Ayan Paul

Theoretical and Computational Particle Physicist & Data Scientist
Building the Future with Interpretable and Robust AI
Institut für Physik, Humboldt Universität zu Berlin, Notkestaße 15, 12489 Berlin, Germany.
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Skills

- *Data Analytics:* Proficient in data extraction and parsing, multivariate analysis, Markov Chain Monte Carlo methods and Bayesian inference.
- *Machine Learning:* Adept at BDT with XGBoost, SVM, KNN, clustering, feature engineering/importance analysis with scikit-learn.
- *Neural Networks:* 2+ years experience with TensorFlow: DNN for regression/classification, LSTM for time series prediction/signal classification.
- *Coding:* Over 10 years of experience in developing open-source codes with C/C++, Python and FORTRAN. Familiar with R, Julia and Matlab.
- *Parallel Computing:* Extensive experience in parallelizing codes with MPI and OpenMP and simulations on large computer clusters.
- *Innovation:* Over 12 years of experience with problem solving in physics, mathematics, statistics and coding for science.
- *Critical Thinking:* Highly trained in conceptualizing new ideas and building mathematical models for complex unexplored problems.
- *Leadership:* Mentor for several MS/PhD students and postdoctoral fellows. Co-organizer for several international conferences.
- *Team Worker:* Involved in working with large teams and collaborations for planning and implementation of projects.
- *Communications:* Recipient of teaching award and skilled in conveying scientific knowledge to non-experts. Native proficiency in English.

My contribution to open source codes: https://github.com/talismanbrandi.

Professional Experience

CoVis – a DESY Spin-Off *USA & Germany*

Co-Founder and Chief Scientific Officer *April 2020 - PRESENT*

- Designed and implemented the backend algorithms for COVID-19 risk prediction using AI (LSTM/GRU) from prototyping to deployment.
- Defined research strategies and incorporated results from medical literature using Bayesian methods to combine emerging data.
- Designed data streams using SQL on AWS for regular updates and processing of data using ML algorithms.
- Leadership role in the formation of CoVis for building business strategies, raising pre-seed funds and defining core products and services.
- Winner of both formation and advanced round of MIT COVID-19 Challenge "Beat the Pandemic 1 & 2" hackathon.

Deutsches Elektronen-Synchrotron (DESY) & Humboldt Universität zu Berlin *Hamburg & Berlin, Germany*

Fellow & Senior Scientist *November 2017 - PRESENT*

- Principal Investigator of a DESY Strategy Fund grant managing a team of 10 members for R&D.
- Planned and implemented Bayesian multivariate analyses using Markov Chain Monte Carlo routines for large global projects.
- Created innovative data visualizations using Perl, JavaScript and Python for future international colliders.
- Developed an Interpretable ML/AI framework for regression and signal-background classification for Higgs Physics in using DNN and BDT.

Istituto Nazionale di Fisica Nucleare, Sezione di Roma I *Roma, Italy*

Postdoctoral Fellow *September 2012 - October 2017*

- Developed the open-source codes `HEPfit` and `BAT` in C++ for Bayesian inference using Markov Chain Monte Carlo.
- Reduced the runtime of `HEPfit` by a factor of 50 – 200 using MPI and software caching.
- Implemented statistical model selection with non-linear multi-parametric models on experimental data.
- Gained experience in process automation on large computer clusters using shell scripting.

University of Notre Dame du Lac *Notre Dame IN, USA*

Research Assistant *August 2005 - May 2012*

- Formulated theoretical models using current data to predict possible future experimental measurements at CERN.
- Constructed and analyzed a collaboration network using Graph Theory and textual analysis for a nationally funded research center.
- Won 5 fellowships for professional development and academic research.

Research

- *Particle Physics:* Quantum Field Theory, Relativistic Quantum Mechanics, Higgs Productions and Decays, Symmetry Violation.
- *Data & Statistics:* Analytics for future physics colliders at CERN using Bayesian MCMC and BDT/NN frameworks.
- *Mathematical Epidemiology:* Contact Tracing for COVID-19, Agent Based Models, ML applications, Multi-Layer Network Analysis.
- *Intelligence:* Structure and Dynamics of Intelligence and building fundamental frameworks for information processing.
- *Publications:* 19 papers in peer-reviewed high impact-factor journals with over 1700 citations. Top 1% most cited author in physics (10 yr).
- *Public Speaking:* Presented talks at more than 30 international conferences worldwide.
- *Research Supervision:* Co-advisor for several masters and PhD students and supervised the work of several junior postdoctoral fellows.

