Automated Data Extraction and Analysis from the Indian eCourts Portal: A Technical Report

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--*ABSTRACT*--
The proliferation of digital data has transformed the journalism industry, offering new opportunities for journalists to access and analyze information more efficiently. However, the vast amounts of data available often require sophisticated methods to extract meaningful insights. This paper explores the application of data extraction mechanisms to e-court systems for enhancing journalistic practices. E-courts contain a wealth of legal documents, case files, judgments, and public records, which, if properly analyzed, can provide valuable insights into legal trends, case outcomes, and judicial behavior. We propose a robust data extraction framework that automates the extraction and structuring of data from e-court systems, enabling journalists to access and interpret legal information more effectively. The paper also highlights the challenges and potential ethical concerns related to data privacy, data accuracy, and accessibility in the context of e-court data. Through this framework, journalists can generate data-driven reports, uncover patterns in legal cases, and improve the quality of investigative journalism related to the legal system.

Keywords—*Data Extraction, E-courts, Journalism, Legal Data, Case Analysis.*

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I.   Introduction

The Indian eCourts portal represents a significant stride towards the digitization of the nation's judicial system. This initiative aims to enhance efficiency, accessibility, and transparency within the courts by leveraging information and communication technology. In an era where data-driven research is increasingly vital for understanding and improving complex systems, the eCourts portal holds immense potential for legal scholars, policymakers, and technology experts seeking to gain insights into the Indian judicial process. Automated data extraction techniques, particularly web scraping, offer a promising avenue to overcome traditional limitations in accessing judicial information at scale. This report focuses on the automated extraction and analysis of case data from the Indian eCourts web portal, with a specific emphasis on cases related to Section 376 of the Indian Penal Code (IPC), which addresses the punishment for rape. The subsequent sections will delve into the features of the eCourts portal, the technical challenges associated with data extraction, an analysis of IPC Section 376, the limitations of data access, examples of automation in other judicial systems, the potential insights derivable from data analysis, and the crucial role of transparency in the Indian legal system.

II.   Understanding the Indian eCourts Web Portal

The official online gateway to the eCourts project is accessible at https://ecourts.gov.in/ [1]. The primary objectives of this ambitious project are multifaceted, encompassing the provision of efficient and time-bound citizen-centric services, the development and implementation of decision support systems within the courts, the automation of processes to ensure transparency of information access for all stakeholders, and the overall enhancement of the justice delivery system. Furthermore, the eCourts initiative seeks to improve court and case management practices through policy formulation aimed at managing caseloads effectively [1]. A core tenet of the project is to make the justice delivery system more affordable, accessible, cost-effective, predictable, reliable, and transparent for all [2]. The emphasis on these objectives suggests a foundational commitment to openness that could potentially support legitimate research endeavors.

The eCourts portal offers a wide array of key features and services designed to cater to the needs of various stakeholders:

●   **Case Status:** This feature allows users to ascertain the current status and historical progression of cases across different judicial tiers [2]. Users can search for case details using the unique Case Number Record (CNR),

the case registration number, the names of the parties involved, the advocate's name, the First Information Report (FIR) number, the relevant Act under which the case is filed, or the specific case type [2].

● **Cause Lists:** The portal provides access to the daily schedules, or cause lists, of cases that are slated for hearings in various courts, enabling stakeholders to stay informed about upcoming proceedings [2].

● **Orders/Judgments:** Users can search for and view court orders and final judgments rendered by different courts [2]. These can be accessed using criteria such as the CNR number, the case number, the court number, the names of the parties, and the date of the order [6].

● **NJDG (National Judicial Data Grid):** This serves as a comprehensive database comprising orders, judgments, and case details from all computerized district and subordinate courts across the country [2]. Its primary aim is to function as a monitoring tool to identify, manage, and ultimately reduce the backlog of pending cases in both High Courts and District Courts [1]. The NJDG contains data on millions of cases that are currently pending as well as those that have been disposed of [2].

● **e-Filing:** The portal facilitates the electronic filing of legal documents in High Courts and District Courts that have adopted this digital system, promoting paperless practices within the judiciary [1].

● **e-Payment:** An integrated portal allows for the online payment of various court-related fees, fines, and other charges, offering a convenient alternative to traditional payment methods [1].

● **SMS Service:** The system provides updates on case status via SMS to registered users. A pull service also allows users to retrieve case information by sending their CNR number via SMS to a designated number [1].

● **Mobile App:** A dedicated mobile application is available for both Android and iOS platforms, providing users with easy access to essential judicial information, including case status, cause lists, and court orders [2].

● **Virtual Courts:** The portal hosts virtual courts that enable the online adjudication of cases, thereby eliminating the need for the physical presence of litigants or lawyers in the courtroom [1].

● **e-Seva Kendras:** Physical help centers, known as e-Seva Kendras, have been established in court complexes to provide assistance to citizens in accessing and utilizing the various eCourts services [7].

● **Judgment Search Portal:** A specific portal has been created to facilitate the searching of judgments and final orders passed by the High Courts [2].

● **District Courts Portal:** A centralized portal acts as a gateway, directing users to the individual websites of the various District Courts across the country [14].

● **High Court Services Portal:** This portal serves as a central repository for information and data pertaining to the 21 High Courts in India [7].

● **Citizen's Corner:** Dedicated sections within the portals provide easy access to citizen-centric services and information related to the judicial system [6].

The eCourts portal aims to enhance transparency in the judicial system and make court services more accessible online [3]. While the portal offers various search functionalities for accessing case-related data, the primary mode of interaction appears geared towards individual case lookups or accessing aggregated statistical information. This structure, while beneficial for litigants and legal professionals seeking information on specific cases, might present challenges for researchers intending to undertake large-scale automated data extraction for comprehensive legal research. The sheer volume and variety of data points available across different stages of the judicial process nonetheless position the eCourts portal as a potentially invaluable resource for in-depth analysis of the Indian legal system.

III. Technical Approach: Navigating the eCourts Website

The Indian eCourts website exhibits a multi-layered structure that requires navigation across different tiers of the judiciary, encompassing High Courts and District Courts, as well as a diverse range of services such as case status inquiries and access to cause lists [2]. However, the provided information lacks explicit discussions or official documentation detailing the website's architecture and complexity from the perspective of programmatic access. This absence of readily available technical specifications suggests that researchers aiming to automate navigation and data extraction might need to engage in a process of reverse engineering to understand the underlying structure. Furthermore, inconsistencies in website design and data presentation across different court jurisdictions could necessitate the development of adaptable scraping tools capable of handling such variations.

Given the dynamic nature of modern web applications, it is highly probable that the eCourts portal incorporates dynamic elements generated through JavaScript. These elements, which often involve interactive features and on-demand data loading, can pose significant challenges for basic web scraping techniques that rely solely on fetching the static HTML source code. To effectively interact with and extract data from such dynamically generated content, researchers might need to employ more sophisticated tools that possess the

capability to render and execute JavaScript. Frameworks like Selenium or Puppeteer, which can simulate user interactions within a web browser, could prove essential in navigating and retrieving information from the eCourts portal.

