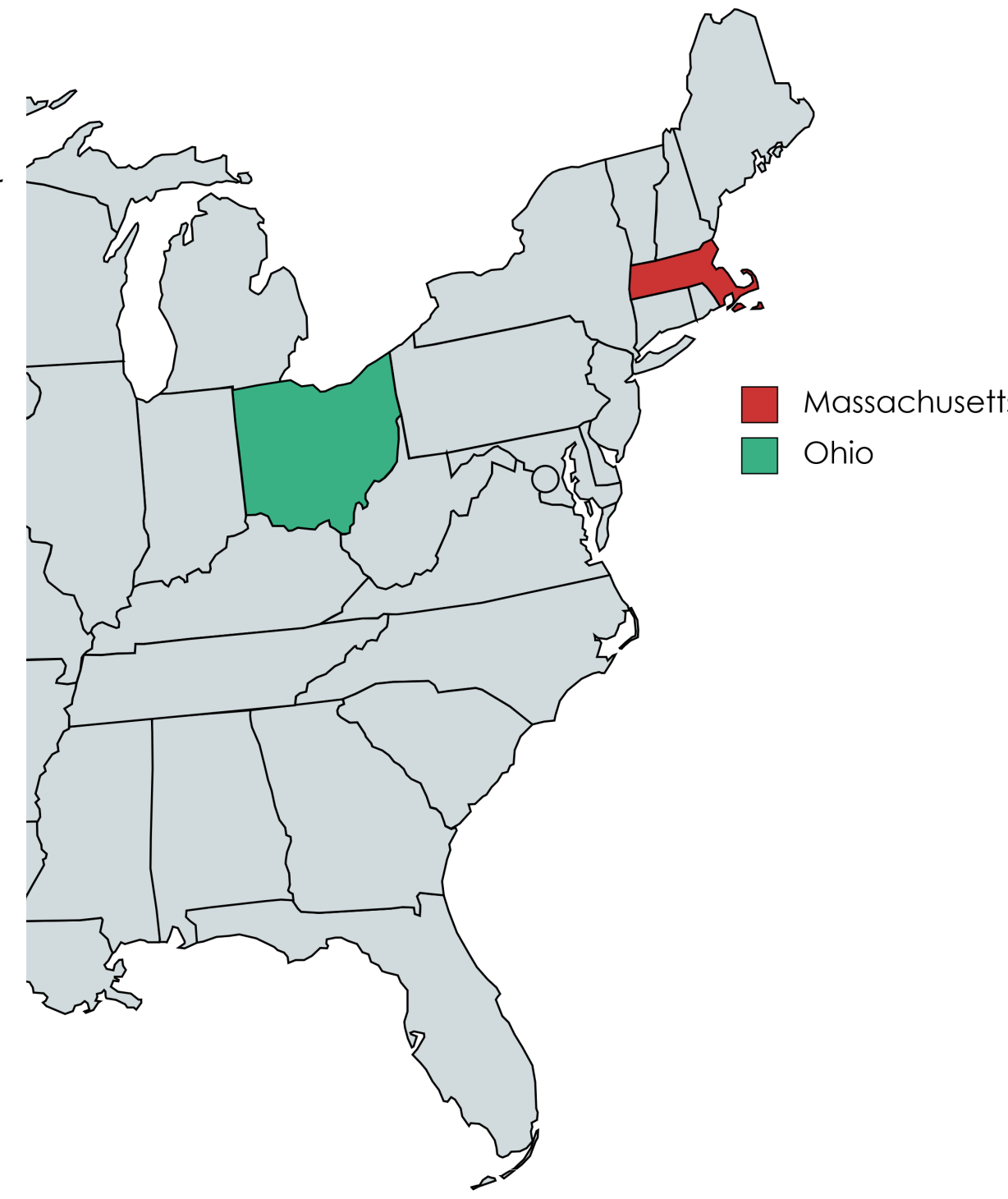


Abstract

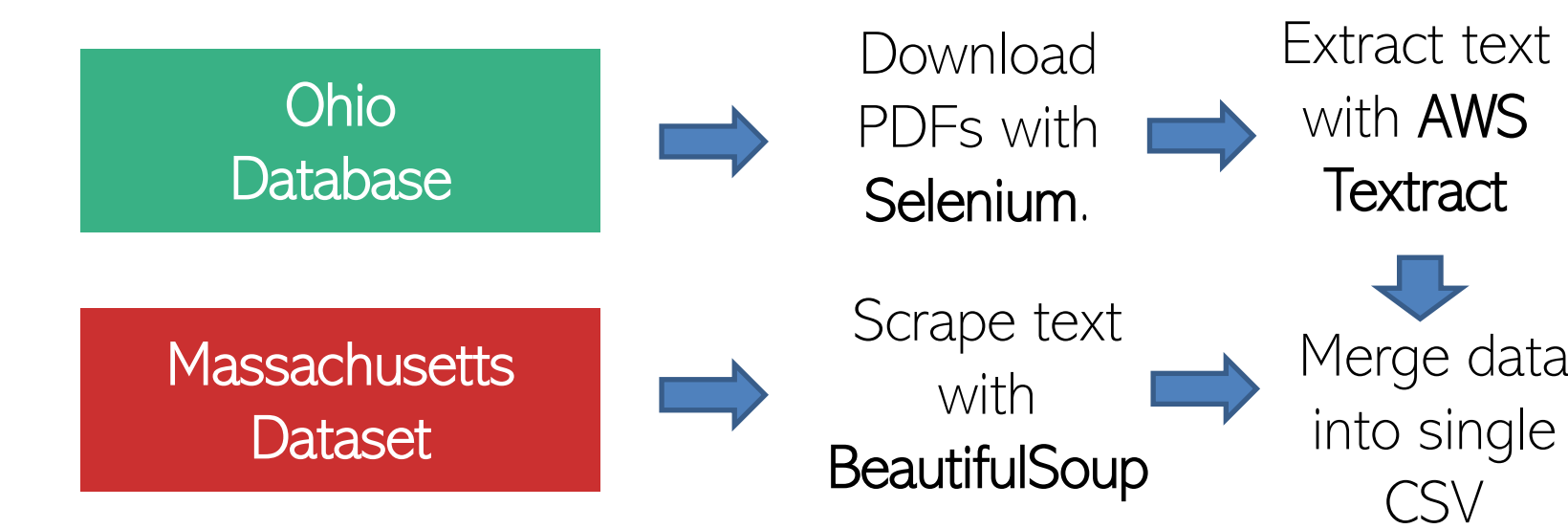
Our team explored state-level mortgage enforcement actions and experimented with a new approach to understanding the financial crisis from a bottoms-up perspective. This project was done in two phases: collecting and organizing mortgage enforcement actions in the states of Ohio and Massachusetts from 2000 - 2010, and then analyzing both trends and texts in these enforcement actions. Before we continued with analysis, we used a mixture of specialized domain knowledge and NLP to process the text and used LDA to categorize texts into different topic models. Our primary finding was that regulations that were signed or enacted proactively were effective deterrents of malpractice.