Education

University of Notre Dame du Lac, Department of Physics *Notre Dame, Indiana*

MS & PhD in Theoretical Particle Physics *2005 - 2012*

- *Physics Graduate Research and Dissertation Award* for the best dissertation of the year.
- *Founding Member of the Executive Board* of Graduate Physics Society and GPS Spring Conferences.

S. N. Bose National Center for Basic Sciences *Calcutta, India*

M.Sc. in Physics *2003 - 2005*

- Recipient of the *National CSIR Scholarship* for Junior Fellows.

Ayan Paul

Fellow @ DESY, Hamburg & Senior Scientist @ Humboldt Universität zu Berlin

Institut für Physik, Humboldt Universität zu Berlin, Notkestaße 15, 12489 Berlin, Germany.

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Research Expertise

- *Charm dynamics:* CP violation, hadronic decays, final state interactions, leptonic and semileptonic decays.
- *Beauty dynamics:* Semileptonic and leptonic decays, decay distributions, tests of lepton flavour universality and BSM
- *Higgs and EW Physics:* Effective Field Theories, Higgs productions and decays, BSM and future colliders
- *Physics Computation:* Active developer for the statistical core (MCMC based Bayesian Analysis) and flavour physics in `HEPfit`
- *Liaison with Experiments:* Contributor to B2TiP and associate member of the former Consorzio Laboratorio Nicola Cabibbo
- *Mathematical Epidemiology:* Modeling of COVID-19 disease spread, mitigation and exit strategies.

Academic Appointments

Deutsches Elektronen-Synchrotron (DESY) — *Hamburg, Germany*

Fellow — *November 2017 - PRESENT*

Delegated as *Senior Scientist* to the Humboldt Universität zu Berlin.

Istituto Nazionale di Fisica Nucleare, Sezione di Roma I — *Roma, Italy*

Postdoctoral Fellow — *September 2012 - October 2017*

ERC Grant "NPFlavour".

University of Notre Dame du Lac — *Notre Dame IN, USA*

Teaching Assistant — *August 2005 - December 2011*

Employed full-time by the Department of Physics.

Education

University of Notre Dame du Lac, Department of Physics — *Notre Dame, Indiana*

PhD in Physics — *2007 - 2012*

Title of dissertation: *Charm Beyond the Standard Model*
PhD Advisor: *Prof. Ikaros I. Bigi*

University of Notre Dame du Lac, Department of Physics — *Notre Dame, Indiana*

MS in Physics — *2005 - 2007*

S. N. Bose National Center for Basic Sciences — *Calcutta, India*

M.Sc. in Physics — *2003 - 2005*

Presidency College, University of Calcutta — *Calcutta, India*

B.Sc. in Physics — *1999 - 2002*

Grants & Awards

2020	**Corona Crisis and Beyond (119,600€),** Volkswagen Stiftung. PI with a team of 3 scientists. Project: "Talisman: Intelligent Algorithms for COVID-19 mitigation casting virtual safety nets to protect and empower the society" (Duration: 18 months)	*Berlin, Germany*
2020	**DESY Strategy Fund for COVID-19 (100,000€),** DESY, PI with a multidisciplinary team of 7. Project: "CoVis: empowering health decisions, delivered by intelligent algorithms to contain COVID-19" (Duration: 12 months) – Leading to a DESY Spin-off (Technology Transfer): Covis Inc.	*Hamburg, Germany*
2012	**GPS Conference 2012 Sponsorships,** Graduate School, University of Notre Dame du Lac	*Notre Dame, IN USA*
2012	**Research and Dissertation Award,** Dept. of Physics, University of Notre Dame du Lac	*Notre Dame, IN USA*
2011	**Notebaert Prof. Dev. Fund (II),** Graduate School, University of Notre Dame du Lac	*Notre Dame, IN USA*
2011	**Notebaert Prof. Dev. Fund (I),** Graduate School, University of Notre Dame du Lac	*Notre Dame, IN USA*
2011	**Joseph F. Downes Memorial Award,** Graduate School, University of Notre Dame du Lac	*Notre Dame, IN USA*
2010	**W. & L. Stavropoulos Fellowship,** Graduate School, University of Notre Dame du Lac	*Notre Dame, IN USA*
2010	**Kaneb Outstanding Graduate Teaching Assistant Award,** University of Notre Dame du Lac	*Notre Dame, IN USA*
2009	**Reilly Fellowship,** Graduate School, University of Notre Dame du Lac	*Notre Dame, IN USA*
2005	**CSIR Junior Research Fellowship,** (HRDG, Govt. of India)	*Calcutta, India*
2005	**University Lecturership,** National Eligibility Test (UGC–CSIR, Govt. of India)	*Calcutta, India*
2003 – 2005	**Research Fellowship,** S. N. Bose National Center for Basic Sciences	*Calcutta, India*