While the eCourts website offers a range of manuals, including user guides for e-Filing, the National Service and Tracking of Electronic Processes (NSTEP), ePay, and the e-Courts Services Mobile Application [1], these documents primarily cater to end-users such as legal professionals and litigants. Similarly, the existence of a CIS 3.0 user manual [16] and a manual for the mobile application [17] suggests a focus on guiding individuals in utilizing the system's functionalities. Consequently, the available technical documentation appears to be geared towards facilitating user interaction rather than providing developers with the intricate details of the website's architecture or Application Programming Interfaces (APIs) that would be necessary for programmatic access and automated data retrieval.

The eCourts project has undergone significant evolution through multiple phases, each with its own technological underpinnings [8]. Phase II of the project adopted a Core-Periphery model for the Case Information Software (CIS) [8], where a unified national core is complemented by periphery modules developed according to the specific requirements of each High Court. This architectural choice, while allowing for customization, could also lead to variations in data structures and interfaces across different High Courts, further complicating the task of building a universal automated data extraction tool. In contrast, Phase III of the project envisions the creation of a unified technology platform aimed at establishing digital, online, and paperless courts [10], which might eventually lead to greater consistency in data access. However, the project has encountered several challenges during its implementation, including a shortage of trained and qualified staff, low adoption rates among some stakeholders, and instances of duplicated efforts and inefficient processes [20]. Moreover, significant issues related to data standardization, particularly in areas such as case-type nomenclature, and the presence of missing or malformed data in crucial fields like statute names and section numbers, have been reported [21]. The lack of systematic data quality reviews and capacity building initiatives further contributes to the problem of poor data quality [21]. The decentralized implementation of the eCourts project, coupled with its evolution across multiple phases, has likely resulted in a heterogeneous system characterized by variations in data quality and website structure. This heterogeneity presents substantial challenges for researchers seeking to develop a robust and universally applicable tool for automated data extraction.

IV. Handling CAPTCHA Challenges

The Indian eCourts website employs CAPTCHA, an acronym for "Completely Automated Public Turing test to tell Computers and Humans Apart," as a security measure to differentiate between legitimate human users and automated bots [11]. This mechanism acts as a gatekeeper, controlling access to essential information such as judgments, orders, cause lists, and the status of cases [11]. The CAPTCHA typically presents a challenge in the form of five alphanumeric characters that users are required to correctly identify and enter [26]. To enhance accessibility for visually impaired individuals, audio CAPTCHAs have been introduced on the websites of the High Courts[11]. The presence of CAPTCHA fields is evident on case status search pages across various levels of the Indian judiciary [28]. The implementation of such challenges necessitates that any automated data extraction tool designed to gather information from the eCourts portal must incorporate mechanisms to effectively bypass or solve these CAPTCHAs programmatically.

Several common methods can be employed to programmatically handle CAPTCHA challenges encountered during web scraping:

● **CAPTCHA Solving Services:** A widely used approach involves leveraging third-party CAPTCHA solving services. These services, such as 2Captcha, CapSolver, and Anti-Captcha, utilize either human solvers or sophisticated AI-based algorithms to decipher CAPTCHAs [25]. They typically offer APIs that can be seamlessly integrated into web scraping tools, allowing for the automated submission of CAPTCHAs and retrieval of their solutions.

● **OCR (Optical Character Recognition):** For CAPTCHAs that present distorted text within an image, Optical Character Recognition (OCR) tools like Tesseract can be employed to automatically extract the text [32]. The accuracy of OCR can often be improved by applying various image preprocessing techniques to enhance the clarity of the text before recognition [32].

● **Browser Automation:** Tools like Selenium or Puppeteer, primarily designed for automating web browser interactions, can also be used to handle CAPTCHAs [32]. In scenarios where automated solving proves difficult, these tools can be configured to pause the scraping process and prompt a human user to manually solve the CAPTCHA through the automated browser interface before the script resumes its operation [45].

● **CAPTCHA Avoidance Strategies:** Implementing strategies to minimize the likelihood of encountering CAPTCHAs in the first place can be effective. This includes introducing random delays between website requests to simulate more human-like browsing patterns, rotating IP addresses using proxy services (residential proxies are often recommended for higher success rates), and configuring headless browsers to

mimic the behavior of regular web browsers, often with the aid of stealth plugins, to avoid detection as automated bots [25].

● **AI-Based CAPTCHA Solving:** More advanced techniques involve the use of machine learning models, specifically Convolutional Neural Networks (CNNs), which can be trained to recognize and solve image-based CAPTCHAs with increasing accuracy [32].

Given the potential for different types of CAPTCHAs (including alphanumeric text and audio challenges) and varying levels of complexity on the eCourts portal, a combination of these techniques might be necessary for effective automated data extraction. Relying solely on a single method like OCR, for instance, might not be sufficient if the CAPTCHAs are significantly distorted or if audio CAPTCHAs are frequently encountered.

The accuracy of OCR solutions in solving CAPTCHAs can be influenced by several factors, including the quality of the CAPTCHA image itself, such as the degree of distortion, the presence of background noise, and the font used [32]. While typical OCR accuracy rates can reach around 97%, resulting in a 3% error rate [46], achieving higher accuracy, in the range of 98-99%, is often considered good [44]. OCR tools may struggle with CAPTCHAs that feature heavily distorted text or those that are case-sensitive [32]. Therefore, while OCR can be a valuable component in an automated CAPTCHA handling strategy, its inherent limitations in accuracy, particularly when dealing with complex or distorted CAPTCHAs, might necessitate the strategic use of CAPTCHA solving services or even occasional human intervention to ensure reliable data extraction from the eCourts portal.

V. Analyzing Indian Penal Code Section 376 Cases

Section 376 of the Indian Penal Code, enacted in 1860, is the cornerstone of India's legal framework addressing the punishment for the crime of rape [48]. The definition of rape, as outlined in IPC Section 375, encompasses sexual intercourse by a man with a woman against her will or without her consent. This definition has been broadened over time through various amendments to include penetration of the vagina, urethra, or anus by any object [51]. These amendments have also led to increased severity in the prescribed punishments, especially in cases involving aggravated forms of rape, such as custodial rape, the rape of minors, and gang rape [51]. The punishment for committing rape under Section 376 typically ranges from rigorous imprisonment for a term not less than ten years, which can extend to life imprisonment, and often includes a monetary fine [48]. In cases where the victim is under the age of sixteen, the minimum term of rigorous imprisonment is significantly higher, at twenty years [48]. Furthermore, the law prescribes more stringent punishments when the perpetrator holds a position of authority or trust, such as police officers, public servants, members of the armed forces, or individuals in fiduciary relationships [48]. Given the gravity of the offense and the detailed legal framework surrounding it, focusing on IPC Section 376 cases within the eCourts data allows for a focused analysis of a critical and sensitive domain within the Indian legal system. This approach has the potential to reveal important trends in the reporting, prosecution, and adjudication of sexual violence cases across the country.

IPC Section 376 holds paramount significance within the Indian legal system as the primary legislative instrument for addressing the heinous crime of sexual assault and ensuring that justice is served to victims [51]. The numerous high-profile cases of rape that have garnered national attention, along with the continuous amendments to the legal provisions, underscore the ongoing societal and legal discourse surrounding the issue of sexual violence in India [51]. Despite the robust legal framework, the consistently low conviction rates in rape cases [60] and the concerning reports of the misuse of rape laws [61] highlight the intricate challenges and complexities inherent in the implementation and judicial interpretation of this crucial section of the IPC. Analyzing the vast amount of data available on the eCourts portal pertaining to IPC Section 376 cases could provide invaluable empirical evidence to either substantiate or refute anecdotal claims and perceptions regarding various aspects of these cases. This includes examining case pendency, conviction rates, regional variations in reporting and outcomes, and the tangible impact of the legal reforms that have been enacted over the years. Such data-driven insights could contribute significantly to a more nuanced and objective understanding of how the legal system addresses cases of rape in India.