Our Data

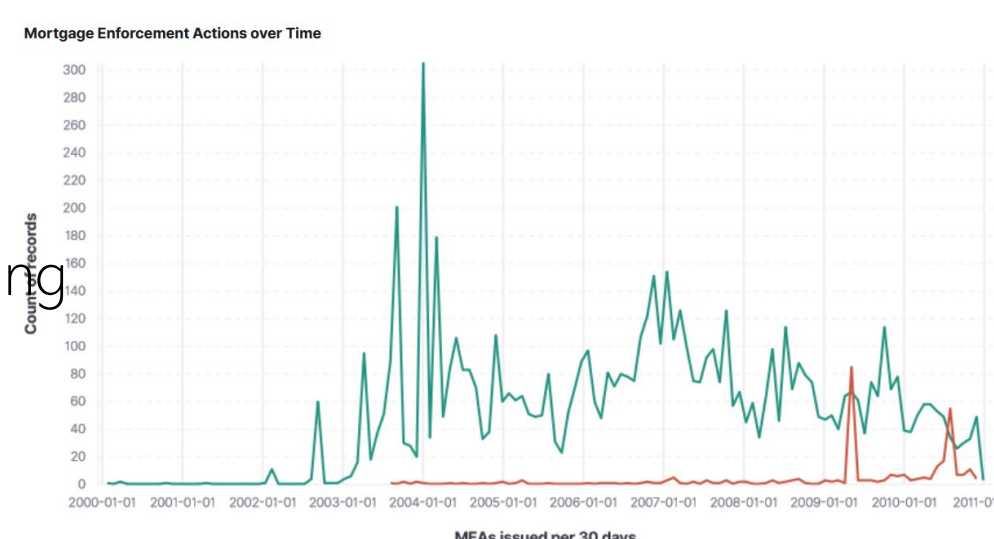
The primary focus of our data was on Mortgage Enforcement Actions. A mortgage enforcement action is a legal document issued by a state regulatory agency that notifies the guilty party of malpractice charges and the associated punishments. Ohio stored their MEAs as PDFs on a government [database](#), while Massachusetts stored their MEAs as [webpages](#). We extracted text from these data sources and filtered out the relevant sections from the text due to the presence of irrelevant legal clauses that colored our analysis.

