Center for infrastructure, Sustainable Transportation and Urban Planning (CiSTUP)
Indian Institute of Science (IISc)

Summer Internship Program 2024

The Centre for infrastructure, Sustainable Transportation and Urban Planning (CiSTUP) at IISc invites applications for the "***Summer Internship Program 2024"*** to work on various projects.

General

1. The stipend for students with/or pursuing a bachelor's degree is Rs. 15,000 a month, and for those with/or pursuing a master's degree is Rs. 20,000 a month. An internship certificate will be provided upon successful completion of the program.
2. Selected candidates will have to arrange their accommodation.
3. Preference will be given to candidates who can join immediately and for a longer duration of time.
4. Applicants can apply for one or multiple projects mentioned below.
5. All internship positions are in-person only.
6. Based on the performance of the candidates during the internship, we also offer long-term research collaboration opportunities (such as semester-long projects) and permanent positions (Project Associate/Assistant, Research Associate, and Junior Research Fellow).

Responsibilities

1. Candidates should be motivated to learn new skills/software and willing to work on computational and experimental projects. Strong programming/debugging skills and an understanding of mathematical modeling are advantages.
2. Read and implement research papers and perform literature reviews for the assigned project.
3. Analyze data, conduct experiments, and contribute to research publications in leading journals and conferences.

How to Apply: Submit your application by using the following Google Form: Link

Selection Procedure: Candidates will be initially shortlisted based on their eligibility criteria and relevant experience. The selection process will include a skill test and an interview round. If needed, an additional interview may be conducted to shortlist final candidates.

Note: We receive a large volume of applications each year and may not be able to respond to individual queries. Only the selected candidates will be informed before the deadline.

Timeline:

Date	Event
05:00 PM 21st March 2024	Last date to submit your application
22nd-24th March 2024	Round 1 Shortlisting
05:00 PM 27th March 2024	Declaration of Round 1 results
28th-30th March 2024	Round 2 Interviews
31st April 2024	Round 3 (if needed)
05:00 PM 1st April 2024	Final results

Project Specifics

1. Network Optimization Models for Traffic and Transit (C++ Developer)
   - **Description**: This research aims to develop an open-source tool to simulate transit systems and predict crowding/ congestion accurately. It can answer several "what-ifs" related to public transit systems, such as how passengers react in case of a decrease in ticket price, events like delays and cancellations, and how the collective selfish choices of agents translate to flows and crowding in transit systems. The proposed framework is designed especially for dense large-scale networks like Bangalore. For more details, refer (video), (website).
   - **Project In-charge**: Prateek Agarwal (link), Dr. Tarun Rambha (link)
   - **Eligibility:** Candidate should be proficient in C++ programming. Familiarity with Python and Machine learning is advantageous.

   Contact for any clarifications: Prateek Agarwal (link)

2. Applying Machine Learning Models to Combinatorial Optimization Problems. (OR/ML Analyst)
   - **Description:** This project involves understanding how machine learning models can assist traditional optimization libraries in solving combinatorial optimization problems such as mixed integer programs (MIP). Possible ML applications could be to identify whether a heuristic MIP solution is sub-optimal or whether a given MIP node is a good candidate for branching.
   - **Project In-charge:** Vivek Vasudeva (vivekvasudev@iisc.ac.in), Dr. Tarun Rambha (link)
   - **Eligibility:** Candidate should have taken courses in optimization, data structures and machine learning and should be proficient in Python and have a good understanding of C/C++. Familiarity with solvers such as CPLEX or Gurobi would be considered a plus.

   Contact for any clarifications: Vivek Vasudeva (vivekvasudev@iisc.ac.in)

3. Choice Modelling
   - **Description:** As an intern, you will contribute to coding various discrete choice models in Python, for predicting transportation demand. In addition, you will also be vital in testing and improving a tool developed using Python and integrated with QGIS.
   - **Project In-charge**: Dr. Abdul Rawoof Pinjari (link)
   - **Eligibility**: The candidate should be available for at least two months. Candidate must be proficient in Python and have a working knowledge of QGIS. Familiarity with basic concepts in probability and statistics is desirable.

Contact for any clarifications: Anil NP Koushik (anil.koushik@fsid-iisc.in)

4. Road Safety Data Analysis (Power BI)
    - **Description:** This project involves developing a Power BI dashboard for road safety data. Interns will be expected to review existing accident data, identify data gaps, conduct data cleaning, and develop visualization of the data in Power BI.
    - **Project In-charge:** Dr. Vijay Gopal Kovvali & Dileepan K
    - **Eligibility:** Strong data visualization experience with Power BI

    Contact for any clarifications Dileepan K (dileepank@iisc.ac.in)

5. Population Synthesizer
    - **Description:** The project involves writing Python codes for modules of a population synthesizing tool. The intern's task will be to use various datasets and synthesize the city's population.
    - **Project In-charge**: Dr. Abdul Rawoof Pinjari (link)
    - **Eligibility**: The candidate should be available for at least two months. Candidate must be proficient in Python, possess basic knowledge of probability and statistics, and have a working understanding of Git. Familiarity with basic concepts in Machine Learning is desirable.