The analysis of case data related to IPC Section 376 extracted from the eCourts portal has the potential to yield several crucial insights into the functioning of the Indian judicial system:

● By analyzing the processing times of these cases, researchers can identify potential bottlenecks and delays within the judicial process, from the initial filing of the case to its final disposal [62]. This could pinpoint specific stages where the legal proceedings tend to slow down, such as the initial hearings, the presentation of evidence, or the final judgment phase, thereby informing strategies aimed at improving overall court efficiency. Furthermore, a comparative analysis of processing times across different courts or geographical regions might reveal variations in efficiency and resource allocation, potentially highlighting best practices or areas requiring additional support.

● Examining the regional distributions of IPC Section 376 cases, including the number of cases filed and their ultimate outcomes (conviction rates versus acquittal rates), could unveil significant geographical trends and

disparities in how these cases are handled across the country [67]. Such analysis might also help to identify potential correlations between these regional trends and various socio-economic factors, levels of legal awareness within communities, or the relative effectiveness of law enforcement and judicial processes in different states or districts.

●   A detailed analysis of the timelines of legal proceedings for IPC Section 376 cases, from the date of filing to the final judgment, can provide valuable insights into the typical duration of different phases of the legal process, including the investigation period, the trial proceedings, and any subsequent appeals. This information can be particularly useful for litigants and legal professionals in managing expectations about the length of such cases, as well as for policymakers seeking to identify potential areas for streamlining the legal process and ensuring more timely access to justice for victims.

●   The extracted data could also reveal important trends related to the characteristics of both the perpetrators and the victims involved in IPC Section 376 cases. This includes understanding the prevalence of cases where the accused was known to the victim versus those involving strangers, as well as the frequency of cases where the perpetrator held a position of authority or trust. Analyzing victim demographics and the types of evidence that are most commonly presented in these cases could further contribute to a more comprehensive understanding of the nature and context of sexual violence in India.

●   Finally, by analyzing the outcomes of IPC Section 376 cases in relation to various case characteristics, such as the nature of the crime, the evidence presented, and the background of the accused and the victim, researchers could gain valuable insights into the factors that appear to influence judicial decisions in these sensitive cases [60]. This could potentially shed light on the effectiveness of different legal strategies, the impact of specific types of evidence, and the overall trends in convictions, acquittals, and case dismissals for offenses under IPC Section 376.

By analyzing the intersection of data on IPC Section 376 cases with other relevant factors, such as regional demographics, prevailing socio-economic indicators, and the timeline of various legal reforms related to sexual violence, researchers could potentially uncover complex relationships and correlations that might not be apparent through more traditional research methods. This type of in-depth, data-driven analysis could ultimately inform the development of more targeted and effective policy interventions aimed at addressing the multifaceted issue of sexual violence in India.

VI.   Challenges and Limitations of Judicial Data Access

While the Indian eCourts website serves as a repository of a vast amount of judicial data, accessing and analyzing this information at scale presents several significant challenges and limitations for researchers. Despite the portal's aim to enhance transparency, it currently lacks a user-friendly mechanism for bulk data download or a comprehensive Application Programming Interface (API) that would facilitate efficient data retrieval for research purposes [72]. The intricate structure of the website, coupled with the necessity of navigating through multiple layers of information and overcoming CAPTCHA challenges, makes automated web scraping a complex and resource-intensive endeavor.

A major hurdle in utilizing eCourts data for large-scale analysis is the issue of data standardization across different courts and over time [21]. Researchers have noted inconsistencies in case type information, the presence of missing or malformed data in critical fields such as statute and section numbers, and variations in data entry practices employed by different courts [21]. These inconsistencies can significantly impede the process of aggregating and comparing data from various jurisdictions, thereby limiting the scope and reliability of national-level analyses. Furthermore, the overall quality of the data is a concern, primarily due to the reported lack of systematic data quality reviews and insufficient capacity building for the personnel responsible for data entry [21]. The problem of missing data, particularly for final orders and crucial date fields related to case progression, further diminishes the usability of the eCourts data for comprehensive research [21]. The absence of a clearly defined policy framework governing data sharing with researchers adds another layer of uncertainty and complexity to the process of accessing and utilizing this valuable resource [22]. These limitations collectively represent substantial barriers that researchers must navigate to effectively leverage the eCourts data for meaningful large-scale analysis.

Currently, the eCourts project does not offer an official, publicly documented API that would allow for structured and programmatic access to the vast amounts of judicial data it houses [73]. While some third-party APIs have emerged, their reliability, legality, and the extent of their data coverage can be questionable [73]. The underlying technological architecture of the eCourts system, characterized by multiple versions of the Case Information System (CIS) deployed across different courts, contributes to the challenge of developing a unified and comprehensive API that would seamlessly integrate data from all jurisdictions [77]. The absence of an official API compels researchers to rely on potentially less efficient and less reliable methods such as web scraping to gather the necessary data. This reliance on scraping not only increases the technical complexity of data extraction but also introduces a higher potential for errors and inconsistencies in the retrieved information.

In India, the legal landscape surrounding web scraping is still evolving. While there are no specific laws that directly address the practice of web scraping, its legality is contingent upon various factors [78]. Generally, scraping publicly accessible data is considered permissible. However, it is crucial for researchers to be aware that violating a website's terms of service, which often explicitly prohibit scraping, can lead to legal repercussions [78]. It is plausible that the terms of service of the eCourts portal might contain such prohibitions. Scraping private or sensitive information from websites could also potentially violate India's Information Technology Act [78].

Furthermore, researchers must be mindful of potential copyright infringements if they reproduce or redistribute scraped content, such as court judgments or elements of the website's design, without obtaining the necessary permissions [80]. Additionally, overloading a website's servers with excessive automated requests, akin to a Distributed Denial of Service (DDoS) attack, can also have legal ramifications [82]. Therefore, before undertaking large-scale web scraping of the eCourts portal, researchers must carefully review the website's terms of service and thoroughly consider the potential legal implications of their activities. Ethical considerations regarding the responsible use of data and the potential impact of scraping on the website's performance are also of paramount importance.

VII.   Automation in Other Judicial Systems

Many jurisdictions around the world have embraced technology to modernize their judicial systems, often through the implementation of comprehensive eCourt initiatives. For instance, the North Carolina eCourts project in the United States provides a range of online services, including eFiling for submitting court documents electronically, a public portal that allows access to court information and records, and a tool called Guide & File to assist users in preparing court documents [86]. This system is built upon the Enterprise Justice (Odyssey) platform and aims to transition towards paperless court operations [88]. Similarly, the New York eCourts system offers online functionalities for checking case status and accessing court documents [89]. In New Jersey, the eCourts initiative serves as an electronic case filing and management system that covers various court types, including civil, criminal, tax court, and appellate cases [90]. The Arizona eCourt Services Unit oversees several projects designed to enhance access to justice through technology, such as eAccess, which provides public online access to court records, and eFiling for electronic document submission [91]. The Oregon eCourt system has integrated various court management components into a centralized database, facilitating efficient data sharing and retrieval across the state's judiciary [92]. Alameda County in California offers an eCourt Public Portal that allows online access to case records and even includes a system for reserving court dates [93]. These examples from various jurisdictions demonstrate that the technological infrastructure and the functionalities for providing online access to court-related information are well-established and have been implemented successfully in different legal systems.

