Anubhav Singh

Postdoctoral Fellow
Toronto Intelligent Decision Engineering Laboratory (TIDEL)
Department of Mechanical & Industrial Engineering
University of Toronto

Date of Birth: January 28, 1989
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Education

2019 – 2024 **Ph.D. in Engineering**
The University of Melbourne, Melbourne, Australia
Title: Lazy constraint generation and tractable approximation for large scale planning problems
Specialization: *Artificial Intelligence Planning*
Primary Advisers: A/Prof. Nir Lipovetzky and Dr. Miquel Ramírez
Additional Mentor (Informal Adviser): Prof. Peter J. Stuckey

2017 – 2019 **Masters of Information Technology**(*with distinction*)
The University of Melbourne, Melbourne, Australia
Specialization: *Computing*
Adviser: A/Prof. Nir Lipovetzky
WAM: 86 — Dean's Honours List (Top 5% of the cohort)

2007 – 2011 **B.Tech. in Computer Science**
Jaypee Institute of Information Technology, Noida, India
Specialization: *Distributed Computing*
Adviser: Prof. Abhishek Swaroop

Awards & Honours

2019 **Melbourne Research Scholarship**, offered to high-achieving domestic and international research students

2019 **Dean's Honours List**, in recognition of academic excellence (top 5%) in the Masters of Information Technology

2014 **Accenture Celebrates Excellence, Pathfinder Award**, for designing innovative strategies to manage the evolving cybersecurity risks

2012 **Accenture Celebrates Excellence, Gold Standard Award**, bestowed to the early-career employees who are within top 5% of their cohort

Academic & Industry Experience

2024 - Present **Postdoctoral Fellow** (full-time, 11 Mar 2024 to present), TIDEL, Mechanical and Industrial Engineering, University of Toronto, Canada

- Explored and established connections between Domain-Independent Dynamic Programming (DIDP) and problem-solving paradigms in Operations Research and Artificial Intelligence Planning to advance general-purpose solution methods.

- Developed an automated abstraction approach for DIDP, leveraging techniques from Abstract Interpretation in Program Verification, Operator Counting in Artificial Intelligence Planning, and Satisfiability Modulo Theories (SMT).
- Developed Constraint Programming (CP) and DIDP formulations for Quadratic Traveling Salesman Program and demonstrated the superior scalability of DIDP compared to CP, Branch-and-cut, and Mixed-Integer Linear Programming (MILP) approaches.
- Investigated the role of redundant structural knowledge in Quadratic Unconstrained Binary Optimization (QUBO) formulations and demonstrated its potential to improve solver convergence.
- Oversaw student research projects and supported students in the dissemination and reproducibility of scientific results.

2023 **Casual Research Assistant** (casual, 30 Jun 2023 to 30 Nov 2023), Electrical and Electronic Engineering(EEE), The University of Melbourne, Australia

- Served as a Casual Research Assistant in the Control and Signal Processing Lab (CSP Lab).
- Implemented state-of-the-art motion-planning algorithms developed by CSP Lab researchers, replicated scientific results, and developed material to bootstrap the research activities of incoming Graduate Research students.

2019 **Software Engineer** (casual, 11 Mar 2019 to 07 Apr 2019), EdSmart - Cloud Paper Group Pty Ltd., Melbourne, Australia

- Developed ASP.NET Core Web APIs and managed Azure cloud databases, redesigning database components to improve scalability and support evolving application requirements.
- Developed and optimized SQL scripts to support client data analytics and reporting requirements.

2015 - 2016 **Consultant** (full-time, 7 Sep 2015 to 29 Jul 2016), EY, Bengaluru, India

- Provided cybersecurity risk management audit and consulting services to a major financial institution, including developing alternative security protocols for systems that did not meet established security requirements and conducting system audits against ISO 27001 (Information Security Management) standard.

2011 - 2015 **Senior Security Analyst** (full-time, 6 Jul 2011 to 31 Aug 2015), Accenture, Bengaluru, India

- Developed and maintained a security posture management system for projects operating across Accenture India. The system leveraged audit findings and security incident data to assess the effectiveness of security controls, evaluate cybersecurity risk exposure, and monitor the overall security posture of projects.
- Provided cybersecurity risk management consulting services to offshore software development teams, developing and implementing security procedures to meet client requirements.
- Conducted compliance audits and assessments against ISO 27001 (Information Security Management Systems) and ISO 22301 (Business Continuity Management Systems) standards.

Teaching Experience

2019 - 2022 **Teaching Assistant** (casual, 25 Feb 2019 to 31 Dec 2022), The University of Melbourne, Australia

- AI Planning for Autonomy (COMP90054) — Created tutorial and workshop notebooks, delivered tutorials and performed marking.
- Machine Learning (COMP30027) — Held consultations, delivered tutorial, and performed marking.

