From Fragmentation to Systematization: A Standardized Quality Selection and Systematic Reconstruction Approach for RISC-V Courses

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Motivation

RISC-V is an open instruction set architecture that has rapidly developed in recent years, garnering widespread attention due to its flexibility and openness. However, despite the rapid expansion of its ecosystem, the courses available for beginners and developers face numerous challenges, hindering both technology dissemination and talent cultivation.

Methods

The paper propose a three-step framework to standardize and systematize RISC-V courses.

First, using Bilibili analytics, lectures are filtered by views, like ratio, and comment density to select the top 30% of high-engagement content.
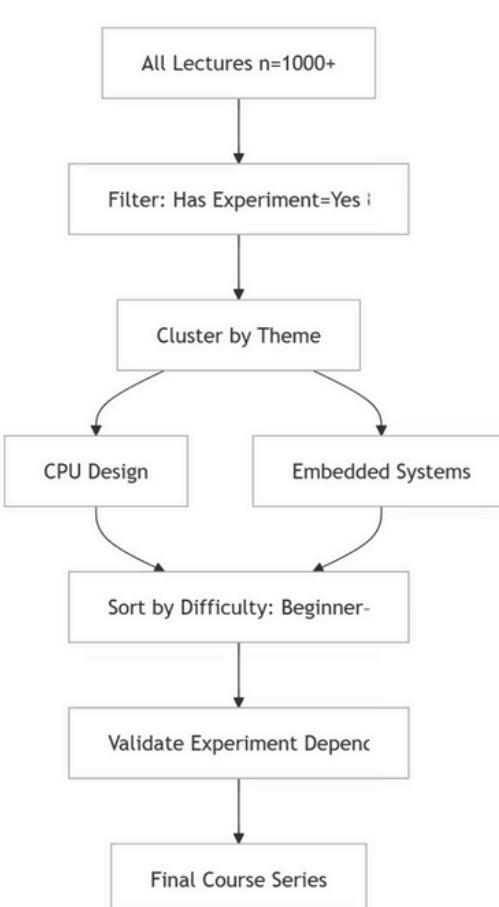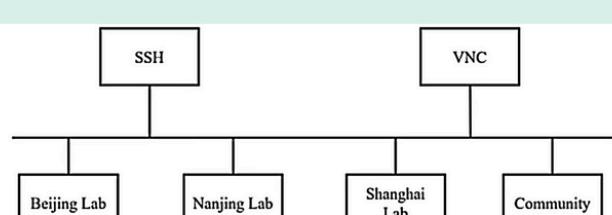
Next, a quality evaluation model with four weighted criteria—technical accuracy, pedagogical structure, practical relevance, and experimental completeness—is applied by experts to ensure content precision and teaching effectiveness.

Finally, a tag-based reconstruction method organizes filtered videos into coherent course series by theme, difficulty, experimental availability, and release time, removing outdated or non-practical materials.

Criterion	Weight (%)	Description
Technical Accuracy	25	Correctness and depth of RISC-V concepts.
Pedagogical Structure	25	Logical progression, clarity, and learner accessibility.
Practical Relevance	25	Applicability to real-world RISC-V development.
Experimental Completeness	25	Availability and effectiveness of hands-on exercises.
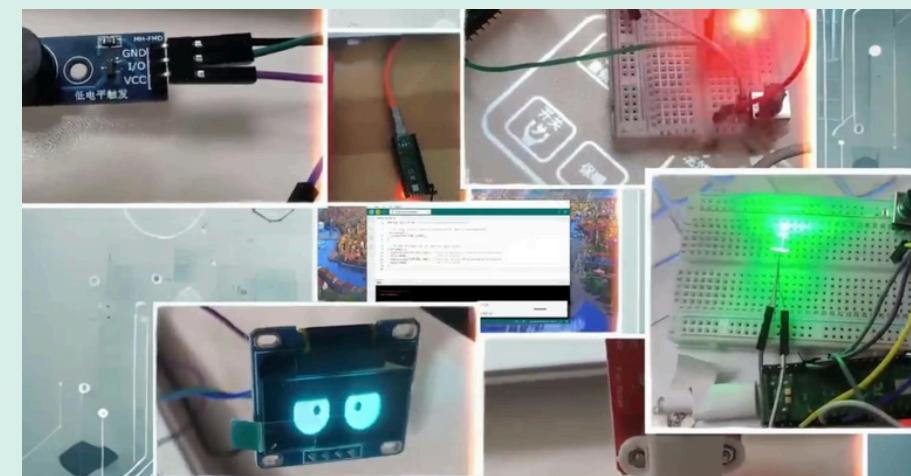
Tag	Category Values	Purpose
Theme	RISC-V CPU Design,	Groups courses by technical domain.
Difficulty	Beginner/Intermediate/ Advanced	Ensures hierarchical progression.
Has Experiment	Yes/No	Filters out non-practical content.
Release Time	Year (2020-2025)	Prioritizes recent content (<5 years old).

All Lectures n=1000+
→ Filter: Has Experiment=Yes
→ Cluster by Theme
→ CPU Design / Embedded Systems
→ Sort by Difficulty: Beginner-
→ Validate Experiment Depend
→ Final Course Series

To support hands-on learning, a distributed online RISC-V Lab connects physical boards across Beijing, Nanjing, and Shanghai via SSH/VNC, enabling remote experiments and seamless online – offline integration.

SSH | VNC
Beijing Lab | Nanjing Lab | Shanghai Lab | Community

Results & Impact

The success of this initiative is evident from the engagement metrics on platforms such as Bilibili.com, referencing Table 3. The primary channel, comprising 787 videos, has garnered 1.37 million views, 39,000 likes, and 25,000 followers. Notable series include "RISC-V Software Porting and Optimization Championships," "KSCO's Hands-on RISC-V High-Performance Simulator," and "From Scratch: Writing a RISC-V Compiler." A second channel, comprising 137 videos, has garnered 60,000 views, 2,273 likes, and 659 followers, featuring series such as "RISC-V Computing Floating Bridge" and "WiringX for Milk-V Duo. "
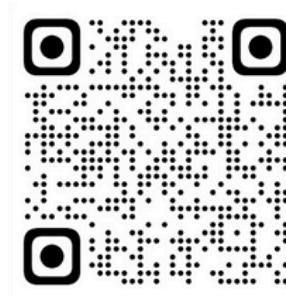
Metric	Primary Channel	Secondary Channel	Total
Number of Videos	791	137	928
Total Views	1.37 million	60,000	1,430,000
Total Likes	39,000	2273	41,273
Total Followers	25,000	628	25,628

Conclusion

This work establishes a standardized and systematic approach to improving the quality of RISC-V education. By combining data-driven filtering, expert-based evaluation, and tag-guided reconstruction, fragmented online lectures are transformed into coherent, progressive course series. The integration of a distributed online RISC-V Lab further bridges theory and practice, creating an accessible and scalable learning ecosystem. Experimental results and community feedback demonstrate significant improvements in learner engagement and instructional effectiveness. Future work will focus on expanding multilingual course content and applying AI-driven quality evaluation models.
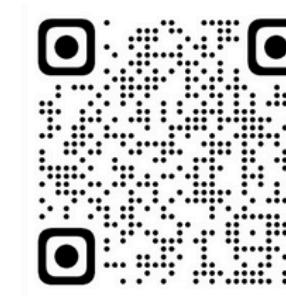
About Us

Bilibili Channel 1

Bilibili Channel 2

OS Matrix