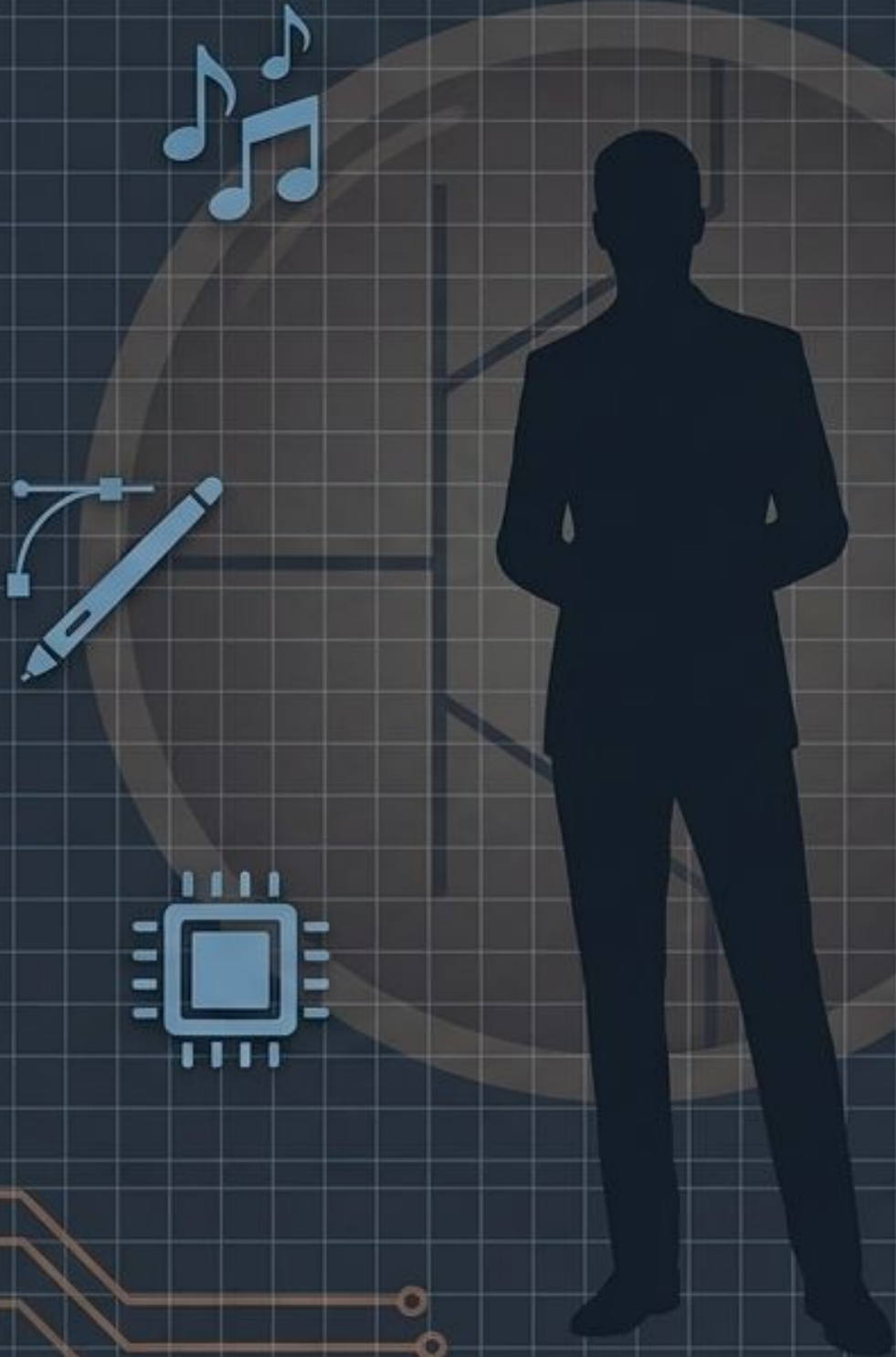


Bridging the Gap: The Open Source EDA Revolution

Strengthening ecosystems, enabling reproducible research, and the future of eSim.