Data Extraction



Data Summary

Total: 7241 entries
 Ohio: 6918 (611 missing MEAs)
 Massachusetts: 323 (1 missing MEA)



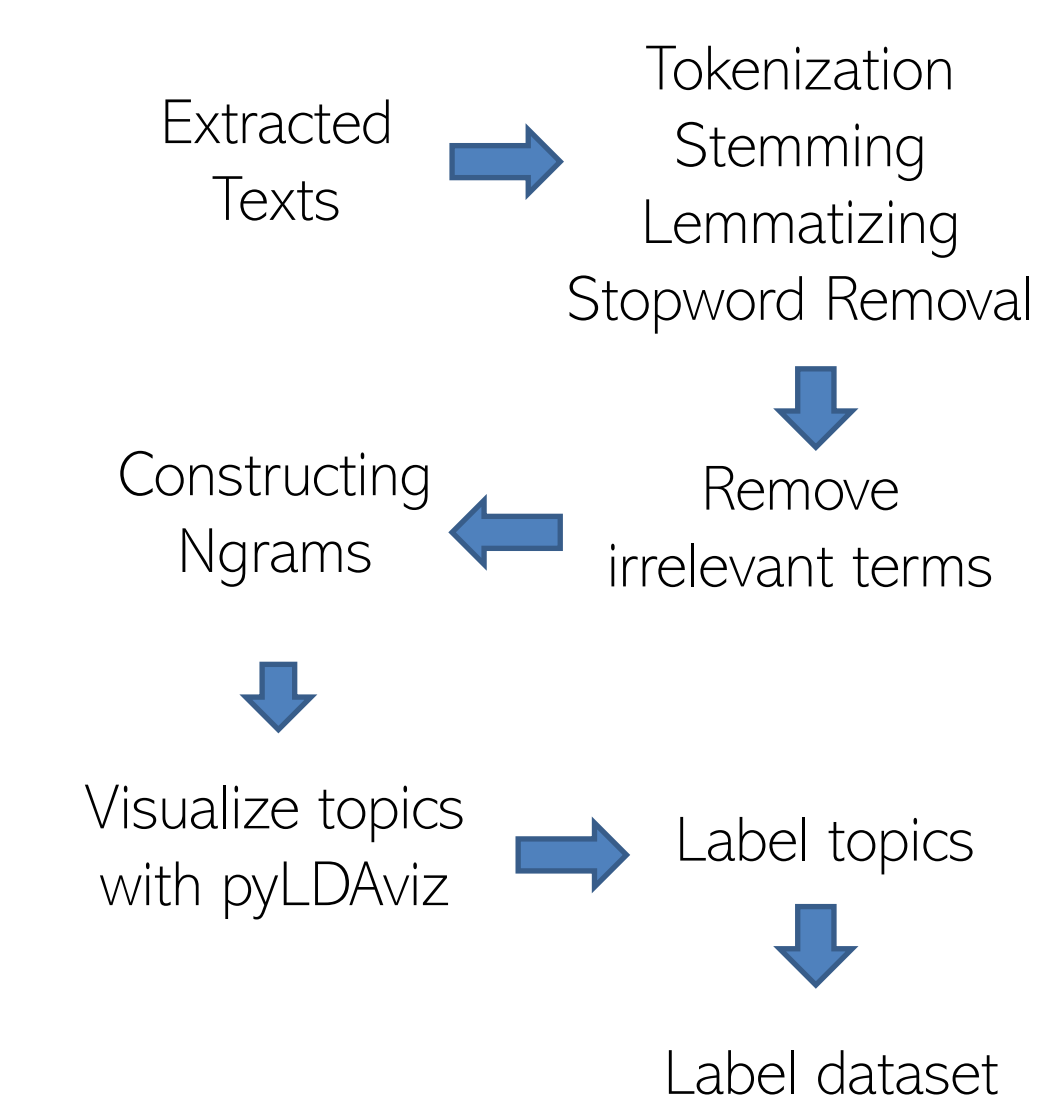
Extracting Relevant Text

... Division's **allegations** that Respondent violated R.C. 1322.07 by making a substantial misrepresentation on Respondent's renewal application and in obtaining a Mortgage Broker Certificate of Registration through a false or fraudulent representation to the Division; and **WHEREAS** the Division finds that the allegations contained in the Notice are true; IT IS ORDERED THAT, pursuant to R.C. Chapters 1321 and 119, Respondent's ...

