YURIY ILCHENKO

Curriculum Vitae

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EDUCATION:

- **Ph.D. in Experimental Particle Physics** **2006 - 2012**
  Southern Methodist University, Dallas, TX USA
  Thesis title - *Measurement of the Top Quark Mass in Dilepton Final States with Neutrino Weighting Method at DØ experiment* (advisor: Robert Kehoe)
- **M.S. in Theoretical Physics** **2003 - 2004**
  Odessa National University, Odessa, Ukraine
  Graduated with Distinction
- **B.S. in Physics** **1999 - 2003**
  Odessa National University, Odessa, Ukraine
  Graduated with Distinction

EMPLOYMENT:

- **Postdoctoral Fellow**, ATLAS, UT/Austin (Austin, TX, USA): *2013* - ***Present***
- Research Assistant, SMU (Dallas, TX, USA): *2009 - 2012*
- Teaching Assistant, SMU (Dallas, TX, USA): *2006 - 2009*
- Software Engineer, Arete Ukraine Ltd. (Odessa, Ukraine): *2004 - 2006*

RESEARCH EXPERIENCE:

ATLAS Experiment, since 2013

- **Search for $t\bar{t}H$ in multilepton final states**
  To suppress background contirbution from the $t\bar{t} + jets$ events in the search for $t\bar{t}H$, I proposed to employ Boosted Decision Trees (BDT) algorithm for the lepton identification. As an alternative to TMVA which showed bad performance, I suggested to use scikit-learn MVA library. I have demonstrated that scikit-learn provides an improvement of about 35-45% in the non-prompt lepton rejection. To be able to apply BDT from the scikit-learn library in the ATLAS software framework, I have developed and validated a special BDT converter - https://github.com/yuraic/koza4ok. The converter is capable of saving scikit-learn BDT model to the TMVA xml format. The supported boosting methods are AdaBoost and Gradient Boosting. Besides the $t\bar{t}H$ search at ATLAS, this converter is also being used by the LHC scientists in other tasks such as BDT software triggers at LHCb. I have successfully applied sklearn-trained BDT on the ATLAS simulated data and showed that at a given $t\bar{t}H$ signal efficiency the overall $t\bar{t} + jets$ background can be reduced by almost 50%. Aside of the BDT lepton identification, I have also participated in the evaluation of the $t\bar{t}V$ theoretical systematics.
- **Offline Data Quality**
  Currently, I am the offline Data Quality infrastructure expert which is a very critical responsibility for the ATLAS experiment. I am responsible for the DQ web displays production for

Tier-1 reprocessings as well as maintaning core DQ services such as DQ web server. During LHC LS1, I have been upgrading base DQ monitoring classes in the Atheha framework and developing new DQ xml-rpc services. I am in charge of supporting offline DQ packages, e.g. DataQualityUtils, DataQualityInterfaces, etc., addressing JIRA DQ tickets, finding and fixing bugs in the DQ software as well as in dependencies such as ROOT, Cherrypy and others. Additionally, my responsibilities include interactions with the sub-system experts for updates. I am also standing on-call expert for the DQ Tier-0 operations and offline DQ infrastructure support for the detector sub-systems.

DØ Experiment, 2009 - 2012

- **Measurement of the top quark mass in the dilepton channel**
  I used Neutrino Weighting method to measure the top quark mass and estimate its statistical uncertainty in $t\bar{t}$ events with two leptons in the final state. I have designed and implemented an algorithm that performs kinematic reconstruction of the dilepton $t\bar{t}$ events for a given configuration of neutrino pseudorapidities. To calculate event weight used in Neutrino Weighting method, I also implemented numerical integration over the neutrino pseudorapidity choices with different jet assignments. I used *in-situ* jet energy calibration from ℓ+jets channel to achieve significant reduction in the final systematic uncertainty.
- **Jet energy scale calibration**
  To minimize jet energy scale (JES) uncertainty on the top quark mass measurement, I participated in the jet response correction factor determination. The γ+jet sample used to determine the response is considerably contaminated with dijet events. I used the hollow cone template method to estimate the purity of γ+jet sample. Consequently, I incorporated into DØ framework the effect of γ+jet sample impurity on the overall JES systematical uncertainty. Additionally, I performed jet energy scale closure tests on γ+jets for both Data and Monte Carlo.

ATLAS Experiment, 2006 - 2009

- **Online Data Quality**
  To assist efficient recording and processing of good quality data at the ATLAS experiment, I worked on the development of the Data Quality Monitoring Display. I implemented the first working example of the display in Java and later re-implemented in C++ with QT. I was one of the main developers of the display until moved to the DØ experiment in 2010. The work was originally presented at the CHEP 2009 conference and the proceeding is published in "Journal of Physics: Conference Series".
- **Search for supersymmetry in a three letpon plus jets channel**
  I estimated signal significance versus isolation cuts for different fake rate scenarios in coannihilation region of supersymmetry in three lepton final state. I also studied impact of different isolation cuts on the primary background, $t\bar{t}$, and its composition. The result is documented in the ATLAS communication note "ATL-COM-PHYS-2008-167".