Sumanto Kar | FOSSEE, IIT Bombay | sumantokar@iitb.ac.in

“My work focuses on strengthening open technical ecosystems, enabling reproducible engineering workflows, and bridging the gap between academic research and community-driven software development.”



Pillar 1: FLOSS Advocacy

Replacing expensive proprietary software with robust open-source alternatives.

Pillar 2: Tool Upgrades

Developing and maintaining high-level engineering software tailored for modern academia.

Pillar 3: Skill-Based Training

Democratizing technical education through hands-on labs, spoken tutorials, and national fellowships.

Ministry of Education (MoE), Government of India
NMEICT

Proprietary software has created an academic bottleneck

The Proprietary Trap



- Exorbitant licensing fees block small enterprises and students.
- Closed ecosystems prevent community auditing and code optimization.
- Academic research remains locked behind paywalls, rendering simulation results non-reproducible for the global community.

The Open Alternative



- Free, accessible, and globally distributed.
- Community-driven model refinement and tool extension.
- True scientific reproducibility where anyone can download, run, and verify peer-reviewed electronic circuits.

Enter eSim: The Unified Open EDA Platform

An integrated tool built on a modular stack of proven open-source software (KiCad, Ngspice, Python), offering a generic and extensible platform for electronic innovation.

Circuit Design

Full schematic capture with custom power and signal libraries.

PCB Design

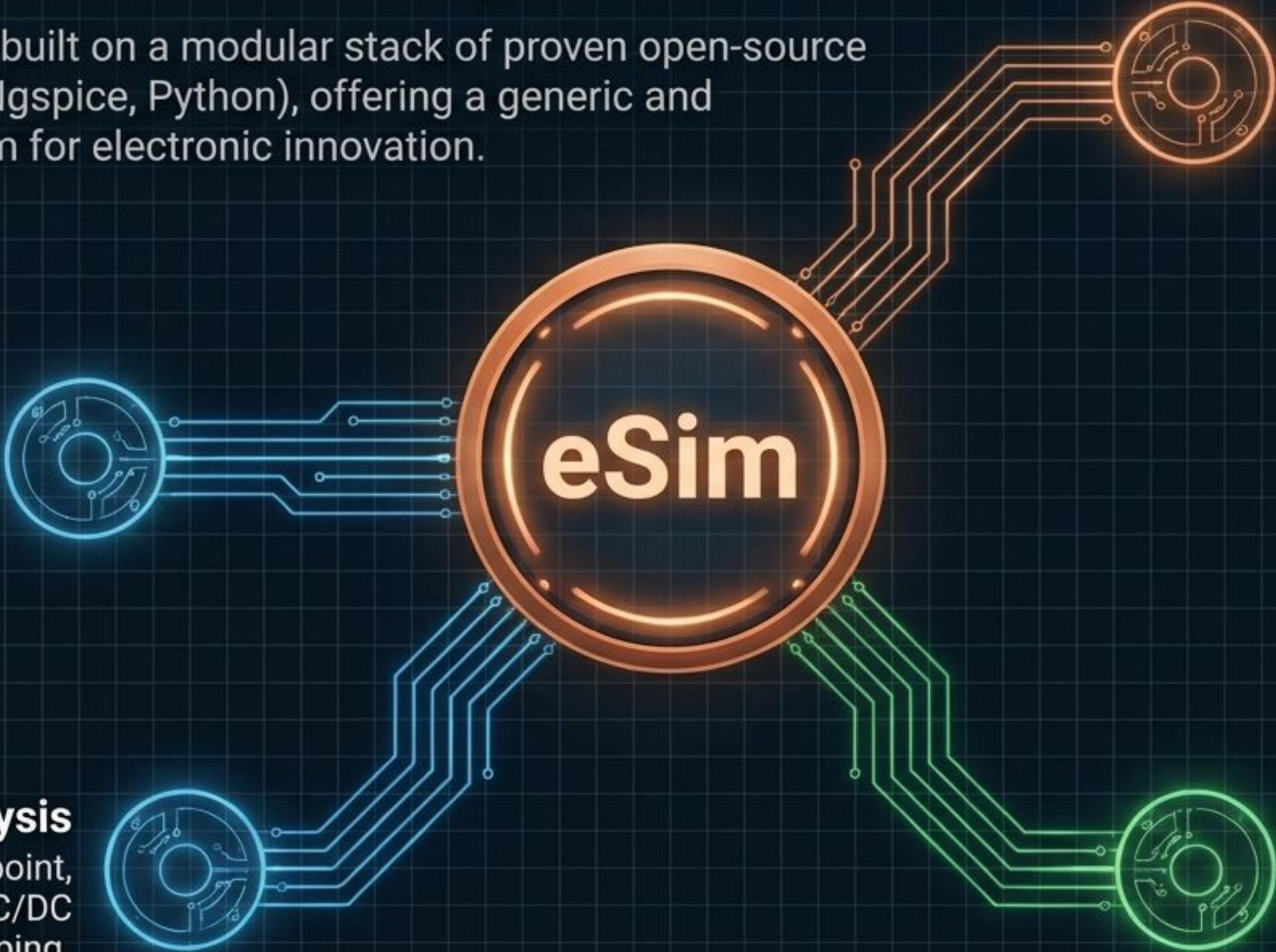
Direct translation from schematic to gerber file layout.

