

MARK S. NEUBAUER

+1(217) 244-3913 ◊ 411 Loomis Laboratory of Physics ◊ 1110 W. Green Street, Urbana, IL 61801

msn@illinois.edu ◊ www.marksneubauer.com ◊ [neubauer-group.github.io](https://github.com/neubauer-group)

EDUCATION

Ph.D., Physics, University of Pennsylvania 2001

Dissertation: *Evidence for ν_e Flavor Change through Measurement of the 8B Solar Neutrino Flux at SNO*

Advisor: Dr. Eugene Beier

B.S., Physics, Kutztown University 1994

Graduated *Summa Cum Laude*

PROFESSIONAL APPOINTMENTS

University of Illinois at Urbana-Champaign, Urbana, IL USA

Professor Department of Physics 2018 –

Affiliate Professor National Center for Supercomputing Applications 2018 –

Affiliate Professor Department of Electrical and Computer Engineering 2019 –

Affiliate Professor Discovery Partners Institute 2024 –

Associate Professor Department of Physics 2013 – 2018

Assistant Professor Department of Physics 2007 – 2013

Postdoctoral Fellow *University of California at San Diego, La Jolla, CA, USA* 2003 – 2007

Massachusetts Institute of Technology, Cambridge, MA, USA 2001 – 2003

HONORS AND AWARDS

Breakthrough Prize in Fundamental Physics 2016

Dean's Award for Excellence in Research (U. Illinois) 2013

Fellow, Center for Advanced Study (U. Illinois) 2012 – 2013

NSF Career Award 2011

Fellow, National Center for Supercomputing Applications 2008 – 2009

Arnold O. Beckman Research Award (U. Illinois) 2007

Member, Sigma Xi (Massachusetts Institute of Technology) 2002

Chairman's Teaching Award (University of Pennsylvania) 1995

SELECTED FUNDING AWARDS

Co-PI PREP: Accelerating Research and Education in AI/ML for Science NSF 2024 –

Co-PI [POSE: Phase II: An Open Source Ecosystem for Collaborative Rapid Design of Edge AI Hardware Accelerators for Integrated Data Analysis and Discovery](#) NSF 2023 –

Lead PI [U. Illinois Experimental HEP base grant](#) DOE 2022 –

PI [Democratizing AI Hardware with an Open-Source AI-Chip Design Toolkit](#) DPI 2022 –

Co-PI [Accelerated AI Algorithms for Data-Driven Discovery Institute](#) NSF 2021 –

PI [FAIR Framework for Physics-Inspired Artificial Intelligence in HEP](#) DOE 2020 –

PI [U. Illinois ATLAS Phase-II HL-LHC Upgrade](#) NSF 2020 –

Co-PI [Advancing Science with Accelerated Machine Learning](#) NSF 2019 –

PI [U. Illinois Institute for Research and Innovation in Software for HEP Award](#) NSF 2018 –

PI [U. Illinois ATLAS Tier-2 Computing Center Award](#) NSF 2010 –

PI [Scalable Cyberinfrastructure for AI and Likelihood-Free Inference](#) NSF 2018 – 2022

PI [Conceptualization of a Software Innovation Institute for HEP](#) NSF 2015 – 2018

Co-PI [Data and Software Preservation for Open Science](#) NSF 2012 – 2016

Co-PI [MRI: Development of Ultrafast Tracking Electronics](#) NSF 2011 – 2017

PI [CAREER: Fast Hardware Tracking and Parallel Computing Strategies for Integrated Research, Education, and Outreach in Particle Physics](#) NSF 2011 – 2017

