Suchetan Saravanan

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EDUCATION

Birla Institute of Technology and Science (BITS), Pilani *CGPA: 8.16/10.0*
Bachelor of Engineering in Electrical and Electronics Engineering *Aug 2020 – Jan 2024*

Thesis title: Fisher information and traversability-estimation-based active SLAM for exploration in 3D environments

JOURNAL AND CONFERENCE PUBLICATIONS

[1] FIT-SLAM 2: Efficient 3D exploration with Fisher information and traversability-based adaptive roadmap
S. Saravanan, A. Bains, C. Chanel, D. Vivet – ***Published in Robotics and Autonomous Systems, 2025*** [**Paper**]

[2] FIT-SLAM: Fisher information and traversability-based active SLAM for exploration in 3D environments
S. Saravanan, C. Chauffaut, C. Chanel, D. Vivet
Presented at IEEE International Conference on Automation, Robotics and Applications (ICARA), 2024 [**Paper**]

[3] Traversability-Aware Planning with Dynamic Speed Profiling for Planetary Exploration
S. Saravanan, D. Vivet – ***Presented at IEEE International Conference on Space Robotics (iSpaRo), 2025*** [**Paper**]

TALKS AND PRESENTATIONS

- Roadmap-explorer: A fast and reliable robot exploration module – Talk at **ROSCon 2025, Singapore** [**Video**]

- ROS 2 CMV: A custom message visualizer for RViz – Lightning talk at **ROSCon 2025, Singapore** [**Video**]

- Lightweight global traversability mapping with any graph-based SLAM on ROS 2
Lightning talk at **ROSCon 2024, Denmark** [**Video**] and a talk at **ROSCon India 2024** [**Video**]

RESEARCH AND WORK EXPERIENCE

- **NaviR2eS Research Team, ISAE-SUPAERO** Toulouse, FR
Research Collaborator (Remote) *Jan 2024 – Present*
   o Developed *FIT-SLAM 2*, an active exploration framework with a novel topological roadmap construction, TSP-based goal scheduling and real-time Fisher information computation, increasing exploration rate by 34% over the current state-of-the-art.
   o Designed and developed a dynamic speed profiling heuristic for global planning to improve the estimation of travel time to goals, achieving a 10% improvement in traversal time and a 44% improvement in safety in unstructured environments.

   Undergraduate Researcher – Bachelor's thesis [**Thesis**] *July 2023 – Dec 2023*
   o Exhaustively surveyed active SLAM and robot exploration literature to formalize gaps in information-, localization-, and traversability-aware exploration for unmanned ground vehicles.
   o Architected and implemented *FIT-SLAM*, an exploration module that combines Fisher information-based utility with a traversability layer, demonstrating reduced exploration time, localization covariance and traversal risk over existing methods.

- **Clutterbot** [**Link**] Bangalore, IN
Robot Software Engineer *July 2024 – Present*
   o Owned the navigation software end-to-end; delivered a scalable navigation framework with runtime-swappable planners and controllers, rich telemetry and diagnostics. Mentored peers and managed software releases.
   o Built a closed-set object navigation module powered by a custom segmentation mask classifier trained using DinoV2. Deployed advanced control schemes for dynamic environments, including an extension of the Graceful Controller law for dynamic obstacle avoidance, increasing docking success to 95% in dynamic scenes.
   o Led the development of a behavior tree-based navigation handler along with a recovery action server to perform context-aware error recovery.

   Robot Software Intern *Jan 2024 – June 2024*
   o Designed a probabilistic perception pipeline that fuses semantically segmented depth imagery with LiDAR data, enabling dynamic global re-planning when traversing highly cluttered routes.
   o Developed a multi-objective approach-pose estimator that jointly optimizes object scale, local traversability, manipulation effort and clutter configuration, yielding robust pre-grasp poses and improving positioning around pickable objects.

- **Project Kratos** [**Link**] BITS Pilani, IN
Manipulation Subsystem Lead *May 2021 – May 2023*
   o Led the development of a closed-loop feedback control system, coupled with a high-level perception and fault-recovery module, enabling robust end-effector trajectory tracking on a 5-DoF manipulator with $\leq$ 2 cm accuracy for manipulation tasks.
   o Engineered an end-to-end visual perception pipeline using NVIDIA DeepStream for low-latency letter and object recognition, enabling fully autonomous typing and switch-actuation behaviors for the University Rover Challenge, 2022.

