ANEŽKA KLUSTOVÁ

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CURRENT POSITION

Imperial College London, UK 10/2020 - Present
High Energy Physics Research (PhD), President's Scholar

Awarded Imperial President's PhD Scholarship to study neutrino-nucleus interaction cross-sections and their effects on neutrino oscillation measurements on DUNE and MINERvA.

Supervised by: Prof Morgan Wascko, Dr Abbey Waldron

Thesis title: Measurement of Nuclear Dependence in Inclusive Antineutrino Scattering (*provisional*)

Thesis defense: 02/2024

RESEARCH HIGHLIGHTS

MINERvA

- Lead the 1D and 2D measurement of inclusive antineutrino scattering on carbon, hydrocarbon, iron and lead in lepton and hadron kinematics using machine-learning vertexing.
- Revised technique to maximize flux uncertainties cancellations in cross-section ratios and calculated fluxes for individual targets.
- Responsible for data production, validation, implementation of calorimetric corrections, and evaluation of recoil uncertainties for the data preservation effort.

DUNE

- Designed the geometry, simulation and the event display for the near detector gaseous argon prototype for Phase 2. Lead the reconstruction efforts.
- Commissioned, assembled and operated the test detector at Fermilab.

High-Pressure gas Time Projection Chamber (TPC) Teststand

- Examined the suitability of multi-wire proportional chambers from ALICE TPC as a readout option at high-pressure. Optimised charge gain for different gas admixtures/pressures/voltages.

EDUCATION

University College London (UCL), UK 2016 - 2020
MSci Natural Sciences, Physics and Inorganic & Materials Chemistry

1st Class Honours, Mathematical & Physical Sciences Dean's List Commendee (top 5%)
Master's Thesis: Exotic Contributions to Neutrinoless Double Beta Decay
Investigated the Beyond the Standard Model processes mediating neutrinoless double beta decay, specifically scalar and vector Majoron assisted decays. Demonstrated that two neutrino double beta decay can be used as a probe to investigate New Physics. *Supervised by:* Prof Frank Deppisch.

National University of Singapore, Singapore 2018 - 2019
Awarded study abroad placement.

Gymnázium J. K. Tyla, Hradec Králové, Czech Republic 2012 - 2016

PAST RESEARCH EXPERIENCE

Fermilab, USA 09/2022 - 03/2023
Visiting Researcher
Commissioning, assembly and operations of the Teststand of an Overpressure Argon Detector (TOAD).

CERN, Switzerland 06/2019 - 08/2019
Summer Student at Neutrino Platform
R&D of silicon photomultiplier (SiPM) calibration system for the T2K scintillator tracker detector. Measured SiPM characteristics and scintillating-fibre light distribution system efficiency. Designed experimental components in CAD. Analysed data in ROOT. *Supervised by:* Prof Davide Sgalaberna, Dr Umut Kose.

University College London, UK 06/2018 - 08/2018
Summer Research Student in High Energy Physics
Development of the SuperNEMO validation strategy for neutrinoless double beta decay and background events. *Supervised by:* Dr Cheryl Patrick, Prof David Waters.

Sotio a.s., Czech Republic 06/2017 - 08/2017
Process Development Intern
Carried out cytometric and cell culture statistical data analysis, and cell culture modelling. Preparation of active cellular immunotherapy treatment, worked in clean premises (GLP training).

Czech Technical University in Prague, Czech Republic 09/2015 - 06/2016
Research Intern in the Faculty of Nuclear Sciences and Physical Engineering
Studied dynamic behaviour of nuclear reactors with the school reactor VR-1. *Supervised by:* Dr Filip Fejt.

Czech Academy of Sciences, Czech Republic 09/2014 - 06/2015
Open Science Research Intern at the Institute of Physics
Efficiency study of silicon thin films and solar cells. *Supervised by:* Dr Antonín Fejfar.

AWARDED FUNDING

Research Student Conference Fund, Institute of Physics, UK 10/2022
Funding covering registration fee for NuInt 2022 in Seoul, South Korea.

