

INT Program

Precision QCD with the Electron-Ion Collider

Participant Introductions, week 3

Werner Vogelsang (University of Tübingen)

Research interests: QCD corrections, resummation, spin-dependent PDFs

- Paper 1, NLO corrections and factorization for single-inclusive spin asymmetries (Rein, Schlegel, Tollkühn,WV) <u>2503.16097</u>
- Paper 2, NNLO global analysis of polarized parton distribution functions (Borsa, de Florian, Sassot, Stratmann, WV) <u>2407.11635</u>



Renee Fatemi (University of Kentucky)

Research interests: Using jets to explore collinear and TMD PDFs and FFs in vacuum and nuclear matter. Muon g-2 and BSM signals at the EIC.

- Detailed report on the positive muon anomalous magnetic moment of the muon to 0.2 ppm. <u>PRD 110,</u> 032009 (2024)
- Performance optimization for a scintillating glass electromagnetic calorimeter at the EIC (Crafts, Fatemi,Horn,Kalinkin) JINST 19 05, C05049 (2024)
- Azimuthal transverse single spin asymmetries of inclusive jets and identified hadrons inside of jets <u>PRD 106, 072010 (2022)</u>



Peter Meinzinger (Zürich University)

Research interests: Collider phenomenology, precision calculations, event generation

As seen on arXiv:

- Hard Diffraction in Sherpa, 2407.02133
- Hadron-level NLO predictions for QCD observables in photo-production at the Electron-lon Collider, <u>2311.14571</u>

Diffractive jet production in DIS



Aude Gehrmann-De Ridder (ETH Zürich)

Research interests: Precision computations in perturbative QCD and their applications to collider phenomenology As seen on arXiv:

•Jet rates in Higgs boson decay at third order in QCD, <u>2502.17333</u>

•QCD predictions for vector boson plus hadron production at the LHC, <u>2405.17540</u>



Thomas Gehrmann (Universität Zürich)

Research interests: Precision calculations, amplitudes, collider phenomenology

As seen on arXiv:

•Precise Determination of the Strong Coupling Constant from Dijet Cross Sections up to the Multi-TeV Range, 2412.21165

 Identified Hadron Production in Deeply Inelastic Neutrino-Nucleon Scattering, <u>2504.05376</u>



Cristian Pisano (University and INFN Cagliari)

Research interests: (G)TMDs, quarkonium production and polarization

- Transverse momentum dependent shape function for J/ψ production in SIDIS, <u>2304.09473</u>
- J/ψ polarization in semi-inclusive DIS at low and high transverse momentum, <u>2110.07529</u>



Xiaoxuan Chu (Brookhaven National Laboratory)

Research interests: saturation, proton spin and its 3D imaging

- Paper 1, Investigating the broadening phenomenon in two-particle correlations induced by gluon saturation, <u>2503.08447</u>
- Paper 2, Measurements of the Z0 cross section and transverse single spin asymmetry in 510 GeV p+p collisions, <u>2023.15496</u>



Wenbin Zhao (University of California, Berkeley)

Research interests: Relativistic hydrodynamics, connection between HIC and EIC; Two-particle correlations to probe the gluon saturations.

- Paper 1, Investigating the energy dependence in HICs from nonlinear QCD evolution, with the initial parameter fixed to the HERA data, <u>2502.05138</u>
- Paper 2, Employ the CGC framework to perform a detailed numerical investigation of dihadron correlations at forward rapidities, <u>coming soon</u>
- Paper 3, Multi-scale Imaging of Nuclear Structures at the Electron Ion Collider, <u>2303.04866</u>



Adrian Dumitru

Research interests:

- High-energy (eikonal) scattering
- C-odd ggg/Odderon exchange & proton structure
- Spin dependent BFKL gg(Pomeron) and ggg(Odderon) exchanges in exclusive quarkonium processes



Jani Penttala (UCLA)

Research interests:

- NLO computations in small x
- Search for saturation
- TMD factorization
- Energy correlators

- Diffractive deep inelastic scattering at NLO in the dipole picture, <u>2401.17251</u>
- Finite-size effects on small-x evolution and saturation in proton and nuclear targets, <u>2411.13533</u>



Farid Salazar (Temple University)

Research interests:

Saturation physics and tomography in dilute-dense collisions at HERA, RHIC, LHC and EIC including: i) higher-order computations ii) factorization/resummation iii) phenomenology

As seen on arXiv:

- Unveiling the sea: universality of the transverse momentum dependent quark distributions at small-x. 2503.16162
- Transverse momentum dependent factorisation in the target fragmentation region at small-x. 2502.02634
- Back-to-Back Inclusive Dijets in Deep Inelastic Scattering at Small x: Complete NLO Results and Predictions. 2308.00022 (PRL)

Jet production in target fragmentation region of DIS



TMD jet fracture functions at small-x



Edmond Iancu (Saclay)

Research interests:

High-energy QCD, gluon saturation, CGC Particle production in eA/pA Higher order calculations Factorisation, Resommation, Evolution

As seen on arXiv:

- 1. Jet definition and TMD factorisation for SIDIS 2408.03129 (PRL)
- 2. TMD factorisation for diffractive jets at small x 2402.14748 (JHEP)
- 3. Unveiling the sea: universality of quark TMDs at small x 2503.16162



R_pA ratio for sea quark TMDs

Yuri Kovchegov (The Ohio State University)

Research interests: small-*x* physics, saturation, proton spin at small *x*, helicity and OAM evolution equations at small *x*, TMDs and GPDs at small *x*

As seen on arXiv:

- Quark and gluon helicity evolution at small x: revised and updated, F. Cougoulic *et al*, <u>2204.11898</u> [hep-ph].
- Helicity evolution at small x: quark to gluon and gluon to quark transition operators, J. Borden *et al*, <u>2406.11647</u> [hep-ph].
- Orbital angular momentum at small x revisited, Y. Kovchegov and B. Manley, <u>2310.18404</u> [hep-ph].



Possible Topics:

- Spin at small *x*.
- Unification of/matching between small and large *x*.

Cyrille Marquet (Ecole Polytechnique, France)

Research interests:

small-*x* physics : saturation, CGC TMDs at small *x* : NLO corrections, higher-twist corrections, matching with BFKL

As seen on arXiv:

- Back-to-back dijet production in DIS at next-to-eikonal accuracy and twist-3 gluon TMDs <u>2410.00612</u>
- Sudakov double logs in single-inclusive hadron production in DIS at small x from the color glass condensate formalism <u>2406.08277</u>
- SIDIS at small x at next-to-leading order: transverse photon <u>2505.04557</u>



heavy-quark azimuthal correlations in DIS at small x

Vladi Skokov (North Carolina State University)

Research interests: high energy QCD, small-x, saturation

Current active projects:

- With Ramkumar Radhakrishnan: "NLO gluon production at central rapidity". Through explicit calculations: BFKL of the projectile, JIMWLK of the target, DGLAP in the final state
- With T. Kar and A. Tarasov: subeikonal corrections for dijet. An independent verification of Altinoluk and Beuf et. al. Numerical evaluation of the corrections.
- With S. Tiwari: see next!

Shaswat S Tiwari (North Carolina State University)

Research interests:

TMD factorization, Small-x, JIMWLK on quantum computers

- Paper 1, Perturbative Corrections to Quark TMDPDFs in the Background-Field Method: Gauge Invariance, Equations of Motion, and Multiple Interactions (Mukherjee, V.S., Tarasov, Tiwari) 2502.15889
- Paper 2, Unified description of DGLAP, CSS, and BFKL evolution... (Mukherjee, V.S., Tarasov, Tiwari) 2311.16402



Raju Venugopalan (BNL)

Research Interests:

Small x physics, QCD and GR double copy,

QIS and high energy physics, anomalies and

topological effects, Thermalization,

Worldline methods for precision computations **As seen on arXiv:**

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Role of the chiral anomaly in polarized deeply inelastic scattering. III.
WZW contributions and chiral Ward identities for finite quark mass
2501.10519 (PRD111 2025), with A. Tarasov
2)Entanglement enabled intensity interferometry in ultrarelativistic
ultraperipheral nuclear collisions,
arXiv:2407.15945, Phys. Rev. Res. 7 (2025)
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With Daniel Brandenburg, Haowu Duan, Kong Tu and Zhangbu Xu





Jamal Jalilian-Marian (City University of New York, Baruch College)

Research interests: High energy QCD, small x and gluon saturation and more recently, TMD and Sudakov physics

As seen on arXiv:

- One loop renormalization of quark TMD in light cone gauge: CSS evolution, 2505.****
- SIDIS at small x at NLO: transverse photon, 2505.04557
- Sudakov double logs in single inclusive hadron production in DIS at small x from the color glass condensate formalism,

2406.08277



Possible Topics:

• A unified formalism for both large and small *x*.