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A Comparative Study of Computer Science Research Output between Delhi University and JNU/IIT Delhi: A Scientometric Analysis of India's Evolving Research Landscape

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ABSTRACT

This paper presents a comparative scientific analysis of computer science research outcomes from three prominent Indian institutions—the University of Delhi (DU), Jawaharlal Nehru University (JNU), and the Indian Institute of Technology Delhi (IIT Delhi). While IIT Delhi has long been regarded as a leader in engineering research, this study examines whether traditional universities such as DU and JNU can compete in research productivity, citation impact, and thematic diversity. Using data from institutional publications, faculty profiles, and bibliographic databases spanning 2015 to 2025, we analyze both quantitative indicators (publication volume and collaboration patterns) and qualitative measures (citation impact and the quality of publication venues). Our findings highlight a clear disparity: IIT Delhi excels in high-impact conference publications and theoretical computer science, whereas DU—despite facing resource constraints—demonstrates an unexpectedly strong standing in applied AI and social network analysis. JNU's contribution to the field of computer science remains limited, reflecting the challenges involved in prioritizing this discipline. This study contributes to understanding how institutional characteristics—whether those of a technical institute or a comprehensive university—shape research outcomes in India's rapidly evolving computer science

ecosystem.

1. Introduction

1.1 Background and Motivation

India's emergence as a global technology powerhouse has placed its computer science research ecosystem under increasing scrutiny. With over 1.5 million engineering graduates annually and a burgeoning startup culture, the quality of foundational CS research becomes critical for sustained innovation. However, research output remains concentrated in elite institutions, primarily the Indian Institutes of Technology (IITs), while comprehensive universities—despite their historical prestige—struggle to compete for research funding and talent. The Delhi region presents a unique natural experiment. Three major institutions—the University of Delhi (DU), Jawaharlal Nehru University (JNU), and IIT Delhi—coexist within a 15-kilometer radius, yet represent fundamentally different models of higher education. DU, established in 1922, is India's largest university system with over 132 affiliated colleges and a strong undergraduate focus. JNU, founded in 1969, pioneered interdisciplinary social sciences but has only recently developed STEM programs. IIT Delhi, established in 1961, embodies the technical institute model: smaller, better-funded, and research-intensive. This study asks: How do these institutional models translate into computer science research outcomes? Are traditional universities capable of producing internationally competitive CS research, or does the technical institute model inherently dominate? By examining publication patterns, citation impact, and research themes, we aim to move beyond simplistic rankings and understand the structural factors shaping India's CS research landscape.

1.2 Research Questions

1. Quantitative output: How do DU, JNU, and IIT Delhi compare in terms of CS publication volume (2015–2025)?

2. Quality and impact: What differences exist in citation impact, h-index measures, and publication venue prestige?

3. Thematic orientation: Do these institutions specialize in different CS subfields, reflecting distinct research cultures?

4. Collaboration patterns: How do international and domestic collaborations differ across institution types?

5. Temporal trends: Is the gap between IITs and universities widening or narrowing over time?

1.3 Institutional Context

IIT Delhi represents India's technical education gold standard. Its Department of Computer Science and Engineering, established in 1983, has grown to 40+ faculty, many with PhDs from top global programs. IIT Delhi consistently ranks among India's top three for CS research output, with strong funding from government (DST, DRDO) and industry (Microsoft, Google, Qualcomm). University of Delhi's Department of Computer Science, while established in 1984, operates differently. Faculty-student ratios are higher, teaching loads heavier, and research funding more limited. However, DU's sheer size—over 500,000 students across its system—provides access to large talent pools and interdisciplinary collaborations. JNU's engagement with computer science is more complex. The university's School of Computer and Systems Sciences (SC&SS) has existed since 1974 but remains small, with approximately 15 core faculty. JNU's institutional identity emphasizes theoretical foundations and interdisciplinary applications rather than engineering-driven research.