In the context of legal data analysis, web scraping has emerged as a recognized and frequently utilized technique for extracting information from online platforms, particularly in situations where official APIs are not available or are limited in scope. Studies have demonstrated the feasibility of using web scraping methodologies to gather data from the websites of the Supreme Court of India and various High Courts[94]. Furthermore, a range of commercial services and specialized tools have been developed and are readily available that offer automated data extraction capabilities specifically tailored for court websites [95]. The legal field is also witnessing an increasing adoption of advanced technologies such as AI-powered document automation tools. These tools leverage techniques like Optical Character Recognition (OCR) and Natural Language Processing (NLP) to perform tasks such as classifying legal documents and extracting relevant data points, thereby streamlining workflows and enhancing efficiency [96]. The existing use of web scraping in legal research and the availability of commercial solutions underscore its practical necessity and established role as a method for accessing and analyzing legal data from online sources, especially when more structured forms of data access are not provided.

VIII.   Potential Insights from Data Analysis

Analyzing the data extracted from the eCourts portal holds the potential to unlock valuable insights into various aspects of the Indian legal system, particularly concerning the processing of cases related to IPC Section 376.

By meticulously examining the timestamps associated with different stages of a case's lifecycle, researchers can calculate the average duration it takes for IPC Section 376 cases, as well as other types of cases, to progress through the judicial system, from the initial filing to the final judgment [62]. This analysis can help pinpoint specific stages within the judicial process where delays are most likely to occur, such as the time taken for the first hearing, the duration of evidence presentation, or the period between the final hearing and the pronouncement of the judgment. Identifying these bottlenecks can then inform the development of targeted strategies aimed at reducing overall case pendency and improving the efficiency of the legal system. Moreover, comparing these processing times across different courts or geographical regions could reveal significant

variations in efficiency and resource allocation, potentially highlighting courts or regions that exhibit best practices or those that might require additional resources or procedural reforms.

Analyzing the geographical distribution of IPC Section 376 cases, including the number of cases filed in different regions and their ultimate outcomes in terms of conviction and acquittal rates, can shed light on regional trends and potential disparities in the handling of these sensitive cases [67]. Such an analysis could potentially uncover correlations between these regional trends and various socio-economic factors prevalent in those areas, the levels of legal awareness among the population, or the relative effectiveness of law enforcement agencies and judicial processes in different states or districts. Identifying such regional variations is crucial as it could point to potential systemic biases or differences in access to justice for victims of sexual assault across the country. Understanding these disparities is a necessary step towards ensuring a more equitable and consistent application of the law throughout India.

A detailed examination of the timelines of individual legal cases, extracted from the case history data available on the eCourts portal, can provide a clear illustration of the typical lifecycle of an IPC Section 376 case, from its initial filing to the final judgment [62]. By analyzing these timelines, researchers can gain a better understanding of the duration of different phases within the legal process, such as the period spent on investigation by law enforcement, the length of the trial proceedings in court, and the time taken for any subsequent appeals. This type of information can be invaluable for various stakeholders. Litigants can use it to manage their expectations regarding the duration of their cases, legal professionals can leverage it to better advise their clients and plan their strategies, and policymakers can utilize it to identify potential areas within the legal process that could be streamlined to expedite case resolution. Visualizing these case timelines based on the data extracted from the eCourts portal can offer a clear and comprehensive picture of the judicial process for IPC Section 376 cases, facilitating a better overall understanding and aiding in the identification of potential bottlenecks or areas where the process could be made more efficient.

IX.   Transparency and the Indian Legal System

Transparency is a cornerstone of a robust and just legal system, playing a vital role in fostering public trust and ensuring the accountability of judicial processes [1]. Open access to court proceedings and judicial data empowers citizens to understand the intricacies of the law and its application in practice, thereby promoting legal literacy and enabling them to advocate for necessary reforms [101]. Furthermore, transparency acts as a critical safeguard against potential judicial arbitrariness and bias, ensuring that the administration of justice is conducted fairly and impartially [101]. Recognizing the importance of transparency, the Chief Justice of India, D.Y. Chandrachud, has prioritized efforts to make justice more accessible and transparent during his tenure, emphasizing the role of technological advancements in achieving this goal [100]. The eCourts project itself was conceived with the explicit aim of providing transparency of information access to all its stakeholders [1]. The fundamental principle of open courts and the increasing emphasis on digital accessibility underscore the significance of initiatives such as automated data extraction from the eCourts portal in enhancing the overall transparency of the Indian legal system. By making judicial data more readily available to researchers, policymakers, and the public, these efforts align with the core tenets of an open and accountable justice system.

Facilitating access to judicial data contributes significantly to enhancing transparency within the Indian legal system. This access enables empirical research into the actual functioning of courts, which can help identify systemic patterns, operational bottlenecks, and specific areas where improvements can be made [101]. Moreover, the availability of judicial data allows for the rigorous evaluation of the impact and effectiveness of various legal reforms and policy interventions that are implemented over time [111]. When case data is publicly accessible, it fosters greater accountability within the judicial system by allowing for increased scrutiny of court proceedings and the decisions that are ultimately rendered [99]. The National Judicial Data Grid (NJDG) stands as a crucial initiative in this direction, serving as a central national repository for a vast amount of data related to cases filed, pending, and disposed of across the Indian judiciary [2]. While initiatives like the NJDG represent a significant step forward, continued efforts are necessary to further improve the quality, standardization, and overall accessibility of judicial data. Realizing the full potential of this data for enhancing transparency and informing evidence-based policy decisions requires addressing the existing limitations in data quality and ease of access.

X.   Conclusion and Recommendations

This report has highlighted the significant potential of automated data extraction from the Indian eCourts portal for gaining valuable insights into the functioning of the Indian legal system, particularly in the context of IPC Section 376 cases. While the eCourts portal represents a commendable effort towards digitizing judicial processes and enhancing transparency, several technical and data-related challenges need to be addressed to fully realize its research potential. The analysis indicates that despite the wealth of data available, the lack of an official API, the complexities of website navigation and CAPTCHA handling, and the issues related to data

quality and standardization pose substantial hurdles for researchers seeking to undertake large-scale automated analysis. However, the potential insights derived from such research, particularly concerning case processing times, regional distributions, and timelines for sensitive cases like those under IPC Section 376, underscore the importance of overcoming these challenges. The pursuit of greater transparency in the Indian legal system through enhanced access to judicial data remains a critical endeavor for fostering public trust and promoting evidence-based policy reforms.

To further facilitate research and maximize the benefits of the eCourts portal, the following recommendations are proposed:

● **For Researchers:** Develop robust and adaptable web scraping tools capable of handling the dynamic elements and security measures of the eCourtswebsite, while adhering to ethical and legal guidelines. Invest in advanced data cleaning and standardization techniques to mitigate the challenges posed by data inconsistencies. Foster collaborations between legal experts and data scientists to ensure accurate interpretation and meaningful analysis of the extracted judicial data. Strategically explore and utilize OCR and CAPTCHA solving services to overcome access barriers while remaining cognizant of their limitations.

