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TABULA RASA

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Spoofing countermeasures for speaker verification systems

Speech and Audio Processing Research Group
Supervisor: Nick EVANS

Spoofing: threat for biometric systems

- **Spoofing**: presentation of a falsified trait to the sensor of a biometric system to provoke **illegitimate acceptance**.

- **EU FP7 Tabula Rasa Project**:
  - 2D Face,
  - 3D Face,
  - Fingerprint,
  - **Voice**,
  - Gait, …

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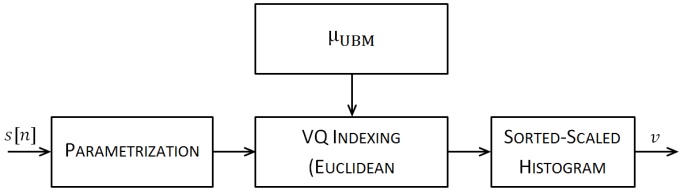
SEVENTH FRAMEWORK PROGRAMME

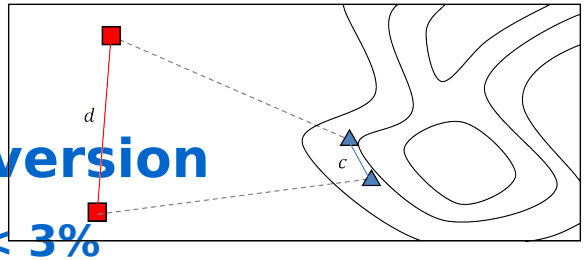
- Spoofing for Voice:
  - Systems: 6 different including one state-of-the-art
  - Attacks: replay, synthesis, voice conversion, artificial signals
  - False acceptance increases from 5% to 50-90%

Spoofing Countermeasures

- **higher-level features**

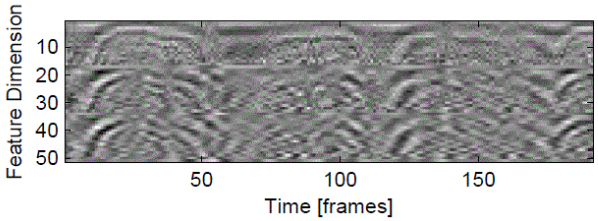


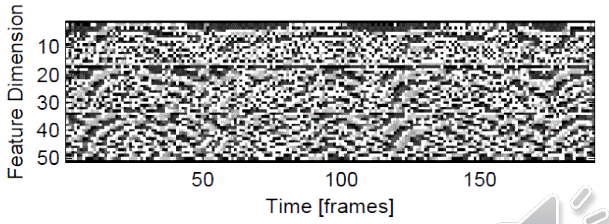
- **speech quality assessment**



- **pair-wise distances against voice conversion**
  - **False acceptance decreases from 90% to < 3%**

- **Local Binary Patterns (LBP)**
  - one-dimensional
  - two-dimensional





- **fusion**

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Linguistic normalization for speaker diarization and recognition

Speech and Audio Processing Research Group
Supervisor: Nick EVANS

What is Speaker Diarization?