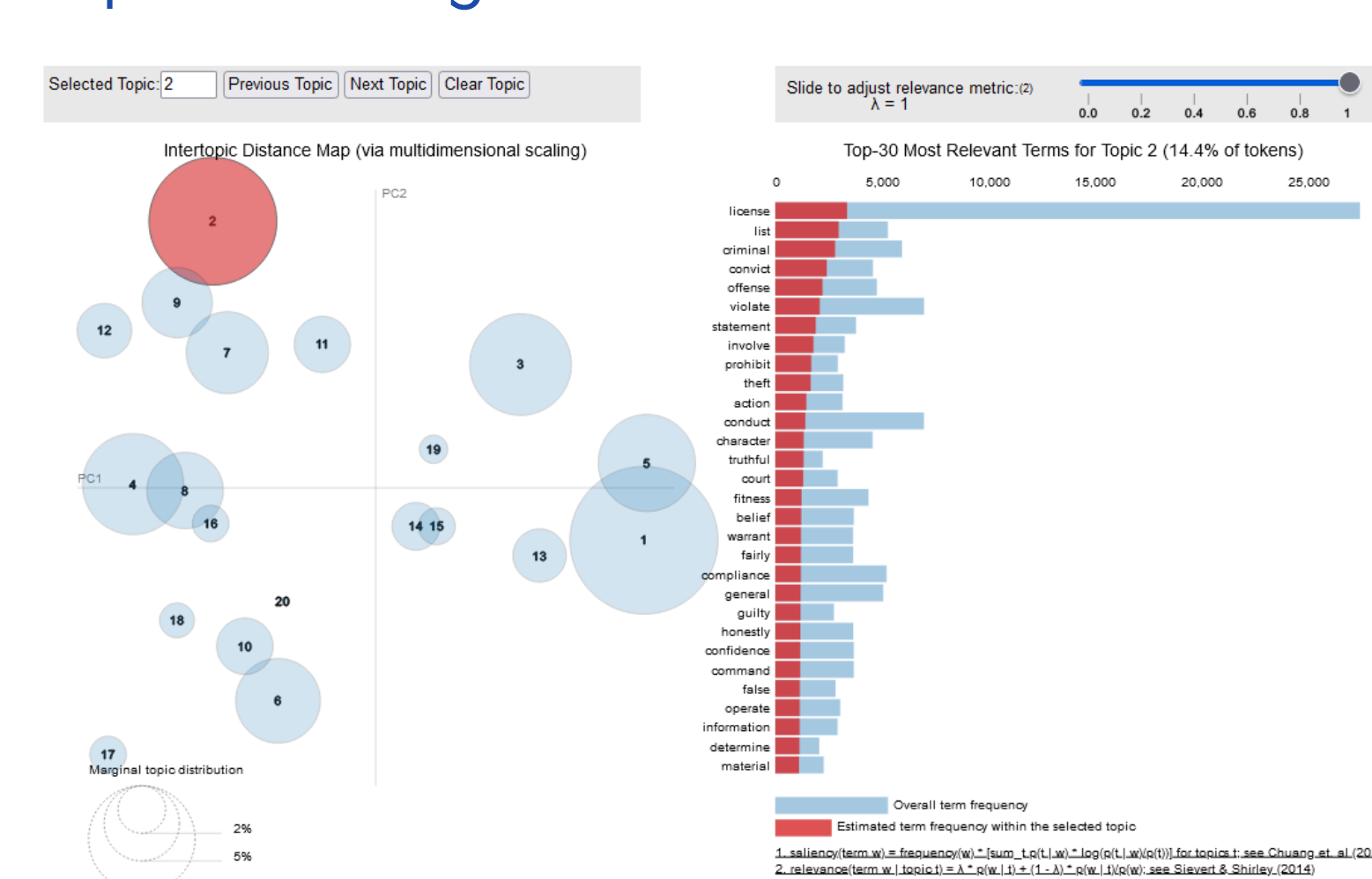
Methods

After we extracted the text from various sources, our focus turned to NLP (using SpaCy) and LDA (using gensim) to produce topic models that classified wrongdoing in the text. We tuned our model by removing specific irrelevant terms ("commonwealth") and adjusting the number of topics, to find topic models with high coherence (high c_v scores) and understandability.

NLP Workflow



Topic Modelling Visualization



Ohio Findings

Our primary finding for the state of Ohio was centered around the 2007 Homebuyer's Protection Act. Prior to this bill, not only was Ohio not as strict, but its main regulatory focus was reactive. This bill represented a shift in policy priorities, as regulations became proactive, and much more stringent. This resulted in a steep decline of MEAs in the ensuing years because it was now harder to obtain a license to issue loans and the standards to which lenders were held tightened. Thus, we see a decrease in MEAs across the board, but especially those related to criminal backgrounds and conduct.