SCIENCE COLLABORATIONS AND SELECTED APPOINTMENTS

| | |
|---|-------------|
| ATLAS Collaboration , CERN Large Hadron Collider, Geneva, Switzerland: | 2007 – |
| • Team Leader, University of Illinois ATLAS Group | 2014 – |
| • Member, US ATLAS Institutional Board | 2014 – |
| • ATLAS Collaboration Board Institute Representative | 2014 – |
| • ATLAS Trigger/DAQ Institute Board Representative | 2014 – |
| • ATLAS Phase-II Upgrade Institutional Representative | 2017 – |
| • Member, ATLAS Event Filter Tracking Heterogenous Commodity Hardware Task Force | 2021 |
| • Member, ATLAS Event Filter Tracking Custom Hardware Task Force | 2021 |
| • Member, US ATLAS Resource Allocation Committee (US, ATLAS) | 2012 – 2017 |
| • Deputy Manager, US ATLAS Physics Support, Software and Computing | 2012 – 2015 |
| • Member, US ATLAS Management Advisory Committee | 2012 – 2015 |
| • Chair, US ATLAS Tier-3 Computing Implementation Committee | 2015 |
| • Member, US ATLAS Tier-3 Study Group | 2013 |
| • ATLAS Representative to the OSG Council | 2012 – 2015 |
| • Level-3 Manager, US ATLAS Application Software | 2010 – 2012 |
| • Member, US ATLAS Program Management Plan Committee | 2009 |
| • Contact Editor for ATLAS Publications: JINST 16 (2021) , JHEP 04 (2019) , PLB 790 (2019) , JHEP 01 (2016) , EPJC 75 (2015) , PLB 718 (2012) , PRL 107 (2011) | |
| • Member, ATLAS Editorial Board for ATLAS Publications: JHEP 06 (2018) , PLB 761 (2016) , PLB 756 (2016) , PRD 92 (2015) , PLB 737 (2014) , PLB 718 (2013) , PLB 712 (2012) | |
| CDF Collaboration , Fermilab Tevatron, Batavia, IL USA: | 2001 – 2008 |
| • Convener, Diboson Physics Group | 2006 – 2007 |
| • Project Leader, Central Analysis Facility | 2002 – 2004 |
| SNO Collaboration , SNOLab, Sudbury, ON Canada: | 1996 – 2002 |
| • Trigger System and GPS-based Timing System | 1996 – 2001 |

RESEARCH HIGHLIGHTS

Multi-boson Production as a Probe of New Physics 2007 –

My group has made extensive study of multi-boson (involving W , Z , Higgs boson h) production at hadron colliders:

- Stringent limits on the production of new particles decaying to multi-boson states and constraints on new physics [EPJC 80 \(2020\)](#), [JHEP 04 \(2019\)](#), [PRD 100 \(2019\)](#), [PLB 790 \(2019\)](#), [PRD 98 \(2018\)](#), [JHEP 03 \(2018\) 009](#), [JHEP 03 \(2018\) 042](#), [PLB 765 \(2017\)](#), [EPJC 77 \(2017\)](#), [JHEP 09 \(2016\)](#), [PLB 755 \(2016\)](#), [JHEP 01 \(2016\)](#), [EPJC 76 \(2016\)](#), [EPJC 75 \(2015\)](#), [JHEP 01 \(2015\)](#), [PLB 737 \(2014\)](#), [PLB 718 \(2012\)](#), [PRL 107 \(2011\) 231801](#), [PRL 107 \(2011\) 041802](#), [EPJC 71 \(2011\)](#)
- First measurement of ZZ production at a hadron collider [PRL 100 \(2008\)](#)
- First observation of WZ production [PRL 98 \(2007\)](#)
- Authored two review articles on electroweak and diboson physics [RMP 84 \(2012\)](#), [ARNPS 61 \(2011\)](#)
- Served as Chapter Editor for a review article on Di-Higgs Production [Rev. Phys. 5 \(2020\)](#)

Higgs Boson Discovery and Measurement 2012, 2015

My group contributed to the Higgs boson discovery [PLB 716 \(2012\)](#), which led to the 2013 Nobel Prize in Physics for its theoretical prediction, through analysis of the $l\nu l\nu$ channel and the observation of $h \rightarrow WW^{(*)}$ [PRD 92 \(2015\)](#).

Resolution of a b -baryon Lifetime Puzzle 2007

I led an analysis measuring the Λ_b^0 lifetime $\tau(\Lambda_b^0)$ in the exclusive decay $\Lambda_b^0 \rightarrow J/\psi\Lambda^0$. At the time of publication [PRL 98 \(2007\)](#), this was the most precise $\tau(\Lambda_b^0)$ measurement and higher than the previous world average by 3.2σ . This measurement resolved the long-standing " Λ_b^0 Lifetime Puzzle" in favor of the early theory calculations of $\tau(\Lambda_b^0)$.

