Final study of a master's thesis

Software Engineer

Signal processing/Machine learning/Acoustic engineering /Optimization problems/Blind Source Separation/Auditory Scene Analysis

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Mechanical System Design Engineering
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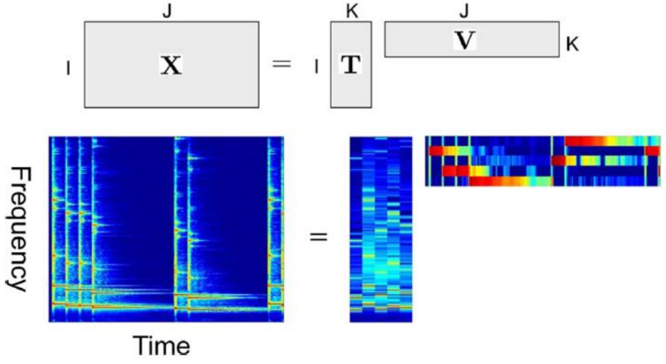
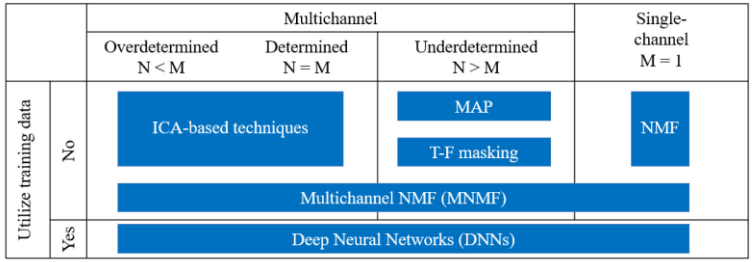
Final Project

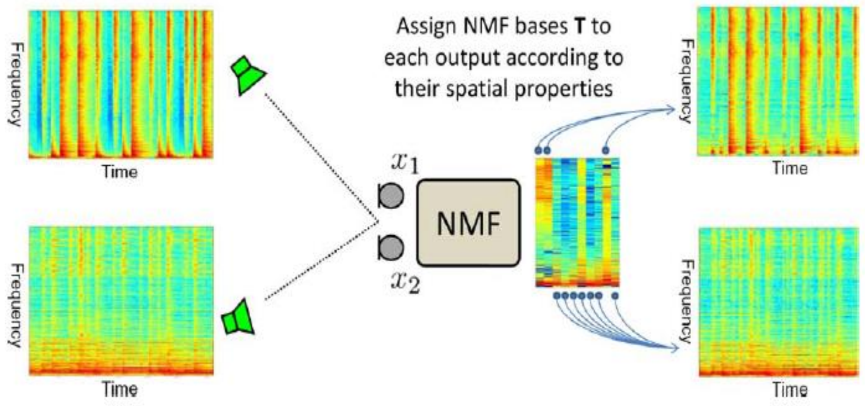
※ Underdetermined Blind Source Separation using Normalized Spatial Covariance Matrix and Multichannel Nonnegative Matrix Factorization



1)

Fig. 1. Formulation of NMF (top) and its application to a music signal (bottom). Frequent sound patterns are identified in matrix $\mathbf{T}$ along with their activation periods and strengths shown in matrix $\mathbf{V}$.