Early Career Researcher Accommodation Stipend, NuInt 2022, South Korea 10/2022
Stipend covering all accommodation fees for NuInt 2022 in Seoul, South Korea.

President's PhD Scholarship, Imperial College London, UK 2020 - Present
Full tuition fees funding, stipend to assist with living costs and conference/consumables fund to design and pursue a doctoral research at Imperial College London, UK.

Kellner Family Foundation Scholarship, Czech Republic 2016 - 2020
Stipend covering living costs to undertake undergraduate studies at University College London, UK.

SELECTED CONFERENCES & TALKS

LNBF/DUNE UK Project Meeting, Bristol, UK 07/2023
Invited talk: Neutrino-Nucleus Interactions at MINERvA – physics talk about the MINERvA experiment, recent results and impact on DUNE.

Institute of Physics APP and HEPP Annual Conference, London, UK 04/2023
Parallel talk: High-Statistics Measurement of Nuclear Dependence in Inclusive Antineutrino Scattering in 1D and 2D with MINERvA.

NuInt 2022, Seoul, South Korea 10/2022
Plenary talk: The MINERvA Flux Prediction.

New Perspectives 2022, Fermilab, USA 06/2022
Invited talk: MINERvA in 10 Minutes.

Neutrino 2022, Virtual Seoul, South Korea 05/2022
Poster: Measurement of Nuclear Dependence in Inclusive Antineutrino Scattering with MINERvA.

APS April Meeting 2022, New York City, USA 04/2022
Parallel talk: Measurement of Nuclear Dependence in Inclusive Antineutrino Scattering with MINERvA.

Opportunities with Atmospheric Neutrinos (OWAN21), London, UK 10/2021
Invited student quickfire talk: Measurement of Nuclear Dependence in Inclusive Antineutrino Scattering with MINERvA.

SELECTED PUBLICATIONS

1. A. Ritchie-Yates *et al. First operation of an ALICE OROC operated in high pressure Ar-CO_2 and Ar-CH_4.* e-Print: 2305.08822 [physics.ins-det] (2023). Submitted to EPJ C.
2. MINERvA Collaboration. T. Cai *et al. Measurement of the axial vector form factor from antineutrino–proton scattering.* Nature 614 (2023) 7946, 48-53.
3. MINERvA Collaboration. J. Kleykamp *et al. Simultaneous Measurement of ν_μ Quasielasticlike Cross Sections on CH, C, H_2O, Fe, and Pb as a Function of Muon Kinematics at MINERvA.* Phys.Rev.Lett. 130 (2023) 16, 161801.
4. MINERvA Collaboration. L. Zazueta *et al. Improved constraint on the MINERνA medium energy neutrino flux using $\overline{\nu}e^- \to \overline{\nu}e^-$ data.* Phys.Rev.D 107 (2023) 1, 012001.
5. DUNE Collaboration. *A Gaseous Argon-Based Near Detector to Enhance the Physics Capabilities of DUNE.* Snowmass 2021. e-Print: 2203.06281 [hep-ex] (2022).
6. MINERvA Collaboration. F. Akbar *et al. Vertex finding in neutrino-nucleus interaction: a model architecture comparison.* JINST 17 (2022) 08, T08013.
7. MINERvA Collaboration. R. Fine *et al. Data Preservation at MINERvA.* Snowmass 2021. e-Print: 2009.04548 [hep-ex] (2020).

RELEVANT SKILLS

· Advanced understanding of statistical techniques used in neutrino cross-section measurements
· Proficient in C++, Python, ROOT, Matlab and Mathematica
· Analysis/data preservation (Docker, Singularity, CI)
· Use of machine-learning libraries (PyTorch, TensorFlow)
· Detector geometry modelling (GEANT4)
· Simulation and reconstruction software development (art) using versioning systems (CVS, git)
· Experience with detector R&D, commissioning, assembly, maintenance, and data taking

SUPERVISION & TEACHING EXPERIENCE

Imperial College London, Department of Physics, UK 2021 - Present
Graduate Teaching Assistant

· Supervised an Undergraduate Research Opportunities Programme (UROP) project on MINERvA (2023).
· Taught 3rd year undergraduate Nuclear and Particle Physics seminars (2022/2023).
· Supervised 1st year undergraduate project 'Building & Optimising a Multi-stage Coil Accelerator' (2022).
· Demonstrated and marked 3rd year undergraduate Computational Physics (2021/2022).
· Supervised a summer student project on neutrino-nucleus interactions at MINERvA (2021).

