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# Passenger Arrival Estimator and Dynamic Workforce Planner for Airport Security Screening Checkpoints

Background

In the United States, the traveling public must undergo various screening procedures with the intent of ensuring that no dangerous or prohibited items are carried into the public transportation system. Such screening is typically conducted by the Transportation Security Administration (TSA), which is an agency of the U.S. Department of Homeland Security with authority over the security of the traveling public in the United States. While all modes of public transport fall within their scope of authority, the TSA is chiefly concerned with air travel, employing screening officers in airports, armed Federal Air Marshals on planes, as well as mobile teams of dog handlers and explosives specialists.

Notwithstanding the various systems utilized to process passengers, the sheer number of individuals traveling through airport checkpoints continues to stress the system, leading to slowdowns, inefficiencies, and potential security risks. Improved systems are needed to provide insights into security screening processing times, predictive system throughput, actionable operational policies, data, and recommendations. Unfortunately, present systems lack the ability to provide useful predictive analytics in an intuitively understood presentation. Transportation security screeners around the world, and especially domestic TSA security screeners are therefore likely to benefit from the systems, methods, and apparatuses for evaluating wait times and queue lengths at screening zones via a deterministic decision support algorithm.

Invention Description

Researchers at Arizona State University have developed a passenger arrival estimator to minimize passenger queue lengths and wait times. This innovation integrates data from multiple sources, performs algebraic, statistical and artificial intelligence procedures on that data, and then combines those results to obtain more accurate predictions of passenger arrivals at security screening checkpoints (SSCPs). Input sources include federal aviation documents such as the T-100 report and a commercial program (OAG) containing flight schedules. The analysis includes a logic-based mechanistic modeling approach to first estimate base passenger arrival numbers. Machine learning is then applied to adjust the estimates based on historical data for day of week, week of year, and time of day.

Finally, the estimates are combined with a time-series analysis model built on historical data. Those forecasts are then combined with data on the number of available security officers per time interval in order to better manage Travel Document Checker (TDC) and Baggage Screening lanes. Tests on actual data demonstrate that the integrated ensemble method reduces estimation error. The integrated system provides operational recommendations on the number of TDCs and screening lanes needed at any given time in order to achieved a desired quality of service (e.g., no more than 10-min wait times). These configurations are then translated into staffing needs and workforce allocation decisions.

Potential Applications

- Airport security checkpoints
- Queueing optimization
- Passenger volume forecasting
- Workforce allocation

Related Publication:

Demand prediction and dynamic workforce allocation to improve airport screening operations

Faculty Profile of Professor Jorge Sefair

Faculty Profile of Professor Ronald Askin