# Niharika Ranjan Singh

2044 Montecito Ave Apt 8
Mountain View, CA 94043

Phone: (765) 280-1804
niharika.rsingh@gmail.com

## Education

**Ph.D. in Experimental Particle Physics** **May 2012**
Purdue University, West Lafayette, Indiana
Adviser: Prof. Matthew Jones
Thesis: A study of quark fragmentation using kaons produced in association with prompt $D_s^{\pm}/D^{\pm}$ mesons.

**Master of Science in Physics** **Jul 2003**
Indian Institute of Technology (IIT) Madras, Chennai, India
Adviser: Prof. C.Vijayan
Thesis: Synthesis and characterization of strongly confined CdS nanostructures.

**Bachelor of Science in Physics, Mathematics and Chemistry** **Jul 2001**
University of Rajasthan, Jaipur, Rajasthan, India

## Experience

**Graduate Research Assistant** **Jan 2005 - May 2012**
Adviser: Prof. Matthew Jones
Department of Physics, Purdue University, West Lafayette, Indiana

- Conducted multivariate statistical analysis using data collected with the CDF detector that was generated in proton anti-proton collisions at the Tevatron, a circular particle accelerator located at the Fermi National Accelerator Laboratory in Batavia, Illinois.
- Extensively used techniques such as binned and un-binned multivariate likelihood fitting procedure; and parameter estimation using maximum likelihood estimation framework. Vast experience in data-driven model building and fitting.
- Constructed probability distribution functions (PDFs) for describing the shapes of various kinematic variables. The key aspect of constructing the PDFs was to demonstrate that the assumed functional forms were justified based on independent calibration data samples and well motivated physics arguments.
- Primarily did programming in C++ for conducting the analysis.

**Member of the CDF collaboration** **Jul 2005 - present**
Fermi National Accelerator Laboratory, Batavia, Illinois

- The collaboration includes over 500 members from 60 institutions worldwide. All the research work conducted using the data collected at CDF is reviewed by members of the collaboration prior to submission of the results to leading journals for publication.
- Primary author of six CDF publications and co-authored over 200 journal articles since I attained the CDF authorship in September 2006.

**Visiting Graduate Researcher** **Jul 2005 - Dec 2007**
Fermi National Accelerator Laboratory, Batavia, Illinois

- Handled the daily operation of the CDF detector along with other members of the collaboration. The CDF detector is a complex detector with various sub-components, which was designed to record signals that were generated when particles produced in proton anti-proton collisions traversed the various components of the detector. Daily operations at CDF involved running and maintaining the high voltage components, the data acquisition system and continuously monitoring the quality of the in-coming data.
- Member of a team of four individuals that worked as on-call (pager carrier) experts for the Time-of-Flight (TOF) sub-detector at CDF. Managed daily functioning, maintenance and troubleshooting problems related to the TOF detector.

**Summer Research Assistant** **Jun 2004 - Aug 2004**
Supervisor: Dr. Seunghee Son
Adviser: Prof. Daniela Bortoletto
Department of Physics, Purdue University, West Lafayette, Indiana

- Studied response and performance of silicon sensors that contributed towards understanding the design optimization issues for future silicon detectors.

**Under-graduate teaching Assistant** **Aug 2003 - Dec 2004**
Department of Physics, Purdue University, West Lafayette, Indiana

- Teaching assistant for introductory mechanics, electricity and magnetism courses. Coordinated and supervised laboratory courses. Guided under-graduate students in assignments, exam preparation and conducted review of concepts in Physics with students at the individual level.

**Research Assistant** **Jan 2003 - May 2003**
Adviser: Prof. C.Vijayan
Department of Physics, Indian Institute of Technology Madras, Chennai, India

- Synthesized strongly confined Cadmium Sulphide nano-structures and characterized them using Transmission Electron Microscopy. Studied absorption and emission spectra of the synthesized nano-structures.

**Summer Research Assistant** **Jun 2002 - Aug 2002**
Adviser: Prof. Rabindranath Pal
Saha Institute of Nuclear Physics, Kolkata, West Bengal, India

- Studied plasma confinement and calculated plasma parameters using a Tokamak. Investigated plasma properties using spectroscopic diagnostic techniques.

## Technical Skills

- Over six years of experience in handling and analyzing large datasets.
- Quantitative analytical skills: Model building and fitting, parameter estimation utilizing maximum likelihood estimation framework, using statistical concepts for data analysis.
- Computer programming: Well versed in C++. Basic knowledge of Java.
- Extensively used ROOT (distinct but similar to R): A data analysis software package that provides an object-oriented framework with all the functionality needed to handle and analyze large amounts of data in a very efficient way. ROOT includes histograming methods, curve fitting, function evaluation, minimization, graphics and visualization classes, as well as a general parallel processing framework that can considerably speed up an analysis.
- Miscellaneous: LaTeX, HTML, Unix shell programming.
- Operating systems: Unix/Linux, Windows and Mac OS X.

## Publications

The publication list comprises of internal and external CDF publications that are submitted in the CDF collaboration; and journal articles submitted to leading physics journals that include the joint CDF author list. I have co-authored over 200 journal articles since attaining the CDF authorship in September 2006 after successful completion of the service requirements at CDF.

