Abdulai Gassama

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Physics Ph.D. Student

Education

- **Brown University** — Providence, RI, USA
  PhD Student, Physics — *Expected Graduation May 2029*
  GPA: 4.0/4.0
  Focus in 2D Topological Defects in Disordered Systems
  Co-PIs: Prof. Xinsheng "Sean" Ling and Prof. J. Michael Kosterlitz (Nobel 2016)

- **Clark University** — Worcester, MA, USA
  Bachelor of Arts (Honors) – Physics
  Minor - Actuarial and Financial Mathematics
  Thesis: *Pattern Formation in Multicomponent Lipid Membranes*

Research Experiences

- **Brown University** — Hybrid
  Condensed Matter Physics Research Assistant — *May 2022 - Present*
  - **Numerical Studies of 1D Random-Field $1/r^2$ Ising model**: Studying 1D random-field Ising model with $1/r^2$ interactions using Monte Carlo. Answering the question of whether systems with quenched disorder or frustration that prevents the emergence of long-range order have a real phase transition. Supervised by Prof. X.S. Ling, Prof. J.K. Kosterlitz, and Prof. R.A. Pelcovits.
  - **Thermally Activated Dynamics in 2D Colloidal Glasses and Crystals**: Using video microscopy and Monte Carlo simulations to investigate the physical mechanism of a two-step 2D colloidal glass transition of rods. NSF-funded. Supervised by Prof. X.S. Ling and Prof. J.K. Kosterlitz.

- **Syros Pharmaceuticals** — Hybrid
  Computational Chemist (Full-time · Summer Position) — *June 2022 – August 2022*
  - **Structure and Ligand-based virtual screening**: Support building and performing molecular dynamics simulations of chosen protein/DNA-ligand complexes via Maestro.

- **Clark University** — Hybrid
  High Energy Physics Research Fellowship — *May 2021 - August 2021*
  - **Intensive Paid Summer Research**: Recipient of LEEP Fellowship Award. I received this for research on graphical manifolds.
  - **Monograph**: Written a 52-page monograph explaining calculations for asymptotically flat manifolds and asymptotically hyperbolic manifolds, titled "Positive Mass In All Dimensions." Supervised by Prof. Aghil Alaee, Harvard CMSA associate.
  - **Impact**: Worked towards a graphical solution for the Horowitz-Myers conjecture.

Ongoing & Refereed Publications

- **Phase Transitions in 1D Dislocation Chains**: J.Eick, A.Gassama, O.Tower, N.Sharma, Prof. X.S. Ling, Prof. J.K. Kosterlitz, and Prof. R.A. Pelcovits——(*In Preparation*)
- ***Review of A Short Course in Computational Geometry and Topology* by Herbert Edelsbrunner. SIGACT News 52(4) :11-14 (2021)**: A.Gassama, F.Green

Honors & Awards

- LEEP Fellowship Award - Clark University, May 2021
  A highly selective grant that helps reward recipients pursue unpaid, problem-based projects or research during the summer months. Typically given to those that have already conducted research for over a year.

Coursework

Quantum Computing · Solid State Physics · General Relativity · Quantum Field Theory · Quantum Many-Body Physics · Applied AI & ML · Advanced Statistical Mechanics · Differential Geometry · Experimental Physics

Technical Background

- **Advanced Experiments**: Electrochemistry, Colloids, Topological Data Analysis
- **Programming**: Python, Java, Julia, Matlab
- **Software**: Maestro (Schrödinger)
- **Statistics**: Very knowledgeable in Totally Asymmetric Exclusion Processes, and Finite State Projection Analyses, Data Fitting, MCMC and Metropolis Hastings Analysis, Stochastic Simulations, Model Optimization
- **ML Libraries**: Knowledgeable in Pytorch, TensorFlow
- **Languages**: English (Native), Japanese (Proficient), Korean (Conversational)