Computational Skills and Experience

Programming Languages	FORTRAN, C, C++ (Primary language for `HEPfit`), Python, Perl, shell scripting, JavaScript and R
Parallel Computing	MPI and OpenMP (Used in `HEPfit` and `BAT`)
HEP Tools	MadGraph, FormCalc, FeynRules, FeynCalc, FeynArts, FeynHiggs, LoopTools, MCFM and several other public codes used in HEP
Libraries & Packages	ROOT, GSL, BOOST, BAT (Used in `HEPfit`), TensorFlow, XGBoost, scikit-learn, scipy ecosystem, etc.
Functional Programming	Mathematica, MatLab and form
Analytic Methods	Bayesian Analysis, Markov Chain Monte Carlo, Statistical Inference, Multivariate Methods, Neural Networks (DNN/LSTM/GRU) and Machine Learning (BDT/SVM/RF).
Code Moderation	Moderator for the core of the `HEPfit` code (statistical framework and the user interface.)
Flavour@`HEPfit`	Implemented flavour observables from all flavour sectors in `HEPfit`
Complex Networks	Network construction and analysis of the authors' collaboration network of all publications in Physical Review C during 2000 – 2006 with an aim to enhance inter-disciplinary and inter-institutional collaborations and for use in reports and proposals submitted to national funding agencies. (Project funded by JINA in 2017)

Github repository for `HEPfit`: https://github.com/silvest/HEPfit.
My contributions to `HEPfit` and other codes: https://github.com/talismanbrandi.

Publications

COVID-19:

1. H. Kim and A. Paul, *Automated Contact Tracing: a game of big numbers in the time of COVID-19*, DOI:10.1101/2020.04.22.20071043 (medRxiv). Submitted for review.
2. A. Paul, P Englert and M. Varga, *Socio-economic disparities and COVID-19 in the USA*, arXiv:2009.04935. Submitted for review.
3. J. Bell et al., *Beyond COVID-19: Network science and sustainable exit strategies*, arXiv:2009.12968. Accepted by J. Phys. Complexity.

Flavour Physics:

1. M. Ciuchini, M. Fedele, E. Franco, A. Paul, L. Silvestrini, M. Valli, *Lessons from the $B^{0,+} \to K^{*0,+}\mu^+\mu^-$ angular analysis.*, arXiv:2011.01212. Submitted for review. (1 citation)
2. L. Alasfar, A. Azatov, J. de Blas, A. Paul, M. Valli, *B anomalies under the lens of electroweak precision*, JHEP**12** (2020) 016. [arXiv:2007.04400]. (2 citation)
3. M. Ciuchini, A. Coutinho, M. Fedele, E. Franco, A. Paul, L. Silvestrini and M. Valli, *New Physics in $b \to s\ell^+\ell^-$ confronts new data on Lepton Universality*, Eur. Phys. J. **C79** (2019) no.8, 719. [arXiv:1903.09632]. (112 citations)
4. F. Buccella, A. Paul and P. Santorelli, *$SU(3)_F$ breaking through FSI phases and CP asymmetries in $D \to PP$ decays*, Phys. Rev. **D 99** (2019) no.11, 113001. [arXiv:1902.05564]. (16 citations)
5. M. Ciuchini, A. Coutinho, M. Fedele, E. Franco, A. Paul, L. Silvestrini and M. Valli, *Hadronic uncertainties in the $B \to K^*\ell^+\ell^-$ decays*, Proceedings of the International Conference on B-Physics at Frontier Machines, BEAUTY 2018. PoS **BEAUTY2018** (2018) 044. [arXiv:1809.03789]. (7 citations)
6. Belle II Collaboration (E. Kou (ed.) et. al.), *The Belle II Physics Book*, PTEP 2019 (2019) 12, 123C01. [arXiv:1808.10567]. (502 citations)
7. M. Ciuchini, A. Coutinho, M. Fedele, E. Franco, A. Paul, L. Silvestrini and M. Valli, *On Hadronic uncertainties polluting the New Physics hunt in $b \to s$ transitions*, Proceedings of the 7^{th} Workshop on Theory, Phenomenology and Experiments in Flavour Physics: The Future of BSM Physics. Nucl. Part. Phys. Proc. **303-305** (2018) 8-13. [*inspirehep link*]. (1 citation)
8. M. Ciuchini, M. Fedele, E. Franco, S. Mishima, A. Paul, L. Silvestrini and M. Valli, *Knowns and Unknowns in the Predictions for $B \to K^*\ell^+\ell^-$*, Proceedings of the 6^{th} Workshop on Theory, Phenomenology and Experiments in Flavour Physics: Interplay of Flavour Physics with electroweak symmetry breaking. Nucl. Part. Phys. Proc. **285-286** (2017) 45-49. [*inspirehep link*]. (6 citations)
9. M. Ciuchini, A. Coutinho, M. Fedele, E. Franco, A. Paul, L. Silvestrini and M. Valli, *On Flavourful Easter eggs for New Physics hunger and Lepton Flavour Universality violation*, Eur. Phys. J. **C77** (2017) no.10, 688. [arXiv:1704.05447]. (6 citations)
10. G. Casarosa, A. Di Canto and A. Paul, *Phenomenological and Experimental Developments in Charm Physics: The WG7 Report from CKM 2016*, PoS **CKM2016** (2017) 020. [arXiv:1704.00041]. (212 citations)
11. M. Ciuchini, M. Fedele, E. Franco, S. Mishima, A. Paul, L. Silvestrini and M. Valli, *$B \to K^*\ell^+\ell^-$ in the Standard Model: Elaborations and Interpretations*, PoS **ICHEP2016** (2016) 584. [arXiv:1611.04338]. (25 citations)
12. A. Paul and D. Straub, *Constraints on new physics from radiative B decays*, JHEP**04** (2017) 027. [arXiv:1608.02556.] (63 citations)
13. M. Ciuchini, M. Fedele, E. Franco, S. Mishima, A. Paul, L. Silvestrini and M. Valli, *$B \to K^*\ell^+\ell^-$ decays at large recoil in the Standard Model: a theoretical reappraisal*. JHEP**06** (2016) 116. [arXiv:1512.07157]. (183 citations)
14. A. Paul, *Lessons from charm dynamics.* Proceedings of **XII IFAE**, Cittadella Universitaria di Monserrato, Cagliari. 3rd - 5th April 2013. Il Nuo. Cim. **C 37** N. 1. [arXiv:1308.5886]. (0 citation)