MISCELLANEOUS

Imperial HEP Student Seminar Lead 05/2023 - Present
Imperial HEP Equity, Diversity & Inclusion Committee Member 03/2023 - Present
UCL Natural Sciences Academic Representative and Transition Mentor 2016 - 2018
Outreach talks to school pupils aged 15+ (2017, 2019, 2022).

LANGUAGES

Czech Native Speaker
English Fluent
German B1 Goethe-Zertifikat
Russian Conversational

TRAINING AND EXTRACURRICULAR ACTIVITIES

Asia-Europe-Pacific School of High Energy Physics, Pyeongchang, South Korea 10/2022
33 lectures and every-day discussion sessions, supporting international collaboration between PhD students from all around the world. Included poster session.

SLAC Summer Institute, Stanford University – Virtual 08/2022
Two-weeks long summer programme with virtual lectures and discussion on 'Golden Opportunities: Puzzles and Surprises - Past & Future.

STFC HEP Summer School, University of Oxford, UK 09/2021
Two-weeks long school aimed at UK-based experimental particle physics PhD at the end of their first year of training, consisting of lectures, tutorials and related problem sheets. Included poster sessions.

Neutrino Interaction School, DUNE 06/2021 - 07/2021
Series of classes, talks and hands-on activities introducing neutrino-interaction physics, including interaction cross-section measurement, evaluating systematic uncertainties and interaction modelling within DUNE.

MINERvA 101 Week 06/2021
Series of talks and hands-on activities introducing neutrino-interaction physics, including interaction cross-section measurement, evaluating systematic uncertainties and interaction modelling within MINERvA.

DUNE Computing Training 05/2021
Introduction to data volumes at FNAL, basic overview of art and LArSoft, development of configuration files to control batch jobs, grid submission and monitoring.

Introduction to Machine Learning, Yandex School of Data Analysis 01/2021 - 02/2021
Intensive 2-week course of machine learning and deep learning methods, via a series of lectures (formal definitions and derivations), seminars (hands-on data analysis) and 2 Kaggle competitions. Included classification, regression, feature selection, dimensionality reduction, feature scaling, clustering and special deep learning topics such as convolutional neural networks and generative adversarial learning. Achieved 94% (top 1 score).

Technology Internship Experience UK, Bright Network 07/2020
Three-day virtual internship programme including seminars on communication and collaboration, creative problem solving and design, agile software development and networking with Accenture, Google, Goldman Sachs, Bloomberg, Amazon and Vodafone representatives. Enterpreneurial team project on delivering Facial Verification in Customer Banking App Sign-In Process.

The Physics of Life Online Summer School, Princeton University 06/2020 - 08/2020
Weekly lectures and discussions of the provided reading material geared towards creating a bridge between undergraduate physics and applications in living systems. Included topics ranging from bacterial and cellular motility to computational neuroscience introduction.

UCL Interdisciplinary Journal Club 2017 - 2018
Collaborative club for Natural Sciences to meet excellent researchers, learn new analytical techniques, practise presentation skills, and discuss the newest research activities.

Beginners HTML/CSS Web Development Course, Code First Girls 10/2017 - 12/2017
An introduction to web development consisting of fundamental skills of front-end web dev (HTML, CSS, JavaScript), collaborative development with Git and Github, and a team project of creating a website.

UCL Global Citizenship Programme: Justice & Equality 06/2017
Team project based on examining climate change from the perspective of justice (uneven effect distribution) through innovation and entrepreneurship.

August 2023, London Anežka Klustová