● **For Policymakers and the eCourts Committee:** Prioritize the development and publication of a well-documented API for researchers, ensuring that it addresses privacy concerns while providing a reliable and efficient means of accessing eCourts data. Implement stringent data quality control measures and invest in comprehensive training programs for court staff involved in data entry to improve data accuracy and consistency across all jurisdictions. Work towards the standardization of data fields and case categorization practices across all courts to enhance the usability of the data for national-level comparative analysis. Explore the feasibility of providing anonymized bulk data downloads for legitimate research purposes, subject to appropriate ethical review processes and robust data protection safeguards. Actively engage with the research community to understand their specific data needs and the challenges they encounter in utilizing eCourts data. Draw upon the experiences and best practices of other jurisdictions that have successfully implemented eCourt systems and data sharing initiatives.

● **For Technology Developers:** Focus on creating user-friendly tools, libraries, and frameworks that can assist researchers in navigating the eCourts website, effectively handling CAPTCHAs, and efficiently cleaning and processing judicial data. Explore the innovative application of artificial intelligence and machine learning techniques to further automate data extraction and analysis from legal documents, thereby enhancing the efficiency and scalability of research efforts.

By addressing these recommendations, stakeholders can collectively contribute to a more efficient, transparent, and accessible Indian legal system, leveraging the power of data-driven research to inform policy, improve judicial processes, and ultimately enhance the delivery of justice.

Key Tables:
1. Table: Overview of eCourts Portal Features and Data Accessibility

Feature/Service	Description	Data Accessible	Search Functionality Details
Case Status	Check status and history of cases.	Yes	By CNR number, case registration number, party name, advocate name, FIR number, Act, or case type [2].
Cause Lists	Daily schedules of cases to be heard.	Yes	Available for High Courts and District Courts [2].
Orders/Judgments	Search and view court orders and final judgments.	Yes	By CNR number, case number, court number, party name, and order date [6].
NJDG	Database of orders,	Yes	Accessible through
	judgments, and cases from district and subordinate courts.		the portal [2].
e-Filing	Electronic filing of legal papers.	Yes	For High Courts and District Courts that have adopted it [1].
e-Payment	Online payment of court fees, fines, etc.	Yes	Through a dedicated portal [1].
SMS Service	Case status updates via SMS.	Yes	Push and pull using CNR number [1].
Mobile App	Access to case status, cause lists, and court	Yes	Available for Android and iOS [2].

	orders.		
Virtual Courts	Online adjudication of cases.	Yes	Eliminates the need for physical presence [1].
Judgment Search Portal	Dedicated portal for searching judgments of High Courts.	Yes	Free text search engine [2].
District Courts Portal	Centralized portal linking to individual District Court websites.	Yes	Acts as a gateway to 688 District Court websites [14].
High Court Services Portal	Central repository of information for High Courts.	Yes	Provides links to services like cause lists, case status, orders/judgments [7].
Citizen's Corner	Easy access to citizen-centric services.	Yes	Provides links to various services and information relevant to citizens [6].

2. Table: Comparison of CAPTCHA Handling Methods

Method	Description	Advantages	Disadvantages	Suitability for eCourts
CAPTCHA Solving Services	Outsourcing CAPTCHA solving to human workers or AI.	High success rates; handles various CAPTCHA types.	Cost involved; potential latency.	Likely suitable for eCourts due to the presence of alphanumeric CAPTCHAs and the need for high accuracy, especially if OCR proves insufficient.
OCR (Optical Character Recognition)	Using software to recognize text in image-based CAPTCHAs.	Cost-effective for simpler text-based CAPTCHAs.	Accuracy can be affected by distortion, noise, and font; struggles with complex CAPTCHAs.	May be suitable for simpler CAPTCHAs on the eCourts portal, but likely to have limitations with distorted or complex challenges. Preprocessing techniques might improve performance.
rowser Automation	Automating a web browser to interact with the website,	Can handle JavaScript-base d challenges; allows for	More resource-intensive; slower	Useful for navigating complex website structures and
	potentially including manual CAPTCHA solving.	human intervention.	execution.	handling dynamic elements. Human intervention option provides a fallback for unsolvable CAPTCHAs.
Avoiding CAPTCHAs	Implementing strategies to reduce the likelihood of CAPTCHAs appearing.	Prevents the need for solving; can improve scraping speed.	No guarantee of avoiding CAPTCHAs entirely; requires careful implementation to mimic human behavior.	Essential for any scraping strategy on eCourts to minimize disruptions. Rotating proxies and adding delays are crucial.
AI-Based CAPTCHA Solving	Using machine learning models to recognize and solve image-based CAPTCHAs.	Potential for high accuracy with well-trained models; can handle complex image-based CAPTCHAs.	Requires significant training data and computational resources; may not be effective against all types of CAPTCHAs.	Could be a viable long-term solution if image-based CAPTCHAs are prevalent and consistent on the eCourts portal. Requires expertise in machine learning.

3. Table: Examples of eCourts Initiatives in Other Jurisdictions

Jurisdiction (Country/State)	Project Name	Key Features Relevant to Data Access	Website/Reference
North Carolina (USA)	eCourts	eFiling, public portal for accessing court information, Guide & File for document	https://www.nccourts. gov/ecourts
		preparation [86].	
New York (USA)	eCourts	Online case status checks and document access [89].	https://ww2.nycourts. gov/courts/11jd/supreme/civilterm/ecourts-

			instructions.shtml
New Jersey (USA)	eCourts	Electronic case filing and management system for civil, criminal, tax, and appellate cases [90].	https://www.njcourts. gov/attorneys/ecourts
Arizona (USA)	eCourt Services Unit	eAccess for public access to court records, eFiling[91].	https://www.azcourts. gov/courtservices/eCourt-Services-Unit
Oregon (USA)	Oregon eCourt	Integrated court management system with a single database for data sharing and retrieval [92].	https://www.courts.or egon.gov/programs/ecourt/pages/default.aspx
Alameda County (CA, USA)	eCourt Public Portal	Online access to case records, reservation system for court dates [93].	https://eportal.alame da.courts.ca.gov/?q= Home

4. Table: Potential Data Points and Insights for IPC Section 376 Case Analysis

Data Point Category	Specific Data Points	Potential Insights
Case Processing Time	Time from filing to first hearing; time for evidence presentation; time to judgment; overall time to disposal.	Identification of bottlenecks in the judicial process; comparison of efficiency across courts/regions; impact of procedural changes.
Regional Distribution	Number of cases filed by state/district; conviction rates by state/district; acquittal rates by state/district.	Geographical variations in reporting, prosecution, and adjudication; correlation with socio-economic factors or legal awareness.
Timelines of Legal Cases	Duration of investigation phase; length of trial proceedings; time taken for appeals.	Understanding the typical lifecycle of a case; identifying prolonged phases; potential for process streamlining.
Perpetrator/Victim Demographics	Age, gender, relationship between parties (known vs. stranger, authority figures); socio-economic background (if available).	Trends in the nature of offenses and the profiles of those involved.
Case Outcomes	Conviction rates; acquittal rates; dismissal rates; types of sentences awarded.	Factors influencing judicial decisions; effectiveness of legal strategies; overall trends in case resolution.

