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Enabling Stronger, Safer Borders with AI-powered Screening by Babel Street Match

A major border security agency processes hundreds of thousands of international travelers daily. It wanted to replace a decades-old name screening system that used traditional name matching methods with more accurate and scalable technology that would better facilitate the passage of legitimate travelers while keeping out bad actors. The agency was also committed to strengthening its borders with newer technology and algorithms to stay ahead of its many challenges.

The challenge

As the number of watchlists and travelers increased, the existing name matching system was unable to keep up. The large number of false positive hits to watchlists created longer queues at the border and burdened border agents with more secondary screenings than necessary. In addition, the many false positives caused agents to mistrust the system and pass people through when the queues were too long.

In the new system, the agency sought to significantly improve three areas:

- **Accuracy** to reduce the number of false positives

- **Faster** screening to improve travelers' experience at the border

- **Adaptability** of the system to be easily maintained and adjusted to future needs

Accuracy

In the current state, the agency had a "match rate" of 15%, meaning an average of 15 of every 100 passengers would be flagged as a watchlist match that required secondary screening. However, fewer than one in every 100 passengers is a true positive — that is, a person actually appearing on a watchlist. Furthermore, while the system was generating false positives, it was also missing true positives and false negatives that might pose a real threat.

Speed

To match names, the old system used a complex set of rules to generate "all possible" variations of watchlist names (such as Sindy, Cindy, Cyndi, Cyndy) — which meant long screening times for very long names — further lengthening lines at the border. More than 70% of arrivals to this country have names of non-European origin. Using a rules-based system,

names with four to six components (particularly common among Arabic and Sri Lankan names) could create thousands of variations for a single name. Names with many initials — frequently coinciding with long names — also took significant computer resources to screen quickly.

Adaptability

Rules are easy to add and change, but a change to one rule might inadvertently affect another rule and alter how other names were matched in unexpected ways. Yet, it was a natural expectation that as watchlist data changed or policies changed, the system needed to adapt to different types of name variations or match more stringently or loosely as required.

The solution

As an initial target, the agency sought to cut the match rate to around 6%. However, at the same time it could not afford to reduce security through missed matches.

The agency conducted a thorough comparison of its legacy matching technology against other options on the market. After multiple head-to-head evaluations and proofs of concept over four years, it chose AI-enabled Babel Street Match. Just a few years earlier, Match had been adopted by U.S. Customs and Border Protection to strengthen its screening system.[1]

Match immediately delivered greater accuracy out-of-the-box through:

- Built-in human knowledge of names: how they vary and their linguistic and cultural context in more than two dozen languages, including nicknames, gender, and titles/honorifics

- Consideration of more than 15 types of name variations — such as initials, phonetic similarity, transliteration variations, truncated names and cross-lingual name matching — through a coordinated set of algorithms including explainable AI

- A patented two-pass approach that balances speed with accuracy

Match's broad range of flexible configurations enabled the agency to optimize screening performance with current watchlists. Babel Street Match's user-friendly administrative interface transparently shows the factors that contribute to the intuitive match confidence score (from 0 to 100%) for each pair of names. With this information, non-technical subject matter experts and border agents can understand how scores are calculated and compare how different sets of configurations affect match scores in real time.
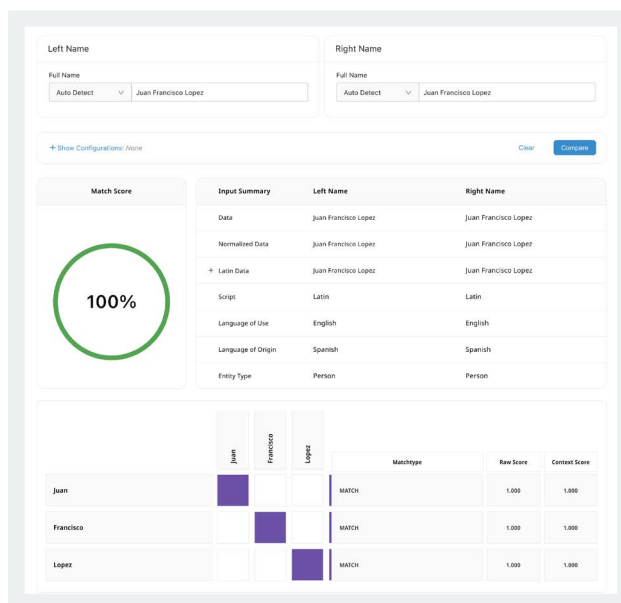

Figure 1: Screenshot of the explainable AI and match calculations shown through Babel Street Match's administrative interface

For seven months, Babel Street professional services experts worked closely with the agency and border agents to carefully test configurations and adjust the product's matching behavior to fit the types of matching issues within the names, dates, and nationalities found in the agency's databases. For example, the match score threshold from a "noisy" watchlist could be raised higher to filter out more false positives without increasing false negatives, whereas the threshold for matches from a "cleaner" watchlist could be lower to reduce false positives.

The customer-centric Babel Street approach led to product enhancements in Match's date matching functionality to replicate the intuition of border agents, thus ensuring that matches shown to agents were the ones that really required human review.

With Match's powerful tuning mechanisms, the agency had a name screening solution that could be continuously monitored and adjusted as watchlist data and priorities evolved.

The impact

Babel Street Match has been deployed and operating satisfactorily since 2024 at the agency's hundreds of border checkpoints.

Significantly, although the agency had initially wished to reduce the match rate to 6%, they ultimately chose a configuration that produced a match rate of 7%. Why? At that level, matches were close enough that border agents felt that a human should be reviewing them. An unexpected bonus was that Babel Street Match only needed approximately 30% of the hardware that had been previously required for the legacy system.

During tuning, the team also discovered that Match was catching matches missed by the older system involving people with common names, thus increasing the number of bad actors caught.

Today the agency has Babel Street Match in use at e-gates in the country's border checkpoints and airports, as well as for screening applicants to its trusted traveler programs.

Less than a year after deployment, the agency reported members of the public with common names such as "John Smith," have written in to congratulate the border security agency on what they've done to improve their systems. In the past, people with common names would often be flagged for secondary screening and were unable to use the faster e-gates.

The agency recorded these return on investment benefits:

- Reduced time at e-gates and an increase in the number of people now able to use them

- Reduced secondary screening thereby freeing up border staff

- Savings in hardware and staffing

- Future-proofed name matching through explainable matches and flexible configurations that can be tested through the administrative interface

The agency recently tested Match against lists of criminal offenders and saw a reduction in false positives from 80,000 down to just 100!

At the end of the deployment and configuration of Babel Street Match, the agency's major stakeholder declared that "name matching is not our biggest problem anymore."

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