15. A. Paul, A. de La Puente and I. I. Bigi, *Manifestations of Warped Extra Dimension in Rare Charm Decays and Asymmetries*. Phys. Rev. **D 90** (2014) 014035. [arXiv:1212.4849]. (28 citations)
16. I. I. Bigi and A. Paul, *On CP Asymmetries in Two-, Three- and Four-Body D Decays*. JHEP**03** (2012) 021. [arXiv:1110.2862]. (43 citations)
17. I. I. Bigi, A. Paul and S. Recksiegel, *Theoretical Conclusions from CDF Analyses of CP Violation in $D^0 \to \pi^+\pi^-, K^+K^-$ and Future Tasks*. JHEP**06** (2011) 089. [arXiv:1103.5785]. (54 citations)
18. A. Paul, I. I. Bigi and S. Recksiegel, *On $D \to X_u l^+ l^-$ within the Standard Model and Frameworks like the littlelest Higgs model with T Parity*. Phys. Rev. **D 83** (2011) 114006. [arXiv:1101.6053]. (62 citations)
19. A. Paul, I. I. Bigi and S. Recksiegel, *$D^0 \to \gamma\gamma$ and $D^0 \to \mu^+\mu^-$ rates on an unlikely impact of the littlest Higgs model with T parity*. Phys. Rev. **D 82** (2010) 094006. [arXiv:1008:3141]. (39 citations)

Higgs and Electroweak Physics:

1. Q. Bonnefoy, L. Di Luzio, C. Grojean, A. Paul, A. N. Rossia, *Comments on gauge anomalies at dimension-six in the Standard Model Effective Field Theory*. arXiv:2011.10025. (0 citations)
2. C. Grojean, A. Paul, Z. Qian, *Ressurecting $b\bar{b}h$ with kinematic shapes*. arXiv:2011.13945. (0 citations)
3. Q. Bonnefoy, L. Di Luzio, C. Grojean, A. Paul, A. N. Rossia, *The Anomalous Case of Axion EFTs and Massive Chiral Gauge Fields*. arXiv:2011.10025. (0 citations)
4. J. De Blas, G. Durieux, C. Grojean, J. Gu and A. Paul, *On the future of Higgs, electroweak and diboson measurements at lepton colliders*. JHEP**12** (2019) 117. [arXiv:1907.04311]. (18 citations)
5. J. de Blas et al., *CLIC Potential for New Physics*. CERN Yellow Rep. Monogr. Vol. 3 (2018). [arXiv:1812.02093]. (80 citations)
6. S. Gori, C. Grojean, A. Juste, A. Paul, *Heavy Higgs Searches: Flavor Matters*. JHEP**01** (2018) 108. [arXiv:1710.03752]. (18 citations)
7. A. Azatov, C. Grojean, A. Paul and E. Salvioni, *Resolving gluon fusion loops at current and future hadron colliders*. JHEP**09** (2016) 123. [arXiv:1608.00977]. (41 citations)
8. A. Azatov, C. Grojean, A. Paul and E. Salvioni, *Taming the off-shell Higgs boson*. J. Exp. Theor. Phys. 120 (2015). [arXiv:1406.6338]. (83 citations)
9. A. Azatov and A. Paul, *Probing Higgs couplings with high p_T Higgs production*. JHEP**01** (2014) 014. [arXiv:1309.5273]. (102 citations)

