A Better Approach to AI for Regulatory Compliance

Companies with regulatory compliance burdens are flocking to AI for time-savings and cost reductions. The money involved is staggering: Since 2013, “AI for healthcare” startups have raised $4.3 billion across 576 deals\(^1\) at an average of almost $7.5 million each. Meanwhile, the World Economic Forum expects financial institutions to invest $10 billion in AI by 2020.\(^2\)

The reasons for these investments? AI can help the healthcare system save $269 billion annually,\(^3\) according to McKinsey. AI will save the banking industry $1 trillion by 2030,\(^4\) says Bain & Company. And PwC predicts that AI could contribute $15.7 trillion\(^5\) to the global economy.

But these big numbers obscure an important point: **AI isn’t living up to the hype.** Costly failures of large-scale AI systems\(^6\) are making companies more wary of investing millions into big projects with vague promises of future returns. And every month brings new articles and think-pieces about bursting the AI hype bubble.

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\(^3\) [https://www.mckinsey.com/featured-insights/](https://www.mckinsey.com/featured-insights/)


AI FOR COMPLIANCE REQUIRES MORE THAN AI

The truth is that “artificial intelligence” is just a tool. It doesn’t really “do” anything on its own. What matters is how you combine AI with other technologies. In a field like regulatory compliance, for example, the challenges involved can vary wildly by industry and country. So, in order to address these problems, you need a combination of three technologies:

1. Semi-structured data parsing
2. Natural language processing (NLP)
3. Machine learning and AI

The complex structure of regulatory and legal documents means that each of these technologies will fall short if it’s not supported by the other two. But most off-the-shelf analytics tools use only one or two of the three, leaving valuable data behind or overlooking critical context.

Lexalytics, on the other hand, has developed all three into a comprehensive platform. We don’t “solve” entire industries. Instead, we build semi-custom applications that solve specific compliance challenges for our clients.

The rest of this paper will explain:

- Why many “AI for compliance” solutions fall short
- What you need to know to build an “AI for compliance”
- 3 real-world examples of effective AI for compliance
WHY AI OFTEN FALLS SHORT IN REGULATORY COMPLIANCE

Every organization is subject to some regulation. Healthcare providers, pharmaceutical companies and financial services firms face particularly heavy burdens. But despite massive investment and clear market opportunities, technology solutions for regulatory compliance are proving difficult to develop. Why?

In short: Because the complex structure of the documents involved means that traditional data analytics techniques aren't able to extract and understand all of the data that compliance professionals rely on.

Legal documents are full of both structured elements (such as tables and sub-headers) and unstructured elements (free-standing text sections, descriptive lists or commentary on information within tables). Two documents may share a format, such as a contract template. But the unstructured text sections are not standardized, and data may differ wildly even within the structured elements.
This distribution of data makes it very difficult to create a single piece of software that can automatically identify and extract everything of value. Most existing systems use one or two of three technologies:

1. **Semi-structured data parsing**
2. **Natural language processing**
3. **Machine learning and AI**

But the truth is that none of these can do the whole job on its own:

- **A commercial semi-structured data parser won’t understand the meaning of the text it extracts**
- **An open-source NLP engine won’t understand how structured elements fit in**
- **An AI trained on regulatory documents can choke when presented with new content to analyze**

To clarify this last point: AI relies on learning from examples. But regulatory compliance often deals with documents where the format changes but the information within remains consistent. In these cases, an AI system may stumble because the information it’s asked to process looks very different from the data it was trained on.
THE KEY TO BUILDING AN EFFECTIVE AI FOR REGULATORY COMPLIANCE

As we discussed earlier, large-scale AI systems that promise to replace humans are turning out to be unreliable or downright dangerous. The real opportunity here is to create technology solutions that help humans do their jobs better and faster by alleviating tedious, repetitive tasks.

To build an AI solution that actually helps humans with regulatory compliance tasks, you need to understand three points:

1. Regulatory compliance is very complex, but generally means confirming something: whether a particular document is compliant, or that your organization is properly tracking and adhering to shifting regulatory updates.

