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**Introduction Reading Worksheet**

Identifying Moves as a Group

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| Instructions |

1. *Decide on key terms to search for an article in Google Scholar. Pick an article that has a clear Introduction and or background section. (You can use article you already read)*
2. *Verify your paper choice with the professor.*
3. *Insert information from one research article you will read in the* ***Article Information*** *table.*
4. *Using the introduction, background and/or a related sections from one of the research articles you are reading, copy and paste 1~2 example sentences that perform the move described in the* ***Reading Table.***
5. *If the information is not available, put N/A (N/A or not applicable) in the example space. I.e. if “we” or “our” is not used in the introduction you are reading, you can place N/A in that example space in the table.*

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| *Article Information* | |
| Title | Learning to decode linear codes using deep learning |
| Author (s) | Eliya Nachmani; Yair Be'ery; David Burshtein |
| Journal Title | 2016 54th Annual Allerton Conference on Communication, Control, and Computing (Allerton) |
| Year of Publishing | 13 February 2017 |
| Volume/Issue |  |
| Pages | p.6 |
| Keywords / Search Terms | weight, deep learning, belief propagation algorithm |

Copy and paste the abstract right below here:

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| Introduction Reading Table |

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| **Introduction** | |
| Content | Example from your article |
| Importance of this research area | This paper is very important. It is first time, to apply deep learning to the field (channel coding). |
| Reference/citation in a sentence about prior research | Since this paper is the first to apply deep learning, there is no previous paper & research. |
| Showing a research knowledge gap   * Lack of info * Incorrect prior research * Unclear knowledge | The picture of the structure of the neural network is wrong. |
| Purpose or aim of this research | implementation of deep learning techniques for the design of improved decoders  (source sentence : We regard this work as a **first step** in the implementation of deep learning techniques for the design of improved decoders.) |
| Sentence that outlines paper’s sections (e.g. methodology, results, discussion, conclusion) | A novel deep learning method for improving the belief propagation algorithm is proposed. : methodology. |
| Grammar / Tense | Example from your article |
| Use of I / my or We / our | Hence we are required to train the decoder using a huge collection of codewords from the code, and due to the exponential nature of the problem, this is infeasible, e.g., for a BCH(63,45) code we need a dataset of codewords. |
| Present Simple Tense | A well-known family of linear error correcting codes are the low-density parity-check (LDPC) codes [10]. |
| Reason for verb tense use | Because it explains the definition about LDPC. |
|  |  |
| Present Perfect Tense | In recent years deep learning methods have demonstrated significant improvements in various tasks. |
| Reason for verb tense use | because deep learning is still being used in communication research’s field. |
|  |  |
| Past Tense | *Additionally, deep learning combined with reinforcement learning techniques was able to beat human champions in challenging games such as Go [4].* |
| Reason for verb tense use | *Because beating AlphaGo was a long time ago.*  (alpha go vs human’s game(match) was a few years ago. ) |
| Additional features | Example from your article |
| Citation and reference of prior research 1 | Recall that this is a fundamental property of message passing algorithms [16]. |
| Citation and reference of prior research 2 | Note that Hinton [20] recommends to initialize the weights with normal distribution. In Figures 8 and 9 we plot the weights of the last hidden layer. |
| Vocabulary | From your article (erase the examples and put yours here) |
| Adjective/ descriptive phrase #1 | **renowned [famous, widely used]** |
| Source sentence | **The renowned BP decoder [10], [16] can be constructed from the Tanner graph, which is a graphical representation of some parity check matrix that describes the code.** |
| Adjective/ descriptive phrase #2 | **alternative [selective]** |
| Source sentence | **Our alternative representation is a trellis in which the nodes in the hidden layers correspond to edges in the Tanner graph.** |
| Noun #1 | **Motivation [enthusiasm for doing something ]** |
| Source sentence | **The motivation behind the new proposed parameterized decoder is that by setting the weights properly, one can compensate for small cycles in the Tanner graph that represents the code.** |
| Noun #2 | **Implementation [the act of starting to use a plan or system]** |
| Source sentence | **We regard this work as a first step in the implementation of deep learning techniques for the design of improved decoders.** |
| Adverbs #1 | **simultaneously [happening or being done at exactly the same time]** |
| Source sentence | **Another notable property of the neural network decoder is that we learn the channel and the linear code simultaneously.** |
| Adverbs #2 | **Partially [not completely]** |
| Source sentence | **We believe that the BER improvement was achieved by properly weighting the messages, such that the effect of small cycles in the Tanner graph was partially compensated.** |
| Verb #1 | **Emphasize [to show that something is very important or worth giving attention to]** |
| Source sentence | **It should be emphasized that the parity check matrices that we worked with were obtained from [19].** |
| Verb #2 | **Investigate [to examine a crime, problem, statement, etc. carefully, especially to discover the truth]** |
| Source sentence | **Furthermore, we plan to investigate the connection between the parity check matrix and the deep neural network decoding capabilities.** |