

Curriculum Vitae

Jungwon Lim

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Summary of Interests

I am interested in studying physical observables that can be measured experimentally and computed within theoretical frameworks describing the Universe. During my PhD, I focused on scattering amplitudes and their fundamental building blocks, Feynman integrals. My current research centers on uncovering hidden simplifications, symmetries, and mathematical structures underlying observables in fundamental physics.

Education

- **Max Planck Institute for Physics**, Ph.D. Program (IMPRS, Quantum Field Theory Group), Feb 2022 – Dec 2025
Supervisor: Prof. Johannes M. Henn
- **ETH Zürich**, M.Sc. in Physics, Sep 2019 – Jul 2021
- **Daegu Gyeongbuk Institute of Science and Technology (DGIST)**, B.Sc. in Science, Mar 2015 – Feb 2019

Research Experience

Undergraduate Research

1. Undergraduate Group Research Program (UGRP), DGIST
 - UGRP I & II: Multiple inflation and CMB distortions
 - UGRP III & IV: The possibility and stability of baryogenesis in supersymmetric cosmology
2. Internships
 - Molecular Modeling Lab, DGIST
 - APC Group, Université Paris Diderot

Master's Research

1. Semester Project
CMS Pixel Group, ETH Zürich
2. Master's Thesis (ETH Zürich)
IR-Resummation of the Bispectrum in EFTofLSS
Supervisor: Prof. Leonardo Senatore

Ph.D. Research (Max Planck Institute for Physics)

Supervisor: Prof. Johannes M. Henn

- Study of infrared (IR) factorisation in $\mathcal{N} = 4$ sYM
- Computations of three-loop Feynman integrals for Higgs plus jet productions
- Calculations three-loop three-point form factors in $\mathcal{N} = 4$ sYM
- Mathematical formulation of a class of generalised Feynman integrals having exponential terms

Research Highlights

- **First-time computation of the full set of three-loop four-point non-planar Feynman integrals with one massive leg**, contributing to Higgs-plus-jet amplitudes in QCD at leading color.
- **First-principles calculation of three-loop three-particle form factors** of $\text{tr}(\phi^2)$ and $\text{tr}(\phi^3)$ in $\mathcal{N} = 4$ sYM at leading color.
- **Discovered a counterexample to the conjectured adjacency conditions from C_2 cluster algebras** in four-point planar integrals with one massive leg.
- **Developed a mathematical formulation for a class of generalized Feynman integrals** that incorporate exponential factors in addition to the standard Feynman propagators, and extended conventional techniques to these integrals.

Publications & Preprints

1. Twisted Feynman Integrals: from generating functions to spin-resummed post-Minkowskian dynamics, J.-H. Kim, J.-W. Kim and J. Lim, [[2512.21210](#)].
2. Analytic evaluation of the three-loop three-point form factor of $\text{tr}(\phi^3)$ in $\mathcal{N} = 4$ sYM, J.M. Henn, J. Lim, W.J. Torres Bobadilla, *JHEP* **02** (2025) 085.
3. Graded transcendental functions: an application to four-point amplitudes with one off-shell leg, T. Gehrmann, J. Henn, P. Jakubčík, J. Lim, C.C. Mella, N. Syrrakos, L. Tancredi, W.J. Torres Bobadilla, *JHEP* **12** (2025) 215.
4. First look at the evaluation of three-loop non-planar Feynman diagrams for Higgs plus jet production, J.M. Henn, J. Lim, W.J. Torres Bobadilla, *JHEP* **05** (2023) 026.
5. CMB spectral μ -distortion of multiple inflation scenario, G. Bae, S. Bae, S. Choi, S.H. Lee, J. Lim, H.S. Zoe, *Phys. Lett. B* **782** (2017) 117–123.

Talks Presented

- *Recent progress on three-loop Higgs plus jet amplitudes*, Talk at *Matter To The Deepest 2025*, University of Silesia, Sep 15, 2025.
- *Progress on three-loop four-point integrals with one massive leg*, Talk at *Scattering Amplitudes @ Liverpool*, University of Liverpool, Mar 27, 2025.

- *Computing Feynman integrals for three-loop three-point form factors in $N=4$ SYM and Higgs plus jet amplitudes in QCD*, Talk at seminar for the Theoretical High Energy Physics group, University of Mainz, Jan 21, 2025.
- *Computing form factors in $N=4$ sYM for Higgs plus jet(s) production*, Talk at *YOUNGST@RS “Loop-the-Loop : Feynman Calculus and its Applications to Gravity and Particle Physics”*, Virtual Workshop in MITP, Nov 14, 2024.
- *Computing Feynman integrals for high precision particle physics*, Talk at *RU-A “Fundamental Particles and Forces” Day*, Max Planck Institute for Extraterrestrial Physics, Oct 23, 2024.
- *Three-loop Feynman integrals and an application to three-point form factors in $N=4$ super Yang-Mills*, Talk at *High Precision for Hard Processes (HP2)*, University of Turin, Sep 11, 2024.
- *Three-loop Feynman integrals for Higgs plus jet production*, Talk given at *IMPRS Colloquium*, Max Planck Institute for Physics, May 23, 2024.
- *New observations on three-loop Feynman integrals for Higgs plus jet production*, Talk given at *IMPRS Colloquium*, Max Planck Institute for Physics, Apr 27, 2023.
- *Computing Scattering Amplitudes in $N=4$ SYM without knowing Feynman diagrams*, Talk given at *Young Scientist Workshop*, Castle Ringberg, May 13, 2022.

Teaching Experience

- Lecture series (~ 8 hours) *Modern Techniques to Compute Feynman Integrals* at Max Planck Institute for Physics (Sep – Nov 2025)

Schools Attended

- *Amplitudes 2025 Summer School*, Korea Institute for Advanced Study, Seoul, South Korea (Jun 9–13, 2025)
- *6th School of Analytic Computing in High-Energy and Gravitational Theoretical Physics*, Casa della Cultura di Atrani, Italy (Oct 2–14, 2023)
- *Amplitudes 2022 Summer School*, Charles University, Prague, Czech Republic (Aug 1–7, 2022)

Conferences and Workshops Attended

- *Symbology@15*, MPP, Garching, Germany, Dec 2025
- *Matter To The Deepest 2025*, University of Silesia, Katowice, Poland, Sep 2025
- *Amplitudes 2025*, Seoul National University, Seoul, South Korea, Jun 2025
- *Scattering Amplitudes @ Liverpool*, University of Liverpool, UK, Mar 2025
- *YOUNGST@RS “Loop-the-Loop : Feynman Calculus and its Applications to Gravity and Particle Physics”*, Virtual workshop in MITP, Nov 2024
- *Holonomic Techniques for Feynman Integrals*, MPP, Garching, Germany, Oct 2024
- *High Precision for Hard Processes (HP2 2024)*, University of Turin, Turin, Italy, Sep 2024

- *Special Functions: From Geometry to Fundamental Interactions*, MIAPbP, Garching, Germany, Aug 2024
- *Elliptics and Beyond 2024*, MPP, Garching, Germany, Aug 2024
- *Amplitudes 2024*, Institute for Advanced Study, Princeton, NJ, USA, Jun 2024
- *Galaxies meet QCD*, ETH Zürich, Zürich, Switzerland, 21st Feb 2024
- *Amplitudes 2022*, Charles University, Prague, Czech Republic, Aug 2022
- *Novel Developments in Scattering Amplitudes*, MIAPbP, Garching, Germany, Jul 2022

Computational Skills

- **Programming Languages:** C/C++, Python, Mathematica, Maple, Julia