Analysis

Deep operating point, transient, and AC/DC sweeping.

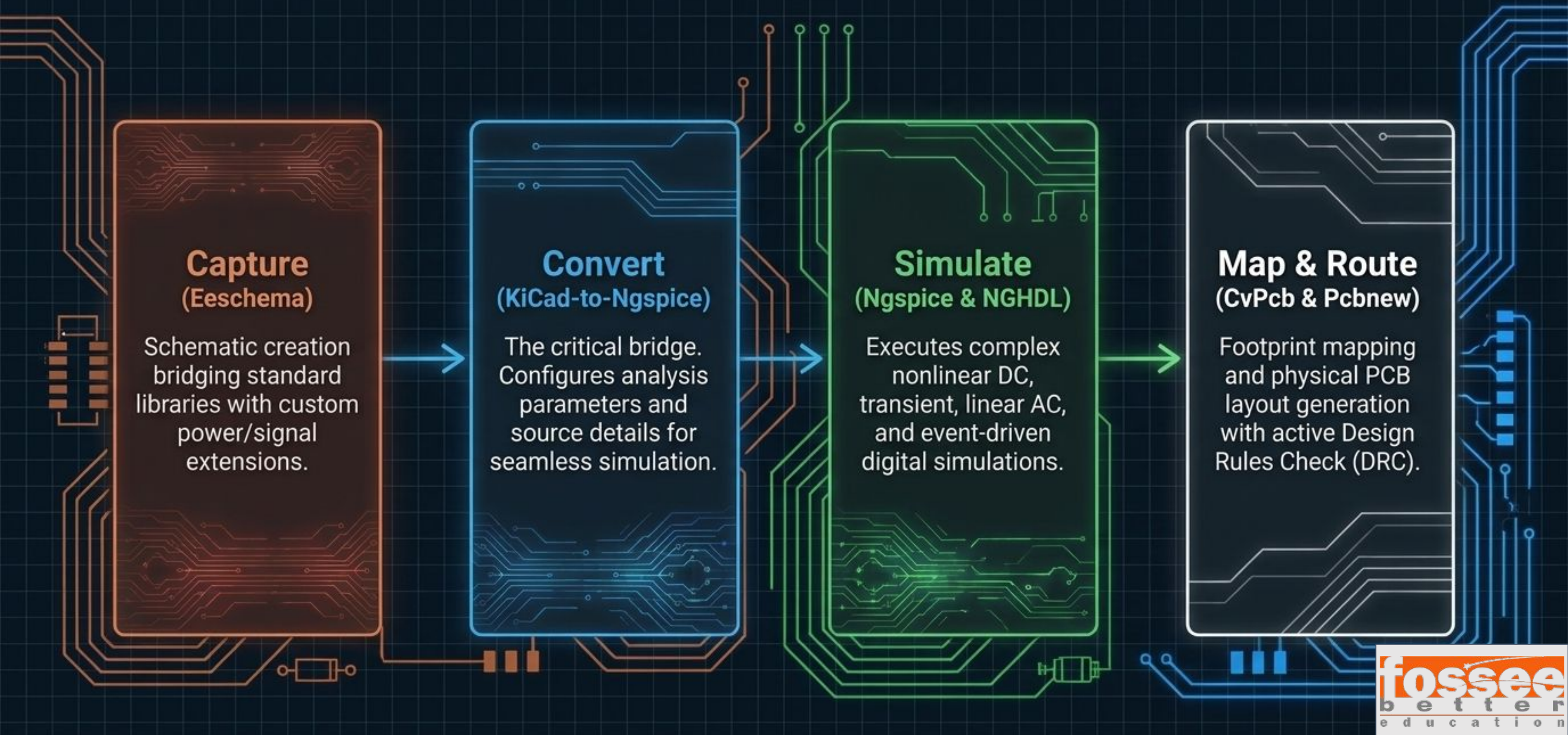
Simulation

Analog, digital, and mixed-mode testing.

