Mustafa Mustafa

Specialties: Physics, Data Analysis, C++, ROOT, Linux
mmustafa.com • github.com/MustafaMustafa • mstftsm@gmail.com

Education

2009-2013 **Ph.D. in Physics (High Energy Nuclear Physics)**.
Purdue University, IN.

2004-2008 **B.Sc. in Physics**
University of Jordan, Amman, Jordan.

Work Experience

2013-Present **Postdoctoral Fellow**. *Lawrence Berkeley National Laboratory*.
Relativistic Nuclear Collisions group (RNC), Nuclear Science Division.

2010-2013 **Graduate Research Assistant.** *Purdue University, IN.*
High-Energy Nuclear Physics Group.

2008-2009 **Research Assistant.** *Purdue University, IN.*
Remote collaboration with Prof. Sabre Kais.

2008 **Research Assistant.** *University of Jordan, Amman, Jordan.*
Prof. Jameel Khalifeh's group.

2009-2010 **Astronomy Laboratory Teaching Assistant, ASTR 263, ASTR 264.**
Purdue University, IN.

2008-2009 **Physics Laboratory Instructor.**
Middle East Technical University, North Cyprus Campus.

2007 **DAAD Intern.** *Ilmenau Technical University, Ilmenau, Germany.*

Projects and Contributions

C++ code review and guidelines:

2014-Present **C++ coding guidelines committee**, STAR experiment, Brookhaven Nat. Lab.
Member of the committee to re-write the STAR experiment coding guidelines and include the new C++11 standard. The new guidelines are to take into account the millions of lines of C++ code in STAR existing code base. Work in progress, Github repo: http://goo.gl/iKedgb

2014 **Muon Telescope Detector simulation software code review**.
STAR experiment, Brookhaven National Lab.

2013 **Forward Gem Tracker point maker code review**.
STAR experiment, Brookhaven National Lab.

C++ Software Development:

2013-Present **Charm production in p+p collision at $\sqrt{s}$ = 200 GeV (STAR experiment)**
Designed and built a package to analyze 13TB of p+p collisions data. The data is first reduced to 1.5TB which resulted in an order of magnitude reduction in processing time. The code base is ~15k lines of code. Github repo: http://goo.gl/mHQF8P.

2012-Present **Heavy Flavor Tracker - PXL simulators (STAR experiment)**
Designed and implemented: **1)** Simulation data containers **2)** Simulators interface **3)** Fast simulator **4)** Pile up hits adder **5)** STAR wrapper for DIGMAPS sensors response emulation tool. Github repo: http://goo.gl/Z37Cx8.

Large Scale Data:

2014 **Cosmics data production for TPC alignement**, STAR experiment,
Designed and wrote scripts to re-stage and submit jobs to analyze 150TB of cosmics data. The data was located on tapes and the available buffer disk space was 5TB. The scripts handled the request of data from the High Performance Storage System (HPSS), ensuring re-staging requests fulfilment, distributing the analysis jobs on 7 running job dispatching scripts, ensuring jobs completion and output files integrity, freeing disk space of analyzed data. The data was finally analyzed using 37k jobs.

2010-2013 **Embedding Team**, STAR experiment,
Joined the team as an embedding helper and later promoted to an embedding deputy. During my term I worked on: **1)** Quality assurance of production physics and detector performance in simulation vs. data. **2)** Submit and follow-up on issues and bugs with the core Software and Computation team. **3)** Participate in restructuring the embedding work-flow and thus refactoring submission and production management scripts. **4)** The embedding team and I finished more than 25 HF embedding requests (17m events) for Quark Matter 2012 within sixth months. This required 6500 CPU weeks and 30TB of disk space.

Selected Research:

2014-Present **Measurement of non-photonic electrons in U+U collisions (STAR experiment)**
Mentoring Masters student Katarína Gajdošová (Czech Technical University, Prague).
Preliminary results will be presented at the 53rd International Winter Meeting on Nuclear Physics, Borimo, Italy. (Jan/2015).

2013-Present **Charm production in p+p collision at $\sqrt{s}$ = 200 GeV (STAR experiment)**
Measurement of charm production at mid-rapidity by direct reconstruction of $D^0 \to K\pi$ and $D^* \to D^0\pi \to K\pi\pi$ from RHIC year 2012 run.
Preliminary results were presented at Quark Matter 2014 (PDF).

2013-Present **Time Projection Chamber (TPC) alignment and calibration (STAR experiment)**
Carrying R&D on alignment and calibration of STAR TPC. TPC gas $\omega\tau$ and field distortion correction coefficients measurement using cosmic ray data and verification using Magboltz simulations. TPC alignment using HFT and cosmic rays data.

2013-Present **Measurement of non-photonic electrons in p+p collisions (STAR experiment)**
Mentoring Ph.D. student Xiaozhi Bei (UIC and CCNU).
Poster at Quark Matter 2014. Paper in preparation.