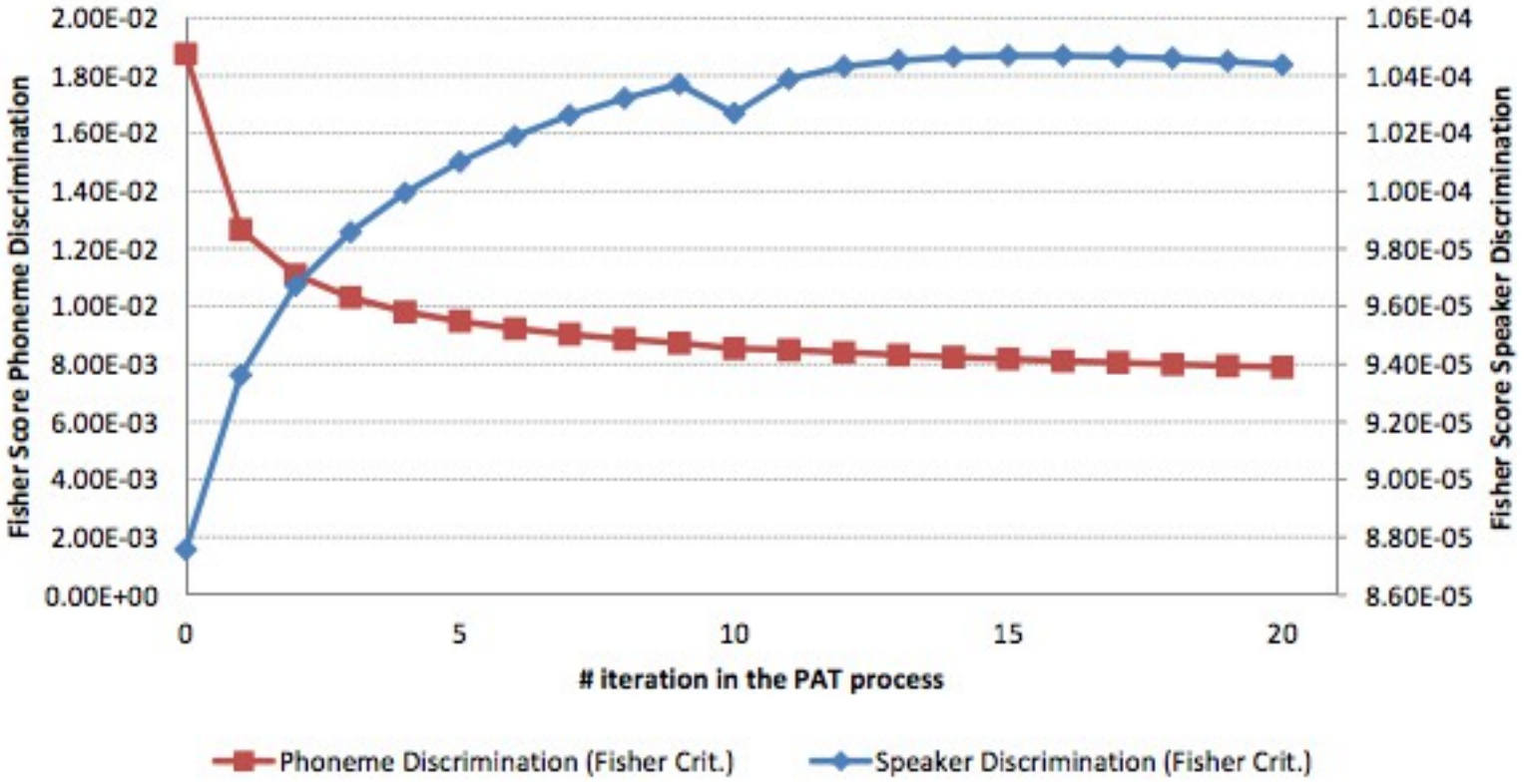
- who (S) spoke when (G)?

$$\left(\tilde{S}, \tilde{G}\right) = \arg\max_{S,G} \mathrm{P}(S, G|O)$$

- acoustic observations, *O*
- **unwanted linguistic variation**

PAT: Phone adaptive training

PAT maximizes the inter-speaker variation while minimizing the intra-speaker variation



