Experimental Evaluation of Machine Learning based Wireless Communication Algorithms

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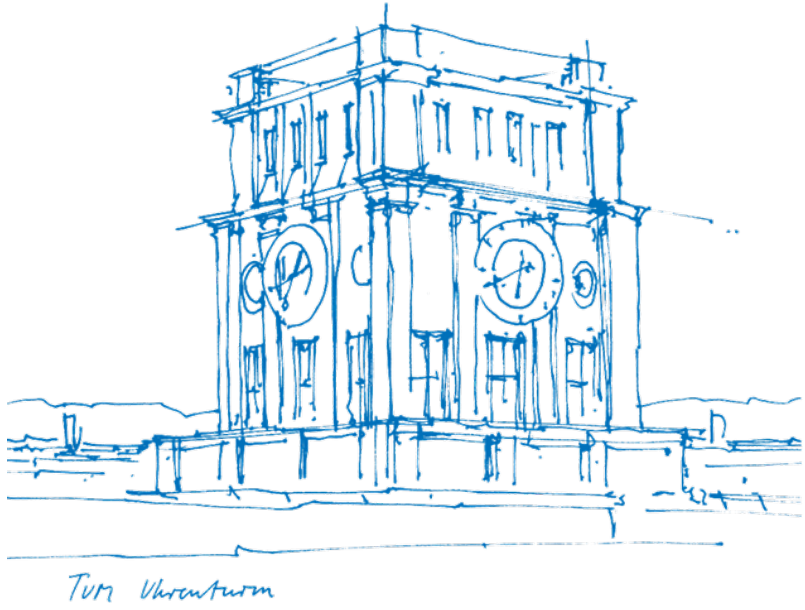

Introduction

- Channel Estimation is vital for any Wireless systems
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- Channel Estimation is vital for any Wireless systems
- Required to revert the channel propogation effects
- For perfect Channel estimation, pilot symbols are to be placed on all sub carriers
- For massive MIMO $\Rightarrow$ No. of Antennas $\propto$ Pilot overhead
- Current reseach for potential solutions include
  - Model based channel estimation
  - Machine learning based algorithms to find the channel

Summary of Thesis

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- Use the data to train a Inverted Neural Network as shown below

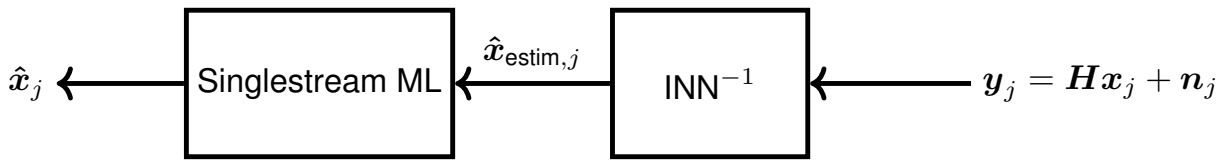

Figure: ML Model for learning the network

Summary of Thesis

- LTE Fundamentals
- Possible Options for a MIMO Setup
- Chosen Experimental Setup
- Results
- Conclusions and future work

LTE Fundamentals

Possible Options for a MIMO Setup

Experimental Setup

Demo

Results

A Slide with a different header

Some text, possibly **bold** or highlighted.

- Bullet points
- Second point
  - Sub-bullet

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Some text, possibly **bold** or highlighted.

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1. First
2. Second
3. Third

Frame with highlight boxes and alternative header

Important Result[1]

The following holds:[2]

$$E = mc^2$$

[1] This is a footnote in a block title.

[2] This is a footnote in a block body.

Frame with highlight boxes and alternative header

Important Result[1]

The following holds:[2]

$$E = mc^2$$

$$\Downarrow$$

Can also be used without a title. Three color types are available: block (blue), alertblock (red), and exampleblock (green). Spacing may need some manual adjustment if formulas are included at the top or bottom of blocks.

[1] This is a footnote in a block title.

[2] This is a footnote in a block body.

- We consider some simple formulas, e.g. $\max(0, 1) = 1$
- Complicated formula: $h_J(y) = \sum_{K \subset N} \int_{\mathbb{R}} g_K(x, y) f_J(x) dx$
- This looks slightly weired since math fonts are smaller than text fonts.

However, this does not really affect equations.

$$h_J(y) = \sum_{K \subset N} \int_{\mathbb{R}} g_K(x, y) f_J(x) dx$$

No title on this frame.[1]

Example Block

Spacing around blocks is minimal (if option frameblock is used). Extra spaces, e.g. `vskip` or `vspace`, should be used.

Text below block.

[1] Smith et al., 2100: “Title of a paper that will be written in the future”, *IEEE Trans Inf. Theory*

TUM Colors

In diagrams and plots only use the following colors:

- Black, White
- Yellow, RGB 255/180/000
- Orange, RGB 255/128/000
- Red, RGB 229/052/024
- Dark Red, RGB 202/033/063
- Blue, RGB 000/153/255
- Light Blue, RGB 065/190/255
- Green, RGB 145/172/107
- Light Green, RGB 181/202/130

Final Slide

Add some vertical space.

Increase spacing between bullet points:

- More information can be found in the beamer user guide
- Use `pdflatex` to compile the source
- Have fun creating your slides!