Eshwen Bhal

PhD student

62A St Pauls Road, Bristol, United Kingdom. BS8 1LP

+44 (0) 78414 09961 | eshwen.bhal@bristol.ac.uk | eshwen | ebhal | eshwen-bhal-714557195 | eshwen.bhal

Profile

I am a final year PhD student in particle physics, searching for dark matter using big data from the Large Hadron Collider (LHC) as part of the CMS experiment at CERN. This involves statistical analysis of large datasets with expertise in Python, and solving wide ranging problems from physics standpoints to programming challenges. Additional responsibilities have included providing detector-related expertise and software, teaching undergraduates and doing public outreach. Aside from work, I partake in many activities such as taekwondo, weight lifting, hiking and skiing.

Education

University of Bristol

Bristol, United Kingdom

Doctor of Philosophy in Physics

Sep. 2016 – Present

- Thesis title: **Hadronic Dark Matter Searches at CMS at 13 TeV** — *Under supervision of H. Flächer. Expected submission in April 2020*
- **Postgraduate student representative** for the particle physics group, 2019–20 — *Role in the Student-Staff Liaison Committee for the School of Physics*
- **CERN**, Geneva, Switzerland — *Long term attachment, Oct. 2017 – Mar. 2019*
- **Calorimeter Layer-2 on call expert** and **Level-1 Trigger shifter**, Geneva, Switzerland — *Additional responsibilities at CERN*

University of Exeter

Exeter, United Kingdom

Master of Physics with Honours in Physics with Astrophysics. Award: First Class (77 %)

Sep. 2012 – Jul. 2016

- Dissertation title: **Simulations of Exoplanet Light Curves** — *Under supervision of T. Harries*
- Recipient of a **Dean's Commendation**, 2016 — *In recognition of outstanding achievement at the fourth stage of my degree*
- Recipient of a **Physics Award**, 2015 — *Being one of the three students with the highest marks at the third stage of my degree*
- Recipient of a **Dean's Commendation**, 2014 — *In recognition of outstanding achievement at the second stage of my degree*
- Recipient of a **Physics Award**, 2013 — *Being one of the three students with the highest marks at the first stage of my degree*
- Recipient of a **Dean's Commendation**, 2013 — *In recognition of outstanding achievement at the first stage of my degree*

Monmouth Comprehensive School

Monmouth, United Kingdom

Secondary school qualifications

Sep. 2005 – Aug. 2012

- **A Level**, 2010–12 — *Biology (A*), Mathematics (A*), Physics (B), Chemistry (AS Level) (B)*
- **GCSE**, 2008–10 — *10 including English Language and Mathematics at grades A* (4) to A (6)*

Skills

Data analysis

- The primary focus of my PhD concerns statistical analysis of large (multi-terabyte) datasets collected by the CMS experiment from the Large Hadron Collider.
- Developed analysis software in Python and C++, using modern data science tools and distributed computing.
- Visualisation with ROOT and matplotlib. Formal presentations of results with LaTeX and Microsoft PowerPoint.

Collaboration

- Belonging to several working groups of around a dozen people as well as a wider collaboration of over 4,000 people.

Problem solving

- Predominant component of any physics degree. As an undergraduate, conducted more traditional pen-and-paper problem solving in many topics. As a PhD student, wrote code to solve physics problems numerically and perform data analysis.

Multitasking

- Often working on multiple projects at once with different working groups during PhD.

Organisation

- Coordinating different aspects of analyses in my PhD, meticulously documenting programming instructions and procedures of analysis components.

Communication

- Presented formally in my PhD at all levels: regular working group updates, research group and collaboration-wide talks, and several conference posters and talks.
- Participated in outreach to the public at the CERN Open Days 2019 and at @Bristol.

Experience

University of Bristol *Bristol, United Kingdom*

Computing Demonstrator *Nov. 2019 – Present*

- Teaching third year undergraduate students Python and its applications for numerically solving physics problems. Also involves formal marking of assignments and providing feedback.

University of Bristol *Bristol, United Kingdom*

Mathematics Tutor *Jan. 2017 – May 2017*

- Taught mathematics for physicists to first year undergraduate students. Also involved formal marking of problem sheets, discussions with the students, and teaching concepts for subsequent assignments.

Publications

2020	Searches for semi-visible jets in proton-proton collisions at $\sqrt{s}$ = 13 TeV in hadronic final states	*In preparation*
2020	Search for an invisibly decaying Higgs boson in proton-proton collisions at $\sqrt{s}$ = 13 TeV in final states with jets and missing transverse momentum	*In preparation*
2018	Search for natural and split supersymmetry in proton-proton collisions at $\sqrt{s}$ = 13 TeV in final states with jets and missing transverse momentum	*JHEP*

Conference talks & posters

2019	**CMS UK Conference,** Searches for semi-visible jets in hadronic final states	*Oxfordshire, UK*
2019	**University of Bristol PGR Conference,** Search for dark matter via an invisibly decaying Higgs boson at CMS	*Bristol, UK*
2019	**Institute of Physics HEPP and APP Conference,** Combined search for an invisibly decaying Higgs boson in hadronic channels at 13 TeV with CMS	*London, UK*
2018	**LHCP Conference,** The CMS Level-1 jet and energy sum triggers in the LHC Run-II	*Bologna, Italy*
2017	**University of Bristol PGR Conference,** Dark matter searches at CMS at 13 TeV	*Bristol, UK*

References

Available on request.