Curriculum Vitae

Worapat Piensuk

PERSONAL INFORMATION

Nationality:	Thai
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EDUCATION

Oct 2021 – Present **The Graduate University for Advanced Studies, SOKENDAI**, Japan
School of High Energy Accelerator Science, Department of Particle and Nuclear Physics
Advisor: Prof. Jun Nishimura
Expected completion: September 2026

Aug 2016 – Jun 2020 **King Mongkut's University of Technology Thonburi**, Thailand
Faculty of Engineering, Department of Mechanical Engineering

RESEARCH EXPERIENCE

Oct 2025 – Present **Realization of Standard Model from the IKKT matrix model**
– Constructed matrix model background configurations, around which Standard Model particles emerge as fluctuations.

Sep 2025 – Present **Bootstrap method on lattice field theory with the θ term**
– Applied the bootstrap method to 2D U(1) gauge theory with θ term for the first time.
– Found consistency with exact results.

Feb 2025 – Present **Lefschetz thimble study of 2D U(1) lattice gauge theory with the θ term**
– Applied Lefschetz thimble method in Monte-Carlo simulations to solve the sign problem caused by the θ term for the first time.
– Incorporated an additional technique to address the topological freezing problem.

Jan 2022 – Dec 2024 **Non-perturbative studies of the IKKT matrix model with the mass term**
– Analytical and numerical studies of the IKKT matrix model with the mass term.
– First application of Lefschetz thimble method in the Monte-Carlo simulations of IKKT matrix model.
– Proposed a new definition of the IKKT matrix model to resolve the artifact that suppresses quantum fluctuations.

Jun 2019 – Aug 2019 **Geometrical condition for integrable systems**
– Derived geometrical integrability conditions on the metric tensors for classical integrable systems, whose conserved quantities are in geodesic form.
– Verified the conditions using integrable Goldfish systems.

Jan 2019 – Jun 2019 **Hamiltonian and Lagrangian formalism of integrable systems**
– A complete study of classical integrable systems with discrete and continuous time in Hamiltonian and Lagrangian formalisms.
– Derived the integrability condition called closure relation using Stokes' theorem, providing its geometrical picture.

Feb 2018 – Jul 2018 **Integrability and chaos in quantum resonant systems**
– Demonstrated using quantum resonant systems that the energy level spacing distributions can be used to classify integrable and chaotic systems.

PUBLICATIONS AND PREPRINTS

– Y. Asano, J. Nishimura, **W. Piensuk** and N. Yamamori, "Exact results in the Lorentzian IKKT matrix model at large D," *manuscript in preparation.*

– Y. Asano, J. Nishimura, **W. Piensuk** and N. Yamamori, "Defining the Type IIB Matrix Model without Breaking Lorentz Symmetry," *Phys. Rev. Lett.* **134** (2025) 4, 041603, arXiv:2404.14045 [hep-th].

– **W. Piensuk** and S. Yoo-Kong, "Geodesic Compatibility: Goldfish Systems," *Rept. Math. Phys.* **87** (2021) 1, 45-58, arXiv:2003.08243 [nlin.SI].

– C. Puttarprom, **W. Piensuk** and S. Yoo-Kong, "Integrable Hamiltonian Hierarchies and Lagrangian 1-Forms," arXiv:1904.00582 [math-ph].

– O. Evnin and **W. Piensuk**, "Quantum resonant systems, integrable and chaotic," *J. Phys. A* **52** (2019) 2, 025102, arXiv:1808.09173 [math-ph].