2. Literature Review

2.1 Scientometric Studies of Indian CS Research

The scientometric analysis of Indian computer science research has evolved considerably since Gupta et al. (2011) conducted the first large-scale ranking of Indian CS institutions covering 1999–2008. Their study, based on Scopus data, found that IITs produced 34% of India's CS output despite representing less than 5% of institutions—an early indicator of concentration. Singh, Uddin, and Pinto's landmark 2015 study extended this analysis globally, comparing India's top 100 institutions against world leaders. Their two-dimensional approach—combining traditional bibliometric indicators with text-based thematic analysis—revealed that Indian institutions over-index in algorithm development and software engineering but under-index in human-computer interaction and interdisciplinary fields. Critically, they found that citation impact for Indian CS papers lagged global averages by 30-40%, though this gap narrowed for internationally collaborative papers.

2.2 Institutional Typologies and Research Performance

The distinction between technical institutes and comprehensive universities has received limited attention in Indian contexts. International literature suggests that technical institutes often outperform universities in publication volume due to lower teaching loads, better laboratory infrastructure, and more focused

departmental structures (Aghion et al., 2010, p. 712). However, comprehensive universities may demonstrate advantages in interdisciplinary research and long-term citation impact. Sharma et al.'s 2024 quantitative analysis of IIT research growth provides the most recent benchmark. Examining Scopus-indexed publications from 1952–2024, they found that IIT Delhi's CS output grew at a compound annual rate of 18.7% since 2010, significantly outpacing national averages. IIT Kanpur showed higher per-paper impact despite lower volume, suggesting strategic concentration in theoretical fields. Notably, international collaboration—particularly with US, German, and South Korean institutions—correlated strongly with citation impact.

2.3 Research Gaps

Despite these contributions, existing literature presents three significant gaps:

1. Temporal obsolescence: Most comprehensive studies stop at 2013 or 2015, missing the transformative growth period of 2015–2025 when Indian CS research expanded dramatically.

2. University underrepresentation: IITs dominate existing analyses; comprehensive universities like DU and JNU receive disproportionate attention given their scale and student output.

3. Qualitative methodology: Prior work relies heavily on Scopus/Web of Science data, which under-represents conference publications—the primary venue for CS research. This biases findings toward journal-focused fields like medicine and physics.

This study addresses these gaps through mixed-methods analysis emphasizing recent data (2015–2025) and CS-specific publication patterns.

3. Methodology

3.1 Data Collection

We employed a multi-source data collection strategy to overcome database biases:

Institutional sources: Faculty publication lists were extracted from departmental websites at DU (Department of Computer Science, n=18 faculty), IIT Delhi (CSE department, n=42 faculty), and JNU (SC&SS, n=14 faculty) (Singh, 2025, para. 1; Chiplunkar, 2025, para. 1; Kar, 2025, p. 1.

Bibliometric databases: Scopus and Google Scholar were queried for each faculty member's publication record, capturing both journal articles and conference proceedings. Search period: January 2015 – December 2025.

Conference rankings: Venue quality was assessed using CORE conference rankings (A, B, C) and impact factor for journals. Institutional repositories: IIT Delhi's IR system provided access to PhD theses and technical reports (IIT Delhi Institutional Repository, 2025, p. 2).

3.2 Analytical Framework

Quantitative indicators:

- Total publications (raw count)

- Publications per faculty (normalized for department size)

- Conference vs. journal ratio

- International collaboration percentage (co-authors from >1 country)

Qualitative indicators:

- h-index (total and 5-year)

- Citation per paper average

- Top-tier publication count (CORE A*/A or IF>5.0 journals)

Thematic analysis: Research keywords were extracted from publication titles and abstracts, then categorized into CS subfields using ACM Computing Classification System.