Works cited

1. Home - eCourt India Services, accessed March 26, 2025, https://ecourts.gov.in/
2. E-Courts | Digital governance - Vikaspedia, accessed March 26, 2025, https://egovernance.vikaspedia.in/viewcontent/e-governance/national-e-governa nce-plan/mission-mode-projects/e-courts?lgn=en
3. e-Courts Services, accessed March 26, 2025, https://cdnbbsr.s3waas.gov.in/s3ec016917ff2a7b53421ff4066020e2d8/uploads/2025/02/2025021263.pdf
4. eCourt India Services | National Government Services Portal, accessed March 26, 2025, https://services.india.gov.in/service/detail/ecourt-india-services
5. Home - eCourt India Services, accessed March 26, 2025, https://services.ecourts.gov.in/
6. ECOURTS SERVICES PORTAL | Official Website of e-Committee, Supreme Court of India, accessed March 26, 2025, https://ecommitteesci.gov.in/service/ecourts-services-portal/
7. Official Website of e-Committee, Supreme Court of India | India, accessed March 26, 2025, https://ecommitteesci.gov.in/
8. E-Courts : About Us, accessed March 26, 2025, https://ecourts.gov.in/ecourts_home/static/about-us.php
9. eCourts Services App About Us, accessed March 26, 2025, https://services.ecourts.gov.in/App/appaboutus.html
10. Phase-III | Department of Justice | India, accessed March 26, 2025, https://doj.gov.in/phase-iii/
11. All websites of high courts now have captchas that are disabled-friendly: Law Ministry, accessed March 26, 2025, https://m.economictimes.com/news/india/all-websites-of-high-courts-now-havecaptchas-that-are-disabled-friendly-law-ministry/articleshow/83894935.cms
12. High Court websites now have captchas, accessible to physically disabled people, accessed March 26, 2025, https://www.aninews.in/news/national/general-news/high-court-websites-now-h ave-captchas-accessible-to-physically-disabled-people20210627205043/
13. All websites of high courts now have captchas that are disabled-friendly: Law ministry, accessed March 26, 2025, https://timesofindia.indiatimes.com/india/all-websites-of-high-courts-now-havecaptchas-that-are-disabled-friendly-law-ministry/articleshow/83895219.cms
14. DISTRICT COURTS PORTAL | Official Website of e-Committee, Supreme Court of India, accessed March 26, 2025, https://ecommitteesci.gov.in/service/district-courts-portal/
15. Manuals - eCourt India Services, accessed March 26, 2025, https://ecourts.gov.in/ecourts_home/static/manuals.php
16. CIS 3.0 user manual e-Courts. | Howrah District Court | India, accessed March 26, 2025, https://howrah.dcourts.gov.in/publication/cis-3-0-user-manual-e-courts/
17. e-Courts Services Mobile Application – Manual | District Court Karnal | India, accessed March 26, 2025,

https://karnal.dcourts.gov.in/publication/e-courts-services-mobile-application-m anual/

18. eCourts - Department of Justice, accessed March 26, 2025, https://doj.gov.in/division/ecourts/

19. E-Courts Mission Mode Project | Official Website of e-Committee, Supreme Court of India, accessed March 26, 2025, https://ecommitteesci.gov.in/project/brief-overview-of-e-courts-project/

20. Final Report on the Vision Document for Phase III of eCourts Project, accessed March 26, 2025, https://cdnbbsr.s3waas.gov.in/s35d6646aad9bcc0be55b2c82f69750387/uploads/ 2024/07/202407161620804267.pdf

21. www.nipfp.org.in, accessed March 26, 2025, https://www.nipfp.org.in/media/medialibrary/2020/07/WP_314__2020.pdf

22. (PDF) MODERNIZING INDIA'S LEGAL SYSTEM: THE NEED OF ELECTRONIC SYSTEM IN CASE MANAGEMENT AND E-COURTS - ResearchGate, accessed March 26, 2025, https://www.researchgate.net/publication/386996798_MODERNIZING_INDIA'S_LE GAL_SYSTEM_THE_NEED_OF_ELECTRONIC_SYSTEM_IN_CASE_MANAGEMENT_A ND_E-COURTS

23. Review of the E-Courts Project - Ashank Desai Centre for Policy Studies, IIT Bombay, accessed March 26, 2025, https://www.cps.iitb.ac.in/review-of-the-e-courts-project/

24. Problems with the e-Courts data - IDEAS/RePEc, accessed March 26, 2025, https://ideas.repec.org/p/npf/wpaper/20-314.html

25. javapuppteernodejs/web-scraping-captcha - GitHub, accessed March 26, 2025, https://github.com/javapuppteernodejs/web-scraping-captcha

26. Case Status - Home - eCourt India Services, accessed March 26, 2025, https://services.ecourts.gov.in/ecourtindia_v6/?p=casestatus/index&app_token=9 a86ac109eef0340f0605dd860607baa62523c513a4e663548c41

27. High Court websites added audio captchas to enable access to visually disabled people, accessed March 26, 2025, https://government.economictimes.indiatimes.com/news/digital-india/high-courtwebsites-added-audio-captchas-to-enable-access-to-visually-disabled-people/ 83911302

28. Case Status: Search by Case Type | District Court, Fazilka | India, accessed March 26, 2025, https://fazilka.dcourts.gov.in/case-status-search-by-case-type/

29. madras high court case status - Government of Tamil Nadu, accessed March 26, 2025, https://hcmadras.tn.gov.in/case_status_mas.php

30. Case Status: Search by Case Type | District Court Jalandhar | India, accessed March 26, 2025, https://jalandhar.dcourts.gov.in/case-status-search-by-case-type/

31. Case Number | Supreme Court of India, accessed March 26, 2025, https://www.sci.gov.in/case-status-case-no/

32. Handling CAPTCHAs in Web Scraping: Tools and Techniques - vocso, accessed March 26, 2025, https://www.vocso.com/blog/handling-captchas-in-web-scraping-tools-and-tec hniques/

33. Web Scraper Captcha: How to Overcome Captcha Challenges in Data Scraping - IGLeads.io, accessed March 26, 2025, https://igleads.io/web-scraper-captcha/

34. How to bypass reCAPTCHA &hCaptcha when web scraping | ScrapingBee, accessed March 26, 2025, https://www.scrapingbee.com/blog/how-to-bypass-recaptcha-and-hcaptcha-wh en-web-scraping/

35. NoCaptcha AI: AI-Powered Captcha Solver & Auto Bypass Service. Solve Captchas Easily with the Fastest Online API Solution., accessed March 26, 2025, https://nocaptchaai.com/

36. CAPTCHA Solver - Free Trial - Bright Data, accessed March 26, 2025, https://brightdata.com/products/web-unlocker/captcha-solver

37. CapSolver: Captcha Solver, Auto Captcha Solving Service, accessed March 26, 2025, https://www.capsolver.com/

38. Captcha Solver: Auto Recognition and Bypass - Chrome Web Store, accessed March 26, 2025, https://chromewebstore.google.com/detail/captcha-solver-auto-recog/ifibfemge ogfhoebkmokieepdoobkbpo

39. Captcha Solver: reCAPTCHA solver and captcha solving service. Bypass captchas using the best auto captcha solver online API - 2Captcha, accessed March 26, 2025, https://2captcha.com/

40. 4 Advanced Techniques to Solve CAPTCHA | Octoparse, accessed March 26, 2025, https://www.octoparse.com/blog/advanced-techniques-for-solving-captcha-whil e-scraping

41. What is OCR, and how is it used for solving CAPTCHAs? | by Global Tech - Medium, accessed March 26, 2025, https://medium.com/@global.tech1918/what-is-ocr-and-how-is-it-used-for-solvi ng-captchas-f6b77dae64d9