Leela Krishna GUDUPUDI
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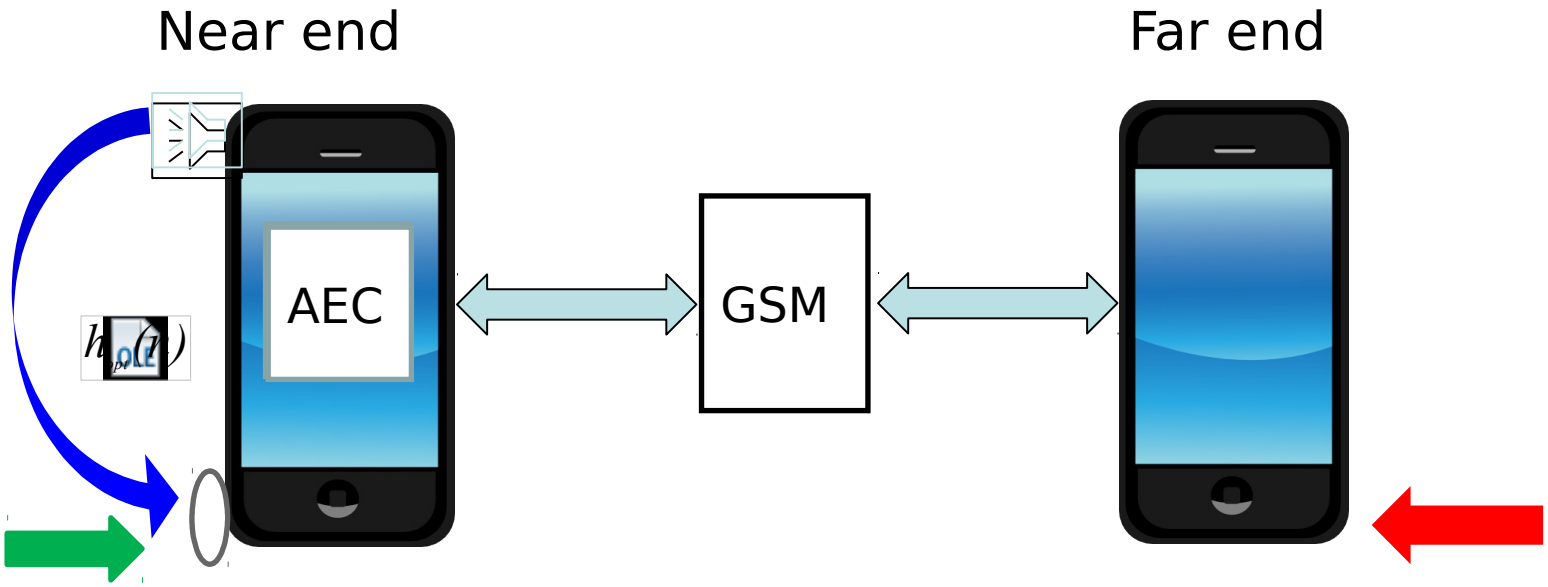
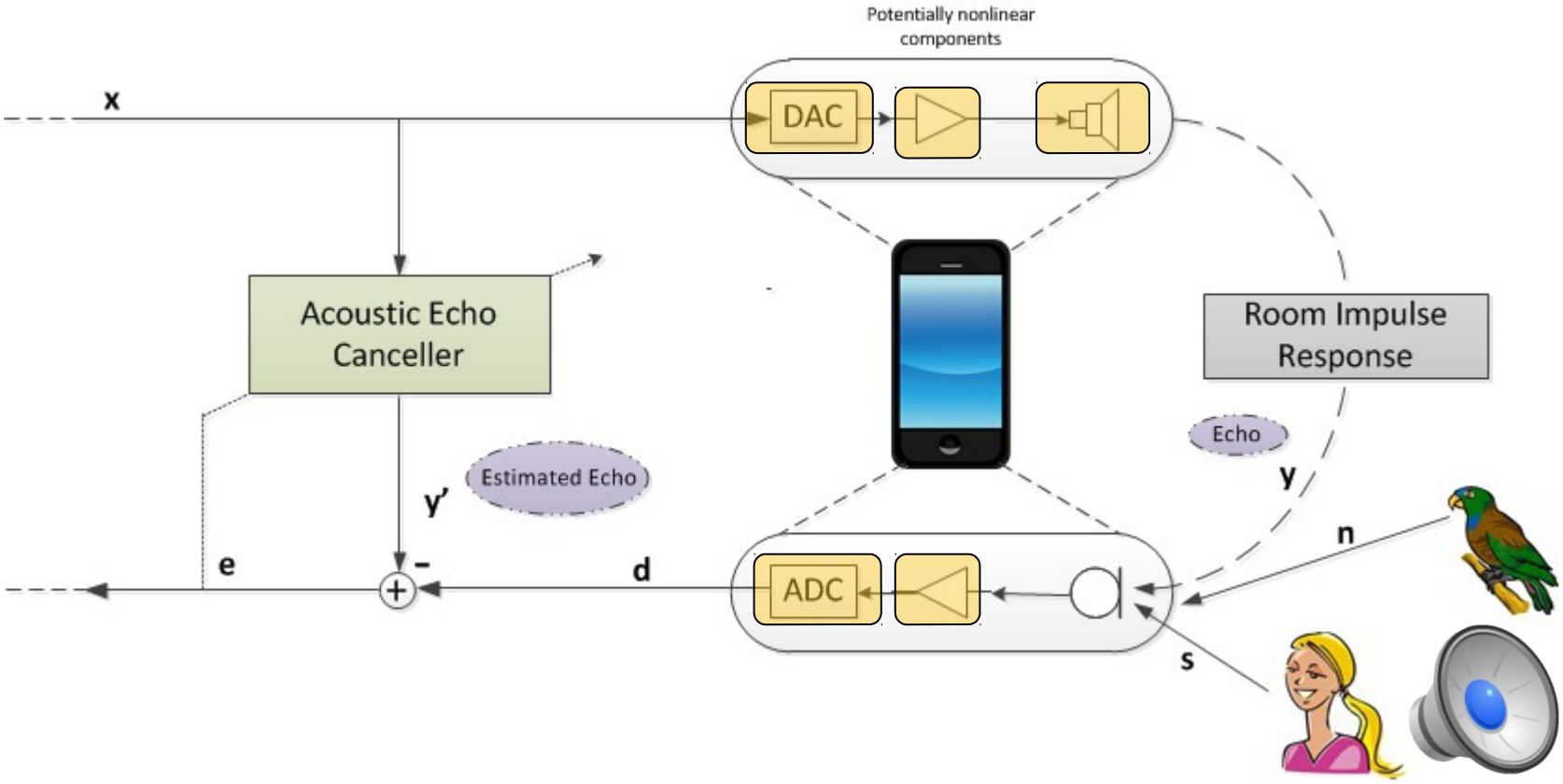
Nonlinear Acoustic Echo Cancellation