Selected Open-Source Work

- **Full-fledged ROS 2 Wrapper for ORB-SLAM3 [Repository]**   Remote
  Author & Maintainer - 300+ stars on GitHub!   *Jan 2024 – Present*

  o Developed a widely adopted ROS 2 wrapper and Dockerized distribution of ORB-SLAM3 with build scripts, launch files, and configuration presets enabling plug-and-play visual SLAM across different robots and datasets.

  o Implemented global mapping and integration utilities, including a map generator package for globally consistent 3D point clouds, robust switching between odometry and SLAM during tracking loss, stitching of local landmark maps, and ROS 2 services for saving and loading of the atlas, pose-graph inspection, and rich debugging within larger autonomy stacks.

- **A global traversability mapping library [Repository]**   Remote
  Co-author & Maintainer - 100+ stars on GitHub!   *June 2023 – Present*

  o Developed a high-performance C++ traversability engine that builds coherent global and local traversability maps from 3D point clouds, and computes real-time risk estimates via a sliding-window update scheme. Risk is computed per-cell neighborhood using slope, elevation discontinuities, and surface roughness, targeting outdoor navigation in highly unstructured terrain.

  o Enables large-scale map correction without auxiliary optimization by associating point clouds with keyframes and by being easily pluggable into any SLAM backend. Added one-shot evaluation on offline global point clouds, support for heterogeneous sensor configurations, and a Nav2 integration layer for ROS 2 autonomy pipelines; benchmarks show $\sim3\times$ lower CPU load than OctoMap, with total usage $<2\%$ on an Intel i5 and per-point cloud evaluation in under $15\,\text{ms}$ for 10cm grid resolution.

- **ROS 2 CMV - A custom ROS 2 interface visualizer for RViz [Repository]**   Remote
  Author & Maintainer - 100+ stars on GitHub!   *May 2024 – Present*

  o Developed ROS 2 Custom Message Visualizer (CMV), a library and GUI toolchain that auto-generates RViz display plugins for arbitrary custom ROS 2 interfaces, making visualizing new interface types trivial in RViz.

  o Integrated with *ROS Babel Fish* to enable runtime visualization without compile-time knowledge of message types, allowing a single RViz display to render virtually all interfaces in the system.

- **Roadmap-explorer: A fast and reliable robot exploration module [Repository]**   Remote
  Author & Maintainer   *May 2024 – Present*

  o Authored a highly customizable robot exploration framework for ROS 2 UGVs that augments classical frontier exploration with an adaptive navigation roadmap and a bounded TSP for tour planning. Provided pluginlib interfaces for frontier search, TSP solvers, and cost calculators for extendability.

  o Incorporated end-to-end Nav2 integration (ROS 2 lifecycle server, behavior-tree plugin, RViz panel, and session save/restore) and demonstrated reliable operation in indoor/outdoor maps $>3,500\,\text{m}^2$ on embedded platforms (NVIDIA Jetson Xavier) with $\sim10\%$ of one CPU core. Achieved 25–45% lower exploration time than baselines such as GB-Planner 2, NBVP, and FAEL in unstructured outdoor environments.

Skills

- **Languages** C++, Python, CUDA, SQL, Shell scripting, Assembly Language, Verilog

- **Frameworks and Libraries** PyTorch, TensorFlow, PCL, OpenCV, NumPy, SciPy, ROS 2 DDS, RMW Zenoh, Eigen, Ceres/g2o

- **Robotics** Robot Operating System (ROS/ROS 2), Gazebo, O3D Sim, Isaac Sim, Nav2, BT-CPP

- **Tools** Docker, Git, MATLAB/Simulink, Jenkins, GitLab deployment, Bloom

Scholarships and Achievements

- Awarded the **ROSCon 2024 diversity scholarship** ($\sim4\%$ acceptance rate) as a recognized open-source contributor.

- Led team Kratos which ranked **1st(India) and 2nd(Asia)** in University Rover Challenge, Utah – May '22

- Led team Kratos which ranked **2nd(Global) and 1st(India)** in Anatolian Rover Challenge, Istanbul – July '22

- Led team Kratos for **Excellence award (Manipulation)** in International Rover Challenge, Bangalore – Jan '23

- **99th percentile** among ~1 million applicants in the JEE Engineering entrance examinations

Volunteer and Extracurricular Activities

- Volunteered to train pre-university and high school students in basic concepts of robotics and embedded systems

- Volunteered at Nirmaan NGO, BITS Goa for the betterment of healthcare and poverty relief

- Volunteered at Abhigyaan NGO, BITS Goa to teach underprivileged middle school students math and physics