Nabin **Kalauni**

CIVIL ENGINEER · RESEARCH ASSISTANT · HYDROLOGIC MODELER

New Manoram Tole, Suryabinayak - 05, Bhaktapur, NEPAL

(+977) 9843-820827 | 075bce083.nabin@pcampus.edu.np | nkalauni.github.io | nkalauni | nabin-kalauni

Research Interests: Climate change and adaptation, Earth system modeling, Computational modeling, Scientific machine learning

Summary

Academic excellence	Best-in-department grades and strong standardized test scores
Research background	Two research articles under review in reputed journals and multiple presentations at renowned conferences
International collaboration	Worked with collaborators and supervisors ranging from Duke University to Max Planck Institute
Computational modeling	Well-versed in computer modeling of the physics behind dynamical systems ranging from vibration isolation to land surface processes
Interdisciplinary	Research involving concepts from a plethora of disciplines such as Lagrangian mechanics, symbolic computation, ML, optimization

Education

Pulchowk Campus, Institute of Engineering (IOE), Tribhuvan University   *Lalitpur, Nepal*
B.ENG. IN CIVIL ENGINEERING   *Nov. 2018 - Apr. 2023*

- Average mark: 75.9% (top 5% of 1000+ at university level)
- **Best in department: Senior year** (86.0 % mark)
- Graduate Record Examination (GRE): **334/340** [Q169 (91%), V165 (95%), W4.5 (81%)]
- English Proficiency (TOEFL iBT): **116/120** [R30, L30, S27, W29]

Current Position and Positions Held

Research Assistant   *Center for Water Resource Studies (CWRS), IOE*
PROF. DR. VISHNU PRASAD PANDEY   *Apr. 2023 - Present*

Student Researcher, Data Science Team   *IOE*
IOExDUKE EARTHQUAKE EARLY WARNING LAB, PROF. DR. HENRI P GAVIN   *Oct. 2022 - Apr. 2023*

Undergraduate Researcher   *Dept. of Civil Engg., IOE*
STRUCTURES AND VIBRATIONS LAB, PROF. DR. KSHITIJ C SHRESTHA   *Feb. 2022 - Dec. 2022*

Research Experience

Himalayan Hydrology Simulation Model (HimSim.jl)   *Center for Water Resource Studies (CWRS), IOE*
MODELING AND PACKAGE DEVELOPMENT   *Apr. 2023 - Present*

- Currently developing a process-based hydrological model with special focus on **snow and glacier processes**
- Set-up model ODEs using ModelingToolkit.jl in the high-performance **Julia** language
- Explored the use of **scientific machine learning**, e.g.: neural ODE and differential parameter learning, to incorporate remotely sensed data to improve model performance
- Expert consultation with Dr. Sujan Koirala (**Max Planck Institute** for Biogeochemistry)

Nepal Climate Information System *CWRS, IOE*

SPATIAL DATA INTERPOLATION AND VISUALISATION *May 2022 - Apr. 2023*

- Implemented Kriging with External Drift (KED) **interpolation** to develop a continuous precipitation and temperature data product all over Nepal
- Developed a user-friendly GUI application in Python for internal use at CWRS as part of B.E. thesis

Publications

PEER-REVIEWED

Cereal yield and water requirements in response to irrigation and soil fertility management in a changing climate: a case of Tulsipur, Western Nepal

Journal of Water and Climate Change (Under Review)

MD ZUBER, NABIN KALAUNI, NIRMAN SHRESTHA, VISHNU P PANDEY *2023*

- Co-first author
- Studied **climate change impacts** on crop yield and irrigation water requirements of rice and wheat
- Statistical downscaling of **CMIP6 climate projections** in **R** (QMAP)
- Crop water modeling using FAO Aquacrop model in Python (AquaCrop-OSPy)
- Investigated **climate-resilient** pathways to boost crop water productivity in climate change scenarios

