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Weizmann Institute of Science

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EDUCATION

- **Weizmann Institute of Science, Rehovot, Israel** 2021-2024
MSc Physics Percentage: 93.5
- **Indian Institute of Technology Bombay, Mumbai, India** 2018-2021
MSc Energy Science and Engineering CPI: 9.42
- **Loyola College, Chennai, India** 2015-2018
BSc Physics CGPA: 9.09

RESEARCH EXPERIENCE

- **Weizmann Institute of Science (WIS)** October 2022 - April 2024
Masters Project under the supervision of Prof. Yosef Nir
– Studied the implications of Higgs-related measurements at the LHC on various BSM frameworks
- **Indian Institute of Technology Bombay (IITB)** June 2019 - December 2020
Masters Project under the supervision of Prof. Karthik Sasihithlu and Prof. M. P. Gururajan
– Conducted literature survey of near-field heat transfer and studied its mechanism
– Performed molecular dynamics simulation of near-field heat transfer across two nanospheres using LAMMPS

TECHNICAL SKILLS AND INTERESTS

Languages (Proficient): English, Tamil
Languages (Less proficient): German, Telugu
Software: Python, Julia, LAMMPS, Mathematica, LaTeX, Git
Areas of Interest: Theoretical physics (Field theory), Tensor networks, Quantum computing, Deep learning

PUBLICATIONS

1. Y. Nir and P. P. Udhayashankar, *Lessons from ATLAS and CMS measurements of Higgs boson decays to second generation fermions*, *JHEP* **06** (2024) 049 [arXiv:2404.16545 [hep-ph]]

ADVANCED COURSES TAKEN

- **Theoretical Condensed Matter Physics** at IITB
Instructor: Prof. Hridis Kumar Pal
– Second quantization, Interacting electron gas, Superconductivity, Magnetism
- **Statistical physics 1** at WIS
Instructor: Prof. Oren Raz
– Equilibrium statistical physics: Phase transitions and critical phenomena, Ising type models; Analytical and numerical methods, renormalization group approach; correlation functions
– Spin Glass physics: mean-field models, the replica trick, replica symmetry breaking
- **Quantum field theory 1** at WIS
Instructor: Prof. Ofer Aharony
– Perturbation theory and Feynman diagrams from Path Integrals (scalars and fermions), perturbative regularization and renormalization, optical theorem and the LSZ reduction formula, Renormalization group
– QED, gauge fixing and the Faddeev-Popov procedure, Ward Identities, non-Abelian gauge theories
– Non-perturbative field theory: QCD (qualitative). 3d QED, instantons and confinement
– Symmetries in QFT, Goldstone's theorem, renormalization and symmetry, the Higgs mechanism (classical and quantum)
- **Elementary particles 1** at WIS
Instructor: Prof. Yosef Nir
– The course followed the book "*The Standard Model: From Fundamental Symmetries to Experimental Tests*" authored by Yuval Grossman and Yossi Nir"
- **General relativity** at WIS
Instructor: Prof. Ulf Leonhardt
– Mathematics required for GR, Einstein equations, Gravitational waves, Black holes, elementary cosmology

•Practical Deep Learning for Science

at WIS

Instructor: Prof. Eilam Gross

- Convolutional Neural Nets, Graph Neural Nets, Transformer, Diffusion

•Supersymmetry

at WIS

Instructor: Prof. Micha Berkooz

- Supersymmetric QM, SUSY algebra and representations, SUSY in 4d, SUSY Gauge theories

•Quantum field theory 2

at WIS

Instructor: Prof. Adam Schwimmer

- The continuum limit
- Lattice Gauge Theories
- Renormalization of Non-Abelian Gauge Theories, Slavnov–Taylor identities
- Regularization and analyticity
- Polchinski ERG and Callan Symanzik equation

KEY COURSE PROJECTS

•Accent modulation using cVAE architecture

at WIS

Course: Practical Deep Learning for Science

1 month

- Learnt various audio processing features like STFT, Mel spectrogram, MFCCs etc.
- Build a cVAE using pytorch modules in python
- Used one hot encoding to switch between accents using audio features like MFCC and time-domain data
- Dataset used: AccentDB - Core & Extended

•Deep Learning with particle collider collision event

at WIS

Course: Experimental Projects

3 weeks

- Understood blocks of code developed by the group of Prof. Eilam Gross
- Modified it to suit the goal of our project, i.e. to determine the fraction of charged and uncharged particles in a collider event

WORKSHOP & SCHOOLS

•Tri-Institute Summer School on Elementary Particles

2023

- Exposure to various aspects of particle physics. Topics in the summer school ranged from theoretical to experimental/observational aspects of particle physics: Underground experiments, cosmology and gravitational waves, to list a few.

REFERENCES

•Prof. Yosef Nir

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Weizmann Institute of Science

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•Prof. Karthik Sasihithlu

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