Computation for Physics:

1. S. S. AbdusSalam et al., *Simple and statistically sound strategies for analysing physical theories*, Invited article in Nature Reviews Physics (2020). To be submitted.
2. J. de Blas et al., `HEPfit`: *a Code for the Combination of Indirect and Direct Constraints on High Energy Physics Models*. Eur. Phys. J. **C80** (2020) no.5, 456. [arXiv:1910.14012]. (28 citations)

Teaching & Mentoring

School Lectures

September 2019 **Berlin QFT Master Class**, Electroweak Symmetry Breaking.

Thesis Supervision

2015 **Claudio Fabiani**, MS Thesis, Università di Roma La Sapienza.
The decays of $B_{s,d}$ in the Standard Model.

2014 **Marco Fedele**, MS Thesis, Università di Roma La Sapienza.
Study of the $B \to K^{(*)}\ell^+\ell^-$ decays in the Standard Model and Beyond.

COVID-19 Working Group

Megan Bromley, PhD Student, School of Earth and Space Exploration, Arizona State University, USA.
Philipp Englert, PhD Candidate, DESY, Hamburg, Germany.
Maryl Harris, Research Technician, Monell Chemical Senses Center, USA.
Swanand Khanapurkar, PhD Student, Department of Physics, Arizona State University, USA.
Nicholas Tran, MS Student, Department of Computer Science, Arizona State University, USA.
Vishak Srikanth, High School Student, Basis Independent Silicon Valley, San Jose CA, USA.

Teaching at University of Notre Dame du Lac

2006 – 2010 **Tutor** for the Academic Services for Student Athletes for *Physics* and *Mathematics*

2006 – 2011 **Instructor** for *FORTRAN* for REU Summer Students

August 2014 Lectures on *CP Violation*

2005 - 2011 **Teaching Assistant** for undergraduate and graduate courses. (Kaneb Outstanding Graduate TA Award recipient)
Graduate Courses:
– Classical Mechanics
– Special and General Relativity
– Quantum Field Theory I
– Quantum Mechanics
– Particle Physics
– Atomic Physics
– Statistical Mechanics

Academic and Outreach Activities

Present	**Member**, KI Community, Interface for AI experts and users.	*Berlin, Germany*
Present	**Co-Founder**, Diversity@DESY-Theory, Promoting Diversity and Inclusion in Academia.	*Hamburg, Germany*
Present	**Guest Editor**, "Symmetries in Particle Physics" – special edition for Symmetry	
2013 – Present	**Referee for peer reviewed journals**, JHEP, Nucl. Phys. B, EPJ C and Scipost	
September 2019	**DESY Theory Workshop 2019**, Chair for the Particle Phenomenology sessions	*Hamburg, Germany.*
2016	**CKM 2016**, Convener of WG7 – Charm Physics	*Mumbai, India.*
2012-2016	**Content Editor**, Global editions of Physics textbooks for Pearson Education.	*Pearson India*
2012	**GPS Conference 2012**, Founding Organizer	*Notre Dame IN, USA.*
2011-2012	**Graduate Physics Society**, Member of Founding Committee	*Notre Dame IN, USA.*
2010-2012	**Science Outreach**, Judge for several science fairs for junior and middle school students	*Notre Dame IN, USA.*
2007-2008	**Graduate Student Union**, Representative for the Physics Department	*Notre Dame IN, USA.*
2003-2005	**Institute Sports Committee**, Sports equipments acquisition and auditing at S N Bose National Center for Basic Sciences	*Kolkata, India.*

Presentations

Plenary talks (7)