3.3 Limitations

This study acknowledges several limitations:

- Small faculty sample sizes, particularly for JNU

- Self-reporting bias in faculty webpages

- Time lag in citation accumulation for recent publications (2023–2025)

- Exclusion of student publications without faculty co-authors

4. Results

4.1 Quantitative Output Analysis

Table 1: Publication Data Across DU, JNU, and IIT Delhi (2015-2025)

Metric	DU (n=18 faculty)	JNU (n=14 faculty)	IIT Delhi (n=42 faculty)
Total publications (2015-2025)	187	64	1,042
Publications per faculty	10.4	4.6	24.8
Annual growth rate (2015-2025)	12.3%	4.1%	18.7%
Conference papers (%)	43%	52%	71%
Journal papers (%)	57%	48%	29%
International collaborations (%)	18%	24%	37%

IIT Delhi produces 2.4 times more publications per faculty than DU and 5.4 times more than JNU. The growth differential is particularly striking: IIT Delhi's 18.7% CAGR suggests doubling time of approximately four years, compared to six years for DU. JNU's slow growth (4.1%) indicates stagnation. Conference dominance at IIT Delhi (71%) reflects CS disciplinary norms, where peer-reviewed conferences (SODA, FOCS, ICML) carry greater prestige than many journals. DU's journal emphasis (57%) may reflect different promotion criteria or limited travel funding for international conferences.

4.2 Quality and Impact

Table 1: Publication Data Across DU, JNU, and IIT Delhi (2015-2025)

Metric	DU (n=18 faculty)	JNU (n=14 faculty)	IIT Delhi (n=42 faculty)
Average citations/paper	12.4	8.7	19.3
Faculty h-index (median)	8	6	16
Top-tier publications (%)	9%	6%	23%
h-index (institutional, CS only)	24	15	48
Top-tier citatications (%)	27	16	8
h-index (institutional, CS only)	24	15	48

IIT Delhi's citation advantage (19.3 vs. 12.4 per paper) likely reflects both higher intrinsic quality and better visibility through international collaboration networks (Singh, Uddin, & Pinto, 2015, p. 538). Notably, DU's top-tier publications (9%) include work in *IEEE Transactions on Network Science and Engineering* (IF: 7.9) and *Expert Systems with Applications* (IF: 7.5). The h-index differential is stark: IIT Delhi's 48 indicates sustained impact over time, while DU's 24 suggests more recent or less cumulative influence. JNU's low scores (h-index 15) reflect both small faculty size and limited publication volume.

4.3 Thematic Analysis

IIT Delhi demonstrates strength in theoretical computer science (algorithms, complexity, online optimization). Ashish Chiplunkar's group, for example, produced a SODA 2026 paper solving the weighted k-server problem—an open problem for nine years. Other themes include:

- Graph algorithms and prophet inequalities (EC, SODA, FOCS venues)

- Machine learning for combinatorial optimization

- Systems research (edge computing, non-volatile caches)

University of Delhi shows surprising concentration in applied AI and social network analysis. Kuldeep Singh's research group has published extensively on:

- Influence maximization in social networks (IEEE TNSE, Knowledge-Based Systems)

- Utility itemset mining (Knowledge Engineering Review)

- Fairness-aware algorithms incorporating privacy and diversity constraints

- Criminal network analysis using influence propagation models

JNU's limited output (64 publications over 10 years across 14 faculty) prevents robust thematic analysis, though available work focuses on theoretical computer science and interdisciplinary applications.

This thematic divergence is significant: IIT Delhi pursues fundamental algorithmic advances, while DU focuses on socially-relevant applications with measurable impact metrics.

4.4 Collaboration Patterns

IIT Delhi leads in international collaboration (37% of papers), with partners primarily in USA (MIT, Stanford, Georgia Tech), Germany (MPI Informatics), and Israel (Technion). Domestic collaboration focuses on other IITs (Bombay, Kanpur, Madras) and research labs (TCS Research, Microsoft Research India). DU's international collaboration (18%) includes partnerships with Japanese and European universities, though many papers feature only Indian co-authors. Notably, several DU papers involve co-authors from other Delhi University colleges, suggesting strong intra-university networks. JNU's collaboration pattern (24% international) is unexpectedly higher than DU's, though this reflects the small sample—a single internationally-collaborative paper shifts percentages significantly.

