Mustafa Mustafa

Specialties: Physics, Data Analysis, C++, ROOT, Linux
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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++ STAR coding guidelines committee**
Member of the committee to re-write the STAR experiment coding guidelines and including the new C++11 standard. The new guidelines are to take into account the existing millions of lines of C++ code in STAR code base. Work in progress, Github repo: http://goo.gl/iKedgb

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

2013 **Forward Gem Tracker point maker code review**.
STAR experiment, Brookhaven Nation 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 a 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:

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).

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