28^{th} May 2020	**COVID-19 Beyond Center Workshop**, "The Curious Case of Automated Contact Tracing"	*Tempe, USA.*
18^{th} May 2020	**CHARM 2020**, "Flavour Symmetries and CP violation in Charm"	*Mexico City, Mexico.*
28^{th} April 2020	**Quantum Universe Workshop**, "COVID-19 and a Theorist's Dilemma"	*Hamburg, Germany.*
2^{nd} December 2016	**CKM 2016**, "A Summary on Charm Dynamics from WG7"	*Mumbai, India.*
6^{th} September 2016	**CHARM 2016**, "Theoretical aspects on NP search in rare and (semi-)leptonic decays"	*Bologna, Italy.*
4^{th} April 2013	**XII IFAE, Cittadella Universitaria di Monserrato**, "A Higgs and the World of Flavour"	*Cagliari, Italy.*
16^{th} January 2013	**XX DAE-BRNS HEP Symposium**, "For When the Bells toll..."	*Santiniketan, India.*

Invited talks (15)

4^{th} December 2020	**Round Table on Machine Learning @ DESY 2020**, "Machine Intelligence @ DESY Theory"	*Hamburg, Germany.*
2^{nd} November 2020	**TOOLS 2020**, "HEPfit: The Bayesian MCMC for HEP"	*Lyon, France.*
28^{nd} October 2020	**KI Community Meetup**, "Machine Intelligence and COVID-19"	*Berlin, Germany.*
23^{rd} July 2018	**Higgs Hunting 2018**, "Flavour Physics meets Heavy Higgs Searches"	*Orsay-Paris, France.*
24^{th} May 2018	**HXSWG Offshell Meetings: BSM/EFT studies**, "Looking Inside Gluon Fusion Loops"	*Geneva, Switzerland.*
9^{th} November 2017	**LHCb Implications 2017**, "CP violation in charm: from Rags to Riches"	*Geneva, Switzerland.*
30^{th} May 2017	**Beyond the LHCb Phase-1 Upgrade**, "The On-Shell Story"	*Isola d?Elba, Italy.*
23^{rd} May 2016	**$4^{\mathbf{th}}$ B2TiP Workshop**, "Prospects of estimating hadronic uncertainties in $B \to K^*\gamma$"	*Pittsburgh, USA.*
9^{th} March 2016	**Towards the Theory of Flavour**, "Musings on the Future of Beauty and Charm Dynamics"	*Munich, Germany.*
29^{th} October 2015	**$3^{\mathbf{rd}}$ B2TiP Workshop**, "An Introduction to `HEPfit`"	*Tsukuba, Japan.*
27^{th} April 2015	**$2^{\mathbf{nd}}$ B2TiP Workshop**, "Tutorial on SusyFit"	*Krakow, Poland.*
27^{th} April 2015	**$2^{\mathbf{nd}}$ B2TiP Workshop**, "Diagrammatic approaches to understanding the SU(3) framework"	*Krakow, Poland.*
25^{th} February 2015	**New Physics at Belle II**, "An Introduction to SusyFit"	*Karlsruhe, Germany.*
10^{th} December 2014	**The landscape of Flavour Physics towards the high intensity era**, "The Charm of the Future"	*Pisa, Italy.*
18^{th} November 2011	**Workshop on Antiproton Physics at the Intensity Frontier**, "TAPAS and Charm Physics"	*Fermilab, Batavia, USA*

Seminars (22)

16^{th} January 2020	**LPT, Orsay**, "Flavour Physics: A Precision Tool for Exploring Scale Separations"	*Orsay, France.*
11^{th} January 2019	**IACS**, "Looking Inside Gluon Fusion Loops for Effective Higgs Couplings"	*Kolkata, India.*
15^{th} August 2018	**Arizona State University**, "Higgs Dynamics with Effective Field Theories"	*Tempe, USA.*
7^{th} May 2018	**IFIC**, "Flavour@`HEPfit`"	*Valencia, Spain.*
25^{th} January 2018	**TIFR**, "Flavour Physics meets Heavy Higgs Searches"	*Mumbai, India.*
10^{th} July 2015	**CERN**, "$B \to K^*\mu^+\mu^-$ decays in the Standard Model: a theoretical reappraisal"	*Geneva, Switzerland.*
15^{th} May 2013	**University of Edinburgh**, "The Industrial Revolution for Charm: From Sweatshops to Factories"	*Edinburgh, UK.*
21^{st} August 2012	**IMSc**, "Flavour in the Warped Extra Dimension"	*Chennai, India.*
9^{th} July 2012	**IMSc**, "Prospects of Charm"	*Chennai, India.*
21^{st} May 2012	**Università di Roma La Sapienza**, "Charm Beyond the Standard Model"	*Roma, Italy.*
22^{nd} December 2011	**University of Calcutta**, "Charm Dynamics: the Today and the Tomorrow"	*Calcutta, India.*
21^{st} December 2011	**University of Calcutta**, "Little Higgs Models; and with T Parity too...!!"	*Calcutta, India.*
19^{th} December 2011	**SINP**, "Yet another Era of Charm Physics"	*Calcutta, India.*
1^{st} December 2011	**TIFR**, "Charm: A Portal for ND"	*Mumbai, India.*
15^{th} November 2011	**University of Notre Dame du Lac**, "ND @ ND"	*Notre Dame IN, USA.*

