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eyecite: A tool for parsing legal citations

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Summary

`eyecite` is a Python package for parsing and extracting legal citations from text. It can recognize a wide variety of citations commonly appearing in American legal decisions, including:

- full case (e.g., `Bush v. Gore, 531 U.S. 98, 99-100 (2000)`)
- short case (e.g., `531 U.S., at 99`)
- statutory (e.g., `Mass. Gen. Laws ch. 1, § 2`)
- law journal (e.g., `1 Minn. L. Rev. 1`)
- supra (e.g., `Bush, supra, at 100`)
- id (e.g., `Id., at 101`)

It also offers tools for efficiently aggregating like citations and annotating citations with custom markup.

Statement of need

Citations are the bedrock of legal writing and a frequent topic of legal research, but few open-source tools exist for extracting them from legal texts. Because of this, researchers have historically relied on proprietary citation data provided by vendors like LexisNexis and Westlaw (e.g., Black & Spriggs, 2013; Fowler et al., 2007; Spriggs & Hansford, 2000) or have used their own personal scripts to parse such data from texts ad hoc (e.g., Clark & Lauderdale, 2012; Fowler & Jeon, 2008). By providing an open-source, standardized alternative to these approaches, `eyecite` promises to increase scholarly transparency and consistency. It also promises to give researchers the extendability and flexibility to develop new methods of citation analysis that are currently not possible under the prevailing approaches.

For example, one burgeoning research agenda seeks to apply machine learning techniques to citation analysis, either to recommend relevant authorities to legal practitioners (Ho et al., Forthcoming), model the topography of the legal search space (Dadgostari et al., 2021; Leibon et al., 2018), or automatically detect and label the semantic purpose of citations in texts (Sadeghian et al., 2018). One obvious application of `eyecite` would be to use it to generate empirical training data for these kinds of machine learning tasks.

To facilitate those kinds of projects and more, `eyecite` exposes significant entity metadata to the user. For case citations, `eyecite` parses and exposes information regarding a citation's textual position, year, normalized reporter, normalized court, volume, page, pincite page, and accompanying parenthetical text, as well as `eyecite`'s best guess at the names of the plaintiff and defendant of the cited case. For statutory citations, `eyecite` parses and exposes information regarding a citation's textual position, year, normalized reporter, chapter, section, publisher, and accompanying parenthetical text. It does this using a database of thousands of regular expressions that have been accumulated and refined over the course of years of research.

Recognizing that in addition to obtaining comprehensive results, researchers often want to parse many documents and citations at once, `eyecite` is also designed with an eye toward

performance: it makes use of the Hyperscan library (Wang et al., 2019) to tokenize and parse its input text in a highly efficient fashion. Additionally, `eyecite` can heuristically resolve short case, supra, and id citations to their appropriate full case antecedents, and it integrates well with custom resolution logic. Finally, for practical applications, it can "annotate" found citations with custom markup (like HTML links) and re-insert that markup into the appropriate place in the original text.

State of the field

To the best of our knowledge, no open-source software offering the same functionality as `eyecite` exists. Other similar packages are either no longer maintained or lack the robust parsing, resolution, or annotation features of `eyecite` (e.g., LexPredict, 2021; Sherred, 2021; Tauberer, 2017). `eyecite` also benefits from being used in production by two public data projects, the Caselaw Access Project and CourtListener, to process and analyze millions of documents in their collections. From these applications, `eyecite` has honed a test suite of real-world citation formats. To further minimize unexpected errors, its codebase enjoys static type checking for all of its functions. At least one study has already used an earlier version of the data generated by `eyecite`'s underlying code (Carmichael et al., 2017).

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