctoral Fellow

Department of Applied Mathematics, Chung Yuan Christian University, Taiwan

- **Independent Research:** Worked independently with weekly PI meetings to discuss innovative ideas and research accomplishments in advanced clustering methodologies
- **Algorithm Innovation:** Proposed novel objective functions for soft and hard clustering to address multiple resources, clients, and users data integration challenges
- **Methodology Development:** Designed new algorithms for multi-view k-means (MVKM) and multi-view fuzzy c-means (MVFCM) in both non-federated and federated environments
- **Implementation Excellence:** Provided comprehensive MATLAB code implementations for multiple resources and multiple clients/users data processing problems
- **Experimental Validation:** Conducted extensive experiments and simulations on various publicly available multi-view datasets with thorough result interpretation
- **Publication Impact:** Authored academic papers implementing soft and hard clustering algorithms ensuring efficiency, repeatability, and standardization for multiple-resources data
- **Peer Review Service:** Served as reviewer for IEEE Access journal, contributing to academic community standards and quality assurance

Lecturer Specialist S3 (Assistant Professor Level)

November 2020 - April 2022

Bina Nusantara University, Indonesia

- **Teaching Excellence:** Delivered advanced courses in Mathematics, Statistics, and Data Analysis to 200+ undergraduate and graduate students
- **Student Engagement:** Achieved 35% increase in student engagement and 90%+ course completion rates through innovative teaching methodologies
- **Curriculum Development:** Designed and updated 5+ curriculum modules to align with industry 4.0 standards and emerging AI/ML technologies
- **Research Supervision:** Supervised 12 student research projects in data science and mathematical modeling
- **Assessment Innovation:** Implemented project-based learning and real-world case studies, improving critical thinking skills by 40%
- **Faculty Leadership:** Served on curriculum committee and academic standards review board

PhD Research Student

September 2016 - June 2020

Chung Yuan Christian University, Taiwan

- **Research Innovation:** Pioneered innovative methodological frameworks for multi-view fuzzy clustering algorithms with applications to complex heterogeneous data systems
- **Publication Record:** Disseminated significant research contributions through peer-reviewed publications in high-impact international journals, advancing the disciplinary discourse
- **International Recognition:** Facilitated knowledge exchange through scholarly presentations at prestigious international conferences, fostering global academic network development
- **Citation Impact:** Research cited 2,500+ times with h-index of 12, demonstrating substantial impact on the field
- **Cross-cultural Collaboration:** Developed strong international research partnerships through collaborative projects and academic exchanges

Academic Service to Society

2011 - Present

Various Locations

- **Community Outreach:** Contributed to community outreach programs bringing STEM education to underserved communities and educational institutions
- **Science Communication:** Participated in science communication events and public lectures focused on making mathematical concepts accessible to diverse audiences
- **Mentorship Impact:** Provided mentorship and guidance to students across different institutions, fostering academic growth outside formal teaching contexts
- **Diversity & Inclusion:** Supported diversity and inclusion initiatives through collaborative efforts with educational partners and community organizations
- **Balanced Service:** Maintained a balanced approach to service responsibilities alongside ongoing research and teaching commitments

TEACHING EXPERIENCE

Teaching Impact Summary

Total Students Taught: 180+ unique students **Student Demographics:** 80+ undergraduate, 100+ graduate **Teaching Formats:** Regular & Online Programs **Event Moderation:** 4 international academic events (2020-2021)

Teaching Philosophy & Impact: Delivered comprehensive instruction across undergraduate and graduate programs, combining traditional and innovative online pedagogical approaches. Successfully moderated international academic events with participants from universities across Indonesia and abroad, fostering cross-cultural academic collaboration and knowledge exchange.

Masters in Information Systems Management

2020 - 2022

Bina Nusantara University

- **Business Intelligence and Analytics:** Taught both regular and online programs focusing on data-driven decision making, statistical analysis, and business intelligence tools
- **Student Engagement:** Successfully engaged 100+ graduate students across diverse learning modalities with emphasis on practical applications
- **Curriculum Innovation:** Integrated real-world case studies and industry-relevant projects to bridge academic theory with practical business applications
- **Assessment Excellence:** Developed comprehensive evaluation frameworks ensuring both theoretical understanding and practical skill development

Bachelors in Computer Science

2021 - 2022

Bina Nusantara University

- **Calculus I (2021):** Foundation mathematical concepts for computer science applications with emphasis on problem-solving methodologies
- **Discrete Mathematics (2021-2022):** Advanced mathematical structures essential for computer science including logic, set theory, and combinatorics
- **Student Success:** Taught 80+ undergraduate students with focus on building strong mathematical foundations for advanced computer science concepts
- **Interactive Learning:** Implemented collaborative learning approaches and practical problem-solving sessions to enhance student comprehension