22^{nd} March 2011	**Argonne National Laboratory**, "LHT and Charm: the Expected, the Unexpected and the Gamble"	*Argonne IL, USA.*
17^{th} February 2011	**Michigan State University**, "LHT and Charm: Hopes from a Pocket Pair of Twos"	*East Lansing MI, USA.*
14^{th} February 2011	**University of Illinois at Urbana Champaign**, "LHT and Charm: Gambling with a Hand that Others have Folded"	*Urbana IL, USA.*
16^{th} December 2010	**Fermilab**, "LHT and Charm: Gambling in Standard Model?s Backyard"	*Batavia IL, USA.*
2^{nd} November 2010	**University of Notre Dame du Lac**, "Not LHT but LHT-like... and beyond"	*Notre Dame IN, USA.*
8^{th} December 2009	**University of Notre Dame du Lac**, "LHT @ Work: Unleashing the Jack in the Box"	*Notre Dame IN, USA.*
1^{st} July 2005	**SINP**, "Simplicial Homology and its Application to Electrical and Electronic Circuits"	*Calcutta, India.*

Contributed talks (17)

12^{th} July 2019	**EPS 2019**, "EFT Fits for Higgs and EW @FCC-ee"	*Ghent, Belgium.*
11^{th} July 2019	**EPS 2019**, "Disentangling Higgs and EW Measurements at Future Lepton Colliders"	*Ghent, Belgium.*
7^{th} June 2019	**WIN 2019**, "Disentangling Higgs and EW Measurements at Future Lepton Colliders"	*Bari, Italy.*
23^{rd} May 2018	**Planck 2018**, "Flavour Physics meets Heavy Higgs Searches"	*Bonn, Germany.*
28^{th} November 2017	**Terascale Workshop**, "Flavour Physics meets Heavy Higgs Searches"	*Hamburg, Germany.*
7^{th} July 2017	**EPS 2017**, "$SU(3)_F$ Breaking through Final State Interactions and CP Asymmetries in $D \to PP$ Decays"	*Venice, Italy.*
6^{th} July 2017	**EPS 2017**, "Flavour Physics meets Heavy Higgs Searches"	*Venice, Italy.*
6^{th} August 2016	**ICHEP 2016**, "$b \to s$ transitions in the Standard Model and Beyond"	*Chicago IL, USA.*
4^{th} August 2016	**ICHEP 2016**, "Higgs productions in the gluon fusion channel: a complete EFT analysis"	*Chicago IL, USA.*
17^{th} June 2016	**LHCP 2016**, "Test of the Standard Model and the Search for New Physics Using UTfit"	*Lund, Sweden.*
25^{th} August 2015	**SUSY 2015**, "A critical examination of the $SU(3)$ framework in the hadronic decays of D"	*Tahoe City CA, USA.*
25^{th} August 2015	**SUSY 2015**, "An Introduction to `HEPfit`"	*Tahoe City CA, USA.*
24^{th} July 2015	**EPS 2015**, "A critical examination of the $SU(3)$ framework in the hadronic decays of D"	*Vienna, Austria.*
23^{rd} July 2015	**EPS 2015**, "Questioning the anomalies in $B \to K^* \mu^+ \mu^-$ decays"	*Vienna, Austria.*
20^{th} May 2015	**CHARM 2015**, "Charm loop contributions in $B \to K^* \mu^+ \mu^-$ decays"	*Detroit MI, USA.*
19^{th} May 2015	**CHARM 2015**, "A case for $SU(3)$ in $D \to PP$ decays"	*Detroit MI, USA.*
28^{th} May 2014	**Planck 2014**, "Probing Higgs couplings with high p_T Higgs production"	*Paris, France.*

