

RICHI DUBEY

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 www.rtemswithrichi.wordpress.com (Technical Blog)

EDUCATION

Birla Institute of Technology & Science, Pilani (BITS Pilani)

Goa, India

B.E., Computer Science | Overall GPA: **8.84/10** (top 5% of the class)

Aug 2017 - June 2021

- *Thesis*: Next-Generation Embedded Development Tools and Technologies – Virtualisation and Automation [\[Link\]](#)
- *Key Courses*: Operating Systems (A-Grade), Computer Networks (A-Grade), Data Structures and Algorithms, Real-Time Systems (in top 5/30, graduate-level course), Computer Programming (in top 7/850)

AWARDS

Merit-Need Scholarship — BITS Pilani

2017 - 2021

40% - 80% fee waiver for consistent & exemplary performance (top **10%** of class by the last semester)

HERCULES Prize - edition 2019/2020 — University of Modena and Reggio Emilia, Italy

February 2021

Awarded €4500 to work with [Prof. Marko Bertogna](#) on High-Perf. Architecture for Low-Power Embedded Systems

Google Summer of Code (GSoC) 2020 — Google

May 2020

Awarded \$4000 to implement [Strong APA Scheduler](#) on [RTEMS](#). Details [here](#)

McGill Summer Undergraduate Research in Engineering (SURE) — McGill University (Cancelled due to COVID)

Awarded \$5,625 to work with [Prof. Liboiron-Ladouceur](#) on Photonic Hardware for AI in summer 2020.

PUBLICATIONS

R. Dubey, V. Banerjee, S. Hounsinnou, G. Bloom, *Strong APA scheduling in a real-time operating system: work-in-progress*, International Conference on Embedded Software (EMSOFT), 2021. [\[DOI\]](#), [\[Talk\]](#), [\[Poster\]](#)

WORK EXPERIENCE

Fellow - CERN (European Organization for Nuclear Research)

October 2022 – Present

Health Safety and Environment ([HSE](#)) Department

Geneva, Switzerland

- Research and development of novel communication protocols and drivers for communication with 300+ radioactive and environmental sensors.
- Part of 3-member team responsible for the management of a distributed and redundant [SCADA](#) system called [REMUS](#) that manages **1000+** diverse sensors deployed in accelerator, experimental, and surface areas at CERN.
- [Developed](#) multi-threaded device drivers in C++ for REMUS and state-aware fault-tolerant networking programs for devices with outdated OSes, enabling robust networking capabilities.

Member Technical Staff - Oracle

July 2021 – September 2022

[Oracle Cloud Infrastructure](#) | [Oracle Process Cloud Team](#)

Bangalore, India

- Implemented new features and fixed production bugs in a multi-tenant cloud application, [Oracle Process Automation](#), having a microservice architecture on Oracle Cloud.
- Wrote terraform code to create and manage the deployment of infrastructure required for the application on the cloud. Deployed these codes in a part of 5-member team across **50+** OCI data centers worldwide.
- Worked with a diverse tech stack, including Java, Spring, Spring Boot, SQL, Terraform, Docker, and Kubernetes.

Research Intern - High-Performance Real-Time (HiPeRT) Lab

Jan 2021 – April 2021

Bachelor's Thesis at the University of Modena and Reggio Emilia, Modena, Italy

Remote

- [Implemented](#) a system for remote benchmarking of workloads in embedded systems by integrating the [Workload Automation \(WA\)](#) tool by ARM with the [Jailhouse](#) partitioning hypervisor on a custom Linux kernel.

- Wrote jailhouse recipes for deploying custom kernels with [Cache Coloring](#), which enhanced workload execution predictability and mitigated contention in the shared memory hierarchy. Using Cache Coloring is proven to provide a maximum speedup up to **77.4%** in certain cases.
- Wrote my [bachelor thesis](#) on the implementation, supervised by [Prof. Marko Bertogna](#).

Research Intern - RTEMS Real-Time Operating System

May 2020 – August 2020

[Google Summer of Code](#) | [More details here](#)

Remote

- Contributed to [RTEMS](#), a [POSIX](#) compliant real-time operating system extensively utilized in various domains, including NASA/ESA satellites, sports bikes, and particle accelerators across CERN and US DoE national labs.
- [Implemented](#) the Strong Arbitrary Processor Affinity (APA) scheduler, a state-of-the-art scheduler that has not been implemented in a real-world operating system.
- The [Strong APA scheduler](#) introduced the ability to dynamically relocate higher-priority tasks among processors, optimizing resource allocation by accommodating lower-priority tasks constrained by affinity requirements. The scheduler is proven to schedule roughly **20%** more task sets than other schedulers for certain utilization.

UNDERGRADUATE RESEARCH PROJECTS

Approaches towards Censorship Circumvention

BITS Pilani

Worked with [Prof. Vinayak Naik](#), head of CS Department

September 2020 – November 2020

- Conducted a comprehensive [review](#) of network vulnerabilities in modern network infrastructure, namely in Encrypted Server Name Indication (ESNI) in TLS 1.3 and in DNS over HTTPS (DoH).
- Used [Noctilucent](#) to explore means of circumventing censorship using ESNI on Microsoft Azure. Notably, TLS 1.3 is employed by nearly **30%** of all websites on the Internet and **59%** of the websites hosted on Cloudflare.

Review of Scheduling in Mixed-Criticality Systems

BITS Pilani

Worked with [Prof. Biju K Raveendran](#)

September 2019 – November 2019

- [Reviewed](#) various scheduling algorithm like Global Preemptive EDF, Criticality Based EDF (CBEDF), etc. and various resource sharing protocols like Priority Ceiling Protocol (PCP), Priority Inheritance Protocol (PIP), etc.
- [Implemented](#) the Earliest Deadline First with Virtual Deadline (EDF-VD) [Scheduling Algorithm](#) by [Prof. Baruah](#) et al. in C and released it on GitHub.

TEACHING EXPERIENCE

Teaching Assistant - Department of CS & IS

BITS Pilani

Designed and conducted tutorials, graded papers, and provided guidance to students for the core courses:

- Data Structure and Algorithm (Semester II, 2019 - 2020)
- Computer Programming (Semester II, 2019 - 2020)
- Logic in Computer Science (Semester I, 2019 - 2020)

OPEN SOURCE CONTRIBUTIONS

RTEMS: [Code Contributions](#), [Documentation Contributions](#) | **Siemens S7200 C++ Driver:** [Code Contributions](#)

SKILLS

Programming Languages: C, C++, Java, Python 3, SQL **Systems:** Linux Kernel, RTEMS Real Time Kernel

Interests: [Playing piano](#), [Painting](#), Skateboarding, Real-time systems, Computer Vision

Languages: Fluent in English and Hindi, Conversational in French