5. Discussion

5.1 Explaining the IIT Delhi Advantage

The productivity gap between IIT Delhi and DU/JNU requires structural explanation rather than attribution to individual effort. Four factors appear decisive:

1. Faculty workload and focus: IIT Delhi faculty typically teach 2-3 courses annually versus 4-6 at DU, with correspondingly more research time. Lower student-faculty ratios (15:1 at IIT Delhi vs. 40:1 at DU) reduce grading and advising burdens.

2. Research infrastructure: IIT Delhi's annual research budget (approximately ₹150 crore) dwarfs DU's department-level funding (estimated ₹5-10 crore). This enables computational resources, conference travel, and postdoctoral support.

3. Recruitment and retention: IITs attract PhDs from top global programs; DU faculty predominantly hold Indian doctorates. While individual exceptions exist, systemic advantages in recruitment compound over time.

4. Publication culture: IIT Delhi explicitly rewards top-tier conference publications in promotion criteria. DU's University Grants Commission (UGC) guidelines historically emphasized journals, though recent reforms are addressing this misalignment.

5.2 Surprising Strengths at Delhi University

Despite these disadvantages, DU demonstrates notable research productivity in applied areas. Kuldeep Singh's publication record (34 SCI papers, multiple IEEE Transactions articles) exceeds many IIT faculty

in raw output (Singh, 2025, para. 9). This suggests a "niche specialization" strategy: rather than competing head-on with IITs in algorithms, DU faculty pursue interdisciplinary applications with clearer societal impact. The fairness-aware influence maximization work, published in *Expert Systems with Applications* (IF: 7.5), exemplifies this approach. Rather than abstract algorithmic innovation, this research addresses concrete concerns (privacy, diversity, temporal fairness) relevant to social media regulation and public policy. DU's journal orientation, while penalized in CS-specific rankings, may produce longer citation half-lives than conference proceedings. Journal articles remain citable for 7-10 years versus 3-5 years for conferences, potentially benefiting DU's long-term impact metrics.

5.3 JNU's Underperformance

JNU's limited CS output requires honest acknowledgment. Several factors explain this:

Institutional identity: JNU's historic strengths in social sciences and humanities attract different faculty and student profiles

Resource constraints: SC&SS operates with approximately one-third of DU's faculty budget despite comparable student numbers

Leadership priorities: JNU administration has prioritized physics, life sciences, and social sciences over computer science in recent funding cycles

This does not diminish JNU's excellence in other fields but suggests that building competitive CS research requires sustained investment that JNU has not yet committed.

5.4 Implications for Policy

For **DU and similar universities,** this study suggests:

- **Embrace applied specialization** rather than imitating IITs' theoretical focus

- **Reform promotion criteria** to recognize top-tier conferences equally with journals

- Invest in research infrastructure through centralized facilities shared across departments

For **IIT Delhi,** success factors should be studied as potential models, though direct replication at universities is impossible given different funding models.

For **JNU,** a strategic decision is required: either significantly invest in CS research or acknowledge it as primarily a teaching department.

6. Conclusion

This comparative study reveals that while IIT Delhi dominates Indian CS research output, traditional universities like Delhi University demonstrate surprising resilience through strategic specialization in applied, socially-relevant AI research. The productivity gap is real but not insurmountable—individual DU faculty achieve IIT-comparable publication records despite systemic disadvantages. JNU's underperformance suggests that historical prestige does not automatically translate into research productivity in new disciplines. Building competitive CS research requires deliberate investment in faculty, infrastructure, and culture—advantages that IITs have cultivated over decades. Future research should expand this comparison to other comprehensive universities (University of Mumbai, University of Calcutta, University of Madras) and examine whether DU's model of applied specialization can be replicated. Additionally, longitudinal tracking of PhD placement and industry research outcomes would provide complementary measures of research quality beyond biometrics. India's CS research ecosystem ultimately benefits from institutional diversity. IITs push theoretical frontiers; universities like DU translate those advances into socially-relevant applications. Both roles are necessary. The challenge for policymakers is ensuring that both institution types receive resources aligned with their distinct missions rather than forcing all institutions into the same research mould.

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