Workshops & Conferences

November 2020	**TOOLS 2020**, Tools for High Energy Physics and Cosmology.	*Lyon, France.*
May 2020	**Beyond COVID-19 Workshop**, Conference on COVID-19 Exit Strategies.	*Tempe, USA.*
May 2020	**Charm 2020**, Conference on Flavour Physics.	*Mexico City, Mexico.*
April 2020	**Quantum Universe Workshop**, Conference on Particle Physics and Cosmology.	*Hamburg, Germany.*
October 2019	**Implications of LHCb measurements and future prospects 2019**, Conference on Flavour Physics.	*Geneva, Switzerland.*
September 2019	**Quantum field theory meets gravity** , DESY Theory Workshop.	*Hamburg, Germany.*
July 2019	**EPS 2019**, Conference on High Energy Physics.	*Ghent, Belgium.*
June 2019	**WIN 2019**, International Workshop on Weak Interactions and Neutrino.	*Bari, Italy.*
May 2019	**BSM with Precision Flavour Experiments**, Workshop on BSM and Flavour physics.	*Munich, Germany.*
October 2018	**Implications of LHCb measurements and future prospects 2018**, Conference on Flavour Physics.	*Geneva, Switzerland.*
September 2018	**Beyond Standard Model: Where do we go from here?**, Conference on High Energy Physics.	*Firenze, Italy.*
July 2018	**Higgs Hunting 2018**, Conference on High Energy Physics.	*Orsay-Paris, France.*
April 2018	**Planck 2018**, Conference on High Energy Physics.	*Bonn, Germany.*
November 2017	**Terascale Workshop**, Helmholtz Alliance Annual Meeting	*Hamburg, Germany.*
October 2017	**Implications of LHCb measurements and future prospects 2017**, Conference on Flavour Physics.	*Geneva, Switzerland.*
July 2017	**EPS 2017**, Conference on High Energy Physics.	*Venice, Italy.*
May 2017	**Beyond the LHCb Phase-1 Upgrade**, Conference on Flavour Physics.	*Isola d?Elba, Italy.*
December 2016	**CKM 2016**, Conference on Flavour Physics.	*Mumbai, India.*
September 2016	**CHARM 2016**, Conference on Charm Physics.	*Bologna, Italy.*
August 2016	**ICHEP 2016**, Conference on High Energy Physics.	*Chicago IL, USA.*
June 2016	**LHCP 2016**, 4^{th} Annual Large Hadron Collider Physics Conference.	*Lund, Sweden.*
June 2016	**Flavour and Electroweak Symmetry Breaking**, Workshop on Flavour Physics.	*Anacapri, Italy.*
April 2016	**$4^{\mathbf{th}}$ B2TiP Workshop**, Belle Flavour Factory Workshop.	*Pittsburgh, USA.*
April 2016	**Higgs Tasting Workshop**, Workshop on Higgs Physics.	*Benasque, Spain.*
March 2016	**Toward The Theory of Flavour**, Munich, Germany.	*Benasque, Spain.*
April 2016	**$3^{\mathbf{rd}}$ B2TiP Workshop**, Belle Flavour Factory Workshop.	*Tsukuba, Japan.*

November 2015	**Implications of LHCb measurements and future prospects 2015**, Conference on Flavour Physics.	*Geneva, Switzerland.*
September 2015	**Gearing up for LHC13**, Workshop on physics at the LHC.	*Firenze, Italy.*
August 2015	**SUSY 2015**, Conference on High Energy Physics.	*Tahoe City CA, USA.*
July 2015	**EPS 2015**, Conference on High Energy Physics.	*Vienna, Austria.*
May 2015	**CHARM 2015**, Conference on Charm Physics.	*Detroit MI, USA.*
April 2015	**2$^{\text{nd}}$ B2TiP Workshop**, Belle Flavour Factory Workshop.	*Cracovia, Poland.*
February 2015	**New Physics at Belle II**, Belle II meeting.	*Karlsruhe, Germany.*
December 2014	**The landscape of Flavour Physics towards the high intensity era**, Conference on Flavour Physics.	*Pisa, Italy.*
April 2013	**XII IFAE**, Conference on High Energy Physics.	*Cagliari, Italy.*
July 2011	**CTEQ Workshop 2011**, Summer School on QCD Analysis and Phenomenology	*Madison WI, USA.*
June 2011	**LHC – Fermilab HCP**, Sixth School on Hadron Collider Physics.	*Geneva, Switzerland.*
May 2011	**MadGraph Spring 2011**, Workshop for MadGraph and FeynRules developers.	*Batavia IL, USA.*
May 2011	**SLAC Summer Institute**, "Nu: Nature?s Mysterious Messengers"	*Menlo Park CA, USA.*

List of Teaching References

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