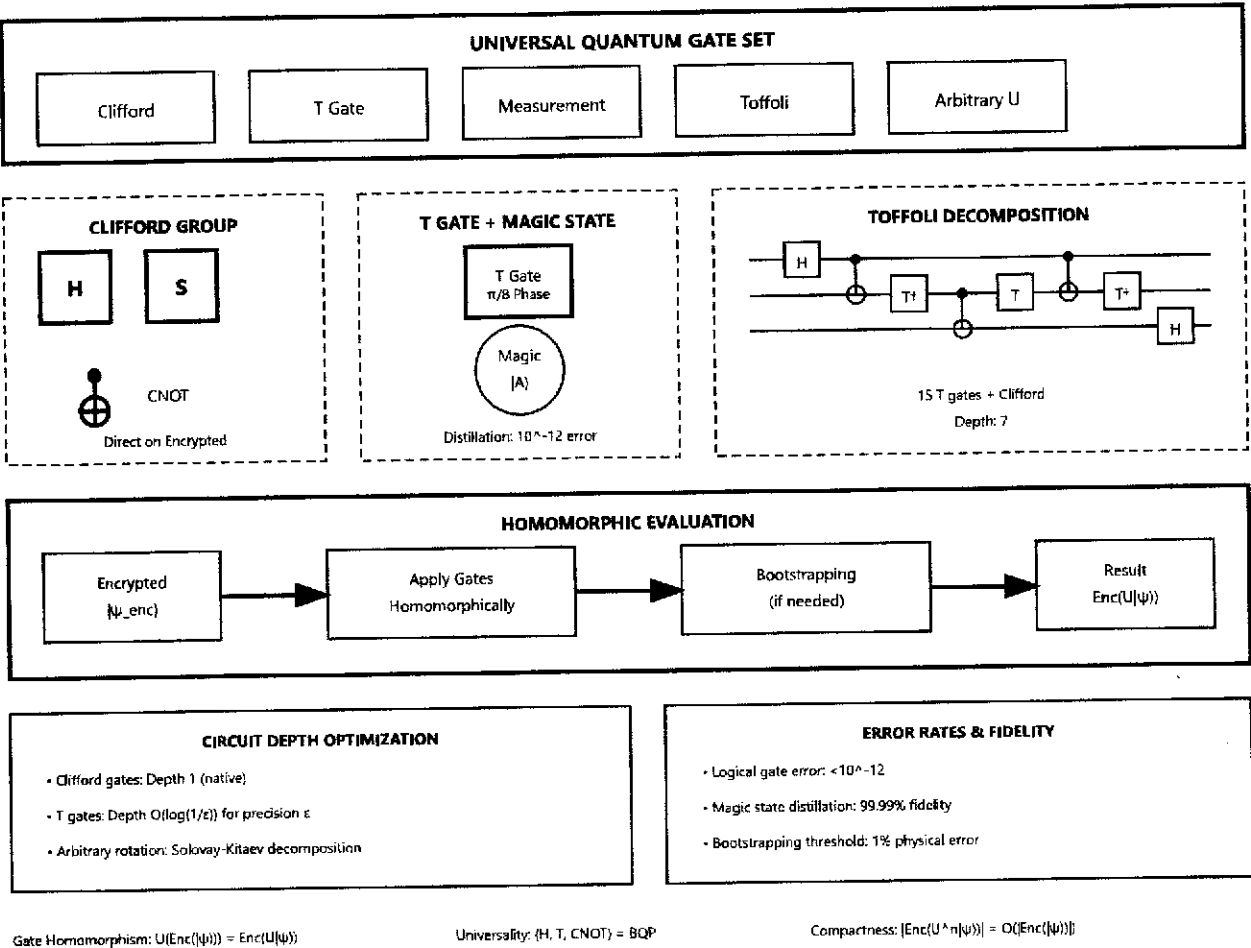


FIGURE 7: QUANTUM HOMOMORPHIC GATE DECOMPOSITION FOR UNIVERSAL COMPUTATION



HOMOMORPHIC EVALUATION

Encrypted
 $|\psi\rangle_{\text{enc}}$

Apply Gates
Homomorphically

Bootstrapping
(if needed)

Result
 $\text{Enc}(U|\psi\rangle)$

CIRCUIT DEPTH OPTIMIZATION

- Clifford gates: Depth 1 (native)
- T gates: Depth $O(\log(1/\epsilon))$ for precision ϵ
- Arbitrary rotation: Solovay-Kitaev decomposition

ERROR RATES & FIDELITY

- Logical gate error: $<10^{-12}$
- Magic state distillation: 99.99% fidelity
- Bootstrapping threshold: 1% physical error

Gate Homomorphism: $U(\text{Enc}(|\psi\rangle)) = \text{Enc}(U|\psi\rangle)$

Universality: $\{H, T, \text{CNOT}\} = \text{BQP}$

Compactness: $|\text{Enc}(U^n|\psi\rangle)| = O(|\text{Enc}(|\psi\rangle)|)$