INVITED TALKS

Jun 2025 **Matrix Membranes and Emergent Spacetime**, *Dublin Institute for Advanced Studies*
"A new definition of the Lorentzian IKKT matrix model with Lorentz symmetry fixed by the Faddeev-Popov procedure"

Feb 2025 **Fermilab QIS/HEP Forum**, *Online*
"Non-perturbative study of Quantum gravity using matrix models"

Nov 2024 **KEK-NAOJ Student Workshop 2024**, *Online*
"Quantum gravity from Matrices"

PRESENTATIONS AT INTERNATIONAL CONFERENCES

Feb 2025 **The 7$^{\text{th}}$ Bangkok workshop on discrete Geometry, Dynamics & Statistics**, *Chulalongkorn University*
"Lefschetz thimble analysis of type IIB matrix model"

Dec 2024 **KEK Theory Workshop 2024**, *High Energy Accelerator Research Organization*
"Defining IKKT matrix model by gauge fixing Lorentz symmetry"

Nov 2023 **KEK Theory Workshop 2023**, *High Energy Accelerator Research Organization*
"The emergence of spacetime in bosonic Lorentzian IKKT matrix model with the mass term"

Dec 2022 **KEK Theory Workshop 2022**, *High Energy Accelerator Research Organization*
"$1/D$ expansion in the bosonic Lorentzian IKKT matrix model with mass term"

PRESENTATIONS AT NATIONAL CONFERENCES

Sep 2025 **JPS Annual meeting 2025**, *Hiroshima University*
"Lefschetz thimble simulations of 2D U(1) gauge theory with the theta term"

Mar 2025 **JPS Spring meeting 2025**, *Online*
"Lefschetz thimble Hybrid Monte Carlo simulations of type IIB matrix model with the Lorentz-invariant mass term"

Mar 2024 **JPS Spring meeting 2024**, *Online*
"Nonperturbative study of superstring theory using bosonic IKKT matrix model with the mass term"

Sep 2023 **JPS Annual meeting 2023**, *Tohoku University*
"The phase diagram of the bosonic Lorentzian IKKT matrix model with the mass term"

Sep 2023 **Discrete Approaches to the Dynamics of Fields and Space-Time**, *University of Tsukuba*
"Surprising aspects of Lorentzian IKKT matrix model"

Apr 2023 **Spring Workshop on Quantum Gravity**, *The Institute of Physical and Chemical Research*
"Analytical Study of IKKT matrix model"

Mar 2023 **JPS Spring meeting 2023**, *Online*
"Exact results of the massive IKKT matrix model at large D"

POSTER PRESENTATIONS

Jan 2025 **The 19^{th} Asian Winter School on Strings, Particles and Cosmology**, *Tsinghua Sanya International Mathematics Forum*
"Non-perturbative study of superstring theory using IKKT matrix model"

Dec 2023 **The 18^{th} Kavli Asian Winter School on Strings, Particles and Cosmology**, *Yukawa Institute for Theoretical Physics*
"Nonperturbative studies of superstring theory: Emergence of expanding universe"

Jan 2023 **The 17^{th} Kavli Asian Winter School on Strings, Particles and Cosmology**, *Institute for Basic Science*
"Non-perturbative studies of superstring theory: Analytical approach to expanding universe"

AWARDS AND SCHOLARSHIPS

Oct 2025 – Present **SOKENDAI Student Dispatch Program**: Fully supported by the Graduate University for Advanced Studies, SOKENDAI to perform research at the National Taiwan University (scheduled completion: December 2025)

Oct 2021 – Present **Japanese Government (MEXT) Scholarship**: For five-year doctoral course study at the Department of Particle and Nuclear Physics, the Graduate University for Advanced Studies, SOKENDAI (scheduled completion: September 2026)

Aug 2016 – Jun 2020 **Petchra Pra Jom Klao Scholarship**: For bachelor's degree study at King Mongkut's University of Technology Thonburi

SKILLS AND LANGUAGES

– **Programming languages:** Fortran, Python, Mathematica.

– **Soft skills:** communication and presentation skills (through various meetings and presentations), interpersonal skills and adaptability (through collaborations with different research groups), time management (through working on multiple projects concurrently).

– **Languages:** English (fluent), Japanese (intermediate).