Speech and Audio Processing Research Group
Supervisor: Nick EVANS

The echo reduction approach



Non-linearities



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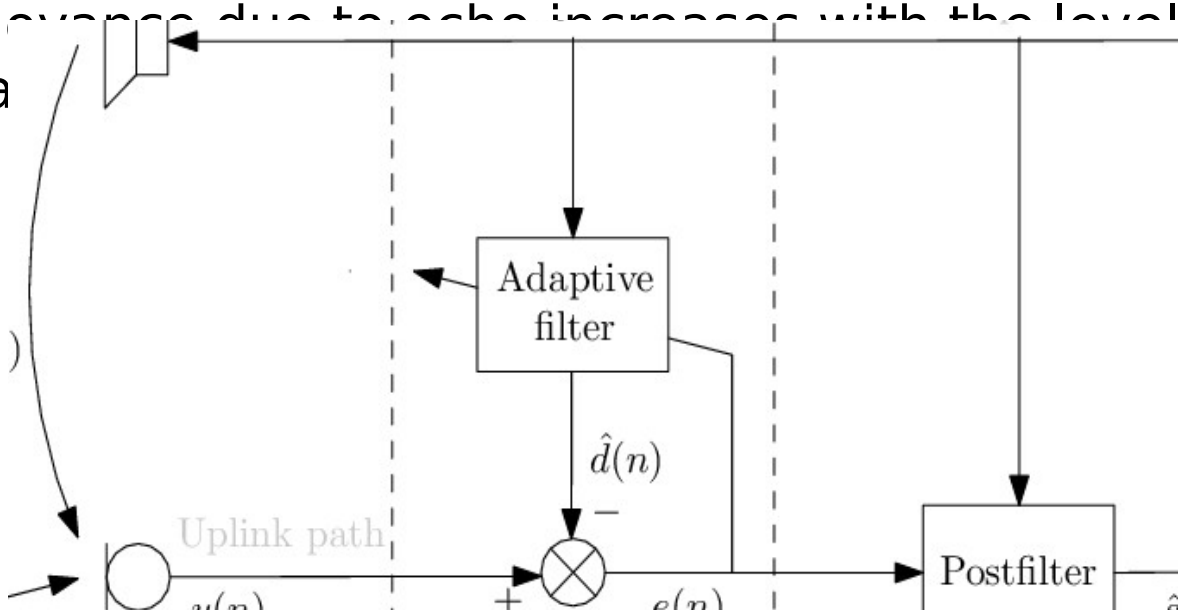
Acoustic echo processing for dual-microphone mobile terminals