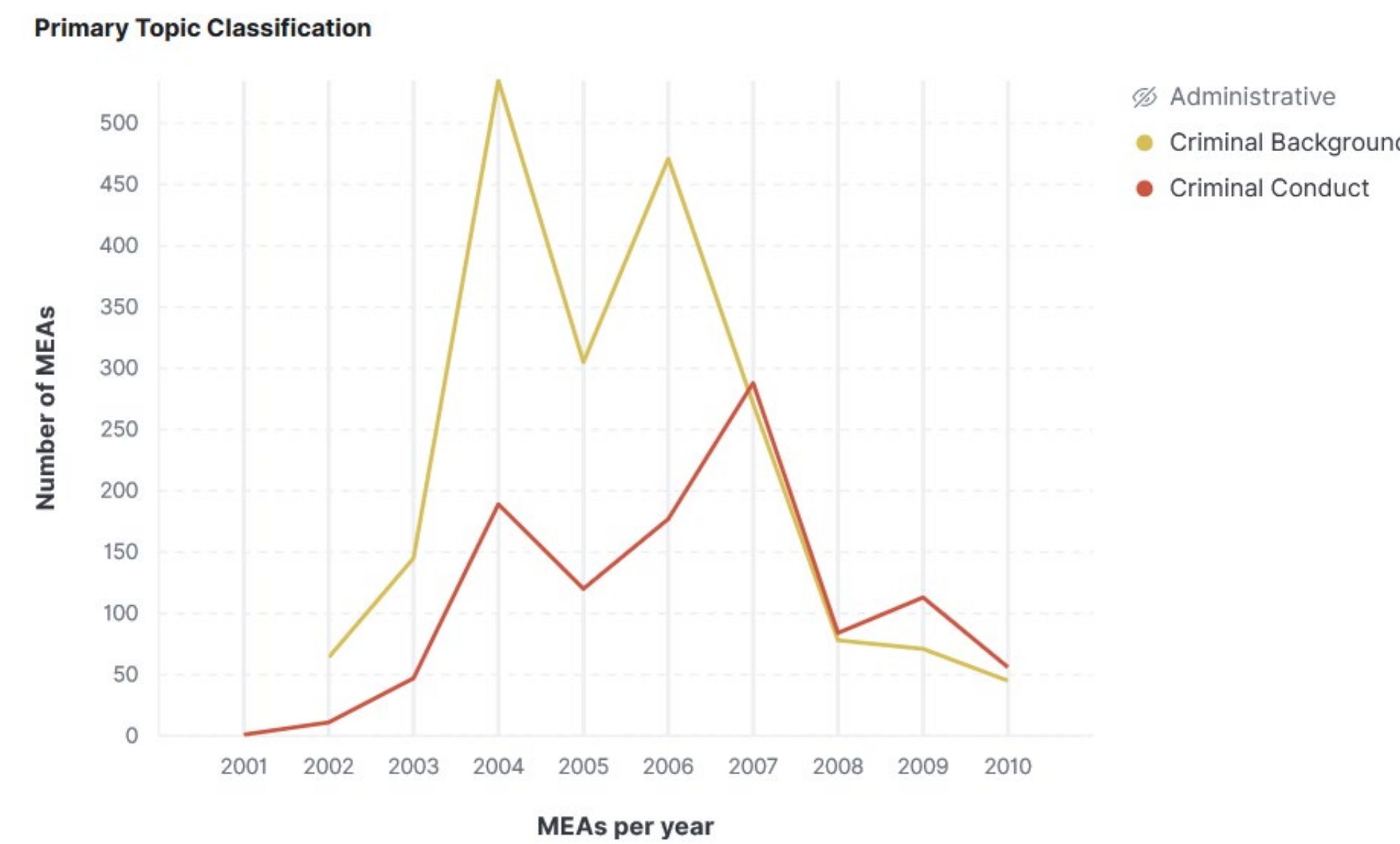


Figure 1: Ohio MEAs classified as "Criminal Conduct" and "Criminal Background" (2000 – 2010)

We also found that when Ohio pursued reactive legislation, their regulatory agencies adapted to the new change, but it did not prevent any actions. When Ohio passed legislation in 2001 that established a mandatory education requirement, as well as a mandatory number of hours to be able to maintain ownership of a license, we see the number of administrative MEAs increase steadily. This implies that the changing rules did not impact the behavior of current actors in the mortgage market but did reveal a problem in the market that had previously been unaddressed.