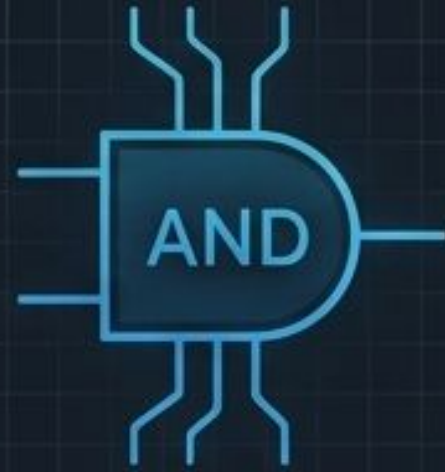


eSim

The Engine Under the Hood: Toolchain Architecture

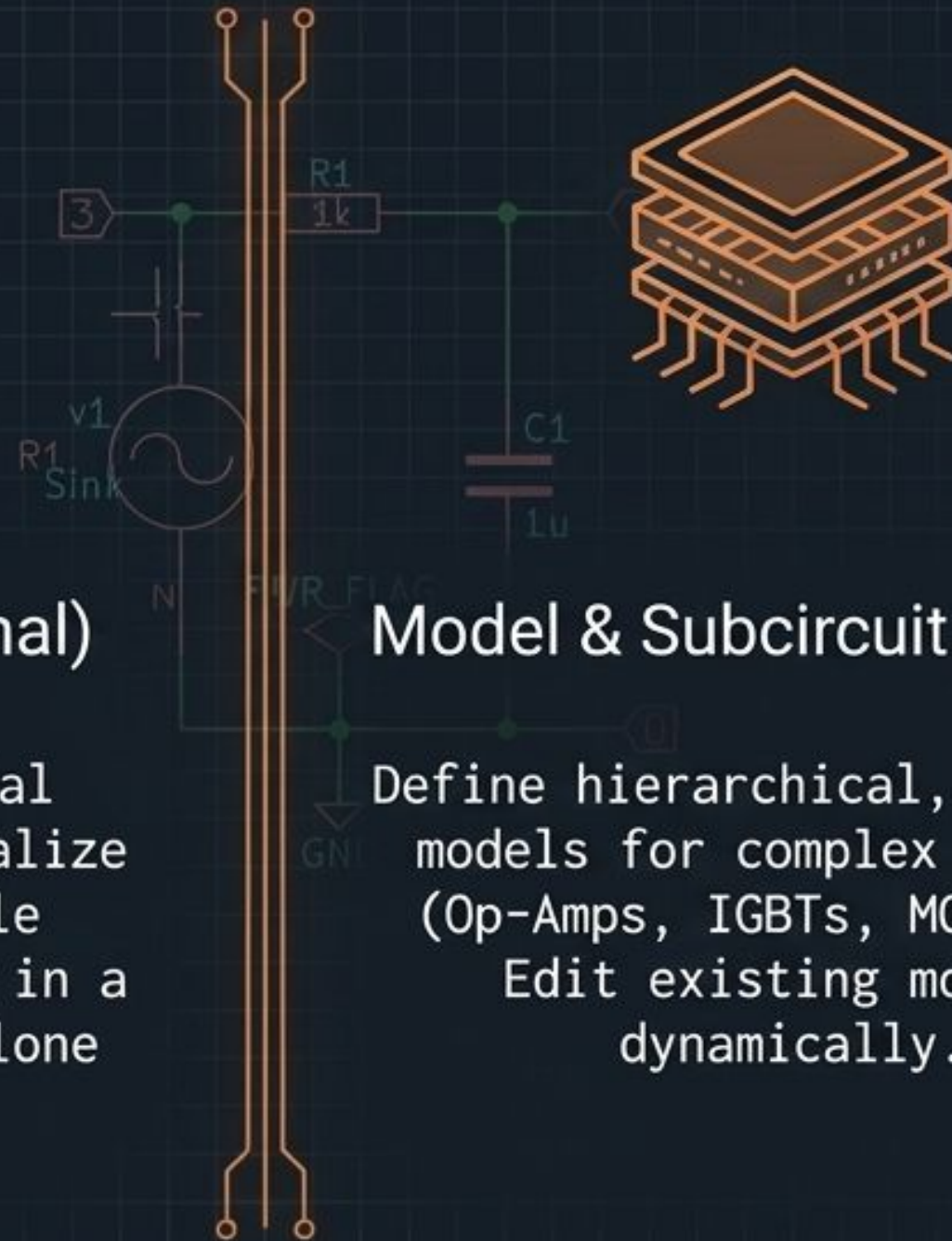


Advanced Capabilities for Modern IC Design



NGHDL (Mixed Signal)

Create custom digital models using VHDL. Realize anything from simple multiplexers to ASICs in a mixed-mode or standalone digital domain.



Model & Subcircuit Builders

Define hierarchical, reusable models for complex devices (Op-Amps, IGBTs, MOSFETs). Edit existing models dynamically.



OpenModelica Integration

Object-oriented modeling using OMEdit and OMOptim. Support for powerful optimization algorithms like Particle Swarm and Simulated Annealing.

Great tools demand rigorous, real-world validation.

Over the last four years, eSim has been stress-tested by thousands of students, researchers, and professionals through national design marathons, continuously integrating cutting-edge Open Source PDKs.

eSim Feature Evolution Matrix (2021–2025)

May 2021 | eSim 2.1

Circuit Design Marathon

Unlocked SKY130 circuit domain integration.
(Partners: FOSSEE, IITB, VSD).

Feb 2022 | eSim 2.2

Mixed Signal Design

Introduced eSim NgVeri and NGHDL capabilities.

Sept 2022 | eSim 2.3

Mixed Signal SoC

Merged SKY130 features with NgVeri & NGHDL for full System-on-Chip design.

Oct 2025 | eSim 2.5

Circuit Design & Sim

Integrated the advanced IHP SG13G2 PDK for cutting-edge open-source VLSI.
(Partners: IHP, IEEE CEDA, IEEE CAS).

The Next Frontier: True Reproducibility

We have proven that open-source tools can handle complex design and teach the next generation of engineers.

The next step? Ensuring that global, peer-reviewed academic research is fully reproducible without requiring thousands of dollars in commercial software licenses (e.g., PSpice, Multisim).



NEW INITIATIVE

Launching the Research Migration Project

The Goal:

Reproduce already published, peer-reviewed work natively inside eSim.

