

To whom it may concern,

Let me tell you more about my experience hoping it will bridge the gap between my resume/CV and the jobs I am applying for. I have close to 4 years experience in C++ development in a Unix/Linux environment. Our code base (a few million lines of code) is mainly for reconstructing and handling petabytes of data. My day to day job is mainly to use the existing code and extend it to do quality assurance of detector performance, detector calibration R&D and finally to do data analysis to extract extremely weak physics signals (signals which are true for 1 in millions of events). This data is analyzed using thousands of CPU days at national laboratories Linux Clusters (NERSC at LBNL and RCF at BNL).

The cycle of our work has helped me build a solid knowledge of programming and especially debugging large code bases, statistical analysis and mathematical modeling in addition to all the usual and unusual gimmicks of the command line to wrangle all this data. Our experiment consists of 550+ scientists which has also given me exposure to working in large international teams in a competitive and a fast-paced environment. I would finally add that my best skill of all is to learn the tools which are needed to get the job done, be it physics, mathematics, electronics or software engineering.

Personally, I became more interested in software development for data analysis purposes over the years. I value and enjoy the time I spend designing and building software and I am looking forward to spending a few years in perfecting these skills.

I hope I gave you a better impression of my background and experience and how it can fit in the industry environment.

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++ Software Development:

- 2013-Present **Charm production in $p+p$ collision at $\sqrt{s} = 200$ GeV**, STAR experiment,
Designed and built a library to analyze 13TB of $p+p$ collisions data. 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>.

C++ Code Review and Guidelines:

- 2014-Present **C++ coding guidelines committee**, STAR experiment, Brookhaven Nat. Lab.
Charged 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 existing STAR 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.

Large Scale Data Analysis:

- 2014 **Cosmic ray data production for TPC alignment**, STAR experiment,
Designed a pipeline to re-stage and submit jobs to analyze 150TB of cosmic ray data. The data was located on tapes in chunks of 4.7GB files and the available buffer disk space was 5TB. The system handled **1)** request of data from the High Performance Storage System (HPSS) **2)** ensuring re-staging requests fulfilment **3)** distributing the analysis jobs on multiple job dispatching demons which are responsible for submitting jobs to a Linux machine cluster **4)** ensuring jobs completion and output files integrity **5)** finally freeing disk space of completed jobs to make space for more data. The data was finally analyzed using a total of ~37k jobs.
- 2010-2013 **Embedding Team**, STAR experiment,
Joined the team as an embedding helper and later promoted to an embedding team deputy. During my term I worked on: **1)** quality assurance of detector performance and physics in simulated data. **2)** submission and follow-up of software issues and bugs with the core Software and Computation team. **3)** refactoring submission and production management scripts to restructure the production workflow. **4)** finishing more than 25 HF production requests for Quark Matter 2012 within sixth months. This required 6500 CPU weeks and 30TB of disk space.

Selected Research:

- 2013-Present **Charm production in $p+p$ collision at $\sqrt{s} = 200$ GeV**, STAR experiment,
Direct reconstruction of $D^0 \rightarrow K\pi$ and $D^* \rightarrow D^0\pi \rightarrow K\pi\pi$ from RHIC year 2012 run. Results were presented at Quark Matter 2014 ([PDF](#)).
- 2013-Present **Time Projection Chamber (TPC) alignment and calibration R&D**, STAR experiment,
1) Measurement of TPC gas $\omega\tau$ and field distortion correction coefficients using lasers data and verification using Magboltz simulations. **2)** TPC alignment using HFT and cosmic rays data.
- 2011-2013 **Experiment study of non-photonic electrons $Au+Au$ collisions**, 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](#).
- 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](#).

Research Mentorship:

- 2014-Present **Measurement of non-photonic electrons in $U+U$ collisions,**
Masters student Katarína Gajdošová (Czech Technical University, Prague).
Results were presented at 53rd Int'l Winter Meeting on Nuclear Physics, Borjomo, Italy (2015).
- 2013-Present **Measurement of non-photonic electrons in $p+p$ collisions,**
Ph.D. student Xiaozhi Bei (UIC and CCNU).
Poster at Quark Matter 2014. Paper in preparation.

Publications and Talks

50+ publications. Full list available at Google Scholar (<http://goo.gl/vBu7pm>) or INSPIRE (<http://goo.gl/1mFOFp>).
A list of talks and seminars can be found in my CV (<http://goo.gl/nJBtpl>).

Skills and Areas of Expertise

- Programming C++ (proficient), python (intermediate)
- Scientific Computing ROOT, Large Scale Data Analysis (on clusters), Monte Carlo Simulations, Mathematical Modeling
- OS Linux
- Online Courses **Machine Learning** (Andrew Ng).
Statistical Learning (Hastie & Tibshirani).

Service and Voluntary Work

- 2014-Present **Heavy Ion Tea (HIT) seminars series**, Lawrence Berkeley Nat. Lab.
Member of the **HIT seminars** organizing committee.
- 2013-Present **RHIC Users' Executive Committee**, Brookhaven Nat. Lab.
Elected post-doc representative. Serving on the Quality of Life at the lab working force.
- 2013-2014 **Heavy Ions Journal Club**, Brookhaven National Lab.
Organized club sessions 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.

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