Speech and Audio Processing Research Group
Supervisor: Nick EVANS

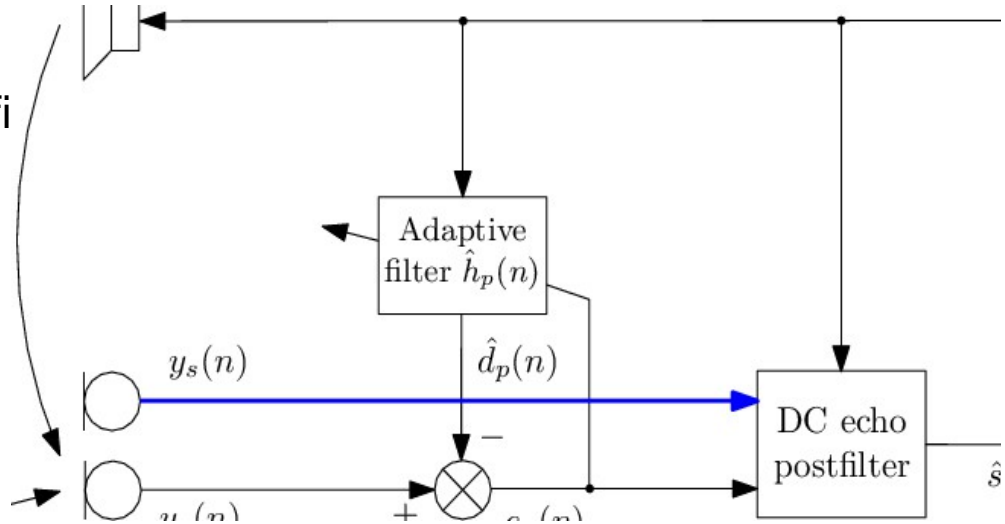
Acoustic echo and its control

- **Acoustic echo:** coupling between loudspeaker and microphone
  - Far-end speaker might hear his own voice
  - Annoyance due to echo increases with the level and the dela



Dual microphone echo control

- Some mobile devices are equipped with two microphone i.e. *iPhone 4*, *Google Nexus One*
- **Novel approach to echo processing for dual-microphone devices**
  - Echo
    postfi



followed by echo

- echo control approach outperforms single-

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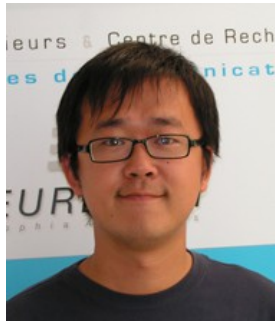

Xuran ZHAO
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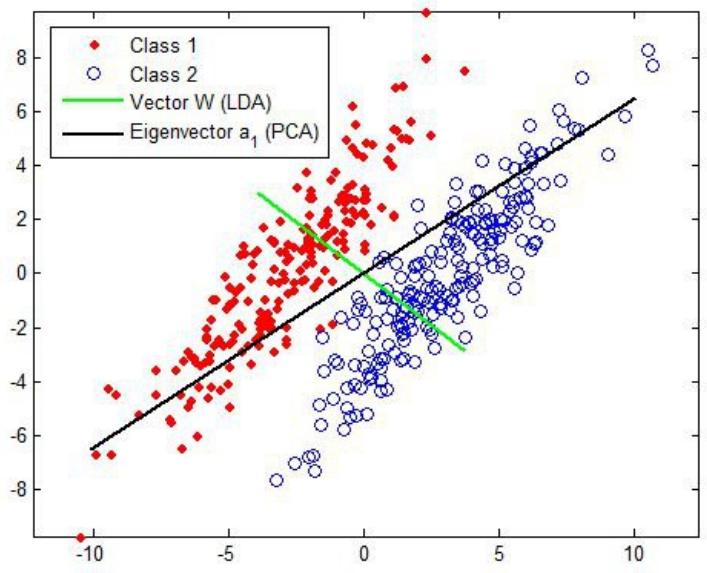
Multi-view Dimensionality Reduction for Multi-modal biometrics

Speech and Audio Processing Research Group
Multimedia Image Processing Group
Supervisors: Nick EVANS and Jean-Luc DUGELAY

Dimensionality Reduction in Biometrics

- **Dimensionality reduction (DR) is often performed on biometric data in order to extract discriminative features;**



- **Single-view DR methods:**
  - **Supervised (LDA, etc.)**
    - **high discriminative power**
    - **need large labeled training set**
  - **Unsupervised (PCA, etc.)**
    - **low discriminative power**
    - **need only unlabeled data**

- **Approaches to multi-view DR model correlation which is not necessarily**

MVDR for Multi-modal Biometrics

- **Bio-model, paired features (Voice and Face for example)**
- **Multi-view Dimensionality Reduction (MVDR)**
  - **sub-space data structure agreement**
  - **need small amount or no labeled data**
  - **high discriminative power**
- **EURECOM algorithms outperform the state-of-the-art**