

Speed limits on and shortcuts to reversible computing

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What is the problem:

- All computations suffer from **errors**
- **Non-equilibrium** and **irreversible** "excitations"

What are the tools:

- Classical and quantum **error correcting codes**
- **Shortcuts to adiabaticity** and thermodynamic control

Possible research agenda:

- Characterize and classify errors in reversible computing
- Adapt quantum and thermodynamic control methods

What is the problem:

- “Information is physical” – Landauer’s principle
- Any form of error correction at expense of **additional work**

What are the tools:

- (Stochastic) thermodynamics of information
- Thermodynamic cost(s) of optimal control strategies

Possible research agenda:

- Develop “thermodynamics of reversible classical computing”
- Quantify resources for **complete run** – including error correction

What is the problem:

- Quasistatic and reversible closely related
- Fast processes limited by **fundamental physics**

What are the tools:

- Classical and quantum speed limits
- **Trade-off relations** between QSL and cost in STA

Possible research agenda:

- Elucidate **analogies** of quantum adiabatic & classical reversible
- Adapt CSL and optimal control for reversible computing

Where do we go from here?



Let's have a chat....