MATH & PENCIL

SOFTWARE CONSULTANCY
MATHEMATICIANS
PROGRAMMERS
DATA SCIENTISTS
NATURAL WINE + BEER ENTHUSIASTS

CASE STUDY #4
AUTOMATED UNDERWRITING OF
CATASTROPHE INSURANCE

Our client is an insurance company. We'll call them ACME Insurance. They specialize in a specific type of insurance called catastrophe insurance (hurricanes, earthquakes, etc).

Before we get to our solution for ACME let's look at how this industry traditionally works:

My name is Joe. I'm the lucky new owner of a condo in South Beach, FL and legally need to buy hurricane insurance for my condo. I sit down with one of my local brokers Ted and he takes down a lot of information; what my condo is made out of, how close it is to the ocean, the nearest fire hydrant, etc. (there are hundreds of parameters). They also send an inspector to my condo to gather additional information about the structure and contents. Once all of that information has been obtained, the broker sends the data to a number of competing insurance companies for quotes… here is where the "fun" begins.

My name is Bill and I work at an insurance company. On Monday morning I wake up and go to work and see 500 unopened emails in my inbox. The 9th email in the list happens to be from Ted. At around 2PM, I finally get to Ted's email. I download all the attachments and look for any useful info in the body (many times I have to read long chains from previous correspondences). I open up PDFs from the inspection as well as the building data from an excel spreadsheet. Ted even attached some useful pictures of the shore line taken from a drone.

After spending the better part of an hour trying to make sense of this data, and loading it to my legacy system (via copy-and-paste), I can start to determine the price. I remember I need to email Jane on the CAT team with a CSV of the data (that I created manually also using copy-and-paste) to have the risk modeled. I realized there is a lot of missing required data so I send all of Ted's data to my colleague Ashish in India. Ashish works overnight to append any missing data while reviewing the submission. Ted's quote will have to wait one more day.

I arrive at work the next day with the email from Ashish with the corrected data. I also have an email from Jane with the CAT results. I manually enter those into my legacy system (via copy-and-paste). I also cut-and-paste some of the numbers into an excel spreadsheet that contains

my non-CAT models. When all of the prices have been calculated I open up a word doc template of the quote, copy-and-paste all the relevant data into the doc, convert it to a nice PDF, and send it to Ted. If Ted accepts my price, I have to go through a similar process to generate a legal agreement (PDF) called a binder. Ted's client Joe is now insured for the next year. I can now finally move onto the next email.

That is the legacy methodology.

THE MATH & PENCIL SOLUTION

ACME insurance hired Math & Pencil because they realized the legacy method described above is incredibly inefficient. Over a period of 24 months, we built an almost completely automated underwriting system which is data-centric, fully scalable, and fully auditable. The system is built and hosted on Amazon EC2 using the latest web technologies (Python, React, etc.) and utilizes a number of advanced machine learning techniques. Our system is used every day by underwriters like Bill except it makes his job vastly easier and more accurate (and probably more enjoyable, too. I mean we don't really know Bill so, we're speculating - maybe he really wants to be a landscaper or a musician - either way, we're pretty confident saving all those copy-and-paste clicks improves job satisfaction and overall sanity). We do definitively know this new system makes the insurance company a lot more money.

HOW THE SOLUTION WORKS

At this point Bill has quit working for the traditional firm and is now working at ACME. Now when Ted's email arrives in Bill's inbox an algorithm downloads the email and corresponding attachments within milliseconds. First, the algorithm strips the attachments and reads the email's body. It uses NLP algorithms (and some other statistics) to identify, tag, and extract the relevant data in the body of the email and saves it into a database (Postgres). It goes through each of the email attachments and classifies the type of file. Different file types are sent to specific parsing algorithms (for Word, Excel, PDF) for more data extraction. After the initial phase is completed, the system uses a series of third-party APIs as well as open-source data

sets (Census) to augment the original data. After the data acquisition is complete, the system uses past underwriter actions and machine learning to predict if the insurance company will take this risk. It then sends all the data automatically to India to be checked one final time.

When Bill arrives to work he logs into the system and looks at a dashboard with all of the submissions ready to quote. He uses the advanced grid technology we built to sort, filter, and search through this data instantaneously to find which submissions he needs to process immediately. With a click of a few buttons, Bill sends the data to be CAT modeled via an API (Jane's job is not needed at ACME). As the modeling is taking place, Bill receives push notifications of the progress while he continues to look at more submissions and data. Finally, when Bill is ready to make a quote he clicks a button and our system generates a beautiful client ready PDF created using Latex and Django templating. An email with the PDF is sent back to the client through our system as Bill is on his way to lunch.

Before working with Math & Pencil underwriters like Bill would be able to process 5-10 submissions on a good day. Today, Bill processes 50-100 a day. ACME can process a lot more submissions with the same number of people because algorithms are doing most of the heavy lifting. That seismic shift in operating methodology is equating to vastly improved profitability for ACME.