2. Legal, medical and financial documents have important information contained within both structured elements (tables and lists) and unstructured text.

3. Traditional data analytics techniques fall short in regulatory compliance because identifying and extracting all of the data from a legal document requires more than AI.
Lexalytics is one of a handful of companies who has both the technology stack and prior experience required here. Much like tailoring an off-the-rack suit, we use AI to customize our proven NLP platform to meet our clients’ unique requirements.

We don’t believe in replacing humans or “solving” an entire industry. Instead, we help our clients do their work better and faster. Recently, we’ve built AI applications to:

<table>
<thead>
<tr>
<th>Targeted AI Applications</th>
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<tbody>
<tr>
<td><strong>1</strong> Help medical coding teams keep up with monthly Medicaid updates by extracting, structuring, and inserting diagnostic and procedure codes into an EHR</td>
</tr>
<tr>
<td><strong>2</strong> Accelerate medical information offices by guiding support agents to the right answers</td>
</tr>
<tr>
<td><strong>3</strong> Reduce non-compliance risk by ensuring that financial advisors make required disclosures and appropriate recommendations</td>
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</table>

These solutions are interesting as unique use cases. But they also serve as good general demonstrations of how to approach the use of data analytics and AI in regulatory compliance.
CASE 1: Helping medical coding teams keep up with Medicaid updates

Healthcare organizations employ teams of professional medical coders (Glassdoor average salary of $37,000)\(^7\) to read monthly Medicaid updates and manually enter the new information into EHRs and other databases. These documents may be dozens of pages long and each state’s Medicaid system distributes its own unique guidelines.

The task is monumental and human coders struggle to keep up. NBC News found medical claim error rates ranging from 7\% to 75\%\(^8\). Medicaid has improved its 2010 error rate of 42\%,\(^9\) but they still lost $31.6 billion to coding errors in 2018, and more than $230 billion over the past 6 years.\(^10\)

In 2017, Medicaid sued UnitedHealth Group,\(^11\) alleging hundreds of millions of dollars in over-billing.

Fully-automated medical coding solutions face major hurdles and may never be viable. Instead, this field is a perfect example of where technology can help humans, not replace them, by easing workloads and reducing error rates.

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\(^7\) https://www.glassdoor.ca/Salaries/us-medical-coder-salary-SRCH_IL.0,2_IN1_KO3,16.htm?countryRedirect=true

\(^8\) https://www.nbcnews.com/business/consumer/its-time-get-second-opinion-paying-medical-bill-n545626


Building a complete “AI for medical coding” isn’t a viable plan

The processes and documents involved in medical coding create big hurdles for any AI system. As demonstrated in Figure 1, relevant diagnostic and procedural codes and updates are contained within a mix of structured elements (tables) and unstructured elements (plain text).

2.2.25 Total Parenteral Nutrition (TPN) Solutions

2.2.25.1 Services, Benefits, and Limitations for Clients Birth through 20 Years of Age

In-home TPN for clients who are birth through 20 years of age may be considered through CCP. Eligible clients may receive short-term or long-term nutritional support when oral or enteral intake are unable to maintain adequate nutrition. Covered services must be medically necessary and prescribed by the physician. Parenteral nutrition solutions, supplies and infusion pumps services may be reimbursed with the following procedure codes:

<table>
<thead>
<tr>
<th>PROCEDURE CODES</th>
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<tbody>
<tr>
<td><strong>Solution Procedure Codes</strong></td>
</tr>
<tr>
<td>B4164</td>
</tr>
<tr>
<td>B4197</td>
</tr>
<tr>
<td><strong>Supply Procedure Codes</strong></td>
</tr>
<tr>
<td>B4220</td>
</tr>
<tr>
<td><strong>Infusion Pump Procedure Codes</strong></td>
</tr>
<tr>
<td>B9004</td>
</tr>
</tbody>
</table>

Fig. 1 | Example of medical coding document with procedure codes and treatment guidelines

Just like a human coder, any AI system must identify and extract all of this information and then relate each data point to the others (which treatment code goes with which diagnosis codes).