Presentations and Posters

2026 ICAPS Conference. Dublin, Ireland – Operator Counting Heuristic for Domain-Independent Dynamic Programming

2025 ICAPS Conference. Melbourne, Australia – New Exact Methods for Solving Quadratic Traveling Salesman Problem

2021 ICAPS Conference. Guangzhou, China – Approximate Novelty Search

2012 – 2015 Accenture, Bengaluru, India – Semi-annual seminar for managers and portfolio leads on managing risks in evolving cyber security landscape

Program committee Membership

International Conference on Automated Planning and Scheduling (ICAPS)

ICAPS 2026	Dublin, Ireland
ICAPS 2025	Melbourne, Australia
ICAPS 2024	Banff, Canada

Association for the Advancement of Artificial Intelligence (AAAI)

AAAI 2027	Montréal, Canada
AAAI 2026	Singapore
AAAI 2025	Philadelphia, USA
AAAI 2024	Vancouver, Canada

International Joint Conference on Artificial Intelligence (IJCAI)

IJCAI 2024	Jeju, South Korea

Journal Reviewing

2025 Robotics and Autonomous Systems (RAS)

Scientific Software

2025-present **Didp-rs**, Rust implementation of Domain-Independent Dynamic Programming (DIDP)
 ⇝ Pypi ⇝ Source Code

2020-present **LAPKT 2.0**, extension of LAPKT (Lightweight automated planning toolkit) for teaching purpose in the subject: AI Planning for Autonomy (COMP90054)
 ⇝ Pypi ⇝ Source Code

2021 **Approximate Novelty Search**, a planning algorithm with state-of-the-art performance which computes a tractable

approximation of novelty, published in ICAPS 2021
⇝ Manuscript ⇝ Source Code

Research Interests Automated Planning and Scheduling, Constraint Programming, Dynamic Programming, Operations Research, Knowledge Representation, Optimization, Hybrid Planning, Reinforcement Learning, Robotics

Technical Skills

Proficient
Mathematical Modeling, Algorithm Design, Artificial Intelligence, Constraint Programming, Mixed Integer Linear Programming, C/C++, Rust, Python

Knowledge
Cyber Security, GNU/Linux advanced user, Robot Operating System (ROS 2), Machine Learning, Numerical Methods,

Familiar
Open MP, Open MPI, R, Java, Matlab, Database Systems, PL/SQL

Languages

Fluent: English, *PTE academic score - 90/90 (Examined in 2019)*

Native: Hindi

Basic: Sanskrit

Hobbies

Racket sports: Table Tennis and Badminton, Reading: Sci-Fi and Fantasy novels

Publications

Papers

[1] Anubhav Singh, Florian Pommerening, Tanja Schindler, J. Christopher Beck, Malte Helmert. Operator-Counting Heuristics for Domain-Independent Dynamic Programming, *Int. Conference On Automated Planning And Scheduling*. 36 pp. 294-303. (2026),

[2] Yuxiao Chen, Anubhav Singh, Ryo Kuroiwa, J. Christopher Beck. New Exact Methods for Solving Quadratic Traveling Salesman Problem, *Int. Conference On Automated Planning And Scheduling*. 35 pp. 325-333 (2025),

[3] Miquel Ramirez, Anubhav Singh, Peter J. Stuckey, Chris Manzie. Temporal Planning via Interval Logic Satisfiability for Autonomous Systems, *Arxiv* 2024.

[4] Anubhav Singh, Miquel Ramirez, Nir Lipovetzky and Peter J. Stuckey. Lifted Sequential Planning with Lazy Constraint Generation Solvers, *Arxiv* 2023.

[5] Anubhav Singh, Miquel Ramirez, Nir Lipovetzky and Javier Segovia-Aguas. Approximate Novelty Search, *Int. Conference On Automated Planning And Scheduling*. 31 pp. 349-357 (2021),

Technical Reports

[1] Anubhav Singh, Nir Lipovetzky, Miquel Ramirez and Javier Segovia-Aguas. Approximate Novelty Search. *Int. Planning Competition Booklet (IPC-10)* , 2023.

[2] Anubhav Singh, Nir Lipovetzky, Miquel Ramirez and Javier Segovia-Aguas. Forward Backward Novelty Search. *Int. Planning Competition Booklet (IPC-10)* , 2023.

[3] Anubhav Singh, Nir Lipovetzky, Miquel Ramirez, Javier Segovia-Aguas and Guillem Frances. Grounding Schematic Representation with GRINGO for Width-based Search. *Int. Planning Competition Booklet (IPC-10)* , 2023.

Referees

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Relationship to Applicant: Ph.D. Adviser

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Relationship to Applicant: Ph.D. Adviser