

Vidya Sagar VOBBILISSETTI

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Timeline

Program	Institution	Advisor	Grades	Duration
○ Postdoctoral fellow	○ INFN Pisa	○ Giulia Casarosa	○ -	○ 2025-27
○ Postdoctoral fellow	○ IFIC, U. Valencia	○ Carlos Marinas	○ -	○ 2024-25
○ Ph.D. in Particle Physics titled "Search for $B^\pm \rightarrow K^\pm \tau^\pm \tau^\mp$ decays in the Belle (II) data samples"	○ IJCLab, U. Paris Saclay	○ Karim Trabelsi	○ -	○ 2020-23
○ M2 in Nuclear, Particle, Astroparticle physics and Cosmology (NPAC) with a thesis titled "Study of anomalous magnetic moment of τ at the Belle II experiment"	○ U. Paris Saclay	○ Karim Trabelsi	○ 15.6/20	○ 2019-20
○ Bachelors in Engineering Physics	○ IIT Madras	○ James Libby	○ 7.8/10	○ 2015-19

Positions of Responsibilities

- Leader of the Software and Performance working group for the Belle II vertex detector upgrade.
- Convener of the Belle II Analysis Software Tools group.
- Librarian for the Belle II High-Level Trigger (HLT) software package.
- Responsible for HLT Data Quality Monitoring (DQM) in the Belle II Experiment.
- Supervised two Masters-level internship students: One with the Belle II experiment during my PhD and one on NA64 μ experiment as a postdoctoral researcher.

Research Experiences

- 1. Performance of Belle II experiments' vertex detector upgrade**
IFIC, Valencia

March 2024 - ongoing
Postdoctoral research

 - Physics performance studies to identify the optimal design for the planned vertex detector (VTX) upgrade.
 - Building a **pre-filter based on VTX standalone reconstruction** for operations at higher luminosities.
 - Participated in DESY test benches to study performance of irradiated sensors and their temperature effects.
- 2. NA64- μ experiment**
IFIC, Valencia

March 2024 - ongoing
PostDoctoral research

 - Built monitoring systems and participated in data taking
 - Studying feasibility of gamma identification using hadronic calorimeters to search for signatures of dark matter.
 - Working on setting up a GenFit based tracking for improved momentum resolution.
- 3. Search for $B^\pm \rightarrow K^\pm \tau^\pm \tau^\mp$ with Belle and Belle II experiments**
IJCLab, Orsay

Oct 2022 - ongoing
PhD thesis

 - Favorable candidate for new physics models trying to explain current anomalies in flavour physics.
 - Current experimental limits for it are four orders of magnitude away from the standard model predictions due to difficulties in reconstructing τ leptons which produce neutrinos.

- **optimisation studies with control samples** to make the best use of the calorimeter information and to achieve the **world-leading sensitivity** with the merged data sets from both experiments.
- Internal review ongoing targeting EPS 2025.

4. Improve decay modeling of B mesons and B-tagging performance Oct 2021 - Sept 2023 IJCLab, Orsay *PhD thesis*

- B-tagging is a common tool used when studying B -meson decays with missing energy.
- For more than a decade, all the B-tagging tools displayed large data-MC discrepancies.
- **Designed new control procedures** to study the impact of decay modeling on tagging performance.
- **Corrected MC model extensively** and significantly improved the data-MC agreement while also **increasing the background rejection**.

5. Software optimization for online trigger Oct 2020 - Aug 2021 IJCLab, Orsay *PhD thesis*

- **Set up essential monitoring systems** for the CPU time, memory and physics related information for computer farm operating the High Level Trigger systems at Belle II.
- Within a span of 6 months **reduced the processing time** of full event online reconstruction, which is run to take trigger decision, **by a factor two** for faster data taking.
- **Debugged critical memory** leaks in the software that were essential for the operation of the trigger systems.

6. Anomalous magnetic moment of τ at the Belle II experiment March - June 2020 IJCLab, Orsay *Masters thesis*

- Given the observations of anomalous magnetic moment in μ , the corresponding effects on τ leptons could be larger if the new coupling could be proportiona to the mass of the lepton
- But τ leptons decay rapidly producing undetectable neutrinos, making it difficult to reconstruct the direction.
- Worked on **efficiently reconstructing the τ direction** to approximate $F_2(0) = a_\tau$ by fitting spin-independent differential cross section.