In addition, any automated system must be able to identify footnotes and addendums that clarify special cases and exceptions, and then connect them to the related diagnostic or procedural codes.
AI helps healthcare orgs keep up with medical billing code updates

Rather than trying to train one giant AI model to solve all of these problems at once, Lexalytics selectively utilizes each of our core technologies to build a system that’s more reliable and customizable.

We never tried to build an AI system to “solve” medical coding. Instead, we built a tool to help human medical coders operate faster and more reliably, saving healthcare organizations time, money and headaches. Stakeholders use our solution to keep up with monthly code changes from Medicaid, extracting data and relevant special cases, and then updating corresponding codes in their EHR systems.

We use our **semi-structured data parser** to identify and extract data from structured elements; **natural language processing** to analyze the unstructured text; and **machine learning** to understand where special cases and exemptions relate to specific codes.

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**id** | **ACTION** | **CATEGORY NAME** | **CATEGORY CODES**
--- | --- | --- | ---
CPT_HCPS_Policy-MediCal_212.pdf | CODE ADDITIONS | Anesthesia | 00731, 00732, 00811, 00813, Code Range (00811, 00813)
CPT_HCPS_Policy-MediCal_212.pdf | CODE ADDITIONS | Audiology | L8625
CPT_HCPS_Policy-MediCal_212.pdf | CODE ADDITIONS | Chemotherapy | C9024, C9028, J9022, J9023, J9203
CPT_HCPS_Policy-MediCal_212.pdf | CODE ADDITIONS | DME | E0953, E0954
CPT_HCPS_Policy-MediCal_212.pdf | CODE ADDITIONS | Evaluation | G0515
CPT_HCPS_Policy-MediCal_212.pdf | CODE ADDITIONS | Injections | 90756
CPT_HCPS_Policy-MediCal_212.pdf | CODE ADDITIONS | Medicine | J0604, J7345, 93793, 94617, 94618, 96573, 96574

**Fig. 2** | Sample output of the Lexalytics Medicaid coding solution (created for this example)

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Our take on “AI for medical coding” can:

1. **Extract procedural and diagnostic codes**
2. **Relate them to the notes and addendums connected to each**
3. **Insert this structured data into an Electronic Health Records system or other database**
CASE 2: Helping Medical Information Offices answer patient questions faster and more reliably

Medical Information Offices (MIO) are responsible for setting up a system to field and respond to patient questions about drugs, both during testing and after release. Given that people's lives may be at stake, it's imperative that every question be answered in a consistent and correct manner each time it's asked.

To ensure compliance, MIOs draw up detailed Frequently Asked Questions (FAQ) files. Patient questions are routed to a call center, sometimes outsourced, where agents reference the FAQ to answer each question. But the complexity of these FAQs means that each agent can take many minutes to answer a single question, even when the same question gets asked many times a day. In one of our data sets, 80% of drug-related medical information questions relate to just 20% of the FAQ.

Building an artificial intelligence to directly answer patient questions would be a herculean task, even without the threat of lawsuits when it got things wrong. Instead, AI can support medical information offices by helping human agents answer questions faster and more reliably.
Our semi-custom application is built on the Lexalytics Intelligence Platform and leverages AI trained with our Pharmaceutical Industry Pack. Our system can immediately understand what conditions, drugs, ailments or issues a customer is calling about and deliver a correct response for the operator, all during the call.

For example, a patient might call in asking,

“How much of this painkiller should I take? I’m a 180-pound guy.”

Our system can tear this down to understand that the question relates to dosage of a painkiller for an adult male. Based on this analysis, we can immediately direct the human agent to the proper answer. (Note: this is a made-up example to illustrate how and where the system works.)

