

# 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 **Introductory 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  $D^0 \rightarrow K\pi$  and  $D^* \rightarrow D^0\pi \rightarrow K\pi\pi$  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  $D^0 \rightarrow K\pi$ .  
*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  $\sqrt{s_{NN}} = 39, 62.4, \text{ and } 200 \text{ GeV } Au+Au$  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  $\sqrt{s} = 200 \text{ GeV}$ .*  
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. Leshchko, 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. Leshchko, 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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