INVITED PRESENTATIONS:

- LCWS 2015, *$t\bar{t}H$ and tH production at the LHC: experimental results and prospects*, Nov 2-6, 2015. Whistler (BC), Canada.
- LLWI 2012, *Measurement of the top quark mass in dilepton channel with the DØ detector*, Feb 19-25, 2012. Lake Louise (AB), Canada.
- DPF meeting 2011, *Measurements of the top quark mass and decay width with the DØ detector*, Aug 9-13, 2011. Providence (RI), USA.
- DØ Summer Workshop in Princeton, *Measurement of the Top Quark mass in dilepton final states with Neutrino Weighting Method in Run IIb1+RunIIb2*, Jun 13-18, 2011. Princeton (NJ), USA.

- DØ Summer Workshop in Marseille, *Measurement of the Top Quark Mass in eμ final states with Neutrino Weighting Method in Run IIb at DØ*,
  Jul 29-Aug 4, 2010. Marseille, France.
- CHEP 2009: *Data Quality Monitoring Display for ATLAS experiment at the LHC* (poster),
  Mar 21-27, 2009. Prague, Czech Republic.

SELECTED JOURNAL PUBLICATIONS:

Primary author publications:

- G. Aad *et al.* [ATLAS Collaboration], *Search for the associated production of the Higgs boson with a top quark pair in multilepton final states with the ATLAS detector*, Phys. Lett. B **749**, 519 (2015) [arXiv:1506.05988].
- V. M. Abazov *et al.* [D0 Collaboration], *Measurement of the top quark mass in $p\bar{p}$ collisions using events with two leptons*, Phys. Rev. D **86**, 051103 (2012) [arXiv:1201.5172].

CONFERENCE PROCEEDINGS AND PAPERS:

- ATLAS Collaboration, *Search for the Associated Production of a Higgs Boson and a Top Quark Pair in pp Collisions at $\sqrt{s}$ = 13 TeV with the ATLAS Detector*, ATLAS-CONF-2016-058. Prepared for ICHEP 2016, Chicago, USA, Aug 3-10 2016.
- ATLAS Collaboration, *Search for the associated production of the Higgs boson with a top quark pair in multi-lepton final states with the ATLAS detector*, ATLAS-CONF-2015-006. Prepared for Moriond EW 2015, La Thuile, Italy, Mar 14-21 2015.
- P. Onyisi, R. Kehoe, V. Rodriguez, Y. Ilchenko, *Analysis of $t\bar{t}H$ Events at $\sqrt{s} = 14$ TeV with $H \to WW$*, arXiv:1307.7280 [hep-ex]. Prepared for Snowmass 2013, Minneapolis, Minnesota, USA, Jul 29 - Aug 6 2013.
- Y. Ilchenko, *Measurements of the top quark mass and decay width with the DØ detector*, arXiv:1111.6203 [hep-ex] (FERMILAB-CONF-11-633-PPD, Nov 2011. 7pp). Prepared for DPF 2011, Providence, Rhode Island, USA, 9-13 Aug 2011.
- P. Renkel, Y. Ilchenko, and R. Kehoe, *Measurement of the Top Quark Mass in eμ Final States with Neutrino Weighting in Run II at DØ*, DØ Conf. Note 6104 (2010).
- C. Cuenca Almenar, A. Corso-Radu, H. Hadavand, Y. Ilchenko, S. Kolos, K. Slagle and A. Taffard, *ATLAS online data quality monitoring*, Nucl. Phys. Proc. Suppl. **215**, 304 (2011).
- Y. Ilchenko, C. Cuenca Almenar, A. Corso-Radu, H. Hadavand, S. Kolos, K. Slagle and A. Taffard, *Data quality monitoring display for ATLAS experiment at the LHC*, J. Phys. Conf. Ser. **219**, 022035 (2010).

REVIEWED INTERNAL NOTES:

- D. Bandurin, N. Bartosik, A. Das, G. Golovanov, Y. Ilchenko, A. Jayasinghe, H. Liu, G. Petrillo, Y.-T. Tsai, A. Verkheev, M. Wang, M. Wobisch, Z. Ye, *Jet Energy Scale Determination for DØ Run IIb*, DØ Anal. Note 6327 (2012).
- P. Renkel, Y. Ilchenko, and R. Kehoe, *Measuring the top quark mass in the dilepton channel with 5.3 fb^{-1}*, DØ Phys. Note 6187 (2012).
- P. Renkel, Y. Ilchenko, and R. Kehoe, *Measurement of the Top Quark Mass in eμ Final States with Neutrino Weighting in Run II at DØ*, DØ Phys. Note 6097 (2010).

