

DHS SCIENCE AND TECHNOLOGY

Prize Competitions for R&D

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So What, Who Cares

The DHS S&T/TSA Passenger Screening Algorithm Challenge was a successful R&D effort under Apex Screening at Speed

- Prize competitions engage “outsiders” to solve problems
- Prize competitions complement industrial R&D
- Prize competitions can be agile and cost-effective
- Care must be taken when setting up the competition to:
 - Attract maximum diversity of talent
 - Give entrants everything they need for success
 - Align competition outputs to operational requirements
 - Understand next steps



Prize Competition Setup

- Prize money must demonstrate return on investment to potential entrants
- Value to entrants > Cost to generate a credible entry
 - More than just Prize x P_{WIN}
- Hardware is tough, ref: X-prize
- Data must be easily accessed and understood
 - Sensitivity
 - Privacy
 - Data formats
 - Data size



Example (non-DHS) hardware competition:
SpaceShipOne awarded
\$10M X-prize in 2004
Competition launched in 1995

[wikipedia](#) user [Renegadeaven](#), [SpaceShipOne test pilot Mike Melvill after the launch in pursuit of the Ansari X Prize on September 29, 2004](#), [CC BY-SA 3.0](#)

Passenger Screening Algorithm Challenge Competition Feedback

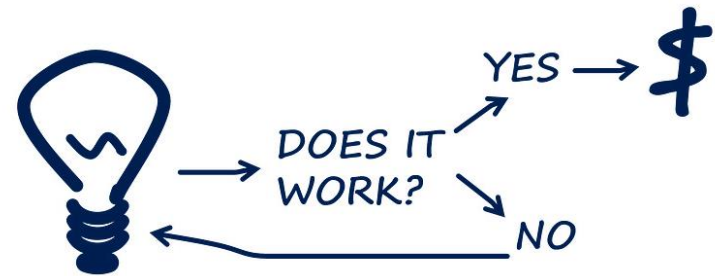
- Large and diverse number of participants
 - 11,510 entrants
 - 508 submissions for Round 1
 - 149 submissions for Round 2
- Competition algorithm performance exceeded team's optimistic expectations
 - Six months from announcement to scoring
- Problem scope was larger than anticipated
 - Segmentation was as challenging as detection
 - Algorithm performance may inform future hardware design



Illustration showing successful detection with improper segmentation

Lessons Learned

- Compelling data set attracted entrants from similar fields
- Feedback to participants
 - Real-time leaderboard
 - Low-cost avenue to “fail fast” or “succeed fast”
 - Demonstrate value beyond the prize purse
 - Potential follow-on work
 - “Feel good” problems with impact
- Clear boundaries on data exploitation
- Confidence-based predictions empower TSA’s Risk-Based Screening goal
 - Straightforward path to full receiver operating curve¹



¹ Swets, J. A., Tanner, W. P., Jr., & Birdsall, T. G. (1961). Decision Processes in Perception. *Psychological Review*, 68(5), 301-340, 301-340.

Questions?



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