

**TN: Tensor Networks, SS2017 (Lecturer: Jan von Delft)**

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Lectures Tutorials	Mon + Wed Thu	Topic
L1	24.04.17	<b>Introduction to Tensor Networks</b> General introduction to tensor networks ideas
L2	26.04.17	<b>Introduction to Tensor Networks</b> General introduction to tensor networks ideas
T1	27.04.17	
	01.05.17	<b>Labor Day</b>
L3	03.05.17	<b>Numerical Renormalization Group (NRG)</b> Logarithmic discretization, mapping to Wilson chain
T2	04.05.17	
L4	08.05.17	<b>Numerical Renormalization Group (NRG)</b> NRG iterations: leading to matrix product states (MPS), energy-level flow
L5	10.05.17	<b>Numerical Renormalization Group (NRG)</b> Static observables, complete many-body basis, quenches
T3	11.05.17	
L6	15.05.17	<b>Numerical Renormalization Group (NRG)</b> Dynamical correlators: full-density-matrix NRG
L7	17.05.17	<b>Density Matrix Renormalization Group (DMRG)</b> Affleck-Kennedy-Lieb-Tasaki (AKLT) model, matrix product states/operators (MPS/MPO)
T4	18.05.17	
L8	22.05.17	<b>Density Matrix Renormalization Group (DMRG)</b> Variational ground state search
L9	24.05.17	<b>Density Matrix Renormalization Group (DMRG)</b> Time-evolving block decimation (TEBD)
	25.05.17	<b>Ascension Day</b>
L10	29.05.17	<b>Density Matrix Renormalization Group (DMRG)</b> Time-dependent DMRG (tDMRG): quenches, growth of entanglement entropy, dynamical correlators: continued fraction expansions, tDMRG, Chebyshev
L11	31.05.17.	<b>Density Matrix Renormalization Group (DMRG)</b> Finite temperature methods: purification, minimally entangled typical thermal states (METTS)
T5	01.06.17	
	05.06.17	<b>Whit Monday</b>
L12	07.06.17	<b>Density Matrix Renormalization Group (DMRG)</b> Long-range interactions, hybrid real-space/momentum space DMRG
T6	08.06.17	
L13	12.06.17	<b>Density Matrix Renormalization Group (DMRG)</b> Tangent-space methods (time-dependent variational principle)
L14	14.06.17	<b>Density Matrix Renormalization Group (DMRG)</b> Applications: dynamical mean-field theory (DMFT), quantum chemistry, non-equilibrium transport, NRG/DMRG-hybrid methods
	15.06.17	<b>Corpus Christi</b>
L15	19.06.17	<b>Symmetries</b> Abelian and non-Abelian symmetries, QSpace
L16	21.06.17	<b>Projected Entangled Pair State (PEPS)</b> General idea, entanglement scaling
T7	22.06.17	
L17	26.06.17	<b>Projected Entangled Pair State (PEPS)</b> Tensor optimization: simple update, full update, ...
L18	28.06.17	<b>Projected Entangled Pair State (PEPS)</b> Tensor contraction, corner transfer matrix
T8	29.06.17	
L19	03.07.17	<b>Projected Entangled Pair State (PEPS)</b>

		Various tensor network contraction schemes (Levin-Nave tensor renormalization group, second and higher order tensor renormalization group, entanglement renormalization, loop optimization)
L20	05.07.17	<b>Projected Entangled Pair State (PEPS)</b> Fermionic signs
T9	06.07.17	
L21	10.07.17	<b>Projected Entangled Pair State (PEPS)</b> Applications
L22	12.07.17	<b>Projected Entangled Pair State (PEPS)</b> Kitaev quantum double and Levin-Wen string nets
T10	13.07.17	
L23	17.07.17	<b>Multiscale Entanglement Renormalization Ansatz (MERA)</b>
L24	19.07.17	<b>Multiscale Entanglement Renormalization Ansatz (MERA)</b>
T11	20.07.17	
L25	24.07.17	<b>Other topics</b> Holography
L26	26.07.17	<b>Other topics</b> Machine learning
T12	27.07.17	