OTHER INTERNAL NOTES:

- B. Ali *et al.*, *Search for the Associated Production of a Higgs Boson and a Top Quark Pair in Multilepton Final States with the ATLAS Detector*, ATL-COM-PHYS-2016-419 (2016).
- B. Ali *et al.*, *Search for the associated production of a Higgs Boson with a top quar pair in multilepton final states with the ATLAS detector*, ATL-COM-PHYS-2015-1350 (2015).
- A. Corso-Radu, H. Havadand, Y. Ilchenko, S. Kolos, H. Okawa, K. Slagle, A. Taffard, *Data Quality Monitoring Framework for ATLAS Experiment: Performance Achieved with Colliding Beams at LHC*, ATL-COM-DAQ-2010-163 (2010)
- Y. Ilchenko *et al.*, *Data Quality Monitoring Display for ATLAS experiment*, ATL-COM-DAQ-2009-070 (2009).
- P. Zarzhitsky, R. Kehoe, R. Stroynowski, P. Renkel, Y. Ilchenko, *Search for Supersymmetry in a Three Lepton Plus Jets Signature*, ATL-COM-PHYS-2008-167 (2008).

AUTHORSHIP IN COLLABORATIONS:

- ATLAS
- DØ

TEACHING EXPERIENCE:

- Southern Methodist University (*Dallas, TX, USA*), 2006-2009
  Teaching Assistant for 7 semesters. Taught one hour recitation for pre-med students and three hour lab per week for non-science majors. Approximately 30 students in the recitation class and 20 students in the lab.
  Recitation web-pages of the physics courses I taught for pre-med students in 2007-2008:
  - Pre-Med Physics I - http://www.physics.smu.edu/ilchenko/2007/fall/1307/ - Mechanics.
  - Pre-Med Physics II - http://www.physics.smu.edu/ilchenko/2008/spring/1308/ - Electricity and magnetism, electromagnetic radiation, optics, and special relativity.

INDUSTRY EXPERIENCE:

- Arete Ukraine, LTD (*Freight forwarding company in Odessa, Ukraine*), 2004-2006
  - My major responsibility was the development of the Customer Relationship Management (CRM) system for marine container transportation company. The system organizes, automates, and synchronizes business processes involving marine container shipping worldwide. It is currently operated at the two ukrainian freight forwarding companies - Chinese Brothers LTD, and Prime Container LTD.
  - I also implemented the Container Tracking System to monitor actual location of marine containers. The information about the containers is acquired by the system from different shipping line web-sites, subsequently reprocessed and stored in the database for further usage by company's staff and customers.

MENTORHSIP & COLLABORATION:

- Since late 2014, I supervise a senior scientist from Dzhelepov Laboratory of Nuclear Problems (JINR, Dubna, Russia), Nazim Huseynov. Nazim works with me in the area of application of Machine Learning for particle identification and searches of rare signals in the ATLAS data.
- In the light of Ukraine becoming an associate member of CERN in Fall 2016, I was officially responsible for writing the ATLAS part of research roadmap for the National Academy of Science of Ukraine. The roadmap projects include search for the single top-Higgs associated

production (tH) as well as application of modern Machine Learning techniques, such as Deep Neural Networks, in the search for tH and $t\bar{t}H$ events.

OUTREACH & MEDIA:

- I have a personal blog at the leading Odessa newspaper where I publish articles about science and technology in Russian, http://dumskaya.net/user/yuriy-ilchenko/. I also translate scientific articles from English to post them on the blog. I believe that role of a true scientist is not only confined to performing high-quality research but also includes sharing ideas with general public, promoting science in society and fostering inter-field communications.
- As the only Odessan working at the LHC experiment, I have been interviewed by the Odessa municipal newspaper that published an article about my work at CERN (in Russian) http://dumskaya.net/news/odessit-ohotitsya-za-bozonom-higgsa-na-bolshom-a-029841/
- Results of the top quark mass measurement I obtained during my PhD study featured in Fermilab Today, Jan 16, 2012. http://www.fnal.gov/pub/today/archive/archive_2012/today12-01-26.html
- An article at SMU blog highlighting my thesis results in application to the search for the Higgs boson. http://blog.smu.edu/research/2012/03/07/fermilab-tevatron-experiments-report-latest-results...

AWARDS:

- Lightner-Sams Graduate Fellowship (Graduate Research), 2007.

COMPUTER SKILLS:

- Concepts: Functional, Object Oriented, and Generic programming, Design Patterns
- Languages: C/C++, Java SE/EE, Python, PHP
- Libraries: STL, BOOST, Qt, Swing, ROOT
- Databases: MySQL, PostgreSQL, SQLite
- Web-technologies: HTML, CSS, JavaScript, AJAX, jQuery, XML, Flex
- Techniques: MVC, SOAP, CORBA, ODBC
- Others: SQL, Linux shell scripting