

# Jan Harold Mercado Alcantara

RIKEN - AIP, Tokyo, Japan

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## Research Interests

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Nonconvex Optimization, Feasibility Problems, Variational Inequalities

## Education

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**Doctor of Philosophy in Mathematics** 02/2018 - 06/2020

National Taiwan Normal University

Dissertation: Dynamical Systems Approach to Complementarity Problems

Advisor: Prof. Jein-Shan Chen

**Master of Science in Mathematics** 05/2013 - 04/2015

De La Salle University

**Bachelor of Secondary Education major in Mathematics** 05/2009 - 09/2012

De La Salle University

## Academic Experience

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**Postdoctoral Researcher** 04/2023 - present

RIKEN Center for Advanced Intelligence Project (AIP), Japan

Member, Mathematical Informatics Laboratory, The University of Tokyo

Supervisor: Prof. Akiko Takeda

**Postdoctoral Scholar** 08/2021 - 03/2023

Institute of Statistical Science, Academia Sinica, Taiwan

Supervisor: Prof. Ching-pei Lee

**Postdoctoral Fellow** 08/2020 - 07/2021

Department of Mathematics, National Taiwan Normal University, Taiwan

Supervisor: Prof. Jein-Shan Chen

## Teaching Experience

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**Assistant Professor** 01/2017 - 12/2017

Mathematics and Statistics Department, De La Salle University

**Teaching Associate** 01/2016 - 12/2016

Mathematics and Statistics Department, De La Salle University

**Lecturer** 08/2015 - 12/2015

Mathematics and Statistics Department, De La Salle University

**Lecturer** 06/2015 - 10/2015

Mathematics Department, Adamson University

11/2012 - 03/2013

### • Courses taught

*Graduate courses:* Linear Algebra and Calculus

*Undergraduate courses:* Abstract Algebra, Differential Equations, Differential Calculus, Integral Calculus, Multivariable Calculus, Differential Equations, Algebra and Trigonometry

## Visiting Experience

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Department of Applied Mathematics, The Hong Kong Polytechnic University

02/2023

Host: Prof. Defeng Sun

Department of Mathematics, National University of Singapore

08/2022 - 10/2022

Host: Prof. Kim-Chuan Toh

## Publications

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### Articles

1. **Alcantara, Jan Harold**, Nguyen, Chieu Thanh, Okuno, Takayuki, Takeda, Akiko, and Chen, Jein-Shan, "Unified smoothing approach for best hyperparameter selection problem using a bilevel optimization strategy", accepted by *Mathematical Programming* (2024).
2. Tang, Jingyong, Zhou, Jinchuan, **Alcantara, Jan Harold**, and Chen, Jein-Shan, "A family of smooth NCP functions and an inexact Levenberg-Marquardt method for nonlinear complementarity problems", *Journal of Nonlinear and Convex Analysis*, vol. 24, no. 11, pp. 2361–2385 (2023).
3. **Alcantara, Jan Harold**, Chen, Jein-Shan, and Tam, Matthew K., "Method of alternating projections for the general absolute value equation", *Journal of Fixed Point Theory and Applications*, vol. 25, no. 1, Article 39 (2023).
4. **Alcantara, Jan Harold** and Lee, Ching-pei, "Accelerated projected gradient algorithms for sparsity constrained optimization problems", *Advances in Neural Information Processing Systems (NeurIPS)* vol. 35, pp. 26723–26735 (2022).
5. **Alcantara, Jan Harold** and Chen, Jein-Shan, "A new class of neural networks for NCPs using smooth perturbations of the natural residual function", *Journal of Computational and Applied Mathematics*, vol. 407, 114092 (2022).
6. Sun, Juhe, Fu, Weichen, **Alcantara, Jan Harold**, and Chen, Jein-Shan, "A neural network based on the metric projector for solving SOCCVI problem", *IEEE Transactions on Neural Networks and Learning Systems*, vol. 32, no. 7, pp. 2886–2900 (2021).
7. Wu, Caiying, Wang, Jing, **Alcantara, Jan Harold**, and Chen, Jein-Shan, "Smoothing strategy along with conjugate gradient algorithm for signal reconstruction", *Journal of Scientific Computing*, vol. 87, no. 1, Article 21 (2021).
8. **Alcantara, Jan Harold** and Chen, Jein-Shan, "A novel generalization of the natural residual function and a neural network approach for the NCP", *Neurocomputing*, vol. 413, pp. 368–382 (2020).
9. **Alcantara, Jan Harold**, Lee, Chen-Han, Nguyen, Chieu Thanh, Chang, Yu-Lin, and Chen, Jein-Shan, "On construction of new NCP functions", *Operations Research Letters*, vol. 48, pp. 115–121 (2020).
10. **Alcantara, Jan Harold** and Chen, Jein-Shan, "Neural networks based on three classes of NCP-functions for solving nonlinear complementarity problems", *Neurocomputing*, vol. 359, pp. 102–113 (2019).
11. **Alcantara, Jan Harold**, Lao, Angelyn, and Ruivivar, Leonor, "Stability analysis of the ODE model representation of amyloidogenic processing in Alzheimer's disease in the presence of SORLA", *Molecular BioSystems*, vol. 12, pp. 1468–1477 (2016).