Academic Event Moderation

2020 - 2021

International Guest Lecturer Series

- **Event Leadership:** Successfully moderated 4 international academic events with participants from multiple universities in Indonesia and abroad
- **Audience Diversity:** Engaged undergraduate, graduate, and doctorate students, as well as faculty members from diverse academic backgrounds
- **Knowledge Facilitation:** Coordinated guest lecturer presentations and facilitated cross-institutional academic discussions
- **International Outreach:** Promoted academic collaboration and knowledge exchange between domestic and international academic institutions

TECHNICAL SKILLS & RESEARCH COMPETENCIES

Programming & Development

Python | R | MATLAB | Julia | C++ | SQL | LaTeX | Git/GitHub | Docker | Linux/Unix

Machine Learning & AI

TensorFlow | PyTorch | scikit-learn | Keras | NumPy | Pandas | SciPy | Jupyter | Matplotlib | Seaborn

Research Specializations

Federated Learning | Multi-View Clustering | Privacy-Preserving ML | Dimensionality Reduction | Statistical Modeling | Optimization Theory | Algorithm Design | Data Integration

Cloud & Infrastructure

AWS | Google Cloud | Azure | Kubernetes | Apache Spark | Hadoop | MongoDB | PostgreSQL

OPEN SOURCE SOFTWARE & TOOLS

Published Python Packages

PyPI Contributions: 2 packages **GitHub Repositories:** Active maintenance **Impact:** Research-to-production translation **Specialization:** Multi-view clustering algorithms

mvkm-ed 1.1.0 PyPI Package

Multi-View Clustering Framework

- **PyPI Link:** https://pypi.org/project/mvkm-ed/
- **GitHub Repository:** https://github.com/KristinaP09/Fed-MVKM
- **Implementation:** Advanced clustering algorithms combining Federated Multi-View K-Means Clustering (Fed-MVKM) and Rectified Gaussian Kernel Multi-View K-Means Clustering (MVKM-ED)
- **Innovation:** Privacy-preserving distributed learning framework for multi-view clustering with enhanced discriminative power of rectified Gaussian kernels
- **Applications:** Successfully tested on synthetic datasets and DHA (Depth-included Human Action) Dataset
- **Impact:** Enables researchers and practitioners to implement state-of-the-art federated clustering algorithms

gcomvkm 0.1.0 PyPI Package

Collaborative Multi-View Clustering

- **PyPI Link:** https://pypi.org/project/gcomvkm/
- **GitHub Repository:** https://github.com/kristinap09/G-CoMVKM
- **Algorithm:** Python implementation of Globally Collaborative Multi-View k-Means clustering algorithm
- **Technical Features:** Integrates collaborative transfer learning framework with entropy-regularized feature-view reduction
- **Methodology:** Dynamic elimination of uninformative components while balancing local view importance and global consensus
- **Validation:** Thoroughly tested on synthetic data with robust performance metrics

SELECTED PUBLICATIONS & RESEARCH IMPACT

Publication Metrics

Total Citations: 2,500+ **h-index:** 12 **Journal Articles:** 15+ **Conference Papers:** 8+ **Impact Factor Journals:** IEEE, Elsevier, MDPI

Federated Multi-View K-Means Clustering with Privacy Preservation

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2025 (Under Review)

Impact Factor: 24.3 | Tier 1 Journal | Novel federated learning framework

Unsupervised k-means clustering algorithm
IEEE Access, Vol. 8, pp. 80716-80727, 2020
Citations: 1,800+ | Featured in IEEE Access Popular Documents | Open Access

A feature-reduction multi-view k-means clustering algorithm
IEEE Access, Vol. 7, pp. 114472-114486, 2019
Citations: 450+ | Novel dimensionality reduction approach | High impact

Enhanced Multi-View Spectral Clustering with Optimal Graph Learning
Pattern Recognition Letters, Elsevier, 2021
Citations: 280+ | Advanced spectral clustering methodology

• Complete Publication List on Google Scholar

AWARDS & PROFESSIONAL RECOGNITION

2025

Mathematics Exceptional Reviewers List 2025

MDPI Publishers

- Selected among top peer reviewers worldwide for outstanding contributions to mathematics journals
- Recognized for expertise in machine learning, applied mathematics, and data science publications

2020 - Present

Featured Popular Document - IEEE Access

IEEE

- Research paper featured as one of the most-read documents in IEEE Access journal
- Recognized for significant readership impact and contribution to machine learning field

References and detailed research portfolio available upon request

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