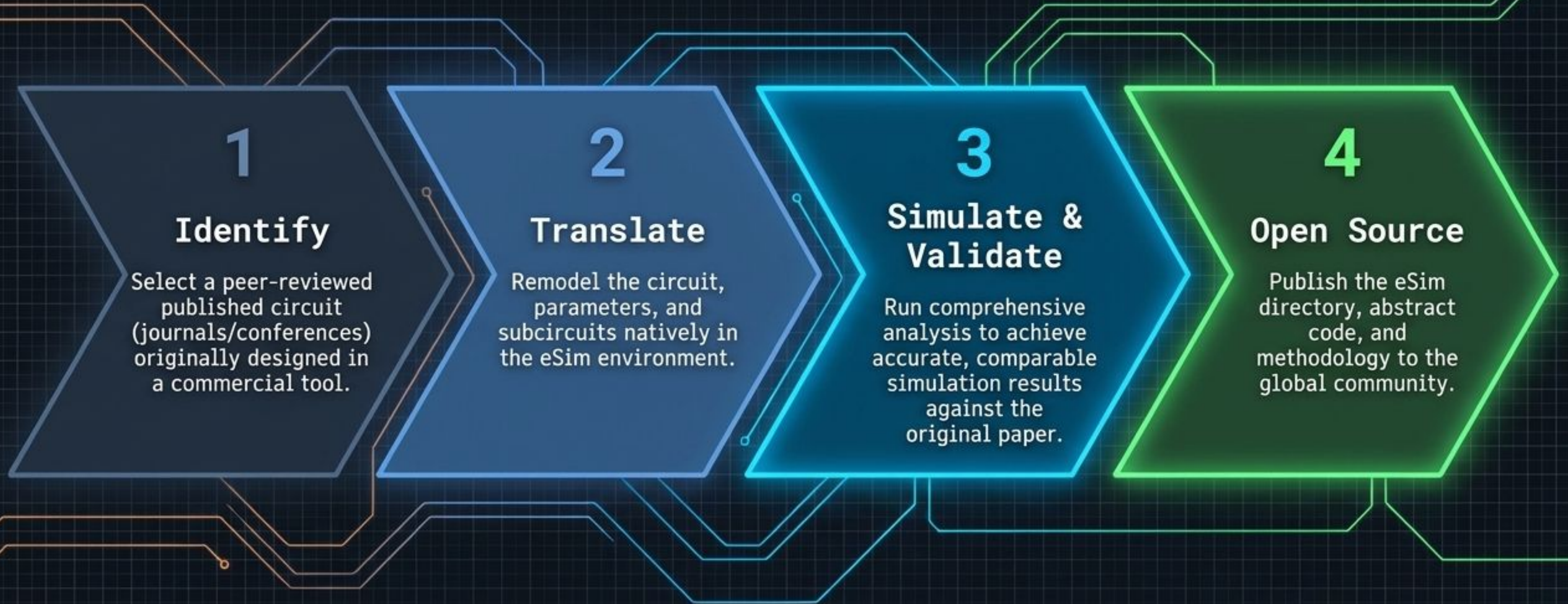
The Target:

High-quality research previously dependent on commercial simulators.

The Outcome:

An open-source, globally accessible repository of verified circuit models.

How the Migration Workflow Operates



Why Contribute to Research Migration?



Recognition

Your contribution and name are permanently published and acknowledged on the official FOSSEE and eSim platforms.



Certification

Receive official certification from FOSSEE, IIT Bombay, validating your expertise in open-source EDA and reverse-engineering.



Impact

You directly bridge the gap, turning locked academic data into a public good for educators and startups worldwide.

Expanding the Ecosystem: Internships & Fellowships

FOSSEE is actively recruiting contributors for the Autumn 2026 cycle.
We are seeking expertise across multiple domains:

Software Engineering

Develop Automated Tool Managers
and write custom KiCad Plugins
(Python/Bash).

Hardware Design

Participate in advanced multi-layer
PCB Design Marathons.

Institutional Adoption

Lead a Lab Migration Project to
transition your university to a
FLOSS-only laboratory.

We are ready to help, and to be helped.

Join Hands with eSim. Contribute code,
report bugs, create pull requests, or
migrate a lab today.

- Platform: `eSim.fossee.in` | `fossee.in`
- Code: `github.com/FOSSEE/eSim`
- Contact: Sumanto Kar | `sumantokar@iitb.ac.in`

Bridging the gap between code and circuit.