    Contact for any clarifications: Anil NP Koushik (anil.koushik@fsid-iisc.in)

6. Rules and Best Road Practices Evaluation for Safe Driving (Video Developer)
    - **Description:** A component of this project focuses on visualizing crash events through video animation. Interns will gain a fundamental understanding of systems thinking for crash analysis and will apply their graphics and visualization background to develop crash scenarios.
    - **Project In-charge:** Dr. Vijay Kovvali & Dileepan K
    - **Eligibility:** Proficiency in creating animated videos using tools like Blender, Canva, Adobe Animate (or similar)

    Contact for any clarifications Dileepan K (dileepank@iisc.ac.in)

7. Rules and Best Road Practices Evaluation for Safe Driving
    - **Description:** The project explores whether there is uniformity amongst all road users' understanding of road rules and best driving practices for road safety. It focuses on bridging the gap between driver behavior and drivers understanding of road rules. Interns would be involved in all aspects of research such as survey instrument development, data collection, data management and analysis.
    - **Project In-charge:** Dr. Vijay Kovvali, Preethama
    - **Eligibility:** Educational background in Psychology and allied fields of study and relevant research experience.

    Contact for any clarifications: Preethama Rajkumar (preeths2001@gmail.com)

8. Reinforcement Learning + Graph Neural Networks
    - **Responsibilities**:
        i. Actively contribute to the development and optimization of traffic signal control and/or traffic flow estimation strategies using advanced algorithms and simulations.
        ii. Work on a cutting-edge project involving traffic engineering, artificial intelligence, and network modelling.
        iii. Utilize strong programming skills and apply Reinforcement Learning algorithms, with a focus on Graph Neural Networks (GNN).
    - **Project In-charge**: Dr. Punit Rathore (link)
    - **Eligibility**:
        i. Availability: 2-6 months.
        ii. Proficiency in Python.
        iii. Comfortable working with libraries such as TensorFlow and PyTorch.
        iv. Familiarity with traffic simulation tools, particularly SUMO (CARLA experience is an added advantage).
        v. Understanding of Reinforcement Learning algorithms for optimization tasks.
        vi. Knowledge of Graph Neural Networks and their application to traffic systems.

    Contact for any clarifications: Rankit Kachroo (rankitk@iisc.ac.in)

9. Multi-modal Data Handling
    - **Responsibilities**:
        i. Handle large-scale multimodal data, including time series, survey/demographic data in text/language format, and images.
        ii. Demonstrate the ability to run models/algorithms with diverse data types.
        iii. Work on Data Science problems.
    - **Project In-charge**: Dr. Punit Rathore (link)
    - **Eligibility**:
        i. Availability: 2-6 months.
        ii. Proficiency in Python is mandatory.
        iii. Prior knowledge of statistical methods and language models is preferable.
        iv. Comfortable with handling and processing various data formats.

    Contact for any clarifications: Tirthajit Baruah (tirthajitb@iisc.ac.in)

10. Web Development
    - **Responsibilities**:
        i. Design, code, and deploy websites, ensuring a seamless and visually appealing user experience.
        ii. Develop APIs to enhance website functionality and integration with other services.
        iii. Work on various aspects of website development, from frontend design to backend logic and database management.

iv. Utilize expertise in web development technologies to create efficient and responsive web applications.
v. Collaborate with cross-functional teams to understand project requirements and deliver high-quality solutions related to transport-related problems.

- **Project In-charge**: Dr. Punit Rathore (link)
- **Eligibility**:

i. Availability: 2-6 months.
ii. Proven experience as a Web Developer with a strong portfolio showcasing website design and coding skills.
iii. Proficient in web development languages such as HTML, CSS, JavaScript, and frameworks like React or Vue.js.
iv. Experience in developing APIs for seamless data communication between the frontend and backend.
v. Knowledge of backend frameworks like Flask or Streamlit for building robust and scalable web applications.
vi. Familiarity with containerization tools such as Docker for efficient deployment.

Contact for any clarifications: Vishwajeet Pattanaik (vishwajeetp@iisc.ac.in)

11. Road Safety Data Analysis (Audits)

- **Description:** This project involves analysing and developing insights for road safety data. Interns will be expected to support in road safety audits, writing reports and data collection from various agencies.
- **Project In-charge:** Dr. Vijay Gopal Kovvali & Dileepan K
- **Eligibility:** M.Tech. Transportation Engineering , knowledge of VISSIM is added advantage.

Contact for any clarifications Dileepan K (dileepank@iisc.ac.in)