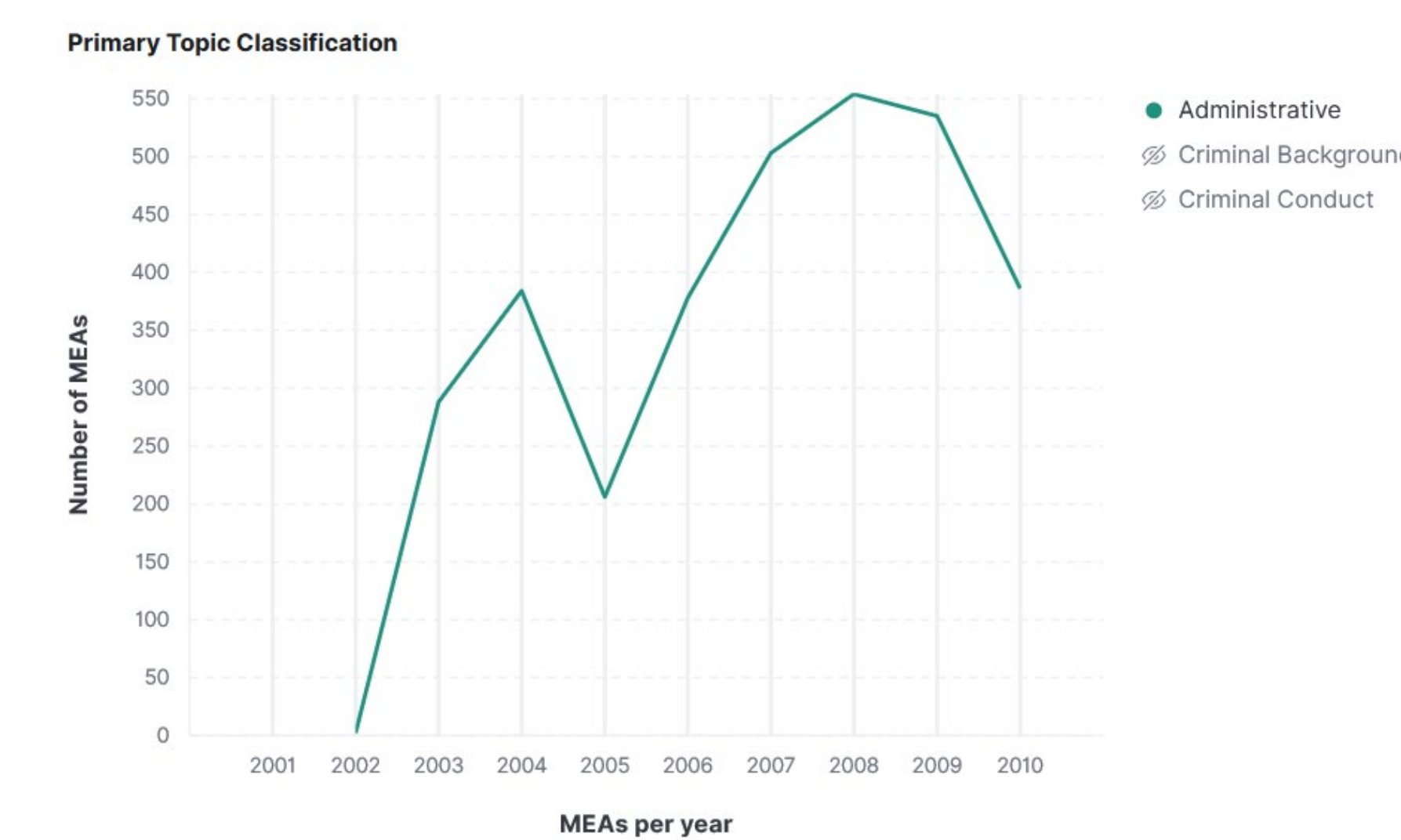


Figure 2: Ohio MEAs classified as "Administrative" (2000 – 2010)

Conclusion

Our work this summer has validated this new experimental approach to understanding the dynamics between state regulatory agencies and mortgage lenders, brokers and loan originators. Our summary analysis of overall trends in MEAs revealed that state legislation of mortgage regulatory statutes was very much needed and effective. Our topic modelling revealed the types of activities that state regulatory agencies identified and sought to regulate and showed clearly the dynamics between regulation and enforcement. The patterns and trends we found in the MEAs can provoke further questions about enforcement priorities and sentiments on the ground that the Bass Connections oral history team can look to answer.

Our work, thoroughly documented, has also provided a guideline and technical toolkit for further work by the Bass Connections data team during the semester to analyze MEA patterns in other states and compare the trends and patterns in MEAs across states.

Our team also created an interactive dashboard with Kibana. Please login as a user with the **username: guest** and **password: apl2021**. We prepared a video to walk new users through the usage of the dashboard.



Massachusetts Findings

In Massachusetts, there were two spikes in the data, one in 2009 and one in 2010. In 2009, the overwhelming number of MEAs issued were classified as Administrative. After further analysis, we found that in 2009 Massachusetts enacted a new regulatory requirement, specifically a surety bond. This requirement would prevent foreclosures by ensuring loan originators take on the debt in the event of a foreclosures. This caused a spike in mortgage enforcement actions as loan originators were not putting up the necessary surety bond.