Resolution of the Solar Neutrino Problem 2001

My analysis of ^8B solar neutrino data from the Sudbury Neutrino Observatory (SNO) collaboration provided the first direct evidence for ν_e flavor change and resolved the decades-long "Solar Neutrino Problem". The first SNO paper [PRL 87 \(2001\)](#) result was based on [my thesis](#) work and led to the [2016 Breakthrough Prize in Fundamental Physics](#) and [2015 Nobel Prize in Physics](#) (A. McDonald, T. Kajita) for the observation of ν_e flavor change.

PUBLICATIONS

Please find a list of my selected publications [here](#) and a full list of my publications [here](#).

PROFESSIONAL SERVICE AND LEADERSHIP

| | |
|---|-------------|
| Member, Discovery Partners Institute | 2020 – |
| Core Member, Illinois Center for Advanced Studies of the Universe | 2020 – |
| Founding Member, Center for Artificial Intelligence Innovation | 2019 – |
| Member of the Executive Committees & Coordination Groups for: | |
| • Accelerated AI Algorithms for Data-Driven Discovery Institute | 2021 – |
| • Fast Machine Learning Laboratory | 2019 – |
| • Institute for Research and Innovation in Software for HEP | 2018 – |
| • HEP Software Foundation | 2016 – |
| • Open Science Grid | 2015 – |
| Guest Associate Editor, Machine Learning and Artificial Intelligence, <i>Frontiers in Artificial Intelligence</i> | 2021 – |
| Review Editor, Cloud Computing, <i>Frontiers in High-Performance Computing</i> | 2022 – |
| Member, Steering Board, Accelerated AI Algorithms for Data-Driven Discovery Institute | 2021 – |
| Member, Equity & Career Committee, Accelerated AI Algorithms for Data-Driven Discovery Institute | 2021 – |
| Community Engagement Coordinator, Accelerated AI Algorithms for Data-Driven Discovery Institute | 2021 – |
| Blueprint Coordinator, Institute for Research and Innovation in Software for HEP | 2018 – 2023 |
| Co-Lead, Snowmass CompF4 Analysis Facilities Topical Group | 2022 |
| Member, IceCube Software and Computing Advisory Panel | 2021 |
| Open Science Grid Resources Manager | 2015 – 2017 |
| Co-Editor, HEP Software Foundation Community White Paper | 2017 |
| Member, Fermilab Operational Readiness Review Committee | 2017 |
| Practice & Experience in Advanced Research Computing (PEARC) Workshop Reviewer | 2017 |
| Member, OSG Campus Infrastructures Community Committee | 2016 |
| Member, DOE LBNF Software and Computing Review Panel | 2014 |
| Member, American Physical Society | 2007 – |
| Chair, Mitsuyoshi Tanaka Dissertation Award Committee (DPF) | 2012 |
| Member, Mitsuyoshi Tanaka Dissertation Award Committee (DPF) | 2011 |

SELECTED TALKS

- *Making the Most of AI & Data Deluge for Science*, Keynote talk at AI Ready Data Workshop, Philadelphia (2024)
- *Energy Frontier Exploration using Particle Physics and AI*, Invited talk APS March Meeting, Minneapolis (2024)
- *Uncertainty Quantification and Anomaly Detection with Evidential Deep Learning*, AI and the Uncertainty Challenge in Fundamental Physics Workshop, SCAI, Paris and Institut Pascal Paris-Saclay (2023)
- *Explainable AI for the Interpretability of Deep Neural Networks*, AI and the Uncertainty Challenge in Fundamental Physics Workshop, SCAI, Paris and Institut Pascal Paris-Saclay (2023)
- *Deep Learning for the Matrix Element Method*, International Conference on Computing for High Energy Physics (CHEP), Norfolk (2023)
- *Sustainable Cyberinfrastructure for Matrix Element Analyses through Deep Learning*, International Conference on High Energy Physics (ICHEP), Bologna, Italy (2022)
- *Data Analysis and Machine Learning Education in the Physics Department at the University of Illinois*, APS Group on Data Science, Community of Practice (2022)
- *Machine Learning in High Energy Physics*, AI For Nuclear Physics Workshop, JLab (2020)
- *Low Mass Higgs Boson Searches from ATLAS and CMS*, Higgs Couplings, Tokyo, Japan (2018)
- *Deep Learning for Higgs Boson Identification and Searches for New Physics at the LHC*, Blue Waters Symposium, Sunriver (2019)
- *Measurement of the Higgs Boson Properties*, Conference on New Physics Interpretations, ANL (2017)
- *Community White Paper and a HEP Software Institute*, APS DPF Meeting, Fermilab (2017)
- *Higgs Boson Prospects for Run-II and the HL-LHC*, SM@LHC 2016 Conference, Pittsburgh (2016)
- *Recent Discoveries in Particle Physics*, Keynote talk at the Prairie Section of the AAPT Conference, UIUC (2016)
- *High-mass Higgs Boson Searches at ATLAS*, ICHEP 2014, Valencia, Spain (2014)
- *Higgs Boson Properties & Prospects*, Plenary talk at APS Prairie Section Meeting, U. Missouri, Columbia (2013)
- *Supersymmetry and BSM Higgs Searches at ATLAS*, ASPEN Winter Conference, Aspen Center for Physics (2012)