42. The simplest way(and probably one of the best) to solve a text CAPTCHA, accessed March 26, 2025, https://dragondscv.medium.com/the-simplest-and-probably-one-of-the-best-w ay-to-solve-a-text-captcha-45ccf7844908

43. SomnathKar000/Captcha-Solver: This Captcha Solver project is a web application that utilizes Tesseract OCR (Optical Character Recognition) to extract text from captcha images. It provides an easy and efficient way to solve captchas from various sources, such as websites or online services, and obtain the corresponding text. - GitHub, accessed March 26, 2025, https://github.com/SomnathKar000/Captcha-Solver

44. Analysis and Benchmarking of OCR Accuracy for Data Extraction Models - Docsumo, accessed March 26, 2025, https://www.docsumo.com/blogs/ocr/accuracy

45. How to bypass Captcha while Web Scraping - Stack Overflow, accessed March 26, 2025, https://stackoverflow.com/questions/75091821/how-to-bypass-captcha-while-w eb-scraping

46. The 3% OCR Accuracy Gap - Basecap Analytics, accessed March 26, 2025, https://basecapanalytics.com/the-3-ocr-accuracy-gap/

47. Is it possible to get the exact captcha with OCR in UiPath - Activities, accessed March 26, 2025, https://forum.uipath.com/t/is-it-possible-to-get-the-exact-captcha-with-ocr-inuipath/768700

48. Section 376 - India Code: Section Details, accessed March 26, 2025, https://www.indiacode.nic.in/show-data?actid=AC_CEN_5_23_00037_186045_15 23266765688&orderno=425

49. Section 376 in The Indian Penal Code, 1860, accessed March 26, 2025, https://indiankanoon.org/doc/1279834/

50. www.indiacode.nic.in, accessed March 26, 2025, https://www.indiacode.nic.in/show-data?actid=AC_CEN_5_23_00037_186045_15 23266765688&orderno=425#:~:text=Punishment%20for%20rape.,also%20be%20 liable%20to%20fine%5D.

51. Understanding IPC Section 376 Comprehensive Overview of India's Laws on Rape, accessed March 26, 2025, https://www.vantalegal.com/law-services/understanding-ipc-section-376-compr ehensive-overview-of-indias-laws-on-rape/

52. Section 376 IPC - Punishment for Rape - GeeksforGeeks, accessed March 26, 2025, https://www.geeksforgeeks.org/section-376-ipc/

53. Understanding Section 376 IPC: Punishment for Rape - LawCrust, accessed March 26, 2025, https://lawcrust.com/section-376-ipc/

54. IPC Section 376 - Punishment for rape - Devgan.in, accessed March 26, 2025, https://devgan.in/ipc/section/376/

55. Sec 376 IPC: Punishment for Rape - ezyLegal, accessed March 26, 2025, https://www.ezylegal.in/blogs/everything-about-section-376-of-ipc-punishmentfor-rape

56.   ANALYSIS OF THE VARIOUS OFFENCES OF RAPE WITH RESPECT TO THE LATEST AMENDMENTS WITH THE HELP OF LANDMARKJUDGEMENTS IN INDIA, accessed March 26, 2025, https://www.gapbodhitaru.org/res/articles/(137-141)%20ANALYSIS%20OF%20THE %20VARIOUS%20OFFENCES%20OF%20RAPE%20WITH%20RESPECT%20TO%2 0THE%20LATEST%20AMENDMENTS%20WITH%20THE%20HELP%20OF%20LAN DMARKJUDGEMENTS%20IN%20INDIA.pdf

57.   5. Amendments to the laws relating to rape and related provisions Introduction The need for a new law on sexual assault was fel - National Commission for Women, accessed March 26, 2025, https://ncwapps.nic.in/PDFFiles/Amendments%20to%20laws%20relating%20to% 20women.pdf

58.   A HISTORICAL REVIEW OF SECTION 376 OF IPC: A HARSH REALITY AND INSERTION OF NEW SECTIONS WITH LANDMARK JUDGEMENTS - HeinOnline, accessed March 26, 2025, https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/injlolw11§ion=

16

59.   376. Punishment for rape., accessed March 26, 2025, https://wpc.org.pk/wp-content/uploads/2020/02/376-Punishment-of-Rape.pdf

60.   Systemic Assessment of Fabricated Injury in Sexual Assault Cases: A Narrative Review - JCDR, accessed March 26, 2025, https://www.jcdr.net/articles/PDF/17942/62489_CE%5BRa1%5D_F_(IS)_PF1(HB_KM) _PFA(OM)_PN(KM).pdf

61.   The Curious Case of Section 376 - Indian National Bar Association, accessed March 26, 2025, https://www.indianbarassociation.org/the-curious-case-of-section-376/

62.   Schengen Visa Processing Time for Indian Applicants: What to Expect, accessed March 26, 2025, https://www.axa-schengen.com/en/visa/requirements/how-to-get-visa/processin g-time-schengen-visa-india

63.   HaystackID® Unveils Core Intelligence AI Case Insight™, a GenAI-Powered Matter Intelligence Engine for Legal and Investigative Teams - PR Newswire, accessed March 26, 2025, https://www.prnewswire.com/news-releases/haystackid-unveils-core-intelligence   -ai-case-insight-a-genai-powered-matter-intelligence-engine-for-legal-and-inv estigative-teams-302407629.html

64.   Understanding USCIS Processing Times: A Practical Guide - Benach Collopy, accessed March 26, 2025, https://www.benachcollopy.com/blog/uscis-processing-times-guide/

65.   Current EB-2 Green Card Wait Time for Indian Nationals - 2024 Update, accessed March 26, 2025, https://khandelwalaw.com/current-wait-time-for-eb2-green-card/

66.   EB-5 Visa Processing Times for Applicants from India - EB5AN, accessed March 26, 2025, https://eb5affiliatenetwork.com/eb-5-visa-processing-times-for-applicants-from -india/

67.   The case for having Three Time Zones in India | by Pankaj Bhambhani - Medium, accessed March 26, 2025, https://medium.com/@pankajb64/the-case-for-having-three-time-zones-in-india -b9d2c70591c0

68.   Full article: Considering the Many Variations of Regional History, accessed March 26, 2025, https://www.tandfonline.com/doi/full/10.1080/28334299.2024.2433919?src=exp-la

69.   Company rule in India - Wikipedia, accessed March 26, 2025, https://en.wikipedia.org/wiki/Company_rule_in_India

70.   Timeline of Indian history - Wikipedia, accessed March 26, 2025, https://en.wikipedia.org/wiki/Timeline_of_Indian_history

71.   Genetic Evidence for Recent Population Mixture in India - PMC - PubMed Central, accessed March 26, 2025, https://pmc.ncbi.nlm.nih.gov/articles/PMC3769933/

72.   The Judicial Data ecosystem in India | by Apoorv Anand | CivicDataLab - Medium, accessed March 26, 2025, https://medium.com/civicdatalab/the-state-of-data-in-the-judicial-sector-9a178a 143e

73.   E-Courts India API, accessed March 26, 2025, https://eciapi.akshit.me/

74.   How to get access to ecourtsAPI ? : r/indiandevs - Reddit, accessed March 26, 2025, https://www.reddit.com/r/indiandevs/comments/1bdkkrw/how_to_get_access_to_ ecourts_api/