## Preprints

12. **Alcantara, Jan Harold**, Lee, Ching-pei, and Takeda, Akiko, "A four-operator splitting algorithm for nonconvex and nonsmooth optimization", arXiv:2406.16025 (2024).
13. **Alcantara, Jan Harold** and Takeda, Akiko, "Theoretical smoothing frameworks for general nonsmooth bilevel problems", arXiv:2401.17852 (2024).
14. Nguyen, Chieu Thanh, **Alcantara, Jan Harold**, Hao, Zijun, and Chen, Jein-Shan, "Smoothing penalty approach for solving second-order cone complementarity problems" (2023).
15. **Alcantara, Jan Harold** and Lee, Ching-pei, "Global convergence and acceleration of projection methods for feasibility problems involving union convex sets", arXiv:2202.10052 (2022).

## Conference Talks

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- o "Smoothing methods for bilevel optimization", Contributed talk at the 25th International Symposium on Mathematical Programming (ISMP 2024), Montréal, Canada, July 2024 (Scheduled).
- o "Global convergence and acceleration of fixed point iterations of union upper semicontinuous operators with applications to feasibility problems and optimization ", Contributed talk at the 2023 Taiwan Society of Industrial and Applied Mathematics (TWSIAM) Annual Conference, Taipei, Taiwan, May 2023.
- o "Accelerated projected gradient algorithms for sparsity constrained optimization problems", Poster presentation at NeurIPS 2022, New Orleans, USA, December 2022.
- o "Method of alternating projections for solving absolute value equations", Contributed talk at the International Conference on Continuous Optimization, Pennsylvania, USA, July 2022.
- o "Proximal algorithms for a class of nonconvex nonsmooth minimization problems involving piecewise smooth and min-weakly-convex functions", Invited Speaker for the Special Session of 2021 Taiwan Mathematical Society Annual Meeting, Taipei, Taiwan, January 2022.
- o "Neural networks based on three classes of NCP-functions for solving nonlinear complementarity problems", Oral presentation delivered at Taiwan Mathematical Society Annual Meeting, Taipei, Taiwan, December 2018.
- o "The dynamics of a breast cancer model with Raphanus sativus extract", Oral presentation delivered at the 2017 Mathematical Society of the Philippines Annual Convention, Legazpi City, Philippines, May 2017.
- o "The dynamics of SORLA's influence on amyloidogenic processing", Oral presentation delivered at the 2016 Mathematical Society of the Philippines Annual Convention, Cebu City, Philippines, May 2016.
- o "Stability Analysis of the ODE Model Representation of Amyloidogenic Processing in Alzheimer's Disease in the presence of SORLA", Oral presentation delivered at the 3rd Asian Regional Conference on Systems Biology (ARCSB2015-TriSys), Selangor, Malaysia, September 2015.

## Invited Talks

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- o "Smoothing approach for hyperparameter learning using bilevel programming", 2023 National Center for Theoretical Sciences Optimization Workshop, National Taiwan Normal University, Taipei, Taiwan, May 2023.

- “Hyperparameter learning and sparse optimization: Theory and algorithms”, Seminar (Online), RIKEN Center for Advanced Intelligence Project, Tokyo, Japan, October 2022.
- “Smooth nonconvex regularizers for sparse recovery problems and an efficient conjugate gradient algorithm”, 2020 National Center for Theoretical Sciences Optimization Day for Young Researchers, National Taiwan Normal University, Taipei, Taiwan, December 2020.
- “Smoothed neural networks for nonlinear complementarity problems”, Workshop on Advances in Continuous Optimization, University of Tokyo, Tokyo, Japan, September 2019.

## Invited Lectures

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- “Projection methods for feasibility problems”, DLSU Mathematics and Statistics Lecture Series, De La Salle University, Manila, Philippines, August 2021.
- “Qualitative Analysis of Solutions and Introduction to Bifurcation”, DLSU Mathematics Lecture Series, Manila, Philippines, 2017.
- “On Stability and Bifurcation Analysis”, First Lecture Series for AY2016-2017, Mathematical Society of the Philippines – National Capital Region held at Mapua Institute of Technology 2016.
- “Mathematical Modelling of Dynamical Systems: Stability Analysis of ODE Models”, DLSU Mathematics Lecture Series, Manila, Philippines, 2016.

## Grants and Awards

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- Participant, Global Young Scientists Summit (GYSS), 2023.
- Travel Grant for Young Scholars Attending International Conferences Abroad, Academia Sinica, 2022.
- Department of Science and Technology – Accelerated Science and Technology Human Resource Development Program (DOST-ASTHRDP) Scholarship, Department of Science and Technology – Science Education Institute, 2013-2015.
- St. La Salle Scholarship, De La Salle University, 2009-2012.

## Professional Service

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- Organizer
  - Bilevel Optimization Session of Continuous Optimization Cluster (Variational Analysis, Variational Inequalities and Complementarity), 25th International Symposium on Mathematical Programming (ISMP 2024)
- Reviewer
  - Computational Optimization and Applied Mathematics
  - Journal of Applied Mathematics and Computing
  - Journal of Computational and Applied Mathematics
  - Journal of Global Optimization
  - Journal of Machine Learning Research
  - Journal of Scientific Computing
  - Neural Computing and Applications

- Optimization
- Pacific Journal of Optimization
- Taiwanese Journal of Mathematics

## References

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**Jein-Shan Chen, Ph.D.**

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Department of Mathematics  
National Taiwan Normal University  
jschen@math.ntnu.edu.tw

**Akiko Takeda, D.Sc.**

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Department of Mathematical Informatics  
The University of Tokyo  
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**Ching-pei Lee, Ph.D.**

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Department of Statistical Inference and Mathematics  
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