

# 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:



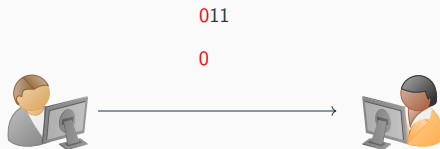
# Classical Vs Quantum Encoding.

Classical:



# Classical Vs Quantum Encoding.

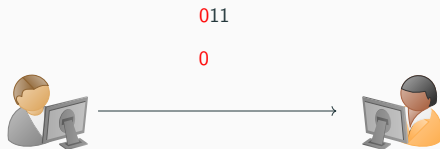
Classical:





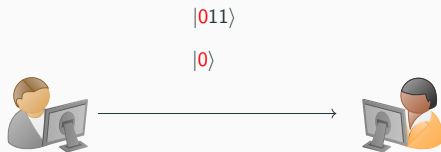
# Classical Vs Quantum Encoding.

Classical:



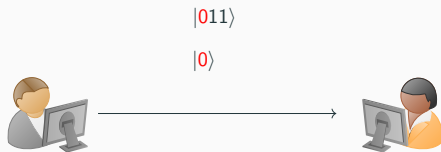
# Classical Vs Quantum Encoding.

Classical:

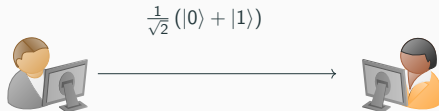


# Classical Vs Quantum Encoding.

Classical:

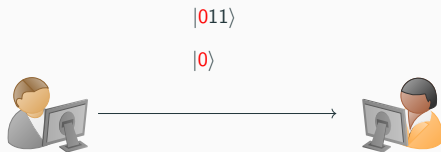


Quantum:

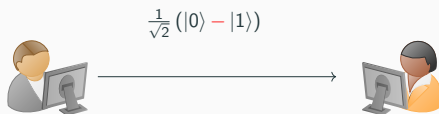


# Classical Vs Quantum Encoding.

Classical:

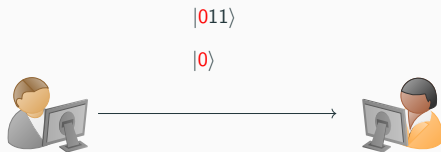


Quantum:

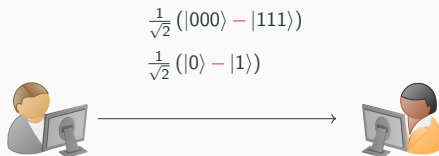


# Classical Vs Quantum Encoding.

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.