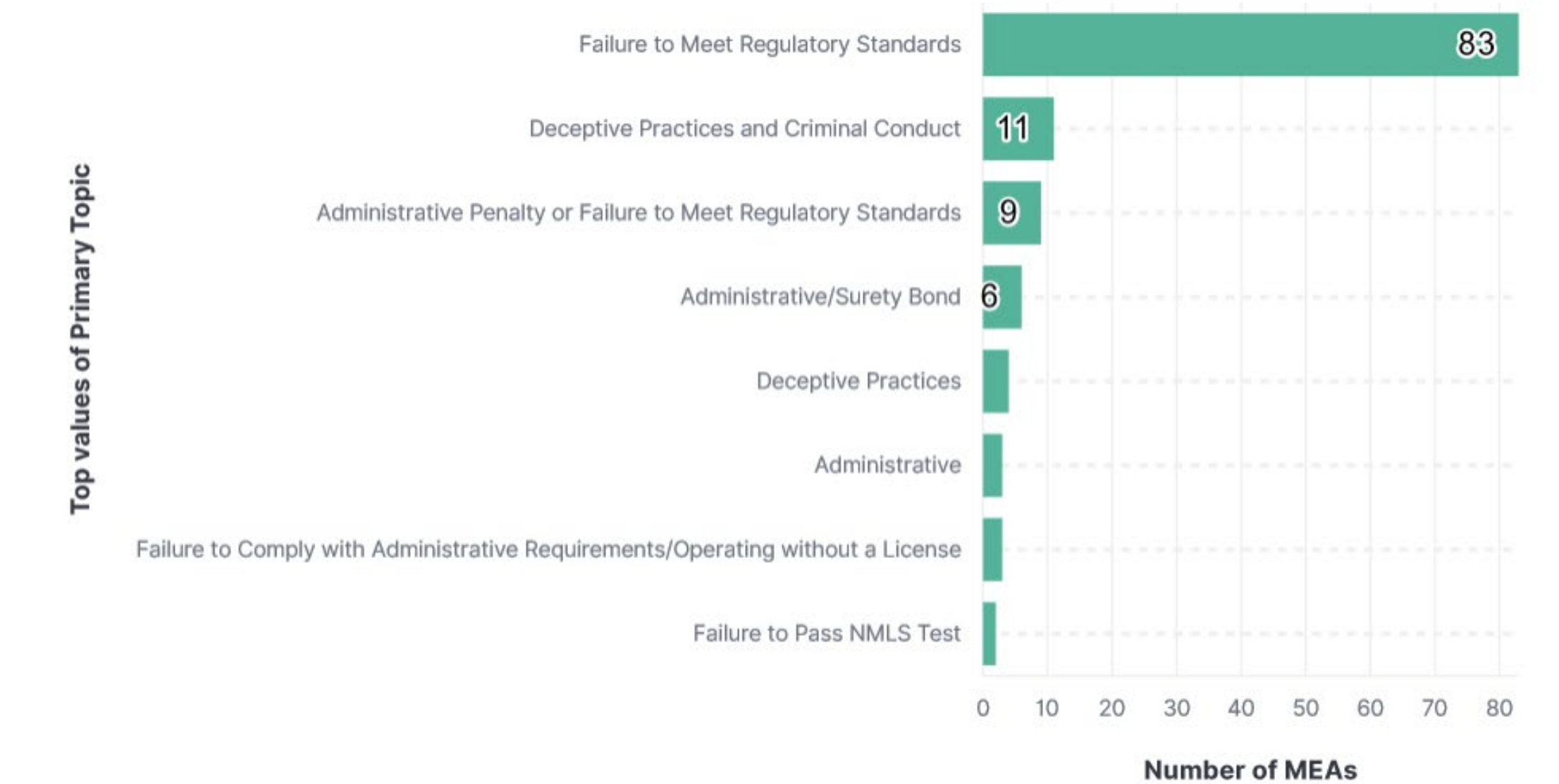


Figure 3: Types of Activities regulated by MEAs in Massachusetts (2009)

The second spike in Massachusetts data occurred in 2010. Upon closer legislative analysis, it became clear that this spike was a result of the newly implemented NMLS Test. This test became mandatory late in 2009, and tested originators on various topics, such as federal mortgage law and ethics. The spike in 2010 was in large part a result of loan originators failing the test by not receiving the mandatory 75% needed to pass.