**Internal CDF Publications**

- N. Ranjan and M. Jones, **A Study of Quark Fragmentation using Kaons Produced in Association with $D_s^{\pm}/D^{\pm}$ Mesons**, CDF Note 10662, Sep 2011.
- N. Ranjan and M. Jones, **COT Energy Loss Calibration for Low $p_T$ Unbiased Tracks**, CDF Note 10272, Aug 2010.
- N. Ranjan and M. Jones, **Parameterization of the TOF residual distribution using soft pions from $D^*$ decays**, CDF Note 10209, Jul 2010.
- N. Ranjan and M. Jones, **Parameterization of Secondary $D_s^{\pm}/D^{\pm}$ Impact Parameter Distributions**, CDF Note 9749, Apr 2009.

**External CDF Publications**

- N. Ranjan (for the CDF collaboration), **A study of quark fragmentation using kaons produced in association with prompt $D_s^{\pm}/D^{\pm}$ mesons**, CDF Note 10704, Jan 2012.

**Conference Proceedings**

- N. Ranjan for the CDF collaboration, **Status of the Upsilon Polarization Measurement at CDF**, CDF Note 10661, arXiv:1110.0048v1, Proceedings of the DPF-2011 Conference, Providence, RI, Aug 2011.

**Selected Journal Publications**

- T. Aaltonen et al., The CDF Collaboration, **A Study of Charged Kaons Produced in Association with $D_s^+/D^+$ Mesons**, (In preparation: My Ph.D. thesis work).
- T. Aaltonen et al., The CDF Collaboration, **Measurements of Angular Distributions of Muons From Upsilon Meson Decays in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV**, FERMILAB-PUB-11-644-E, arXiv:1112.1591 (2011).
- T. Aaltonen et al., The CDF Collaboration, **Search for $B_s \to \mu^+\mu^-$ and $B_d \to \mu^+\mu^-$ Decays with CDF II**, Phys. Rev. Lett. 107, 191801 (2011).
- T. Aaltonen et al., The CDF Collaboration, **Measurement of the $B_s^0$ Lifetime in Fully and Partially Reconstructed $B_s^0 \to D_s^-(\phi\pi^-)X$ Decays in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV**, Phys. Rev. Lett. 107, 272001 (2011).
- T. Aaltonen et al., CDF Collaboration, **Measurement of Ratios of Fragmentation Fractions for Bottom Hadrons in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV**, Phys. Rev. D77, 072003 (2008).

- A. Abulencia et al., CDF Collaboration, **Observation of $B_s^0$-$\bar{B}_s^0$ Oscillations**, Phys. Rev. Lett. 97, 242003 (2006).

The complete list of journal articles can be found at http://www-cdf.fnal.gov/physics/preprints/

**Ph.D. Dissertation**

- Title: A Study of Quark Fragmentation using Kaons Produced in Association with Prompt $D_s^{\pm}/D^{\pm}$ Mesons, FERMILAB-THESIS-2012-07.

## Selected Presentations

- Presentations at CDF: Given about twenty talks in the meetings within the CDF collaboration discussing various aspects of the research work. The internal CDF meetings are attended by members of the collaboration from various institutes worldwide.
- *New Measurements of Upsilon Spin Alignment at CDF*, American Physical Society (APS) meeting, Atlanta, Georgia (Apr 2012).
- *Measurements of Quark Fragmentation Using Kaons Produced in Association with Prompt $D_{(s)}^{\pm}$ mesons at CDF*, American Physical Society (APS) meeting, Atlanta, Georgia (Apr 2012).
- *Status of the Upsilon Polarization Measurement at CDF*, Division of Particles and Fields (DPF) of the American Physical Society, Providence, Rhode Island (Aug 2011).
- *Probing Quark Fragmentation with Ds-K Correlations at CDF*, American Physical Society (APS) meeting, Dallas, Texas (Apr 2006).
- *Large Hadron Collider: Search for the Higgs*, Department of Physics, Purdue University, West Lafayette, Indiana (May 2004)
- *Synthesis and Characterization of Strongly Confined CdS Nanostructures*, Department of Physics, Indian Institute of Technology Madras, Chennai, India (Apr 2003).
- *Solid State Lasers*, Department of Physics, Indian Institute of Technology Madras, Chennai, India (Mar 2003).
- *Non-linear Optics and Second Harmonic Generation*, Department of Physics, Indian Institute of Technology Madras, Chennai, India (Dec 2002).

## Honors and Awards

- Recipient of the Lijuan Wang Memorial Award for graduate research work, Department of Physics, Purdue University, West Lafayette, Indiana (Apr 2012).

- Recipient of Division of Particle and Fields travel award for presenting research work at the American Physical Society meeting, Atlanta, Georgia (Apr 2012).
- Recipient of Department of Physics, Purdue University, travel award for presenting research work at American Physical Society meeting, Atlanta, Georgia (Apr 2012).
- Recipient of Division of Particle and Fields travel award for presenting research work at Division of Particles and Fields meeting, Providence, Rhode Island (Aug 2011).
- Recipient of Division of Particle and Fields travel award for presenting research work at the American Physical Society meeting, Dallas, Texas (Apr 2006).
- Awarded scholarship at Indian Institute of Technology Madras, Chennai, India for academic excellence (Jan 2002 - Jul 2003).
- Scored 90% and ranked 226 out of more than $100,000$ students appearing for Physics - Graduate Aptitude Test in Engineering (GATE), India (Feb 2003).
- Awarded Junior Research Fellowship, for research and teaching profession, in the National Eligibility Test (NET) conducted by University Grants Commission (UGC), India (Dec 2002).