**Introduction**
- Noise level variability can shift the i-vectors to different regions of the i-vector space, and i-vectors with similar SNRs tend to cluster together.
- This phenomenon limits the capability of SNR-invariant PLDA with a single speaker subspace.
- This paper proposes a new SNR-invariant PLDA model by introducing multiple speaker subspaces to the SNR-invariant PLDA model.
- Experiments on NIST 2012 SRE demonstrate the effectiveness of the proposed method compared with PLDA and SNR-invariant PLDA.

**Background**

**Conventional PLDA:** \( x_i = m + V h_i + e_i \)

Pool i-vectors from various background noise levels to train a PLDA model.

**SNR-invariant PLDA:** \( x_i = m + V h_i + Uw_i + e_i \)

I-vectors within the same SNR group share the same SNR factor \( w_i \), the model is trained using the pooled data.

**SNR Subgroups:**

The training set is divided into multiple SNR subgroups according to the highest posterior probability with respect to a GMM trained using the SNRs of the training utterances.

**Proposed Method**

Assuming that speaker variability within a narrow range of SNR occurs in a unique speaker-subspace, multiple speaker subspaces are introduced.

**Likelihood Ratio Scores:**

\[
\begin{align*}
\delta_i &= \text{arg max } (\text{Group } | s) \\
\theta &\sim \text{N} (m_i, V_i, U_i, \Sigma)
\end{align*}
\]

**Results**

- Table 1: Performance of PLDA, S-PLDA and Proposed multi-speaker subspace PLDA on CCC

**References:**