SELECTED PUBLIC LECTURES

- *The Higgs Boson and Beyond: The Big Questions in Particle Physics*, Public Lecture at the APS Prairie Section Meeting, University of Missouri, Columbia, MO (2013)
- *Mind over Matter: Higgs Boson Discovery and What it Means*, World of Science Lecture, William M. Staerckel Planetarium, Parkland College (2012)
- *Higgs Boson Discovery: A Success Story of Big Science with Big Data*, Petascale Day Celebration, National Center for Supercomputing Applications (2012)
- *Unlocking the Dark Secrets of our Universe: How Studying the Smallest Things with the Biggest Project Ever Gets to the Heart of the Matter*, Saturday Honors Physics Public Lecture, UIUC (2010)
- *How the Biggest Science Project Ever Looks at the Smallest Things*, World of Science Lecture, William M. Staerckel Planetarium, Parkland College (2010)

SERVICE ON UNIVERSITY COMMITTEES

| | |
|---|-------------|
| Member, NCSA Research & Education Review Committee | 2023 – |
| Member, NCSA Faculty Fellows Selection Committee | 2022 – |
| Member, NCSA Resource Allocation Committee | 2020 – |
| Member, Campus Research Network Architecture Committee | 2018 – |
| Chair, Illinois Campus Cluster Executive Steering Committee | 2014 – 2016 |
| Chair, Illinois Campus Cluster Investor Forum | 2014 – 2016 |
| Senator, University Campus Senate | 2009 – 2011 |

SERVICE ON COLLEGE COMMITTEES

| | |
|---|-------------|
| Member, Small Equipment Grants Committee | 2024 |
| Member, College Awards Committee | 2022 – 2023 |
| Member, Course and Curriculum Committee | 2022 – 2023 |
| Member, Distinguished Postdoctoral Fellowship Review Committee | 2022 – |
| Member, Engineering Open House Advisory Committee | 2008 – 2018 |
| Member, Research Information Technology Working Group | 2014 |
| Member, NSF Major Research Instrumentation Proposal Selection Committee | 2010 |

SERVICE ON DEPARTMENT COMMITTEES

| | |
|--|---------------------------------------|
| Member, Master of Engineering in Instrumental Physics Admissions Committee | 2023 – |
| Member, Steering Board on New Courses | 2022 – |
| Undergraduate Academic Advisor/Mentor | 2018 – |
| Faculty Advisor, Society of Physics Students (U. Illinois Chapter) | 2008 – 2019 |
| Member, Ph.D. Qualifying Exam Committee | 2012, 2018 |
| Chair/Member, Preliminary Exam and Dissertation Committees | 2008–09, 2011–12, 2016–17, 2021, 2023 |
| Chair, Department Colloquium | 2013 |
| Member, Faculty Search Committee (High Energy Physics) | 2013 |
| Member, Faculty Search Committee (Nuclear Physics) | 2013 |
| Member, Communications Coordinator Search Committee | 2012 |
| Co-Chair, High-Energy Physics Seminar | 2009, 2012, 2022 |
| Faculty Leader, Entrepreneurial Leadership in STEM Teaching & Learning | 2008 – 2011 |