2011-2013 **Measurement of non-photonic electrons production and azimuthal anisotropy (STAR experiment)**
Measurement of non-photonic electrons production and azimuthal anisotropy in Au+Au

collisions at $\sqrt{s_{NN}}$=200, 62.4 and 39 GeV.
Ph.D. thesis. arXiv:1210.5199. arXiv:1405.6348. Two more papers in the pipeline.

2011 **D^* reconstruction with HFT (STAR experiment)**
Study topological reconstruction of D^* using STAR Heavy Flavor Tracker in full GEANT simulations.

2010-2011 **D^0 production in p+p collision at $\sqrt{s}$ = 200 GeV (STAR experiment)**
Measurement of charm cross-section at mid-rapidity by direct reconstruction of $D^0 \to K\pi$. Phys. Rev. D 86, 072013 (2012). arXiv:1204.4244.

Service and Voluntary Work

2014-Present **Heavy Ion Tea (HIT) seminars series**, Lawrence Berkeley National Lab.
Member of the organizing committee of the HIT seminars which are hosted by the (RNC) group at LBNL.

2013-2014 **Heavy Ions Journal Club**, Brookhaven National Lab.
Organized sessions of club to study and discuss recent papers and progress in the field of heavy ion physics.

2008 **Theoretical Physics Lab. Linux Cluster**, University of Jordan.
As a member of a self-organized team we constructed the first Linux Cluster in the University of Jordan for computational physics research.

Publications

50+ publications. Full list available at Google Scholar or INSPIRE.

Selected experimental physics publications (primary author):

2013 *Measurements of non-photonic electron production and azimuthal anisotropy in $\sqrt{s_{NN}} = 39$, 62.4, and 200 GeV Au+Au collisions from STAR at RHIC.*
Mustafa Mustafa (for the STAR Collaboration). Nuclear Physics A 904-905, 665 (2013). arXiv:1210.5199.

2012 *Measurements of D^0 and D^* production in p + p Collisions at $\sqrt{s}$ = 200 GeV.*
L. Adamczyk et al. (STAR Collaboration). Phys. Rev. D 86, 072013 (2012). arXiv:1204.4244.

Mathematical physics publications:

2011 *Supersymmetry identifies molecular Stark states whose eigenproperties can be obtained analytically*.
M. Lemeshko, M. Mustafa, S. Kais, B. Friedrich. New J. Phys. 13, 063036 (2011). arXiv:1106.4402.

2011 *Supersymmetric factorization yields exact solutions to the molecular Stark effect problem for "stretched" state*.
M. Lemeshko, M. Mustafa, S.Kais, B. Friedrich. Phys. Rev. A. 83, 043415 (2011). arXiv:1105.5262.

2009 *A Venn diagram for supersymmetric, exactly solvable, shape invariant, and Infeld-Hull factorizable potential*. M. Mustafa, S. Kais. arXiv:0911.4206.

2009 *Effective polar potential in the central force Schrödinger equation*

M. S. Shikakhwa and M. Mustafa. Eur. J. Phys. 31, 151 (2010). arXiv:1001.3693.

Book chapters:

2009 *General Physics, Electromagnetism Laboratory Manual, 3rd Edition*.
M. S. Shikakhwa, M. Mustafa, R. Al-Rfou', A. Ecevit, M. Ozbakan.
Middle East Technical University, North Cyprus Campus.

Talks

Conference talks:

2013/11 **Measurement of non-photonic electrons in STAR experiment**,
EMMI workshop on Heavy Flavor & QCD Phase Structure in High Energy Collisions, LBL, Berkeley, CA. PDF.

2012/08 **Measurements of non-photonic electrons at STAR experiment**,
parallel talk at *Quark Matter 2012 Int'l Conference*, Washington D.C. PDF.

Invited talks:

2014/06 **Recent open heavy flavor results from STAR experiment**,
RHIC & AGS Annual Users' Meeting, BNL, NY. PDF.

2013/06 **Recent open heavy flavor results at RHIC**,
RHIC & AGS Annual Users' Meeting, BNL, NY. PDF.

2012/10 **Measurements of non-photonic electron in STAR experiment**,
International Workshop on Heavy Quark Production in Heavy-Ion Collisions, Utrecht, Netherlands. PDF.

2012/08 **Measurements of non-photonic electron in STAR experiment**,
Workshop on Heavy Flavor Production in High-Energy Nuclear Collisions,
UIC, Chicago, IL. PDF.

Seminars:

2014/08 **Measurements of electrons from heavy-flavor hadrons decays in STAR experiment**,
University of Illinois at Chicago, Chicago, IL. PDF.

Skills and Areas of Expertise

Skills

Scientific Computing	C++	Linux Clusters
Monte Carlo Simulations	OOP	Linux Admin.
Data Analysis	Python	Mathematical Modeling
ROOT	Mathematica	Mathematical Physics

Online Courses Machine Learning (Andrew Ng).
Statistical Learning (Hastie &Tibshirani).

mmustafa.com • github.com/MustafaMustafa • mstftsm@gmail.com
• +1 765 409 7690 •

Nuclear Science Division, Lawrence Berkeley National Laboratory,
One Cyclotron Road, Berkeley, CA 94720