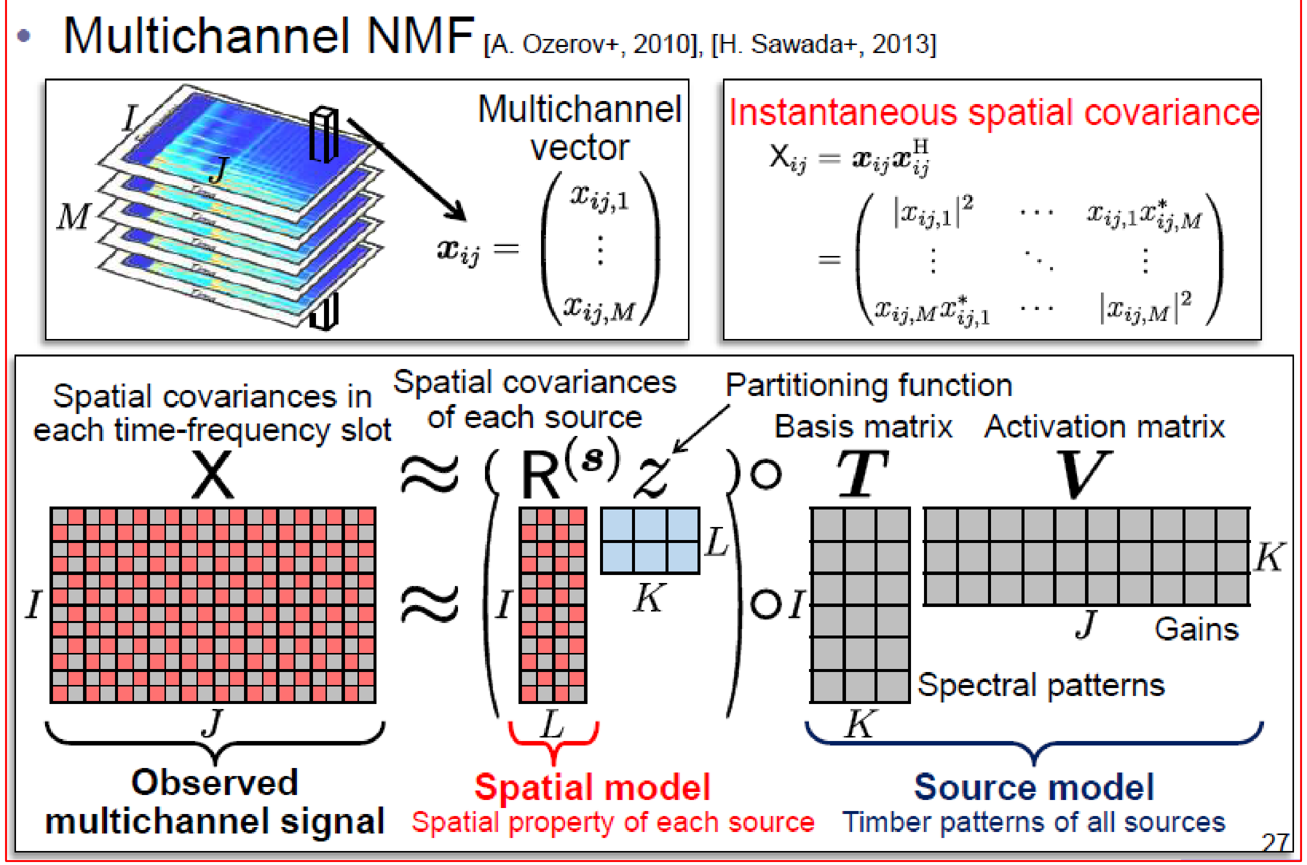




1)

Fig. 2. Multichannel extensions of NMF associate the spatial property with each NMF basis. This enables us to cluster NMF bases according to the source location, and thus perform a source separation task.

2)