Our AI helps medical information offices save thousands of people-hours and dollars, all while reducing non-compliance risk. And while this system was developed for a call-center environment, it also shows great promise for use at all patient touchpoints, including emails, social media comments, chatbots or even a physician’s desk notes.
CASE 3: Reducing risk of disclosure non-compliance for financial services firms

Financial services firms must demonstrate that their employees are working in their clients’ best interests. This imperative can include a number of disclosure requirements:

<table>
<thead>
<tr>
<th>Conflict of interest</th>
<th>Cost of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commission structure</td>
<td>Own-product recommendations</td>
</tr>
</tbody>
</table>

Each disclosure, in turn, may contain a dozen or more sub-components. This adds up to a major burden for the service provider. On average, financial firms dedicate 10-15% of their workforce and spend a combined $270 billion on regulatory compliance annually.

### COMPLIANCE SPENDING IN FINANCIAL SERVICES

- $270 billion industry spending on compliance
- 94% increase in compliance costs from 2011-17
- 10-15% of workforce dedicated to governance, risk management and compliance
- Average 10% of revenue spent on compliance by 2022

### THE COSTS OF NON-COMPLIANCE

- 45x increase in regulatory fines and settlements from 2009-14
- Up to $19.1 million lost revenue
- $1.1 million to $20.4 million business disruption
- Average $3.7 million in productivity loss

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To improve compliance, many firms build a library of template documents with all of the proper disclosures and legal language. Each advisor or broker then modifies the appropriate template on a client-by-client basis. But an average-size financial services firm may produce thousands of pages of client-facing documents every week. In the process, important disclosures may be accidentally modified or removed entirely.

Many firms rely on spot-checks and keyword searches to confirm compliance. But looking for individual keywords may return hundreds of irrelevant matches littered through a document. On the other hand, searching for whole phrases may miss where a disclosure has been truncated or deleted.

The cost of failure is high. GlobalScape estimates that non-compliance can cost a firm up to $39.22 million in lost revenue, business disruption, productivity loss and penalties. McKinsey found a 45x increase in regulatory fines and settlements over 5 years, a trend that’s continuing upwards.

**Using AI to review more documents more quickly**

Rather than trying to build an end-to-end, failure-prone “AI for disclosure compliance,” Lexalytics focused on improving existing processes. Our system empowers financial auditors to review all of their documents almost simultaneously, instead of spot-checking a handful. This substantially reduces non-compliance risk for financial services firms and banks.
We combine our semi-structured data parser with text analytics to quickly analyze long financial documents and extract all of the data, wherever it’s located: legal disclosures, asset allocation tables, statements of advice, client roles, and more. Then, our natural language processing algorithms parse the underlying structure and meaning of the information. This enables us to make complex connections between data points wherever they appear in the document.

Finally, we use artificial intelligence to structure this data and prepare it for further analysis. The nature of this analysis can vary based on your goals and existing technology stack. For example, we can export this data into an Excel spreadsheet. Or, as in Figure 3 below, we can just give you a simple text file.

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**Fig. 3** | *Using Lexalytics to flag where a recommendation goes against the client’s objectives*

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In this example (mocked up for demonstration purposes), the output of our application shows at a glance whether proper disclosures were made, highlights own-product recommendations, and flags suspected cases of predatory lending techniques for further review.
SUMMARY

Regulatory compliance is a complicated area that varies wildly from industry to industry and country to country. The nature of the documents involved means that to build an “AI for regulatory compliance,” you need more than just AI. In fact, you need a combination of:

- Semi-structured data parsing
- Natural language processing (NLP)
- Machine learning and AI

Despite massive investment, many “AI for compliance” tools fall short because a useful regulatory compliance solution requires all three of these technologies, not just one or two.

Lexalytics combines the necessary technology stack with an experienced professional services staff to build semi-custom applications that solve specific regulatory compliance problems in healthcare, biotechnology, financial services and pharmaceuticals.

Contact us online to discuss our approach, or to schedule a consultation for your own regulatory compliance use case.