Welcome to the 1ˢᵗ International School of Hadron Femtography

QUARK-GLUON TOMOGRAPHY COLLABORATION

Thomas Jefferson National Accelerator Facility

September 16-25, 2024

QUARK-GLUON TOMOGRAPHY COLLABORATION

1. **Theoretical studies** of high-momentum transfer processes using perturbative QCD methods and study of GPDs properties

2. **Lattice QCD** calculations of GPDs and related structures

3. **Global analysis** of GPDs based on experimental data using modern data analysis techniques for inference and uncertainty quantification

Collaboration structure

★ **12 Universities**
- Duke University
- Hampton University
- Massachusetts Institute of Technology
- Penn State University Berks
- Stony Brook University
- Temple University
- University of Arizona
- University of Connecticut
- University of Kentucky
- University of Maryland
- University of Washington
- William & Mary

★ **3 National Labs**
- Argonne National Lab
- Jefferson Lab
- Lawrence Berkeley National Lab

★ **Senior Investigators**
- 29 Principal Investigators
- 4 Affiliated Members

★ **Early Career Members**
- 2 Undergraduate Students
- 22 Graduate Students
- 15 Postdoctoral Fellows/Research Associates

Principal Investigator:
Martha Constantinou (Temple University)

Additional Spokespersons:
Ian Cloët (Argonne National Lab)
David Richards (Jefferson Lab)
Feng Yuan (Lawrence Berkeley National Lab)

Executive committee:
Christopher Monahan (William&Mary)
Nobuo Sato ((Jefferson Lab))

Co-Investigators:
Yong Zhao (Argonne National Lab)
Thomas Mehen (Duke University)
Alberto Accardi, Jose Goity (Hampton University)
Wally Melnitchouk, Christian Weiss (Jefferson Lab)
William Detmold, John Negele, Phiala Shanahan, Iain Stewart (MIT)
Leonard Gamberg, Alexei Prokudin (Penn State University Berks)
Sergey Syritsyn, Edward Shuryak, Ismail Zahed (Stony Brook University)
Andreas Metz (Temple University)
Sean Fleming (University of Arizona)
Peter Schweitzer (University of Connecticut)
Keh-Fei Liu (University of Kentucky)
Xiangdong Ji, Kyle Shiells (University of Maryland)
Gerald Miller (University of Washington)
Konstantinos Orginos (William & Mary)
Farid Salazar (Temple)
Felix Ringer (SBU)

Affiliated Senior Investigators:
Luchang Jin (Connecticut)
Jianwei Qiu (Jefferson Lab)
Anatoly Radyushkin (ODU)
Chueng Ji (NCSU)   Zhite Yu (JLab) Asli Tandogan (UConn)   3

Focus Areas - Composition & Expertise

★ Specialization in designing and using effective field theories, chiral perturbation theory, perturbative QCD, and models of QCD

★ Hadron structure-related investigations, e.g., QCD factorization and breaking effects, lepton-nucleon interactions, light-front quantization, gauge topology

➡ Quark & Gluon GPDs and TMDs

➡ Gravitational form factors

➡ Wigner functions

➡ Hadronic structure on the light front

➡ Spin physics

➡ Small-x physics

➡ Strangeness in exchange currents

➡ Large-N_c limit

Focus Areas - Composition & Expertise

★ Long-standing expertise in numerical methods in lattice gauge theories, simulations of QCD, non-perturbative methods for renormalization

★ Investigations of hadron structure via parton distribution functions and generalizations through: (a) Mellin moments method, (b) novel approaches

LATTICE QCD

➡ Quark & Gluon PDFs

➡ Gravitational form factors

➡ Proton spin, momentum & angular momentum

➡ E/M form factors and charged radii

➡ Electric dipole moment

➡ x-dependence of PDFs, GPDs, TMDs

➡ neutrino-nucleon scattering cross-sections

➡ Nuclei structure

Focus Areas - Composition & Expertise

★ Broad expertise in developing frameworks for global analysis of experimental data sets, data science techniques, and analytical studies of aspects of QCD

★ Studies of non-perturbative bound-state problems, chiral effective theories, and the interface of lattice QCD and hadron phenomenology

PHENOMENOLOGY

➡ Quark & Gluon PDFs

➡ GPDs and TMDs

➡ Tensor charge and single-spin asymmetries

➡ Distributions of mass and spin in the nucleon

➡ radii and gravitational form factors

➡ perturbative corrections in DVMP

➡ Bayesian methods to tackle inverse problem

Public information for the scientific community

https://qgtcollab.github.io

Enjoy the School!