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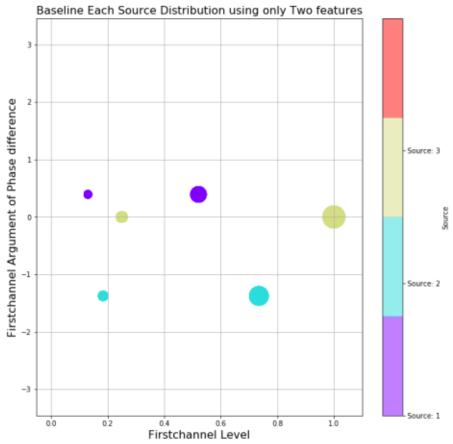
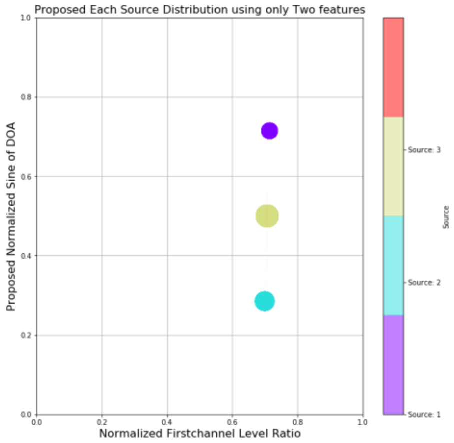
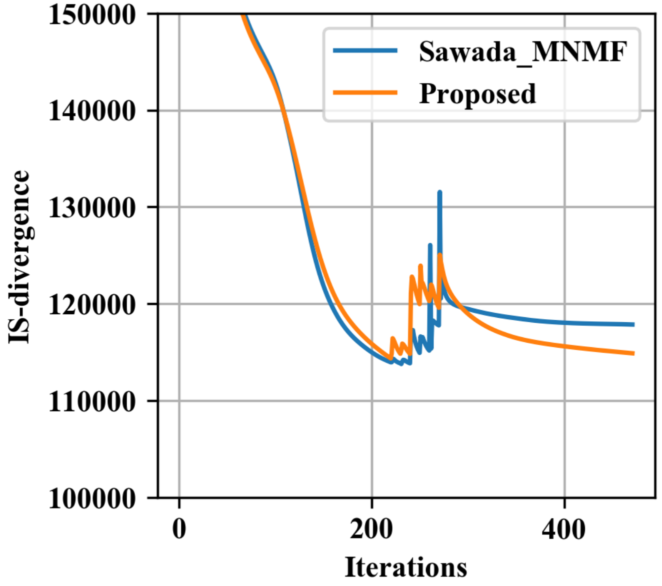
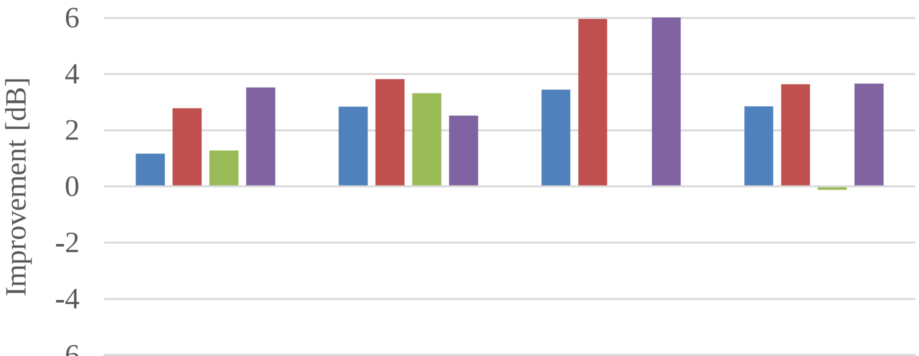
$$X_{ij} = \tilde{\boldsymbol{x}}_{ij}\, \tilde{\boldsymbol{x}}^{H}{}_{ij} = \begin{pmatrix} \left|\tilde{x}_{ij,1}\right|^2 & \tilde{x}_{ij,1}\tilde{x}^*{}_{ij,2} \\ \tilde{x}_{ij,2}\tilde{x}^*{}_{ij,1} & \left|\tilde{x}_{ij,2}\right|^2 \end{pmatrix}$$









	Male	Female	nodrum	wdrum
SDR	1.170228604	2.83994793	3.437905294	2.853895946
ISR	2.785891205	3.813666789	5.962582168	3.634412361
SIR	1.274801204	3.31387163	0.014030228	-0.125796678
SAR	3.527648419	2.523068138	6.159634155	3.655837049