



# THE UNIVERSITY OF CHICAGO

## COMPUTATIONAL AND APPLIED MATHEMATICS COLLOQUIUM

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LIN LIN

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### Feynman Diagrams, Luttinger-Ward Formalism, and Gibbs Measure

THURSDAY, November 29, 2018, at 4:00 PM  
Jones 226, 5747 South Ellis Avenue

#### ABSTRACT

Many-body perturbation theory (MBPT) is widely used in quantum physics, chemistry, and materials science. At the heart of MBPT is the Feynman diagrammatic expansion. However, for quantum many-body problems, many developments of MBPT are only formally valid. This shortcoming raises both theoretical and practical questions. By exploring the correspondence between the Feynman diagrammatic expansion and a certain class of Gibbs measures, we provide a relatively concise and self-contained introduction to MBPT. This requires no more knowledge a priori than basic knowledge of multivariable calculus, combinatorics and convex analysis. We demonstrate that the resulting models yields diagrammatic expansion that can provide useful insights toward the rigorous understanding of certain topics in MBPT, such as the existence of the Luttinger-Ward functional, and the rigorous justification of the bold Feynman diagrammatic series for the first time. (Joint work with Michael Lindsey)



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#### Organizers:

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CAM Colloquium URL: <https://cam.uchicago.edu/seminars/index.shtml>.

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