Sliding Base Isolation in Unreinforced Masonry Buildings with Soil-Structure Interaction Effects

Earthquake Engineering and Structural Dynamics (Submitted)

NABIN KALAUNI, DIPESH BANJADE, KSHITIJ C SHRESTHA *2023*

- Conceptualized an idealized 4-DOF **dynamical system** model of building
- Derived equations of motions (EoMs) from Lagrangian formulation using symbolic computation in Python (SymPy)
- Matrixization of EoMs into an 8-D nonlinear state-space representation to speed up computation
- Visualisation of results and drafting

NON PEER-REVIEWED

A Guide to Nepal Physics Olympiad *Open Source Book*

LAXMAN BISTA, NABIN KALAUNI, SANDESH PARAJULI *2023*

- Wrote an open-source physics book for Nepali physics olympiad aspirants and released on Github
- Wrote solutions to Olympiad-level physics problems in kinematics, statics and dynamics

Conference and Poster Presentations

Kathmandu Geo-Hazard Early Warning Symposium *Kathmandu*

DEEP GAUSSIAN PROCESS FOR EARTHQUAKE EARLY WARNING *2022*

- Presented a poster on the use of ML in forecasting earthquake S-wave features from P-wave
- Implemented a Deep **Gaussian Process** framework in Python (scikit-learn)
- Collaborated with students from Duke University under the supervision of Dr. Henri Gavin

National Conference on Earthquake Engineering *Bhaktapur*

EFFECT OF SOIL-STRUCTURE INTERACTION ON PERFORMANCE OF SLIDING LOW-COST BASE ISOLATORS *2022*

- Gave a presentation at the topmost graduate-level national conference on earthquake engineering

Teaching Experience

Hydrology *CWRS, IOE*
P<small>ROF</small>. D<small>R</small>. V<small>ISHNU</small> P<small>RASAD</small> P<small>ANDEY</small> *Jun. 2023 - Sep. 2023*

- Graded hydrology assignments and curated assignment solution materials
- Graded field visit and lab reports of undergraduate students

Skills

Programming	**Julia** (SciML packages), **Python** (scipy, pytorch, pandas), **R**, Matlab/Octave, C++, and HTML/CSS
Physics	Classical/Langrangian/Hamiltonian mechanics, fluid mechanics, continuum mechanics, thermodynamics
Mathematics	Dynamical systems, numerical analysis, optimization, machine learning, time series analysis
Notable software	Linux, QGIS, Git, Inkscape, LaTeX, LaTeX Beamer

Leadership Experience

Maths and Physics Society, MAPS Pulchowk *Pulchowk Campus*
F<small>OUNDING</small> P<small>RESIDENT</small> *May 2021 - May 2022*

- Founded and led the first maths and physics club at Pulchowk with over 40 members
- Conducted the first-ever National Integration Bee (over 1000 participants) in collaboration with students at MIT Mathematics
- Raised over Nrs. 100,000 and garnered national media coverage

International Physics Olympiad (IPhO) *Lisbon, Portugal*
S<small>TUDENT</small> T<small>EAM</small> L<small>EADER</small> *2018*

- Student team leader of Nepali delegation to IPhO 2018, Lisbon
- Rank 1 out of 10000+ physics students in Nepal in preliminary round of Nepal Physics Olympiad (NePhO) 2018
- Rank 1 out of 20 selected students in final NePhO round 2018

Honors & Awards

2023	**Best in Department: Senior Year**, Highest grade in senior year/ 1000+ students	*Dept. of Civil Engg, IOE*
2023	**National College-Level Team Chess Tournament Winner**, Rank 1/200+ colleges	*Nepal Chess Federation*
2018	**IOE Four-Year Merit-Based Engineering Study Scholarship**, Rank 100/15000+ and scholarship worth about NRs. 300,000	*Pulchowk Campus, IOE*
2018	**Nepal Physics Olympiad (NePhO) Winner**, Rank 1 / 10000+	*Nepal Physical Society*