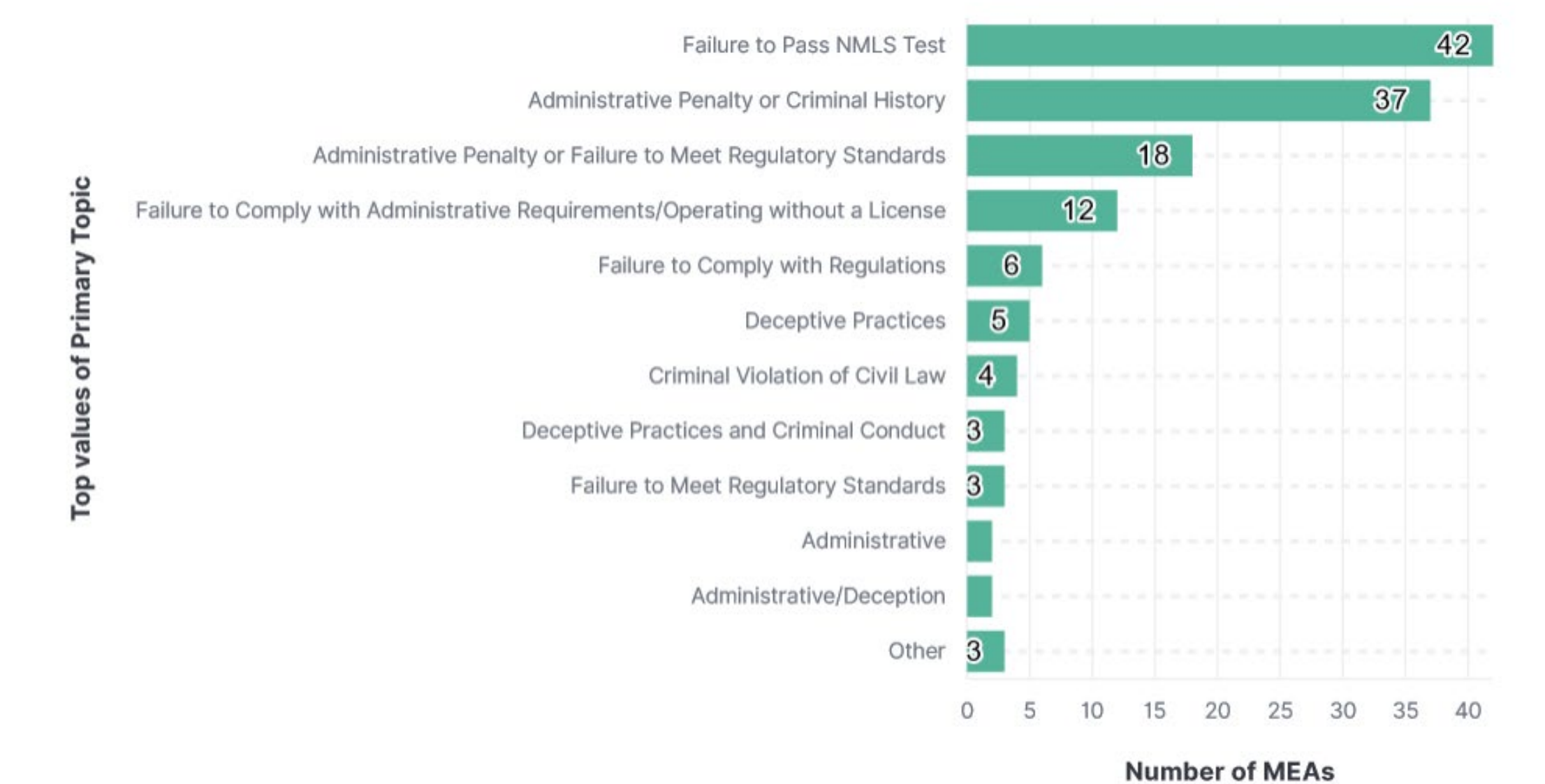


Figure 4: Types of Activities Regulated by MEAs in Massachusetts (2010)

References and Acknowledgements

Our team would like to thank Ms Pamela Prude-Smithers and her team in the Ohio Department of Commerce for being so accommodating with data requests and clarifications regarding data classification and labels, as well as specific legal terminology. We would also like to thank Mr Lee Reiners and Mr Joseph Smith Jr for setting up and maintaining this project for the past 3 summers, as well as the domain guidance provided. We would like to thank Malcolm for laying out the roadmap for the project, for providing much-needed technical advice and for clarifying the roles of data scientists and Kale Wright for her assistance in clarifying legislative details for Ohio and Massachusetts.

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- 2009 Chap. 0044. An Act Adopting The Federal Secure And Fair Enforcement For Mortgage Licensing Act Of 2008, 186th Massachusetts State Legislature. (2009).