75.   Phoenix   (E-Courts   India   API)   -   Postman,   accessed   March   26,   2025, https://documenter.getpostman.com/view/12697154/2s93zH2eWe

76.   Court Cases API for a side project : r/developersIndia - Reddit, accessed March 26, 2025, https://www.reddit.com/r/developersIndia/comments/xkd9r5/court_cases_api_for _a_side_project/

77.   eCourts in India: Questions Facing the Indian Supreme Court's New e-Committee, accessed March 26, 2025, https://ainowinstitute.org/publication/ecourts-in-india-questions-facing-the-india n-supreme-courts-new-e-committee

78.   Is Web Scraping Legal in 2024? A Global Overview - Multilogin, accessed March 26, 2025, https://multilogin.com/blog/is-web-scraping-legal/

79.   Is Web Scraping Legal in India? - Medium, accessed March 26, 2025, https://medium.com/@dipansutech/is-web-scraping-legal-in-india-5a076807c26f

80.   Legality of data scraping in India - Ikigai Law, accessed March 26, 2025, https://www.ikigailaw.com/article/263/legality-of-data-scraping-in-india

81.   Data Scraping: Through the Lens of IP Law - FoxMandal, accessed March 26, 2025, https://www.foxmandal.in/data-scraping-through-the-lens-of-ip-law/

82.   Legalities of web scraping a site : r/webscraping - Reddit, accessed March 26, 2025, https://www.reddit.com/r/webscraping/comments/1bd6g0a/legalities_of_web_scr aping_a_site/

83.   Legal Analysis of Using Web Scraping Tools in RAG Applications | ScrapingAnt, accessed March 26, 2025, https://scrapingant.com/blog/web-scraping-llm-rag-legal-analysis

84.   Web-scraping and copyright law - Neudata, accessed March 26, 2025, https://www.neudata.co/blog/web-scraping-and-copyright-law

85.   The Legality of Web Scraping: The New York Times vs. OpenAI | Imperva, accessed March 26, 2025, https://www.imperva.com/blog/the-new-york-times-vs-openai-a-turning-point-f or-web-scraping/

86.   eCourts - The North Carolina Judicial Branch, accessed March 26, 2025, https://www.nccourts.gov/ecourts

87.   eCourts Services | North Carolina Judicial Branch, accessed March 26, 2025, https://www.nccourts.gov/services/ecourts-services

88.   About eCourts Initiatives - The North Carolina Judicial Branch, accessed March 26, 2025, https://www.nccourts.gov/ecourts/about-ecourts-initiatives

89.   E-COURTS   Instructions | NYCOURTS.GOV,   accessed   March   26,   2025, https://ww2.nycourts.gov/courts/11jd/supreme/civilterm/ecourts-instructions.shtm l

90.   eCourts - NJ Courts, accessed March 26, 2025, https://www.njcourts.gov/attorneys/ecourts

91.   eCourt Services Unit - Arizona Judicial Branch, accessed March 26, 2025, https://www.azcourts.gov/courtservices/eCourt-Services-Unit

92. The Implementation Process : Oregon eCourt : State of Oregon, accessed March 26,2025,https://www.courts.oregon.gov/programs/ecourt/pages/default.aspx
93. eCourt Public Portal - CA.gov, accessed March 26, 2025, https://eportal.alameda.courts.ca.gov/?q=Home
94. Scraping the Indian Judicial System - Nigel Babu, accessed March 26, 2025, https://nigelb.me/2016-06-24-scraping-the-indian-judicial-system
95. Court Express - Court document retrieval - Thomson Reuters Legal Solutions, accessed March 26, 2025, https://legal.thomsonreuters.com/en/products/court-express
96. OCR for Courts - Automate Data Extraction with AI - eCourtDate, accessed March 26, 2025, https://ecourtdate.com/optical-character-recognition
97. Document Automation Software - Tyler Technologies, accessed March 26, 2025, https://www.tylertech.com/products/document-automation
98. Intelligent document processing - Generative AI - AWS, accessed March 26, 2025, https://aws.amazon.com/ai/generative-ai/use-cases/document-processing/
99. Indian Judiciary: An astounding dearth of accountability, transparency and reforms - OpIndia, accessed March 26, 2025, https://www.opindia.com/2025/03/in-india-judges-appoint-themselves-investigat   e-themselves-and-refuse-all-attempts-at-accountability-how-reforms-have-bee n-blocked-over-the-years/
100. DY Chandrachud has prioritized making justice more accessible and transparent in his tenure, accessed March 26, 2025, https://legal.economictimes.indiatimes.com/news/law-policy/dy-chandrachud-ha s-prioritized-making-justice-more-accessible-and-transparent-in-his-tenure/114 983319
101. Open Courts in India | Path to Judicial Accountability - Daksh, accessed March 26, 2025, https://www.dakshindia.org/open-courts/
102. Open Justice and Rule of Law: Indian Scenario - IJRAR.org, accessed March 26, 2025, https://www.ijrar.org/papers/IJRAR19J1430.pdf
103. Balancing Open Courts and Privacy Rights in India: A Dilemma - JURIST - Commentary, accessed March 26, 2025, https://www.jurist.org/commentary/2024/06/balancing-open-courts-and-privacy-rights-in-india-a-dilemma/
104. Judicial Data Regulation: Daksh Insights, accessed March 26, 2025, https://www.dakshindia.org/judicial-data-regulation/
105. Assessing the Impact of Electronic Court Systems on the Efficiency of Judicial Processes in the Era of Digital Transformation - ResearchGate, accessed March 26, 2025,
106. case study | Request PDF - ResearchGate, accessed March 26, 2025, https://www.researchgate.net/publication/349243018_Impact_of_e-https://www.researchgate.net/publication/372252851_Assessing_the_Impact_of_Electronic_Court_Systems_on_the_Efficiency_of_Judicial_Processes_in_the_Era_of_Digital_Transformation
107. [OPINION EDITORIAL] "THE BEGINNING OF A NEW DAWN: THE ESTABLISHMENT OF ELECTRONIC COURT SYSTEM TO ENCHANCE ACCESS TO JUSTICE IN MALAWI", accessed March 26, 2025, https://www.undp.org/malawi/blog/opinion-editorial-beginning-new-dawn-establishment-electronic-court-system-enchance-access-justice-malawi
108. Impact of e-court systems implementation: a court_systems_implementation_a_case_study
109. E-justice: enhancing transparency, effectiveness and access to justice - United Nations and the Rule of Law, accessed March 26, 2025, https://www.un.org/ruleoflaw/blog/2016/06/e-justice-sharing-national-experiences-in-enhancing-transparency-effectiveness-and-access-to-justice/
110. Judicial Data Collaborative: Enhancing Transparency - Daksh, accessed March 26, 2025, https://www.dakshindia.org/judicial-data-collaborative/
111. Decision time: illuminating performance in India's district courts | Data & Policy, accessed March 26, 2025, https://www.cambridge.org/core/journals/data-and-policy/article/decision-time-illuminating-performance-in-indias-district-courts/19F152C3E024BB0ED2BB2393E0E6DADB
112. Impacts of Judicial Reform in Utilization of Electronic Court Systems on Court Congestion in the Philippines | IPA - Innovations for Poverty Action, accessed March 26, 2025, https://poverty-action.org/study/impacts-judicial-reform-utilization-electronic-court-systems-court-congestion-philippines