# Nikhil Kumar Singh


CONTACT INFORMATION

D-215 Hall-8
IIT Kanpur

*Contact:* ksnikhil@iitk.ac.in, +91-8447077602
*GitHub:* https://github.com/ciniks117


RESEARCH INTERESTS

Reinforcement Learning, Formal Methods, Control Theory, Optimization.

EDUCATION

**Indian Institute of Technology, Kanpur**,
PhD, Computer Science and Engineering, Jan 2020 - Present (9.50/10)
Thesis : Synthesis of Safe and Efficient Feedback Controllers for Complex Dynamical Systems.
Advisor: Dr. Indranil Saha

**Indian Institute of Technology, Kanpur**,
MS, Computer Science and Engineering, Jan 2018 - Dec 2019 (9.0/10)
Thesis : Specification guided Automated Debugging of CPS Models.
Advisor: Dr. Indranil Saha

**National Institute of Technology, Jamshedpur**,
B.Tech, Computer Science and Engineering, Aug 2010 - May 2014 (8.70/10)
Project: Intelligent Web Search Engine.

PUBLICATIONS

- **Nikhil Kumar Singh**, Indranil Saha. *"SAFEX : Safe Exploration for Deep Reinforcement Learning based Synthesis of Feedback controllers."* Submitted to AAAI 2025.
- **Nikhil Kumar Singh**, Indranil Saha. *"Frugal Actor-Critic: Sample Efficient Off-Policy Deep Reinforcement Learning Using Unique Experiences."* International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2024), Auckland, New Zealand, May 06-10, 2024. `https://dl.acm.org/doi/10.5555/3635637.3663037`.
  Code at `https://github.com/iitkcpslab/FAC`
- **Nikhil Kumar Singh**, Indranil Saha. *"STL-Based Synthesis of Feedback Controllers Using Reinforcement Learning."* AAAI Conference on Artificial Intelligence (AAAI 2023), Washington D.C., February 07-14, 2023. `https://ojs.aaai.org/index.php/AAAI/article/view/26764`.
  Code at `https://github.com/iitkcpslab/rlstl`
- **Nikhil Kumar Singh**, Indranil Saha. *"Specification Guided Synthesis of Feedback Controllers."* ACM SIGBED International Conference on Embedded Software (EMSOFT 2021), ACM/IEEE, virtual conference, October 08-15, 2021.
  Published in ACM Transactions on Embedded Computing Systems (2021) `https://dl.acm.org/doi/10.1145/3477011`.
  Code at `https://github.com/iitkcpslab/SCoSyn`
- **Nikhil Kumar Singh**, Indranil Saha. *"Specification Guided Automated Debugging of CPS Models."* International Conference on Embedded Software (EMSOFT2020), ACM/IEEE, virtual conference, September 20-25, 2020.
  Published in IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (2020) `https://ieeexplore.ieee.org/document/9211574/`.
  Code at `https://github.com/iitkcpslab/Blars`

AWARDS

- **Prime Minister's Research Fellowship** (Dec'20 - present).
- **ACM India** travel grant (2024).
- Nominated by the Department of CSE, IIT Kanpur for **Cadence Gold Medal** and **SIIC Student Innovation Award** for MS thesis.
- **First** prize in Data structure & algorithm based event *CODATHON* in OJASS'13.
- **Third** prize in Coding based event *CODEMANIA* in Ojass' 13.
- **Second** prize in the event *CODESTORM* conducted by the Computer Society of India at NIT-Jamshedpur held in March-2012.

- **First** prize in the event *LET US C* conducted by the Computer Society of India at NIT-Jamshedpur held in April-2011.

## Honors

- Invited to **Google Research Week 2024**.
- Invited to **Google Research Week 2023**.

## Talks

**Frugal Actor-Critic: Sample Efficient Off-Policy Deep Reinforcement Learning Using Unique Experiences** *AAMAS-24, Auckland, New Zealand,* **May'24**

**Specification Guided Controller Synthesis Using RL** *CSE Dept. IIT Kanpur* **Oct'23**

**Learning-based Controller Synthesis** *Ericsson AI Research* **Mar'23**

**STL-Based Synthesis of Feedback Controllers Using Reinforcement Learning** *AAAI-23, Washington D.C.* **Feb'23**

**Introduction to Controller Synthesis** *CSE Dept. IIT Kanpur* **Oct'21**

**Specification Guided Automated Synthesis of Feedback Controllers** *EMSOFT-21, Online* **Oct'21**

**Specification-Guided Automated Debugging of CPS Models** *EMSOFT-20, Online* **Sep'20**

## Teaching

**Instructor** Introduction to PyTorch (PMRF Lecture series) *Institute of Smart Structures and Systems (ISSS)* **Sep'23 - Dec'23**

**Instructor** Controller Synthesis using Python (PMRF Lecture series) *Institute of Smart Structures and Systems (ISSS)* **Mar'23 - Jul'23**

**Instructor** Introduction to Controller Synthesis (PMRF Lecture series) *Institute of Smart Structures and Systems (ISSS)* **Sep'22 - Dec'22**

**Tutor** Introduction to Computing (ESC101) *Indian Institute of Technology, Kanpur* **May'22 - Jun'22**

**Teaching Assistant** Software Development (CS253) *Indian Institute of Technology, Kanpur* **Jan'22 - May'22**

**Teaching Assistant** Autonomous Cyber-Physical Systems (CS659A) *Indian Institute of Technology, Kanpur* **Jan'21 - May'21**

**Teaching Assistant**Embedded and Cyber-Physical Systems (CS637A) *Indian Institute of Technology, Kanpur* **Sept'20 - Dec'20**

**Teaching Assistant** Formal Methods for Robotics and Automation (CS638A) *Indian Institute of Technology, Kanpur* **Jan'20 - May'20**

## Experience

**Visiting Researcher**, Max Planck Institute for Software Ssytems, Germany **Nov'24 - Present**

- Development of Safe DRL Controllers using Barrier Functions.

**Senior Student Research Associate** FMSAFE Project, IIT Kanpur *Sponsor: MHRD IMPRINT* **Jan'18 - Dec'19**

- Developed an Automated Tool **BLARS** for Debugging CPS Models.

**Software Engineer** OptumSoft, Bangalore **June'14 - Jun'16**

- Software Development in the domain of Distributed Systems. This involved a high-level TACC Compiler Framework.

## Activities

**Coordinator** CODATHON @ OJASS'14

- Organised the flagship Data structure and Algorithms based event in OJASS - the technical fest of NIT Jamshedpur. More than 300 candidates from all over India participated in this event.