7. Improvements in muon identification of the Belle Detector *Bachelors' Summer internship* TIFR, Mumbai

- Extended the **muon identification** algorithm of the **Belle experiment** using machine learning techniques applied on information from almost all sub-detectors.

8. Improvements in muon identification of the Belle Detector (cont.) Aug. 2017 - Sept.r 2018 Department of Physics, IIT Madras *Bachelors' Thesis Project*

- Included calorimeter information to the above analysis.
- Improved the muon identification performance primarily for **low-momentum muons**, those which do not reach RPC based outer detector.

9. Partitions - Number theory August 2016 - March 2017 Department of Physics, IIT Madras

- Computationally found the number of 7-dimensional partitions whose 8-dimensional Ferrers Diagrams fit into a volume of hypercube of side 2 and **reproduced the results in A269699** using the Bratley-McKay algorithm.
- Refining the Wiedemann computation of $M[8]$ by computing $T(8,k)$ for $k=0,1,\dots,256$.

10. Exoplanet Identification August 2017 - November 2017 Astronomy and Physics Club, Center for Innovation, IIT Madras

- Applied **Convolutional Neural Network** on the **NASA's Kepler data** to identify exoplanets using **Transit Photometry**.
- Despite having heavy data imbalance of 200:1 we could get a reliable classifier.

11. Class-D Audio Amplifier

Analog Circuits Laboratory Course, IIT Madras

January - March 2017

Bachelors' Course Project

- Built and demonstrated a composite analog system for **synchronized light and sound** using amplifiers, oscillators, non-overlap generators, pulse width modulators etc.

Scholastic Achievements

- Awarded the Univeristé Paris-Saclay **IDEX scholarship**.
- Awarded the **Charpak scholarship** by Campus France.
- Recipient of **Best Project Award** in High Energy Physics Department for my work at the Tata Institute of Fundamental Research as a visiting student.

Publications

I co-authored 40 analysis publications as part of the Belle II collaboration, some of which utilize B -tagging calibration provided by me, *The Belle II Detector Upgrades Framework Conceptual Design Report* [arXiv:2406.19421](https://arxiv.org/abs/2406.19421) as well as a proceeding on *The OBELIX chip for the Belle II VTX upgrade* [Nucl.Instrum.Meth.A 1067 \(2024\) 169659](https://ui.adsabs.org/abs/2024Nucl.Meth.A.1067).

My thesis [Search for \$B^\pm \rightarrow K^\pm \tau^\pm \tau^\mp\$ decays in the Belle and Belle II data samples \(2023\)](#) is available online. Full list of publications can be found at [InspireHEP profile](#).

Conferences and workshops

- Member of local organizing committee for **Beam telescopes and test beams workshop 2025** in Valencia.
- Presented summary of latest measurements by the Belle II's Electroweak penguin working group at the **Moriond EWP conference 2025**.
- Presented the hadronic B to charm decays branching fraction measurements by the Belle and Belle II experiments at the **CKM conference 2023**.
- Presented summary of latest measurements by the Belle II's Electroweak penguin working group at the **FPCP conference 2022**.
- Presented at many plenary sessions of Belle II General Meetings and Belle Analysis Workshops.
- Presented at the French national conference: Journées de Rencontre des Jeunes Chercheurs 2022
- Attended IN2P3 School of Statistics 2022 and C++ course by HEP Software Federation

Skills

- **Programming languages:** C++, Python, Rust, JavaScript
- **Tools and Software:** scikit-learn, TensorFlow, keras, Valgrind/Callgrind, Linux perf, EvtGen, ROOT, Mathematica, MATLAB, LTSpice, Verilog, CAD

Extra-Curricular Activities

- **Amateur robotics:** Elected as the Technical Affairs Secretary of the hostel to lead the teams in inter-hostel technical competitions like autonomous robotics and quadcopter design.
- **Organization:** Lead the publicity and organization of Bhoutics, the annual physics fest of the Physics Department, IIT Madras in its founding year and the next (2016, 2017)
- **Teaching:** Taught essential sciences to 3 low income schools covering 240 students in the form of video lectures as a part of the National Service Scheme in India.