1 Introduction

1.1 Dictionaries and Dictionary Learning

Dictionaries are great! Just look at all the wonderful applications! Destinguish sparse coding and dictionary learning.

1.1.1 Convolutional Dictionaries

Define and explore the merits of convolutional dictionaries for signals with spatially or temporally invariant properties.

1.2 Convolutional Neural Networks

So many successful convolutional neural networks over past decade!

1.3 Multi-Layer Dictionaries

Reference Elad research tying convolutional neural networks to dictionary learning. Mention Zeiler, ect. Define multi-layer dictionary. Describe needs of multi-layer dictionary (specifically the need to be able to handle multi-channel signals).

1.4 Layout of rest of dissertation

Be sure to highlight novel contributions!

2 Learning Dictionaries for Multi-Channel Signals

2.1 Introduction

Explain the problem and its connection to the rest of dissertation. Focus on the CSC problem.

2.2 Dictionary Types

Explain the types of dictionaries for multi-channel signals and explain why I am focusing on multi-channel dictionaries (as opposed to single-channel dictionaries or some of the tensor-based approaches).

2.3 Literature Review

2.3.1 CSC

FISTA, ADMM, Chodosh and Lucey 2020, Wholberg comparisons

2.3.2 Multi-Channel Variants

Why not ADMM? FISTA, Consensus ADMM, tight-frame assumption trick

2.4 My Novel ADMM Variant

Low-rank approximation, problem substitution for stronger constraint (simplifying problem), the normalization trick

2.5 Conclusion

Be sure to mention drawback of fixed rho

3 Learning Multi-Layer Dictionaries

3.1 Introduction

Explain model, where it would be useful, and the corresponding problems to solve.

3.2 Literature Review

Zeiler 2010, Elad nature of neural networks, Carin probabilistic pruning networks, Murdock and Lucey, Chodosh and Lucey, (Might also want to dig into mulit-layer ISTA and LISTA, ect.) I expect some redundancy between this section and some material in the introductory chapter, though this section should go into more depth.

3.3 My Novel Approach

3.4 Conclusion

I'm not sure if this chapter will need a conclusion or not.