

# **Facial Analysis for Real-Time Profiling**

# Summary

The main aim is that this project will provide a decision aid to Border Control Agencies in the form of a real-time dynamic passive profiling technique, which has the potential to improve hit rates; i.e. to improve targeting the people with malicious intent. The dynamic passive profiling will be compared to a baseline model, both of which are based on the response to a series of questions. The multi-modal facial analysis will provide additional information to the current profiling and the developed techniques will have a wider remit into other domains. It is envisioned that this will be easily integrated into the current process.

# Team

- UK Border Agency
  - Andy Cole & Richard Tomsett
- QinetiQ
  - Vicky Doherty, Stephanie Appleyard & Gemma Huddy
- University of Bradford
  - Hassan Ugail & PostDoc (Advertised)
- Aberystwyth University
  - Reyer Zwiggelaar & Bashar Al-Rjoub

# Research Challenges

- Real-time facial modelling
- Identifying behaviours which can be linked to malicious intent – the baseline
- Development of various facial models related to intent
- Combination of facial models: thermal, visual and hyper-spectral
- Dealing with visual and thermal noise aspects
- Buy-in from stakeholders for the evaluation

# WP 1 – 3 (out of 9)

- WP 1 - Literature review
  - Month 1-8
  - All involved
- WP 2 - Establish baseline for visual and thermal face/eye imaging
  - Month 1-24
  - All involved
- WP 3 - Face/eye models
  - Month 7-18
  - Bradford & Aberystwyth

# Rare Events Modelling

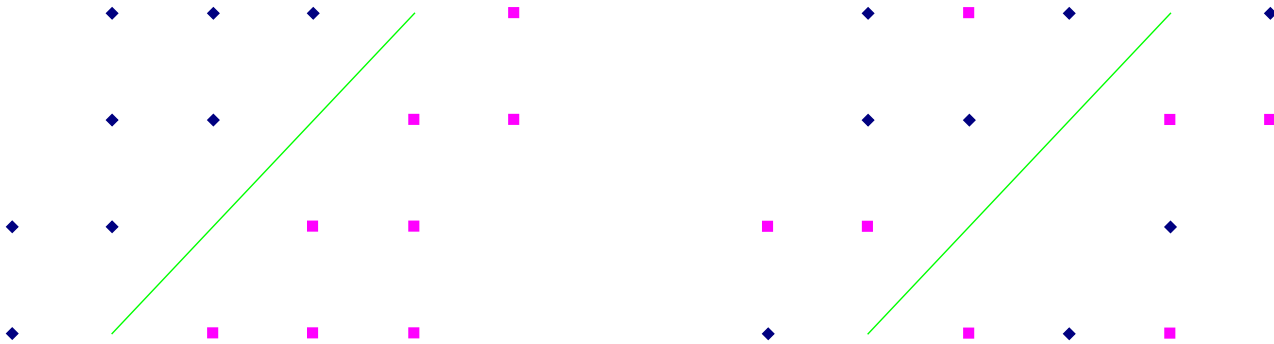
- Pattern recognition system
  - A set of features
  - Baseline
  - Statistical modelling
  - Testing and evaluation

# Rare Events Modelling

- A set of features
  - Thermal face characteristics
    - Distribution/size of regions
    - Distribution/morphology of blood vessels
  - Visible face characteristics
    - Size of pupils
    - (Micro-)Facial expressions

# Rare Events Modelling

- A set of features
  - Good versus bad features



# Rare Events Modelling

- Baseline
  - Linked to behaviour
  - Series of questions and responses
  - Normality versus deceit
    - Or only normality



# Rare Events Modelling

- Statistical modelling
  - Appearance of features modelling
    - Combined or on their own
    - Feature selection or dimensionality reduction
  - Training versus test data
  - Temporal changes
  - Classification using developed models
  - Normality versus outlier detection

# Rare Events Modelling

- Testing and evaluation
  - ROC and FROC analysis
    - Effect of False Positives
  - Operational evaluation
    - The cost of incorrect classification

# Potential Challenges

- Image resolution
- Baseline
- Real-time tracking
- Operational evaluation
- Can effects be hidden
- Will effects be significant

# Summary

- Baseline – QinetiQ
- Thermal Information – Aberystwyth
- Face/Eye modelling – Bradford
- Face tracking – Bradford
- Dynamic modelling – Aberystwyth
- Operational evaluation - All