

# From classical to good quantum LDPC codes.

---

D. Ponnarovsky<sup>1</sup>

Master-Exam-Huji.

Faculty of Computer Science  
Hebrew University of Jerusalem

# Today.

---

- Brif Review of Coding.

# Today.

---

- Brif Review of Coding. Tanner and Expander codes.

# Today.

- Brief Review of Coding. Tanner and Expander codes.
- Quantum Error Correction Codes.

# Today.

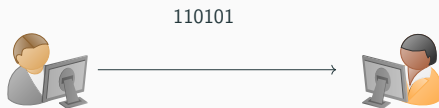
- Brief Review of Coding. Tanner and Expander codes.
- Quantum Error Correction Codes.
- Good Classical Locally Testable Codes and Good Quantum LDPC.

# Classical Vs Quantum Encoding.

Classical:

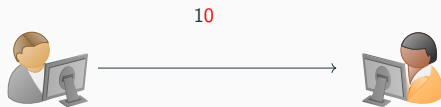


Quantum:



# Classical Vs Quantum Encoding.

Classical:

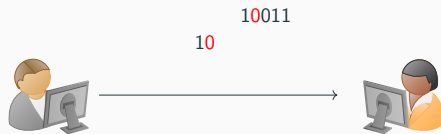


Quantum:

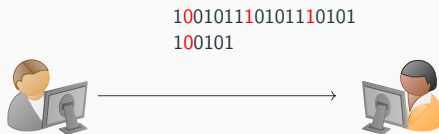


# Classical Vs Quantum Encoding.

Classical:



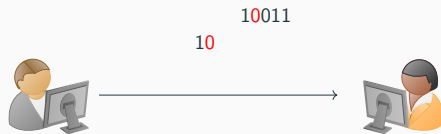
Quantum:



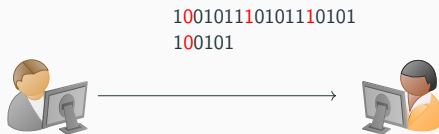


# Classical Vs Quantum Encoding.

Classical:

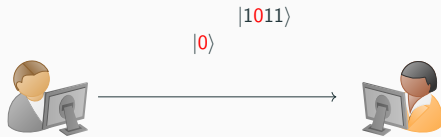


Quantum:

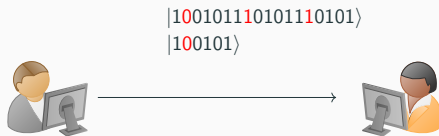


# Classical Vs Quantum Encoding.

Classical:



Quantum:



## Good Classical LDPC Code.

## Good Classical LDPC Code.

## Good Classical LDPC Code.

## Good Classical LDPC Code.









## Idea I - (Uncertainty) Clouds as States.

---



## 'Idea II' - Tanner Checks are 'Too Much' Interdependence.

## 'Idea III' - Impossibility of Both $C_X, C_Z$ being Good.

# Quantum Tanner Code Construction.



## Temporary page!

$\text{\LaTeX}$  was unable to guess the total number of pages correctly. As there was some unprocessed data that should have been added to the final page this extra page has been added to receive it.

If you rerun the document (without altering it) this surplus page will go away, because  $\text{\LaTeX}$  now knows how many pages to expect for this document.